THE CORPORATION OF THE CITY OF BRANTFORD PUBLIC WORKS

MOHAWK LAKE CHARACTERIZATION STUDY
OCTOBER 2019

Aquafor Beech Limited

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Executive Summary

With recent government funding support, the City of Brantford initiated the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project which consists of three (3) overall phases including:

1. Characterization Study
2. Functional Master Drainage and Restoration Study with the following three components: Subwatershed Stormwater, Mohawk Park and Canal Master Plan, and Environmental Assessment
3. Design & Construction of the Cleanup and Remedial Work

The objectives for the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project include the following:

- Protect and enhance the environment in a manner which is in harmony with the natural features of the Mohawk Lake watershed;
- Restore and maintain water quality to a level which maintains ecological integrity and permits desired uses including potential recreational activities;
- Protect, maintain and enhance aquatic communities, with particular regard for fish and fish habitat;
- Protect and maintain self-sustaining natural ecosystems and significant natural features;
- Protect and maintain groundwater recharge / discharge areas and baseflow to a level which ensures adequate supply for desired uses;
- Restore Mohawk Lake area through remedial works and land use controls; and
- Minimize soil loss through land management practices and remedial control measures.

The City of Brantford is undertaking a Characterization Study in order to assess the current conditions of the Lake. The Characterization Study draws upon past studies and field investigations to determine the environmental conditions of the Lake and Canal with the intent of defining potential rehabilitation approaches to improve the environmental quality of Mohawk Lake and Mohawk Canal and provide enhanced recreational, fish and wildlife and downstream water quality conditions.

With input from the background review process, work plans for the individual Environmental Assessments to be completed as part of the scope of work were developed. Per the Terms of Reference, the following Environmental Assessment tasks were completed in order to further fill data gaps identified during the background review phase and validate/update existing data from previous studies. The work plan for the Environmental Assessments included the following:

- **Topographic and Bathymetric Surveys** of Mohawk Lake and Canals.
- **Natural Heritage Assessments** including aquatic resources and habitat assessments (Ontario Stream Assessment Protocols (OSAP)), terrestrial assessments (Ecological Land Classifications (ELC)), Species at Risk (SAR) screening and Significant Wildlife Habitat (SWH) assessments
- **Rainfall Monitoring:**
  - Establishing one (1) Meteorological Data Collection for continuous data collection.
- **Stream Flow Monitoring**:
  - Continuous and single discrete measurements at three (3) individual locations
- **Water quality monitoring**:
  - Grab sampling at four (4) location within the Lake and Canals for eight (8) wet and four (4) dry events, analysed for select parameters.
  - Grab samples at ten (10) locations at select outfall and potential pollution contribution sites for three (3) wet and three (3) dry events, analysed for select parameters.

- **Sediment Sampling**
  - Cores taken at twenty (20) locations and samples taken at select intervals.
- **Hydrologic and Hydraulic Modelling**
  - Flow regime and Floodplain characterization.
- **Hydrogeological Monitoring**
  - Ten (10) groundwater monitoring locations distributed around Mohawk Lake and canals including continuous groundwater level monitoring.
  - One (1) water quality for water quality.
- **Geomorphological Assessments**
  - Geomorphic field assessments and identification of geomorphic conditions and geomorphic hazards for Mohawk Lake, canals and surrounding tributaries.

A summary of the key findings from the field investigations and modelling are summarized below:

Cultural Heritage

The Waterfront Master and District Plan identifies areas with archaeological potential within the City of Brantford upstream of Mohawk Lake including Downtown Brantford, Mohawk Parks, Land and Canal, Hydro Generation Station Ruins, and various locations within the study area with archaeological potential.

Through consultation with ASI, it was confirmed that a Stage 1 Archaeological Assessment will be required as part of the future EA and subwatershed process completed as part of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project.

Soil and Geotechnical

Ten (10) boreholes with monitoring wells were advanced on August 7, 8 and September 4, 2018. Three (3) of these boreholes are nested wells. The soil sub-strata encountered during borehole advancement was logged during drilling and representative soil samples were collected for textural classification.

In general, beneath the existing layer of topsoil or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits. The sub-soils encountered indicate that the subsurface conditions in the area are complex due to the Quaternary glacial processes and the depositional environment that were created from the Grand River.

Hydrogeology/Groundwater

Boreholes with monitoring wells were strategically placed to enable interpretation of a hydrogeostratigraphic profile across the lake area, and to determine background groundwater elevations, groundwater flow pattern, and to characterize the background groundwater quality in the vicinity of the lake. Ten (10) monitoring wells were established at seven (7) locations at depths of 5-6.5m.

Water quality samples were undertaken once from each of these boreholes to verify groundwater water quality conditions. Out of the 8 monitoring wells that were sampled only 5 showed exceedances:

- BH-1D had one slight exceedance of Zinc
- BH-2 had three exceedances of PAHs (Methylnaphthalenes and Phenanthrene) and F2 hydrocarbons
- BH-6 had exceedances in Chloride, Barium, F2 and F3 hydrocarbons, and Phenanthrene
- BH-7S had exceedances in Barium, F3 hydrocarbons and in seven different PAHs (Anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Phenanthrene, Pyrene)
- BH-7D had exceedances in Barium and Phenanthrene

The groundwater levels recorded at the monitoring wells showed variable levels of fluctuation over the 1-year monitoring period. The peaks for each well came in the early spring months and water levels gradually decreased to a minimum in the summer. The groundwater levels indicated that the shallow groundwater flows in southernly directions from an interpreted high groundwater area located north of Mohawk Lake. On the south side of Mohawk Lake, the shallow groundwater continued to flow in a southernly direction, likely toward the Grand River. This is consistent with the groundwater flow trends that Terraqua observed during their study in 1990. Given the relatively high permeabilities of the sub-soils surrounding Mohawk Lake, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities and groundwater recharge to Mohawk Lake from the deeper aquifer system is likely. Groundwater temperatures in the monitoring wells ranged from 6.82°C to 13.86°C.

The results and discussion are based on the draft Hydrogeological Report provided by SEL. The final report will be published under a separate cover and include a more broad discussion of the groundwater characteristics surrounding Mohawk Lake and provide further comparative assessments with previously completed studies.

Flow Monitoring

Flow monitoring completed at three (3) locations provided the following results:

The outlet structure of Mohawk Lake at station FM-1 is constantly flowing. During rainfall events there was no significant increase in water depth within the channel. However, the velocity and corresponding discrete flow measurements recorded in the channel were variable ranging from 0.2498m^3/s to 0.6458m^3/s during rainfall events. Based on the rating curve and continuous data collected at FM-1, the estimated cumulative volume discharged from the Mohawk Lake weir structure and into the Grand River over a 10-month period from August 15th, 2018 to June 18th, 2019, was estimated at 3,477,045m^3.

Continuous flow and corresponding volume estimates for FM-3/2, and FM-4 were determined using the Infoworks model. The volume of water that entered the Lake and Canals from numerous outfall locations was summed to determine an estimate of the total volume of water input into the system from August 15th, 2018 to June 18th, 2019. Based on the hydrographs produced for each of these outfalls, the estimated total volume input from August 2018-June 2019 (10 months) was 2,549,000m^3.

10-month monitoring period, estimates demonstrate that more water leaves (29%) the system through the Mohawk Lake outlet structure than enters the system through the existing stormsewer network. Previous studies (Gore and Storrie 1995) estimated groundwater inputs account for 18% of the flows which discharge from the system. Results of the 2018/2019 monitoring support previous findings which suggest that the Mohawk Lake and canals are subject to significant groundwater inputs from the surrounding areas and aquifers.

Hydrologic Modelling

Flow within the storm sewer network and Lake and canal system for the 2yr through Regional storm events were developed. Minor system was modelled to show the state of surcharge under the 2-year, 5-year and 10-year design events. Flows were incorporated into the Hydraulic model.

Several recommendations have been provided for the EA study:

1. A major system model should be incorporated to route flows according to the urban sewershed rather than based on topology; this will require re-delineation of the storm sewer subcatchment areas to reflect urban drainage patterns (i.e. curb and gutter). Catch basin type should be confirmed for each street and incorporated into the model accounting for slope, grate type and lead size;

2. LiDAR data is recommended to refine the ground model and to generate the overland flow paths. This can be done in the 1D InfoWorks model with the surface elevations at each node inferred directly from the LiDAR ground model.

Hydraulic Modelling

A GeoHECRAS model was developed as part of the study and peak flows for the 2,5,10,100 year and regional storm (Hurricane Hazel) were assessed.

The completed topographic survey included cross-sections every 20-40m of the Lake and Canals extending into the floodplain. 20m cross-sections were generally followed; however, given that the main purpose of the topographic survey was to characterize the local grading of the Lake and canal system for the purpose of floodplain mapping and GeoHECRAS model development, cross-sections were reallocated to crossing locations in order to obtain more detail of the local topography around the crossing structures.

A hydraulic model was developed to understand the potential flooding impact of Mohawk Lake and Canals within the Mohawk Lake subwatershed. Floodlines were created for the regional storm Hurricane Hazel.

- The flood limits remain in the canal corridor, with the majority of the flooding occurring to the south of Mohawk Lake.
- Six (6) buildings and the entire Brantford Wastewater Treatment Plant are within the Regional (Hurricane Hazel) flood limits.
- Under the Regional flood conditions two (2) roads (Mohawk Street and Greenwich Street) are overtopped.
- It is noted that no culvert or bridge overtopped under Regional flood conditions.

Geomorphological Assessment

Geomorphological and erosion assessments were completed as part of the study. A number of erosion sites, long-term erosion hazards, and environmental stream restoration opportunities have been identified and characterized. They are as follows:

1. **Erosion Site #2** on Tributary 1 (Reach T1d) upstream of Glenwood Drive is **high priority** from a risk management perspective. *Immediate steps should be taken to mitigate this risk.*

2. **Erosion Sites #1 and #3** (reaches SC-1 and OF-1) were assigned lower field scores for erosion risks, but they have some environmental restoration and sediment mitigation opportunities. These sites should be considered for future restoration and erosion mitigation as part of the overall revitalization plan for Mohawk Lake.

3. **Tributary 1** generally has local erosion issues with the deterioration of previous roundstone and armourstone engineering works. This watercourse should be monitored for further deterioration of the existing erosion control measures, and a geotechnical risk assessment is recommended for one location in Reach T1c

4. **Mohawk Lake and Canal** were visually assessed for evidence of existing bank instability, including locally undercut banks along the shorelines. The canal and lake embankments were generally considered geomorphologically stable, but detailed geotechnical assessments should be

considered to confirm risks where local evidence of bank instability (and shoreline undercuts) has been identified.

As part of the sediment quality investigations completed for Mohawk Lake, one (1) core was submitted for lead-210 and radiocarbon dating. The results of this testing are summarized below:

- Top 30 centimetres of sediment (~20 cm core depth) deposited in the last 55 years;
- Top 40 – 50 centimetres of sediments (~30 cm core depth) deposited in the last 90 years;
- Pb-210 sedimentation rate is in the range of 0.3 to 0.5 cm/yr (0.1 - 0.2 g cm-2 yr-1);
- Radiocarbon (14C) sedimentation rate is about 0.65 cm/yr for the last ~300 years; and
- Recommended average sedimentation rate is about 0.5 ± 0.1 cm/yr (~0.2 g cm-2 yr-1).

The results of the Lead 210 testing indicate that the top 50 cm of sediment currently in Mohawk Lake has been deposited in the last 90 years, and of that 50 cm 60% of the deposits have occurred in the last 55 years. Based on the age model completed as part of the Lead 210 testing analysis, the sediment accumulation rate follows a linear regression. While the inlet connection to the Grand River was closed in 1983, the sediment accumulation continued on a linear trend indicating that the main source of sediment to the system consists of that produced by erosion and stormwater runoff. Using the recommended average sedimentation rate of 0.5 ± 0.1 cm/year, in the next 40 years an additional 20cm of sediment is estimated to accumulate in Mohawk Lake and the Canals.

The key study question introduced for the geomorphological assessment was: *what are the effective strategies to manage and reduce future sediment loadings to the canal and lake?* Based on the results of the geomorphological assessment, the potential strategies to address this question have been evaluated and prioritized to help guide future phases of the Mohawk Lake revitalization project.

The following recommendations are submitted based on the results of the geomorphological assessment of Mohawk Lake in the City of Brantford:

- Identification and mitigation sediment sources from the urban drainage network that may currently be the primary source of sediment loading the lake, and thus is a critical issue to reduce future sediment supply.
- A suspended sediment monitoring program is an essential undertaking to understand the sources and timing of current sediment loading to the lake.
- Erosion Site #2 is recommended for immediate attention by City staff to mitigation the documented erosion risks. Erosion Sites #1 and #3 may be considered for future works associated the overall Mohawk Lake revitalization project.
- To augment and support the recommended erosion mitigation works and erosion hazard assessments a number of detailed geotechnical investigations should be considered.
    - For detailed engineering design to mitigate risk at Erosion Site #2, Reach T1d.
    - For risk assessment of local geotechnical hillslope hazards in Reach T1c
    - For stability of embankments along the canal, especially where local slope erosion and undercut banks have been identified.

Sediment Assessments

Sediment assessment for quantity and quality were completed of the study.

Sediment Quantity

A bathymetric survey and sediment profiling was completed as part of the current Characterization study to update the surveys completed previously and confirm existing sediment quantities and sediment distribution.

The results of the analysis are as follows:

- Approximately 185,000m^3 of unconsolidated sediment has accumulated within Mohawk Lake and canals:
  - Unconsolidated sediment accumulation within the canals was estimated at 30,000m^3.
  - Unconsolidated sediment accumulation within Mohawk Lake was estimated at 155,000m^3.
- Sediment thickness within the canals ranged from 0 - 1.5m whereas sediment thickness within Mohawk Lake ranged from 0 - 2.4m.
- Water depth within the canals ranged from 0 – 1.0m whereas water depths within Mohawk Lake ranged from 0 – 2.5m.

The 2018 estimate of volume of unconsolidated sediment aligns closer with the 1972 reported volume; however, the 2018 results for general Lake bathymetry, water depth, distribution of sediment, sediment thickness and mapping of the unconsolidated sediment/original (dredged) lake bottom are comparable to the 1994 assessment.

Sediment Quality

Surficial sediment and sediment core samples collected at twenty (20) locations within Mohawk Lake and Canal was completed. Site selection was based on the results of the bathymetric survey completed for the lake and canals. In summary, twelve (12) sampling locations were established within Mohawk Lake; four (4) sampling locations within Mohawk West Canal; and, two (2) locations within Mohawk East Canal. An additional two sampling locations have been included for quality assurance/quality control (QA/QC) purposes from within the Mohawk Lake.

Two (2) different sample collection methods were used to collect the required sediment samples in Mohawk Lake and Canal. The surficial samples (0-10cm) were collected via Petite Ponar; whereas the deeper sediments 10 cm to a maximum depth of 1.5 m were collected via core sampling via Pollutech's hammer core technique.

At each location, three (3) distinct samples were collected/formed (i.e., one (1) surficial sample and two (2) samples representing two (2) distinct depth intervals) for a grand total of 60 individual samples.

Upon the completion of the core sample collection and processing, all core samples were submitted for bulk chemical analyses. Bulk analysis results show that current sediment quality for Mohawk Lake is generally consistent with previously completed sediment quality investigations. Based on the results of the Ontario Reg. 347 Leachate Extraction Tests, none of the samples exceeded the leachate quality criteria therefore the sediment was determined to be non-hazardous.

Natural Heritage

The natural heritage of the study area was characterized through an extensive field program that included both aquatic and terrestrial field studies.

Fish Surveys

Over five days total between September 9 and September 21, 2018, the nets were set and processed for a total of four times at various locations throughout the lake and canals. In general, fish community results are similar to those observed in background data. Overall, 353 total fish and eight different species were captured and released. Common Carp (*Cyprinus carpio*) were also observed in abundance however none were captured during the surveys.

No at-risk fish species, as listed under the federal *Species at Risk Act* (SARA) or the Ontario *Endangered Species Act* (ESA), were identified during the surveys.

Benthic Surveys

Sampling was not conducted within the profundal zone as bathymetric surveys confirmed the presence of high quantities of organic mud/silt and %DO profiling confirmed very low dissolved oxygen levels. This supports background findings and suggests that only midge larvae and worms are present in the profundal zone.

Overall, 341 total organisms and 18 different taxa were sampled within the study site. Results are comparable with background results.

Aquatic Habitat

Aquatic Habitat surveys were completed for west east canal and Mohawk Lake. Overall, results from the aquatic ecology surveys support background documentation.

Vegetation Communities

Vegetation communities were assessed in accordance with the *Ecological Land Classification Protocol for Southern Ontario* (Lee, et al., 1998) on lands within the study area to which permission to enter was granted.

The field work completed within the study area in 2018 identified 26 ELC polygons comprised of 23 vegetation community types. Five (5) of the ELC polygons represent complex communities (i.e., patterns of two or more ecosites or vegetation types forming a mosaic that cannot be mapped at the level of resolution being employed).

Prairie habitats, which are rare in Ontario and have potential to occur in the broader landscape, were specifically searched for during the field surveys undertaken in 2018; no prairie habitats were identified within the study area.

Wetlands

A review of the species list within the wetland evaluation (Ross, 2000) revealed records of species that were not listed as SAR at the time of the evaluation but have since been uplisted. **Should the Mohawk Lake and Oxbow Wetlands evaluation be updated to include recent SAR records, the results of the evaluation would change the status of the wetland complex making it a Provincially Significant Wetland (PSW).** This change in wetland status has implications from a planning policy perspective. For the purpose

of fulfilling future project phase, it is recommended that existing wetland evaluations be updated according to the Ontario Wetland Evaluation, Southern Manual (MNRF, 2014).

Flora

A botanical inventory was conducted in concert with vegetation community surveys to create an inventory of vascular plant species within the study area and to assess whether significant flora was present.No SAR were found during the botanical inventory. Three provincially significant species (S1-S3) were identified:

- Ohio buckeye (*Aesculus glabra*) (S1);
- Tall boneset (*Eupatorium altissimum*) (S1); and
- Pignut hickory (*Carya glabra*) (S3).

Three species considered to be locally rare in Brant County (Oldham, 2017) were also recorded during the field surveys in 2018:

- Carpenter's square (*Scrophularia marilandica*) (locally rare) was identified in Community 3, along the north edge of Mohawk Lake where a steep forested slope abuts the shoreline.
- Columbia watermeal (*Wolffia columbiana*) (locally rare) was identified in Community 21, a small ponded area within Community 20.
- Pale-leaved wood sunflower (*Helianthus strumosus*) was identified in Community 10, where a small patch (~20 stems) was found along the edge of Commmunity 2.

Birds

Breeding bird surveys were completed by Terrastory Environmental Consulting Inc. ("Terrastory") in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al., 2001). A total of sixty-two (62) bird species were recorded during the breeding bird surveys; four (4) of which are Species-at-Risk and one (1) is considered provincially rare.

Records obtained from ebird.org (2017), an online database of public observations, lists sixty-two (62) species previously observed at Mohawk Lake, thirty-one (31) of which were not captured during the breeding bird surveys described above. Of these 31, three are considered to be of Special Concern in Ontario, and one (1) is considered provincially rare.

Mammals

Several common mammal species were observed incidentally during field surveys in 2018.

Herpetofauna

Amphibian call surveys were conducted near wetlands within the study area to determine the presence and significance of breeding anuran habitat within the study area. Surveys followed the standard protocol set out by the Marsh Monitoring Program (Bird Studies Canada, 2009). Aquafor Beech Limited staff completed three (3) surveys at each of the six (6) survey stations. In total, five (5) species were detected during surveys.

Species at Risk

Aquafor Beech Limited consulted a number of primary and secondary information sources to assess the presence of SAR and other Species of Conservation Concern (SOCC) within the study area.

A total of seven (7) SAR and three (3) SOCC have been confirmed to be present within the study area.

An additional fifteen (15) SAR and SOCC were considered to have the potential to occur within the study area based on habitat suitability and/or past occurrence records in the vicinity. None of the listed species were observed in the study area during field investigations for the current study, potentially due to factors such as: the timing of field surveys; elusive behavior; or general difficulty in detection.

Significant Wildlife Habitat

Confirmed SWH include:

- Rare Vegetation Communities; Bald Eagle and Osprey Nesting, Foraging and Perching Habitat; Amphibian Breeding Habitat (Wetlands); Specialized Habitat for Wildlife: Special Concern and Rare Wildlife Species

Potential SWH which may require individual studies include:

- Raptor Wintering Area; Bat Maternity Colonies; Turtle Wintering Areas & Turtle Nesting Areas; Reptile Hibernaculum; Shrub/Early Successional Bird Breeding Habitat

Water Quality

In order to determine the level of exceedance of a pollutant, standards issued from the following agencies were implemented:

- PWQO: Provincial Water Quality Objectives
  - Phosphorus, E. Coli, Total Coliforms, Co, Cu, Fe, Ag, Zn, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene
- CCME: Canadian Council of Ministers of the Environment
  - TSS, Nitrate
- CWQG: Canadian Water Quality Guidelines
  - Al, Mn, Benzo(a)anthracene, Benzo(a)pyrene, Fluoranthene, Pyrene
- PWQMN: The Provincial (Stream) Water Quality Monitoring Network

Guideline exceedances for the same parameters was observed at all four monitoring stations for various events collected throughout the monitoring program. Generally, water quality within the canal and Lake improved from west to east.

When comparing the results to previous studies most of the parameters observed had similar concentrations with the exception of Phosphorus, Iron, Manganese and Zinc. These parameters were observed to have slightly greater concentrations currently in the lake and canals compared to those recorded previously.

Concentration of parameters observed at the PWQMN station upstream of Mohawk Lake either met or slightly exceeded the respective PWQO guidelines whereas Mohawk Lake results for similar parameters exceed the PWQO guidelines. These results are expected as the water quality at Mohawk Lake closer resembles that of a Stormwater Pond, rather than a large, quickly moving natural system such as the Grand River, due to the fact that the majority of Mohawk's inputs come from urban runoff.

During the completion of the water quality monitoring program, observable indications of poor water quality, especially from an aesthetic perspective, was the great deal of trash and debris observed in the west canal. Items such as grocery carts, metal garbage bins and barrels, and computer monitors were seen through the canal and the deterioration of these materials could also be a contributing factor to the poorer water quality observed in the west canal.

Pollution Monitoring

Three rounds of pollution monitoring were completed within the study area to identify pollution hotspots. After three rounds of sampling (one dry weather event and one wet weather event per round) potential pollution "hotspots" were mapped in the upstream catchment.

Recommendations identified during the pollution monitoring include:

- Investigation into possible stormsewer and sanitary sewer cross connections
- Continued pollution monitoring to further isolate the pollution hotspots in the study area and poor performing sewersheds.

Challenges

During the development of the work plans and completion of the Environmental Assessments several challenges were encountered which impacted the Study results in terms of the overall schedule and data quality/availability. The challenges encountered during the completion of the Characterization Study included:

- Property Access
- Weather
- Catchment Hydrologic Response and Canal/Lake Flow Regime
- Vandalism/Theft
- Utility Locates

Conclusions

Overall the results of the study were found to be consistent with background reports. The water quality observations within the Mohawk Lake and canal system are typical of a waterbody within urban environment. When examining the water and sediment quality of Mohawk Lake and its canals over the past 25 years, there does not appear to be a significant change. With the exception of lead and copper, the majority of tested sediment contaminants were within the lowest effect level on aquatic life.

The most consistent contaminant found throughout the entire Mohawk Lake system was PAHs. While PAH exceedances were found in water quality, groundwater quality, pollution monitoring, and sediment quality monitoring, the PAH results presented for Mohawk Lake do not present any reason for undue concern with respect to aquatic life.

Sediment volumes determined as part of this study were comparable to previous studies, with a lower sedimentation rate than reported by previous studies indicating a general equilibrium of the system. While there are short term and long term benefits associated with dredging the Mohawk Lake and Canal system, they are difficult to quantify; consideration in the context of the characterization report and overall cost should be considered, as there is no evidence of the need for environmental dredging to alleviate toxic conditions. Dredging as a means of improving Mohawk Lake may be completed in strategic locations in association with other measures (i.e. end-of-pipe controls, OGS units, LIDs, etc.) implemented to control the suspected sediment inputs originating from erosion sites and stormwater runoff.

Results from this Characterization Report should be incorporated into subsequent stages to inform on the existing conditions of Mohawk Lake and Canals and have provide insight of the additional studies which should be completed to further characterize Mohawk Lake and support future project phases. Recommendations regarding each aspect of the characterization have been included in subsections throughout the report.

1 Introduction

Mohawk Lake is an approximately 13 hectare open water body located in south-west Brantford, just north of the Greenwich St. and associated industrial lands. Mohawk Lake was constructed in the early 1800s as part of a canal system to provide access for barges travelling through Brantford and acted as a turn around feature for said river barges. In the early 1900s, the lake and the surrounding parkland provided the community with a large recreational area within the City boundary. However, years of stormwater drainage and industrial discharges have resulted in the deterioration of the lake. (Source: Gore & Storrie, 1995).

Since the mid-1900's, the City of Brantford has undertaken several investigations in order to gauge the health of the Lake and develop plans to revitalize the Lake and surrounding park areas; however, a lack of available funding sources limited progress and implementation.

With recent government funding support, the City of Brantford initiated the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project which consists of three (3) overall phases including:

1. Characterization Study;
2. Functional Master Drainage and Restoration Study with the following three components: Subwatershed Stormwater, Mohawk Park and Canal Master Plan, and Environmental Assessment; and,
3. Design & Construction of the Cleanup and Remedial Work

The objectives for the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project include the following:

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- Restore Mohawk Lake area through remedial works and land use controls; and
- Minimize soil loss through land management practices and remedial control measures.

The following Characterization Report fulfills Phase 1 of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project and is intended to assess the current conditions of the Lake and canal system. The Characterization Study draws upon past studies and field investigations to determine the environmental conditions of the Lake and canals. The Characterization Study is considered the first steps in defining potential rehabilitation approaches to improve the environmental quality of Mohawk Lake and Mohawk Canals and provide enhanced recreational, fish and wildlife and downstream water quality conditions with its results guiding subsequent Project phases.

2 Study Purpose and Work Plan

The primary purpose of the Phase 1 Characterization Study was to develop an understanding of the form, function, and current conditions within the Mohawk Lake subwatershed based on available background information collected and supporting environmental assessments completed. The results of the environmental assessments completed as part of the Phase 1 Characterization Study intended to verify and/or update results of previously completed assessments/studies and identify potential trends which will provide guidance for future phases of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project.

To fulfill the project purpose, the study team completed a variety of background reviews and environmental assessments. The background review process was completed in two (2) stages and delivered to the City as two (2) individual interim reports. The following provides details of the interim reports including their purpose and function in developing the work plans for the Environment Assessments completed as part of the study:

1. **Interim Report #1**:
   Summarized the background information provided at the onset of the project and identified data gaps. Following the completion of Interim Report #1, information requests were distributed to the City, relevant Agencies and other sources and further research was conducted to fulfill data gaps to the greatest extent possible. The results of the first Interim Report guided the initial development of the work plans for the Environmental Assessments.

2. **Interim Report #2**:
   Summarized the background information provided following the completion of the first Interim Report. The results of the second Interim Report refined the initial development of the work plans for the Environmental Assessments.

With input from the background review process, work plans for the individual Environmental Assessments to be completed as part of the scope of work were developed. Per the Terms of Reference, the following Environmental Assessments tasks were completed in order to further fill data gaps identified during the background review phase and validate/update existing data from previous studies. The work plan for the Environmental Assessments included the following:

- **Topographic and Bathymetric Surveys** of Mohawk Lake and Canals.
- **Natural Heritage Assessments** including aquatic resources and habitat assessments (Ontario Stream Assessment Protocols (OSAP)), terrestrial assessments (Ecological Land Classifications (ELC)), species at risk screening and significant wildlife habitat assessments
- **Rainfall Monitoring:**
  - Establishing one (1) Meteorological Data Collection for continuous data collection.
- **Stream Flow Monitoring**:
  - Continuous and single discrete measurements at three (3) individual locations.
- **Water quality monitoring**:
  - General Program: Grab sampling at four (4) locations within the Lake and Canals for four (4) wet and two 2 (dry) events and analysed for select parameters.
  - Pollution Prevention Program: Grab samples at ten (10) locations at select outfall and potential pollution contribution sites for three (3) wet and three (3) dry events and analysed for select parameters.
- **Sediment Sampling**
  - Cores taken at twenty (20) locations and samples take at select intervals.

- **Hydrologic and Hydraulic Modelling**
  - Flow regime and Floodplain characterization
- **Hydrogeological Monitoring**
  - Ten (10) groundwater monitoring wells distributed around Mohawk Lake and canals including continuous groundwater level monitoring for a period of one (1) year.
  - One (1) water quality taken at each groundwater monitoring location and analysed for select parameters.
- **Geomorphological Assessments**
  - Geomorphic field assessments and identification of geomorphic conditions and geomorphic hazards for Mohawk Lake, canals and surrounding tributaries.

The completion of the work plan occurred in 2018 with a draft Characterization Report delivered in October 2018. Provisional monitoring was completed for an 8-month period following the completion of the draft Characterization Report from October 2018 to June 2019. This provisional monitoring was limited to the following:

- **Rainfall Monitoring:**
  - Continuous rainfall data was collected from October 2018 to December 2018 and April 2019 to June 2019. The station was shutdown during winter season.
- **Stream Flow Monitoring**:
  - Continuous water level data was collected from October 2018 to June 2019 at three (3) individual locations.
- **Water quality monitoring**:
  - General Program was repeated during Fall 2018 to Spring/Summer 2019. Sampling at four (4) locations within the Lake and Canals for four (4) wet and two 2 (dry) events and analysed for select parameters was completed.

The data collected during the provisional 8-month period was incorporated into the results and discussion of the following Final Characterization Report.

3 Report Structure

To ensure consistency with the previously submitted Interim Reports, the Characterization Report has been structured into the following sections:

- Background Information Reviewed
- Site History
- Redevelopment and Revitalization
- Cultural Heritage
- Soil and Geotechnical
- Hydrogeology/Groundwater
- Drainage System and Stormwater Management
- Hydrology
- Hydraulics
- Geomorphological Assessment
- Natural Heritage
- Sediment Assessments
- Pollution Monitoring
- Water Quality
- GIS Data

Within each report section, the following information has been provided:

1. **Background Review:** consolidates the information collected and summarized as part of Interim Reports #1 and #2 submitted to the City in February 2018 and June 2018, respectively.
2. **Field Study Scope and Methodology:** provides an overview the work plans and methodologies followed as part of the environmental assessments completed.
3. **Results and Discussions:** summarizes the results of the environmental assessments completed, provides discussions of the findings and comparisons with background information and/or historical trends/observations
4. **Recommendations:** provides and any applicable recommendations to be considered as part of future Project phases.

4 Background Information Reviewed

Table 4.1 summarizes the background information and resources collected at various project phases and reviewed as part of the preparation of the Characterization Report and previously completed Interim Reports. The background information summarized within the interim reports has been incorporated into the following report to provide a single comprehensive Characterization Report for Mohawk Lake.

Table 4.1: List of Available Background Information Reviewed to Date

No.	REPORT	DATE	NOTES
1	**Mohawk Lake Study, Brantford Ontario** By: M.M. Dillon Limited For: Grand River Conservation Authority	Aug. 1972	Related reports: Biological Survey of Mohawk Lake (1972); a Report on Investigations Re: Canada, City of Brantford (1950)
2	**Biological Survey 1972** By: Al Sandilands, Biologist, Forestry & Wildlife Brant, GRCA For: GRCA	1972	Informs Mohawk Lake Study
3	**Mohawk Lake Landuse Planning Study** By: Mark Peterson, Graduate Student, School of Landscape Architecture, University of Guelph For: Mohawk Lake Steering Sub-Committee of the Waterfront Advisory Committee, City of Brantford; and Six Nations	Aug. 1987	In 1986, the Waterfront Advisory Committee recommended a land use planning study for Mohawk Lake
4	**Mohawk Lake (Brantford) Sediment and Water Quality Investigation** By: Ecological Services for Planning For: Mohawk Lake Committee, City of Brantford	May 1994	-water and sediment quality study -lake sediments are deemed non-hazardous based on results of Ontario Reg. 347 -removal of sediments is recommended to realize the waterbody's beneficial uses
5	**Mohawk Lake Restoration and Park Development Project Master Plan Brief (Odd Pages Only)** By: Gore & Storrie Limited (G&S) For: City of Brantford	June 1995	-this 15pg document used to prepare a rehabilitation plan for Mohawk Lake and area. Informed by 5 detailed technical studies on: -Ecological features -Stormwater Management -Potential Contaminant Sources: Abandoned Landfills -Shallow Creek Park -Sediment Management

6	**Mohawk Lake Rehabilitation Project Ecological Features of Mohawk Lake -Draft** By: Gore & Storrie Limited (G&S) For: City of Brantford	May 1995	-detailed technical study that informed the **Mohawk Lake Restoration and Park Development Project Master Plan Brief, June 1995**
7	**Mohawk Lake Rehabilitation Project Mohawk Lake Stormwater Management Study – DRAFT** By: Gore & Storrie Limited (G&S) For: City of Brantford	May 1995	-detailed technical study that informed the **Mohawk Lake Restoration and Park Development Project Master Plan Brief, June 1995**
8	**Mohawk Lake Rehabilitation Project Summary of Potential Contaminant Sources – Abandoned Landfills and Industrial Properties – DRAFT** By: Gore & Storrie Limited (G&S) For: City of	May 1995	-detailed technical study that informed the **Mohawk Lake Restoration and Park Development Project Master Plan Brief, June 1995**
9	**Mohawk Lake Rehabilitation Project Shallow Creek Park Groundwater Investigation** By: Gore & Storrie Limited (G&S) For: City of Brantford	May 1995	-detailed technical study that informed the **Mohawk Lake Restoration and Park Development Project Master Plan Brief, June 1995**
10	**Mohawk Lake Revitalization Plan City of Brantford** By: Weslake Inc.; Robert Brenner (Ecologist) For: City of Brantford	Feb. 1999	Technical overview and proposed solutions
11	**Mohawk Lake Revitalization Plan City of Brantford** By: City of Brantford using Weslake Inc. Report For: City of Brantford	Apr. 1999	-comprehensive plan with goals and objectives -prepared by City Engineering Dept. -based on Weslake Feb. 1999 Report -prepared to support the Canada Millennium Program application
12	**Canadian Millennium Partnership Program Proposal for the Revitalization of Mohawk Lake City of Brantford, Ontario** By: City of Brantford, -Project Organizer: Mayor Chris Friel For: Canada Millennium Partnership Program	1998	Application, informed by Weslake Report

13	**Waterfront Master Plan**	June 2010	Mohawk Lake is a component of the overall waterfront in Brantford
14	**Mohawk Lake: Review of Past Reports and Studies, Report No. CD2014-070** By: Gregory Dworak, General Manager, Community Services	May 2014	Mohawk Lake: Review of Past Reports and Studies.
15	**Storm Flow Monitoring and System Model Calibration Study.** By: Aquafor Beech Ltd For: City of Brantford	Jan. 2018	-Part of the drainage area stormwater sewer network is being monitored and modelled in this study.
16	**Birds of Ontario** By: Bezener, A.	2000	Illustration guide of birds in Ontario and their habitats. This book was used to assess potentially suitable nesting habitat for candidate birds in the study area.
17	**Atlas of the Breeding Birds of Ontario** By: Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D., Couturier, A.R.	2007	Illustration guide book of the birds in Ontario, their breeding locations, and their habitats. This book was used to assess potentially suitable nesting habitat for candidate birds in the study area.
18	**City of Brantford Official Plan** By: City of Brantford	2016	Official Plan of the City of Brantford; used to inform Natural Heritage System policies.
19	**Aquatic Species at Risk** By: Department of Fisheries and Oceans Canada	2018	Online aquatic species-at-risk database; used to assess the potential for aquatic species-at-risk within the study area.
20	**Species Profile: Red-headed woodpecker** By: Government of Canada	2010	Red-headed woodpecker species profile with habitat preferences. This document was used to assess the potential for this species to inhabit the study area.

21	**Grand River Conservation Authority Wetlands Policy** By: Grand River Conservation Authority	2003	Wetlands policy for the Grand River Watershed.
22	**Ecological Land Classification for Southern Ontario: First Approximation and its Application** By: Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, S. McMurry.	1998	Land classification protocol for Ecoregions 7E and 6E.
23	**Mohawk Lake Turtle** By: Maskel, J.	2017	Youtube video of a snapping turtle in Mohawk Lake.
24	**Provincial Policy Statement 2014** By: Ministry of Municipal Affairs & Ministry of Housing	2014	Ontario Provincial Policy Statement. This document was used to describe natural heritage system policies within the study area.
25	**Natural Heritage Reference Manual** By: Ministry of Natural Resources and Forestry	2010	Reference manual for describing natural heritage features and areas in Ontario.
26	**Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E** By: Ministry of Natural Resources and Forestry	2015	Guide to describe Significant Wildlife Habitat types in Ecoregion 7E.
27	**Surficial Geology of Southern Ontario** By: Ontario Geological Survey Source link: http://www.geologyontario.mndm.gov.on.ca/mnd	2010	Utilized in the Surficial Geology figure
28	**The City of Brantford Geodatabase** By: City of Brantford Titled: Brantford_12Feb2018.gdb Received: February 12, 2018	2018	Utilized in the creation of figures for the Interim Report
29	**Ontario Regulation 150/06 - Grand River Conservation Authority (GRCA) Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations** By: GRCA	Oct. 2015	Policies for the management and delineation of regulated areas within the GRCA jurisdiction.

30	**Grand River Information Network (GRIN)** https://data.grandriver.ca/ By: GRCA	Accessed Feb. 2018	GRCA collection of data available for download, which includes GIS, river and climate monitoring, and other datasets.
31	**Ontario Flow Assessment Tool III** http://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html?site=OFAT&viewer=OFAT&locale=en-US By: Ministry of Natural Resources and Forestry	Accessed Feb. 2018	OFAT creates watersheds, calculates watershed characteristics, executes hydrology models and reports water flow statistics. These outputs can be used by a variety of users and applied to many
32	**Report on Investigations Regarding Canal** By: City of Brantford	1950	Report of proposed dredge and modifications to the canal including technical analysis and cost estimates.
33	**Physiography of Southern Ontario Miscellaneous Release – Data 22** By: Chapman and Putnam For: Ontario Geological Survey	2007	Ontario Soil Physiography
34	**Preliminary Environmental Assessment of a Former Coal Gasification Plant Site, Brantford, Ontario** By: Terraqua Investigations Limited	1990	- ESA
35	**Mohawk Lake Rehabilitation Options Letter** By: Conestoga Rovers For: City of Brantford	2006	- Summary of previous studies and potential remediation recommendations
36	**Cultural Heritage Landscape Feasibility Study: Mohawk Canal and Alfred Watts Hydro Generating Station Ruins** By: ASI For: City of Brantford	May 2016	Feasibility study to determine which heritage planning tool to use for the conservation of Mohawk Canal and surrounding area
37	**Greenwich Mohawk Remediation Program Final Summary, City of Brantford 2017** By: Community Development, City of Brantford For: City of Brantford	Mar. 2017	Summary of the Final Soil Remediation program for the Greenwich Mohawk Brownfield (22 & 66 Mohawk & 347 Greenwich)
38	**Phase Two Environmental Site Assessment 22 Mohawk Street, Brantford, Ontario** By: CH2MHill For: The City of Brantford	Mar. 2014	-Phase 2 ESA -historical buildings at this location -groundwater and soil quality

39	**Phase Two Environmental Site Assessment 66 Mohawk Street, Brantford, Ontario** By: CH2MHill For: The City of Brantford	Mar. 2014	-Phase 2 ESA -historical buildings at this location -groundwater and soil quality
40	**Phase Two Environmental Site Assessment 347 Greenwich Street, Brantford, Ontario** By: CH2MHill For: The City of Brantford	Mar. 2014	-Phase 2 ESA -historical buildings at this location -groundwater and soil quality
41	**Mohawk Street Landfill Site Design & Development Plan - Volumes I and II** By: Gore & Storrie Ltd For: The City of Brantford	Apr. 1992	Original Mohawk Street Landfill design
42	**Mohawk Street Landfill Site 2016 Annual Monitoring Report** By: WSP For: The City of Brantford	Apr. 2017	-Results of annual groundwater and surface monitoring at the Mohawk Street Landfill -more up to date information on landfill control systems
43	**Long Term Monitoring and Contingency Plan Mohawk Street Landfill Site City of Brantford** By: Golder Associates For: The City of Brantford	December 2010	Landfill contaminant control systems overview
44	**Waterfront Master Plan – Bald Eagle Habitat Management Recommendations – DRAFT** By: PLAN B Natural Heritage Landscape Ecology and Natural Heritage Planning	December 2009	- Bald Eagle Habitat Management Recommendations which fed into the Waterfront Master Plan
45	**Environmental Restoration and Management Presentation** By: PLAN B Natural Heritage Landscape Ecology and Natural Heritage Planning	N/A	- Presentation on the Environmental resources within the City of Brantford
46	**Summary of Meeting for MOEE Biomonitoring Results** By: Gore and Storrie Ltd	June 1995	Meeting minutes between MOEE and Gore and Storrie regarding Biomonitoring Results
47	**Distribution of Fish Species at Risk – GRCA Mapping** By: Department of Fisheries and Oceans Canada	May 2015	DFO mapping of distribution of fish species at risk within the GRCA watershed
48	**PAH Contributions from Storm Sewer Sediments (Memorandum)** By: CH2M Gore and Storrie Ltd	Feb. 1996	Memo from CH2M Gore and Storrie Ltd to the City regarding PAH Contributions from Storm Sewer Sediments to Mohawk Lake

49	**LFG Collection System Master Plan Mohawk Street Landfill Brantford, Ontario** By: SCS Engineers	June 2017	Details of landfill gas (LFG) collection system master plan
50	**Mohawk Lake District Working Group Agenda and Minutes**	Jan. 18, 2018	Mohawk Lake District Working Group Proposed Work Program Overview
51	**Mohawk Lake Technical Presentation**	Oct. 2016	Summary of work completed to date for Mohawk Lake revitalization
46	**Long Term Monitoring and Contingency Plan Mohawk Street Landfill Site City of Brantford** By: Golder Associates For: The City of Brantford	December 2010	Landfill contaminant control systems overview
47	**MNRF response to Information Request**	9 April 2018	Response to Aquafor Beech Ltd.'s request for information on species-at-risk, fisheries data, and wetland evaluations.
48	**Mohawk Lake and Oxbow Wetlands – Southern Ontario Wetland Evaluation, Data and Scoring Record**	January 2000	Southern Ontario Wetland Evaluation, Data and Scoring Record (Ross, 2000), with data

Received Post Interim Report #1			
No.	**REPORT**	**DATE**	**NOTES**
1	**Mohawk Lake Rehabilitation Plan Sediment Management Assessment Presentation at 15th International Symposium on Lake, Reservoir and Watershed Management Nov 6-11, 1995, Toronto**	Nov. 1995	-presentation by CH2M Gore & Storrie -detailed technical study that informed the **Mohawk Lake Restoration and Park Development Project Master Plan Brief, June 1995**
2	**Summer 1983 Study of Mohawk Lake: Proposal for Restoration** By: J.C. Roff; C.W. Emerson; J. Dorey; J. Bisset For: City of Brantford	Oct. 1983	-requested by Brantford Dept. of Engineering to determine the feasibility of restoring and to determine the present status of the water quality of Mohawk Lake.
3	**Mohawk Street Landfill Site – 2017 Annual Monitoring Report** By: WSP	April 2018	2017 Annual Monitoring Report for the Mohawk Street Landfill Site
4	**Water Quality Results from Mohawk Lake Outfall** Collected by: Unknown	July and August 2004	General Water Quality results from Mohawk Lake Outfall

5	**Grand River Source Water Protection Plan – City of Brantford** By: GRCA	November 2015	Source water protection policies and mapping for the City of Brantford
6	**Mohawk Lake Visioning Workshop Results (CD2015-118)** By: Gregory Dworak, General Manager, Community Services		Report provides Council with a summary of the ideas that were heard by the Mohawk Lake Working Group at the three workshops held on May 5th, 7th and 14th, 2015
7	**East Ward Creek Report** By: J.M Tomlinson and Associates Ltd	1965	Evaluation of East Ward Creek flooding and detail design alternative for alleviating flooding issues.
8	**Local News Articles of Pilot Testing for Sediment Dredging** By: Gore & Storrie Limited (G&S)	1995	Local News Articles of Pilot Testing for Sediment Dredging
9	**Mohawk Lake Restoration and Park Development Project Master Plan Brief (Full Document)** By: Gore & Storrie Limited (G&S)	June 1995	-this document was used to prepare a rehabilitation plan for Mohawk Lake and area.
10	**Lake Bathymetry Mapping** By: Dillon and Associates	1972	Bathymetry measurements completed by Dillon in 1972
11	**Mohawk Lake Sediment Dredging Pilot Testing – Terms of Reference** By: Gore and Storrie	1995	Terms of reference for the sediment dredging and dewatering pilot study associated with the rehabilitation of Mohawk Lake
12	**City of Brantford 2014 Master Servicing Plan (MSP) for Water, Sanitary, and Stormwater Services** By: Blue Plan Engineering	July 2014	Master Servicing Plan (MSP) for Water, Sanitary, and Stormwater
13	**Emails from Stephanie Dearing (Local Resident) to Janet Ivy (GRCA)**	January 2018	Local input regarding wildlife species observed around the Lake and surrounding areas
14	**Environmental Investigation of the Glebe Farm Lands** By: Naylor Engineering Associates Ltd.	December 2001	Subsurface environmental conditions at the Glebe Farm Lands

5 Mohawk Lake Study Area

The entire City of Brantford is located within the Grand River Watershed and subdivided into seven (7) sub-watersheds as illustrated in **Figure 5.1** including the Mohawk Lake subwatershed which represents the general limits of the study area. The predominate feature of the Mohawk Lake subwatershed is the Mohawk Lake and canal system which was the main focus of the Characterization Study.

Mohawk Lake was constructed in the 1840s as part of the Mohawk Canal, located in the City of Brantford. The Mohawk Canal starts at Shallow Creek Park and continues to the Alfred Watts Hydro Generating Station Ruins at the Grand River, a federally recognized National Heritage River. The 4.8km (3 mile) canal is narrow and shallow with reinforced banks. Mohawk Lake is surrounded by trees with several small open areas that can be accessed for recreational purposes. The shallow lake has a surface area of approximately 13 hectares (32 acres) and depths range from 1 to 3m. Multiple outfalls from the municipal stormsewer system are found along the canal, making stormwater runoff the primary input (water source).

Mohawk Lake's 839 ha drainage area is composed of mainly urbanized sub-catchments, including the Brantford neighbourhoods/districts of Lower Downtown, Colborne, and Mohawk Greenwich. Six Nations owns the 92 acres Glebe Farm No. 40B directly on the north side of the lake. The land directly adjacent to the south side of Mohawk Lake, and north of Six Nations Indian Reserve No. 40. is privately owned. Grand River Conservation Authority (GRCA) owns the land abutting the Grand River. The City of Brantford owns the majority of the remaining adjacent land. The general study area map and property ownership are displayed in **Figure 5.2** and **Figure 5.3,** respectively.

The Mohawk Lake drainage area is comprised of multiple land use types, including low and medium residential, commercial, industrial, and recreational/park/open space usage. The central and northern portions of the drainage area are largely built out with some industrial sites suitable for long term redevelopment. The southeast portion is mainly composed of residential and employment uses with major open space along the canal. This open space includes Mohawk Park and other parkland providing the community with a large recreational area. There is also a brownfield site along Greenwich Street south of Mohawk Canal that is in the planning process for redevelopment for housing. The eastern end of the study area abutting the Grand River is heavily wooded.

The existing land use is displayed in **Figure 5.4**. Note: **Section 5.12.2**, **Figure 5.129** refined the existing land uses and addresses noted data gaps within the City's GIS information noted in **Figure 5.4**.

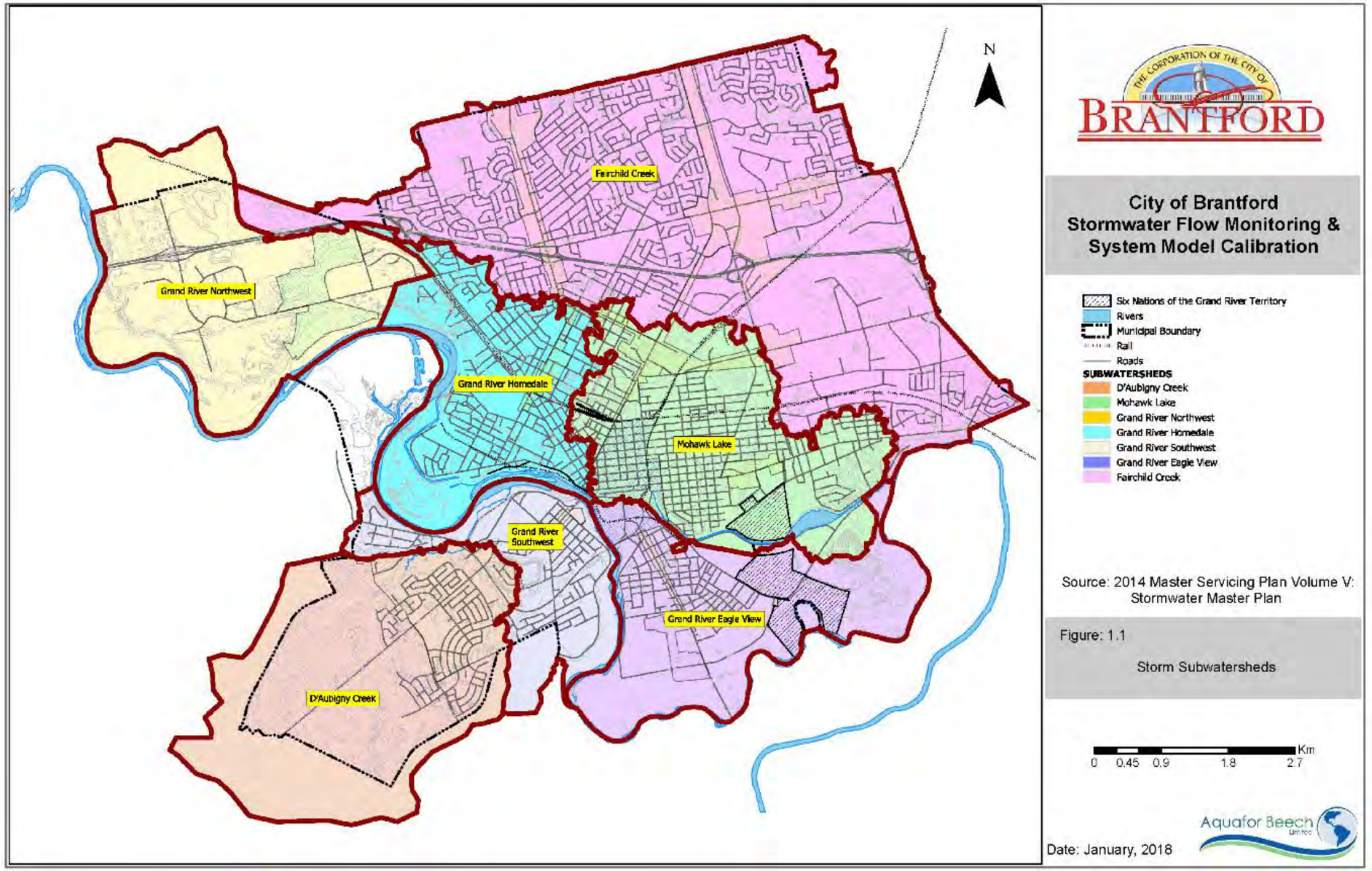
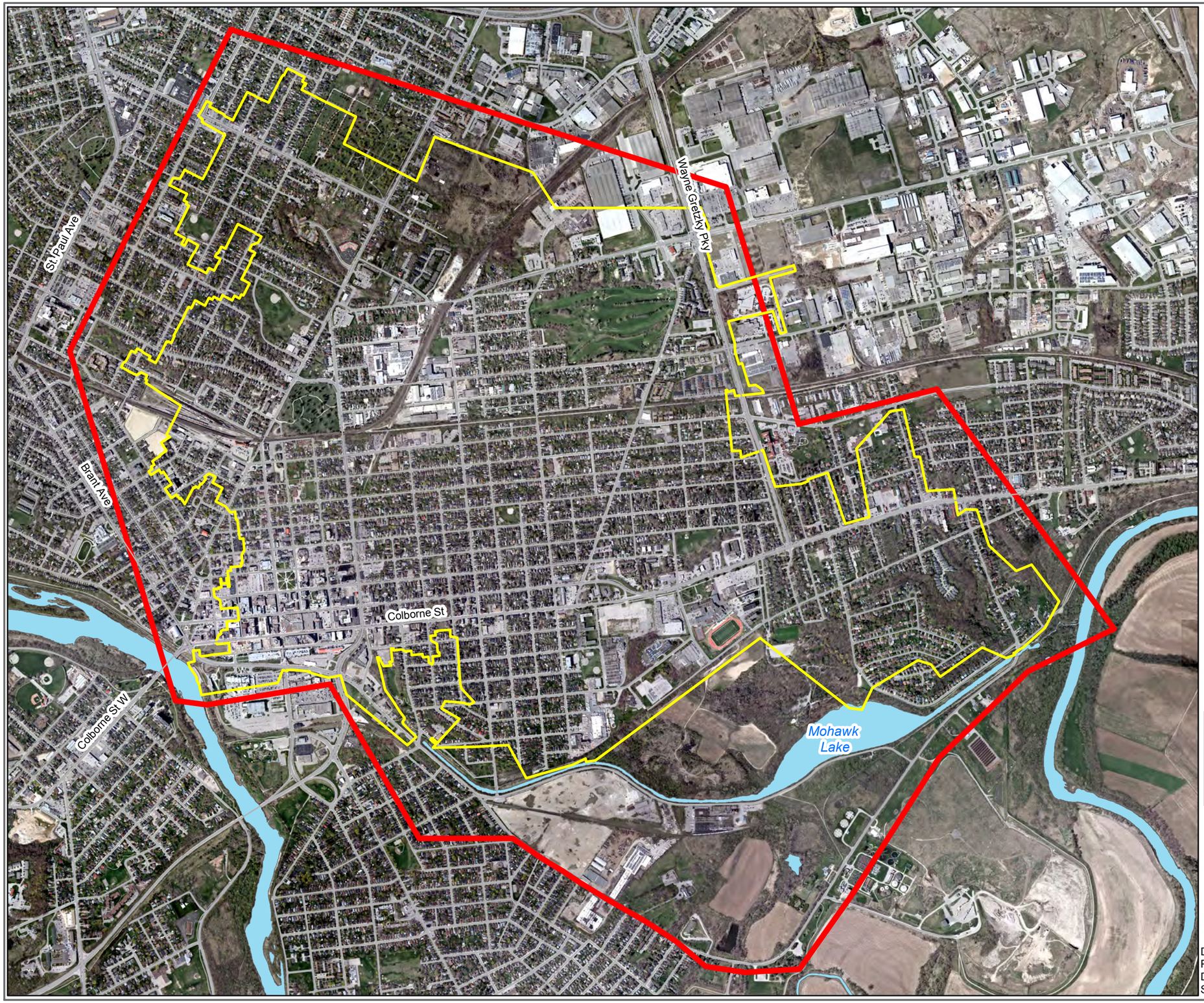


Figure 5.1: City of Brantford Storm Subwatersheds



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Road Centerlines
- Mohawk Lake Subwatershed
- Study Area
- Waterbody

Figure: 5.2

Study Area

0 0.25 0.5 1
Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

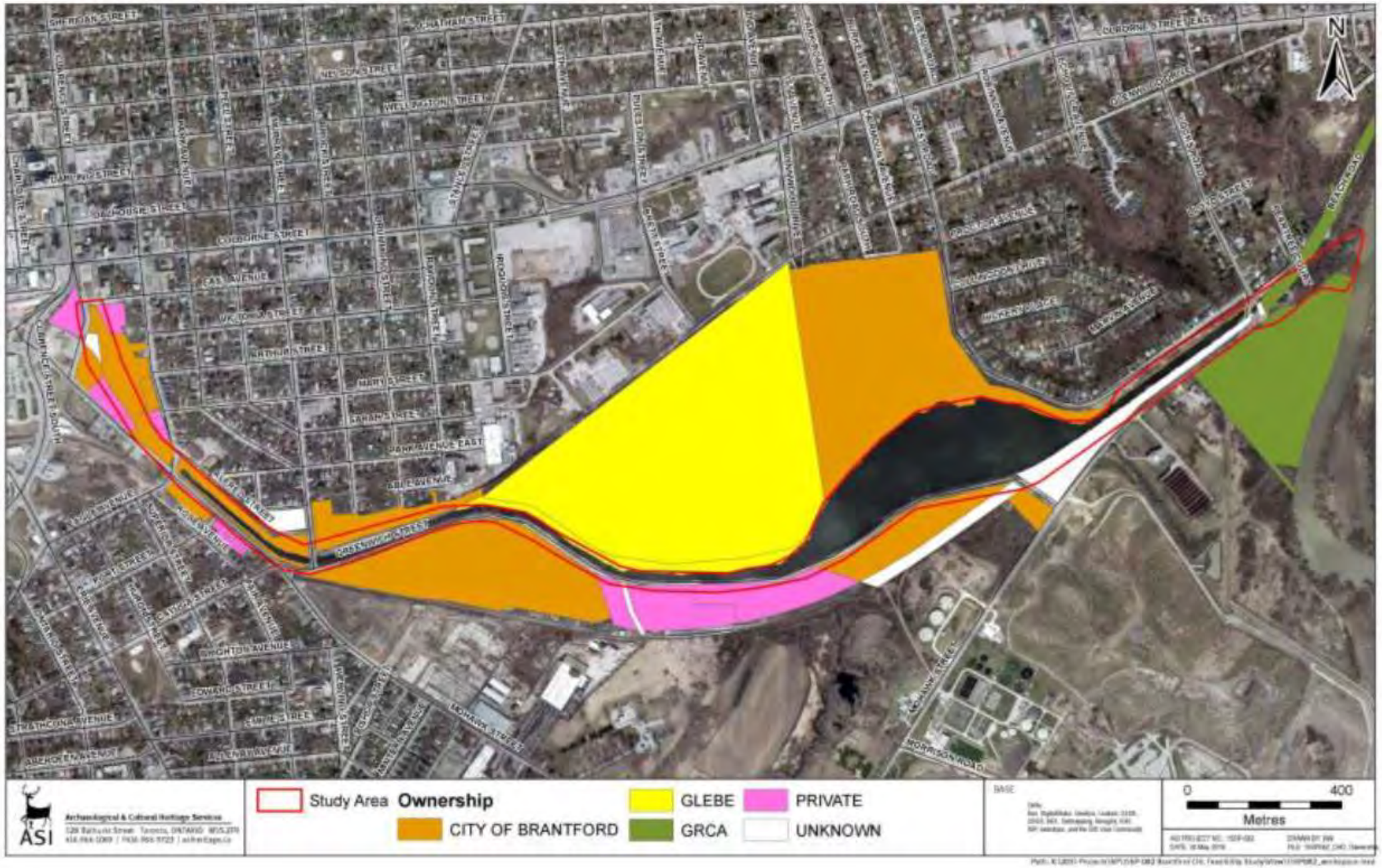


Figure 5.3: Ownership Cultural Heritage Landscape Feasibility Study (ASI: May 2016)

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Rail Trail (GRCA)
- Road Centerlines
- Waterbody
- Study Area

Land Use

- Commercial
- Cultural / Heritage
- General / Residential
- Industrial
- Institutional
- Recreation

Figure: 5.4

Existing Land Use

0 0.25 0.5 1

Kilometers

N

Date: September 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

5.1 SITE HISTORY

Historically, the study area has been intermittently inhabited for thousands of years. Multiple archaeological sites have been discovered within the City of Brantford, including: Fifteen (15) Paleo-Indian sites, ninety-one (91) Archaic sites, twenty (20) Early Woodland sites, twelve (12) Middle Woodland sites, nine (9) Transitional Woodland sites, and twenty (20) Late Woodland sites. The Attiwandaron lived in the Grand River valley before the seventeenth century until their demise in 1653. The Six Nations then used the area as a hunting ground. Eventually Captain Joseph Brant and the Six Nations Indians of the Iroquois Confederacy settled Brant's Ford, near the original Mohawk settlement on the south edge of present-day Brantford. Brant's Ford became the founding place of the future settlement of Brantford.

A canal was proposed to promote Brantford as a major port and industrial city. Construction of the Brantford Cut, now the Mohawk Canal, started in 1842 and officially opened for navigation November 7th, 1848 providing access for barges travelling through Brantford. The Mohawk Canal system was built to bypass 19.3km (12 miles) of meandering river between Bunnells Landing and Brantford. The lake was constructed as part of the Mohawk Canal system to allow for barges to turn around.

The Mohawk Canal served four (4) purposes throughout its history including:

1. Transportation use (1829-1859),
2. Hydro-electric power generation use (1861-1911),
3. Industrial use (1844-1980s), and
4. Recreational use (1848-present).

5.1.1 Transportation

The Mohawk Canal was part of the Grand River Canal, a 91.7km (57 mile) waterway from Brantford to Dunnville. The creation of this canal formed a connection with outside markets including Brantford to Buffalo. The opening of the canal also led to the establishment of new mills and the increase of businesses within Brantford. The entire canal system was owned and constructed by the Grand River Navigation Company. In 1861, after eleven (11) years of operation and poor maintenance the Mohawk Canal was neglected and considered abandoned. The canal continued to be used for both tourism and waste water discharge from the factories along its banks.

5.1.2 Hydro-electric Power Generation

In 1875 Alfred Watts bought the canal rights from the City on the condition that the breaks in the embankment adjacent to the canal were fixed, the water level was maintained at a suitable condition for navigation, hydraulic and mill purposes, and the canal was kept in a sanitary condition. He used the locks as a dam to utilize the 10m elevation difference between the Grand River and the canal. With the improvement of hydro-electric technology, power to Brantford came from DeCew Falls rather than the canal in 1908. The powerhouse at the locks was closed in 1911, and after a flood in 1927 the dam and locks were destroyed.

5.1.3 Industrial

The canal served multiple industrial purposes including: shipping access, a water source for industrial processes, and a hydro-electric power source. Multiple industrial facilities were built along, or closely adjacent to the banks of the Mohawk Canal. Most of the historical pollution in the canal and the lake is the result of indiscriminate dumping of waste materials from the farm implement factories along Greenwich Street.

5.1.4 Recreational

Mohawk Lake and surrounding parkland has been used for recreation for hundreds of years. After the construction of the canal, the water levels in the original wetland rose to form a pond, now Mohawk Lake. Recreational facilities include Mohawk Lake, Mohawk Park, and extensive pedestrian trails, including the Trans Canada Trail and circulation routes. The area has been used for both water-based and open space recreation. Past uses of Mohawk Park include the Brantford Street Electric Railway Station and an amusement park, as well as cycling competitions hosted on the first cinder bicycle track in Ontario. In the 1950s the canal ditch west of Greenwich Street was backfilled creating Shallow Creek Park.

5.2 REDEVELOPMENT AND REVITALIZATION PLANS

The City of Brantford has been working on a plan to revitalize the Mohawk Lake and Canal area for the last thirty years. Multiple plans have been created to reflect the communities' ideas in regard to land use in this area. The enhancement of the natural attributes and recreational usage of the Mohawk Lake area have consistently been a primary focus of both the community and proposed plans. The Mohawk Lake Revitalization Plan developed in 1999 aimed to restore the natural system and improve the recreational usage while respecting the cultural heritage of this site; this same goal is reflected in the Waterfront Master Plan.

The Master Plan, as well as previous studies, have identified the environment, parks, access, heritage and culture, destinations, and neighbourhoods and districts as six components critical in improving the Brantford Waterfront. These components are addressed in the development opportunities in the vicinity of Mohawk Lake (**Figure 5.6**), as well as revitalization of the Lake and Canal.

The recently remediated 50-acre Greenwich Mohawk Brownfield is planned to have a range of residential, commercial, heritage, and recreation uses on the site with a 15m setback from the railway spur line. Improving trail access and creating a waterfront cultural corridor are important aspects in the revitalization of Mohawk Lake and Canal. A continuous linear greenway along the Canal is suggested in the Master Plan and intends to provide for other nodes of recreation activity. A proposed 3km Primary Waterfront Trail on the north side of the lake will encourage pedestrian access to Mohawk Park.

5.2.1 Mohawk Lake Working Group

The Mohawk Lake Working Group was formed in December 2014 in response to the community interest in re-examining the revitalization of Mohawk Lake, Mohawk Canal and its associated waterways. The Working Group is comprised of ex-officio members: MP Phil McColeman, MPP Dave Levac, City of Brantford Mayor Friel, County of Brant Mayor Eddy, and Six Nations of the Grand River Chief Hill, along with staff members form the City of Brantford, Six Nations, and the GRCA. Citizen-members representing various agencies and groups are also members of the Working Group.

The Mohawk Lake Working Group undertook a public consultation process to gain public input to assist in the development of a vision for the Mohawk Lake Project. Three workshops and an on-line survey were available to the public. The purpose of the workshops was to hear from the community about two aspects related to the revitalization of Mohawk Lake:

1. What does the community value about Mohawk Lake from the past and present and what existing features are important; and,
2. What is the vision for Mohawk Lake twenty (20) years from now and what should be maintained, improved or added to meet that vision? (**Figure 5.5**)

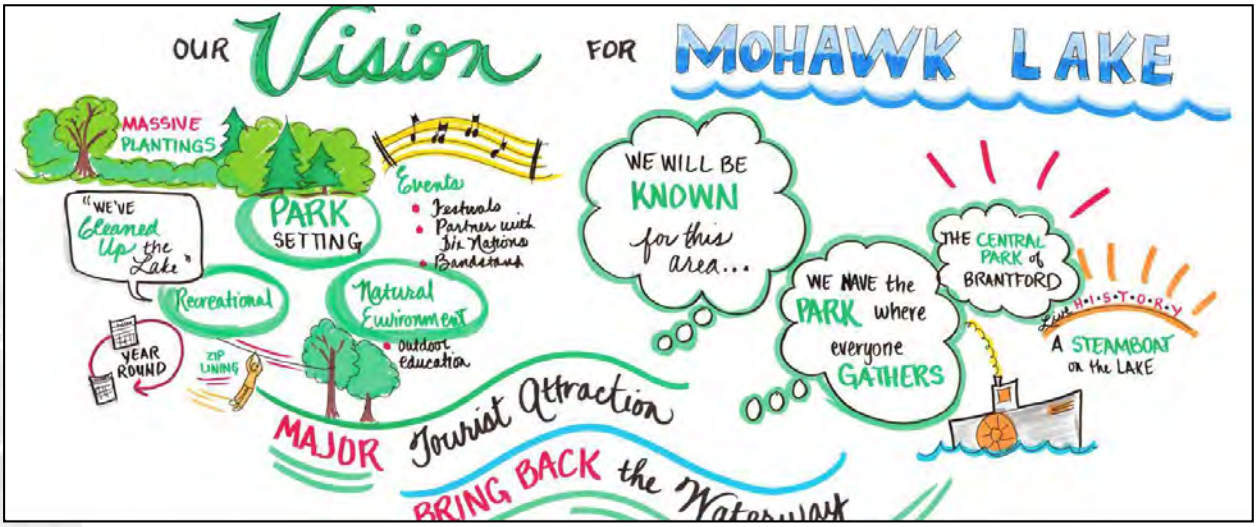


Figure 5.5: Mohawk Lake Working Group Workshop Vision Results

Some of the community's opinions about the Mohawk Lake Revitalization are summarized in the following table.

Table 5.1 Community Feedback re: Mohawk Lake Revitalization

Fears	Hopes
• The impact of a possible Brantford Southern Access Road route through the area; • Over-developing the Lake and Park with recreational and tourism amenities that will impact the area's natural setting; • The expenses to be spent on the project's design, especially if the plan is not implemented; and • Making Mohawk Lake and Canal worse off by disturbing the contaminants that are held in the sediments.	• Reconciliation and collaboration with the Six Nations community through this project; • Using the park for education, recreation, festivals and events; • An all-season lake and park; and • A vibrant green space for all ages and people in Brantford.

The participants 20 Year vision of Mohawk Lake included the following: enhancing and broadening recreational activities on the Lake, such as boating (with an emphasis on non-motorized boats), fishing, swimming and adding beaches. Other suggestions to enhance the area were implementing access to the water, improving the shoreline with native vegetation and more trees, particularly around the Canal section, and improving water quality.

Some common visions for Mohawk Lake and Canal included:

- A kind of "Central Park" in Brantford for families and people of all ages to gather and meet;
- A major tourist attraction that is a place for festivals and events, a place for recreation, a place for romance, a place for children, "the place where everyone meets";
- Change the reputation of the Lake to be known as a safe place and environmentally sound;

- Educational opportunities and research partnerships for school groups and post-secondary institutions and others about the natural environment and about the cultural history of the Canal, Six Nations, and Brantford's industrial heritage;
- Restore or establish connections with the Grand River and with existing parks and trails; "re-connect people to the Lake";
- Restore the natural environment, fish habitat, wildlife, and flora; and
- Establish Mohawk Lake as a place for residents of Brantford to have a "stay-cation" and a place which attracts people to visit and discover Brantford.

These visions resulted in the Mohawk Lake Vision Statement:

I will be the place of vibrancy I was yesterday.
I am the heart of our communities and our place for reflection, healing, and celebration.
I am both Mother Earth's refuge and your family's natural playground.
I am Mohawk Lake.

Comments from the workshops also expressed the revitalization of Mohawk Lake would have a significant effect on Brantford, as improvement to Mohawk Lake and Canal and its waterways could be a "catalyst for rejuvenation" for the entire city that would be a major attraction to both Brantford residents and visitors. Furthermore, the Mohawk Lake, Canal, and Park could help connect various communities, such as the Eagle Place and Echo Place neighbourhoods as well as the Six Nations community.

5.2.2 Mohawk Lake District Plan

The Mohawk Lake District Plan is currently underway to investigate opportunities where the enhancement of Mohawk Lake and Mohawk Canal may contribute to the redevelopment and revitalization goals of the District Area.

The purpose of the District Plan Study is to develop a comprehensive land use structure and policy framework to guide future development for the Mohawk Lake District area, consistent with the City's Official Plan, Provincial Plans and other City master plans and initiatives.

As part of the Mohawk Lake District Planning Study, an evaluation and analysis of options for future development and revitalization of the Study Area will be completed to produce a recommended preferred concept plan and land use policies, which may include:

- Amendments to the Official Plan and Zoning Bylaw;
- Where applicable, the anticipated boundaries of implementing plans of subdivision;
- Cost estimates of the works necessary, and phasing;
- Recommendations related to the City's options regarding the retention or sale of City-owned lands or strategic acquisition of any other lands within the Study Area at different stages; and
- Recommendations for further study.

The City of Brantford has set the following Study Objectives for the Mohawk Lake District Plan:

- To align and coordinate planning information with several other municipal projects and initiatives occurring in the Study Area;
- Incorporate efficient, cost-effective development and land use patterns that help to achieve Provincial growth targets and densities, prescribed in the *Growth Plan for the Greater Golden Horseshoe*;

- To identify the location and appropriate mix of a range of land uses, including any emergency or surface infrastructure (i.e. stormwater management facilities) but excluding industrial uses, and identify the appropriate buffering and compatibility between existing and future uses;
- To provide detailed development policies and urban design guidelines to ensure development of these lands is consistent with the City's Official Plan, and achieves the objectives of the Provincial Policy Statement, and conforms to the Growth Plan, as well as represents current and contemporary land use planning principles;
- To identify environmental attributes and constraints and prepare a development concept plan that protects and enhances the natural environment;
- To undertake a comprehensive transportation assessment to determine the potential development impacts on existing intersections and roadways within and immediately surrounding the Study Area;
- To utilize the complete streets approach to ensure that urban elements are connected to each other and to adjacent portions of the City by roads, trails, pedestrian and bicycle facilities and transit routes in order to create transit supportive, pedestrian and bicycle-friendly, accessible, convenient, safe and energy efficient environments;
- To undertake the study in a manner that engages the Brantford community and Six Nations of the Grand River Territory in accordance with the *City of Brantford's Community Involvement Framework*; and
- To complete the study in a timely and efficient manner.

5.2.3 Discussion and Recommendations

Redevelopment plans around Mohawk Lake and throughout the subwatershed are ongoing and constantly evolving as planning phases progress. Future phases of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project will have to consider the most recent Official Plan, Master Plans and individual planning studies in order to guide potential remediation alternatives.

Figure 5.6: Waterfront Master Plan Core Environmental Features, Restoration Areas, Parks, & Linear Parks on Dyke

5.3 CULTURAL HERITAGE

The following section summarizes and describes the existing Cultural Heritage features within the Mohawk Lake area including the results of the cultural heritage landscape (CHL) feasibility study and areas of cultural heritage or archaeological importance.

An archeological review was undertaken as part of the Characterization Study by ASI which included an evaluation of the Cultural Heritage and archaeological studies completed within the Mohawk Lake subwatershed and identification of additional studies which may be required in order to support future project phases.

5.3.1 Background

The Cultural Heritage Landscape (CHL) Feasibility Study: Mohawk Canal and Alfred Watts Hydro Generating Station Ruins was completed to assess the Mohawk Canal and Alfred Watts Hydro Generating Station Ruins for a potential CHL Study, and to determine the appropriate protection or designation tools for the study area.

The Mohawk canal and Alfred Watts Hydro Generating Station Ruins study area has been identified as a potential cultural heritage landscape and is known to meet the criteria for designation under the Ontario Heritage Act (OHA Regulation 9/06 - Criteria For Determining Cultural Heritage Value or Interest). Its cultural heritage value and interest stems from its design/physical values, historical/associative values, and contextual values.

Mohawk Lake and Surrounding Areas

Forty-eight (48) resources were previously identified by the City of Branford or GRCA, or identified in archival research and historic mapping as having potential cultural heritage value. After field review and analysis by ASI, each Build Heritage Resources (BHR) or Cultural Heritage Landscape (CHL) was evaluated based on O Reg. 9/06 criteria. Features identified as meeting one or more of these criteria have been identified as having confirmed heritage value. Features meeting multiple criteria, consistent of the heritage attributes of the CHL are considered strong candidates for conservation and inclusion in the CHL.

Forty-seven (47) of the resources were identified as having some cultural heritage value, of these: twenty-four (24) were identified as being strong candidates for conservation, nineteen (19) were identified as being candidates for conservation, and four (4) were identified as weak candidates for conservation.

The Cultural Heritage Landscape (CHL) Feasibility Study by ASI gave the following recommendations in regards to protecting the cultural heritage of the Mohawk Canal system:

1. Recognition as a Cultural Heritage Landscape through an Official Plan Amendment for Mohawk Canal and Alfred Watts Hydro Generating Station Ruins area;
2. Two Stage Implementation of the Official Plan Amendment:
    a. Preparation of Cultural Heritage Landscape Technical Study and Conservation Plan; and,
    b. Official Plan Amendment for the Designation of a Cultural Heritage Landscape
3. Public consultation and stakeholder engagement: a formal community consultation process which outlines the methods and tools for engaging stakeholders in the community and maximizing input at each stage of the project should be prepared; and,
4. City of Brantford Archaeological Master Plan and mapping of areas of archaeological potential should be updated as a part of the CHL Technical Study and OPA process, in order to ensure that these resources are identified and protected.

The ASI study concluded that the Mohawk Canal and Alfred Watts Hydro Generating Station Ruins retains significant cultural heritage value and is worthy of recognition and protection as a Cultural Heritage Landscape. A review of CHL policy has identified the preferred alternative for recognizing the features as a Cultural Heritage Landscape is through an Official Plan Amendment. Standard procedures for Official Plan Amendments under the Planning Act were recommended to be followed with respect to giving notice, providing information, and public consultation to ensure the long-term protection and enhancement of the significant cultural heritage landscape.

Upstream Catchment Area

The ASI CHL feasibility report study area centred around the remnants of the Mohawk Canal between the Grand River, the former locks, and Alfred Watts Hydro Generating Station ruins to the east, and Shallow Creek Park to the west, and either side of the canal banks. This area does not include a large portion of the Mohawk Lake study area upstream of the Lake and canals.

The Waterfront Master and District Plan identifies areas with archaeological potential within the City of Brantford upstream of Mohawk Lake including Downtown Brantford, Mohawk Parks, Lake and Canal, Hydro Generation Station Ruins, and various locations within the study area with archaeological potential, as seen in **Figure 5.7**. Within the downtown core, Brant Avenue and Colborne Street are important historic transportation corridors established as part of the Hamilton to London Road in the early nineteenth century. These roads aided the development of Brantford, and both align towards the historic Lorne Bridge. Colborne Street marks the southern boundary of the historic downtown core of Brantford and Brant Avenue was where prominent nineteenth century residents built their residences. Both streets are linked to the successful industries connected to the Grand River via the Mohawk Canal. Brant Avenue is designated under Part V of the Ontario Heritage Act as a heritage conservation district. Unfortunately, similar to the ASI CHL feasibility report study, the Waterfront Master and District Plan does not characterize the northern section of the Mohawk Lake study area.

The City of Brantford Planning Department released a map identifying areas in the City of Brantford with Archaeological Potential that included the entire Mohawk Lake study area. The Areas of Archaeological Potential identified six (6) areas of interest to the Mohawk Lake Characterization study including: the downtown core, Arrowdale Public Golf Course, Brantford Train Station, Greenwich St along the south side of Mohawk Lake, Shallow Creek Park, the Alfred Watts Generating Ruins, and the southern part of the Study area around Mohawk Street. See **Figure 5.8** for the entire map.

5.3.2 Coinciding Works and Recommendations

ASI is currently completing a Cultural Heritage Study as part of the Mohawk Lake District Plan to further characterize the archaeological potential of the area. Results from this study were not available during the preparation of the Mohawk Lake Characterization Study but should be considered to inform future studies and phases of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project once available. Through consultation with ASI, it was confirmed that a Stage 1 Archaeological Assessment will be required as part of the future EA and subwatershed process completed as part of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project. The Stage 1 Assessment shall include a full review of registered archaeological sites within the Mohawk Lake Study Area.

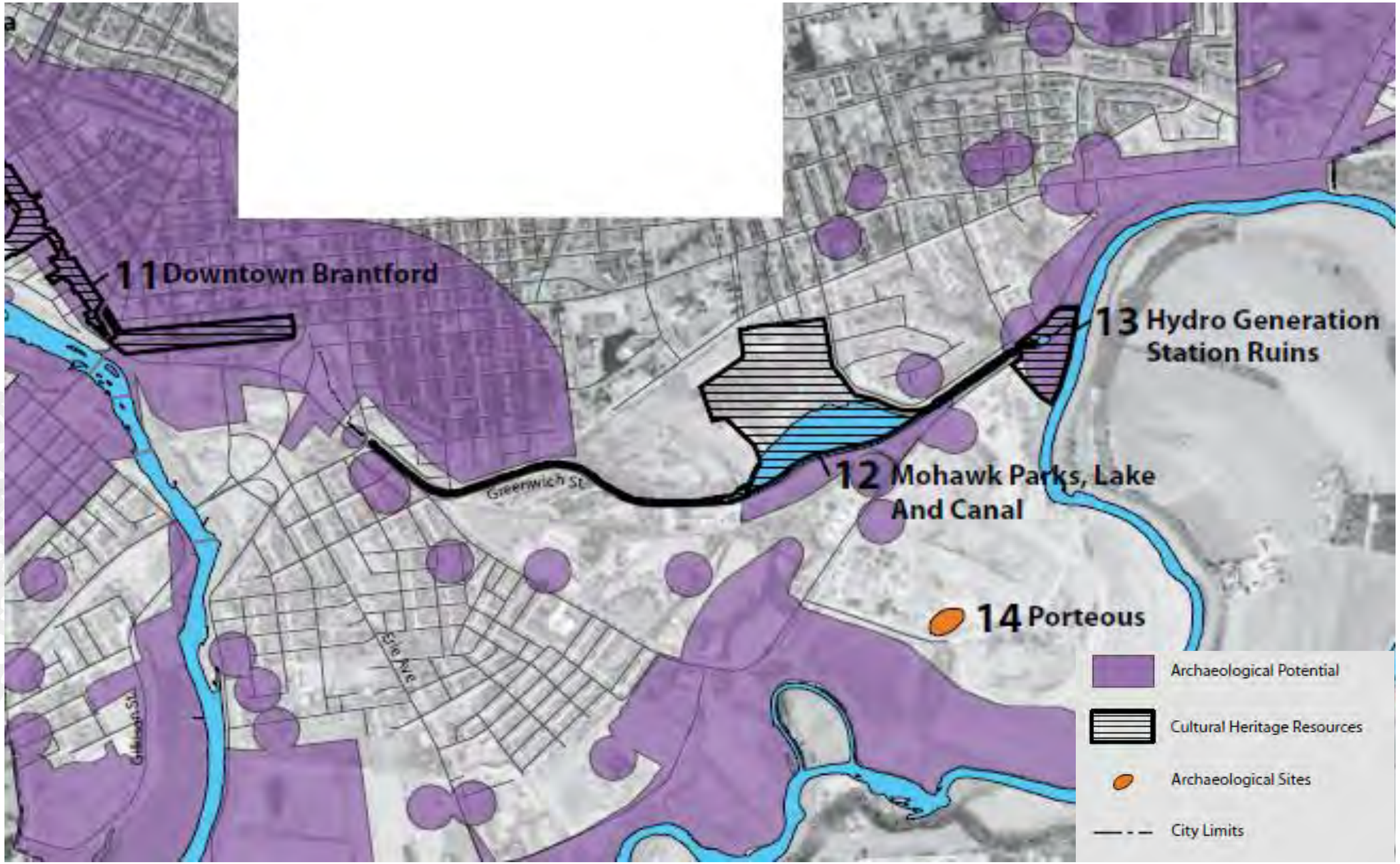
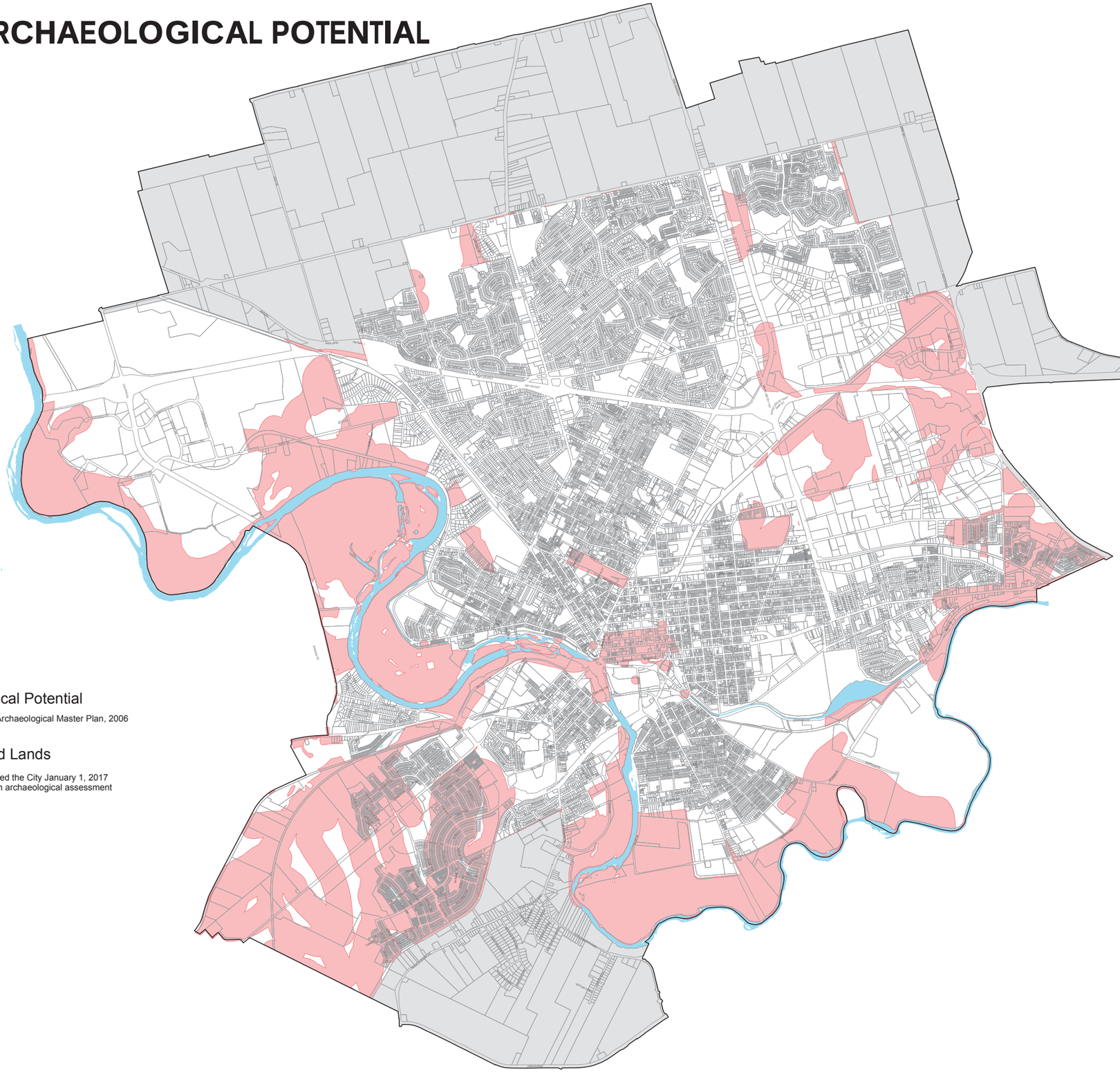


Figure 5.7: Heritage & Culture Framework per the Waterfront Master and District Plan 2010

AREAS of ARCHAEOLOGICAL POTENTIAL

CITY OF BRANTFORD



Legend

Archaeological Potential

Source: Review of Archaeological Master Plan, 2006

Unassessed Lands

New Lands that joined the City January 1, 2017
and have not had an archaeological assessment

0 250 500 1,000
Metres

City of Brantford Planning Department, January 2017

Figure: 5.8

5.4 SOIL AND GEOTECHNICAL

The following section summarizes the general sub-surface characteristics of the study area and describes the overburden geological units, their material composition, origins and the underlying bedrock. The information provided was based upon the geotechnical investigations completed as part of the Characterization Study and results of previous investigations and studies.

5.4.1 Background

Soils and Surficial Geology

The surficial geology of the Brantford area is a complex mix of glaciofluvial and glaciolacustrine deposits, reworked by the present day Grand River. According to the physiographic regions of Chapman and Putnam of southern Ontario (Chapman and Putnam, 2007) the study area is classified as sand plain.

A review of Ministry of Northern Development and Mines (MNDM) map 2240, Pleistocene Geology of the Brantford Area, Southern Ontario, (MNDM, 1972) shows four (4) main geologic units within the Mohawk Lake study area. See **Figure 5.9**.

Areas south of and including Mohawk Lake and canal are underlain by modern alluvial sediments of the Grand River comprised of unsubdivided sand, silt, gravel clay and muck. The lake and canal almost form a boundary between the glaciolacustrine and older alluvial deposits to the north. From previous sediment characterization exercises of the lake bottom it was presumed, by hand probing, that the bottom appeared to be a compact, sand-silt and gravel mixture (Dillon, 1972). Boreholes from environmental investigations completed at 347 Greenwich St., 66 Mohawk Dr. and 22 Mohawk Dr., located just south of the canal and 1.0km west of the lake show the deposits to be variable in thickness from about 2.0 - 5.5m and extending to depths from 3.5 – 6.0 mbgs which are underlain by silty clay/clayey silt (CH2MHill, 2014).

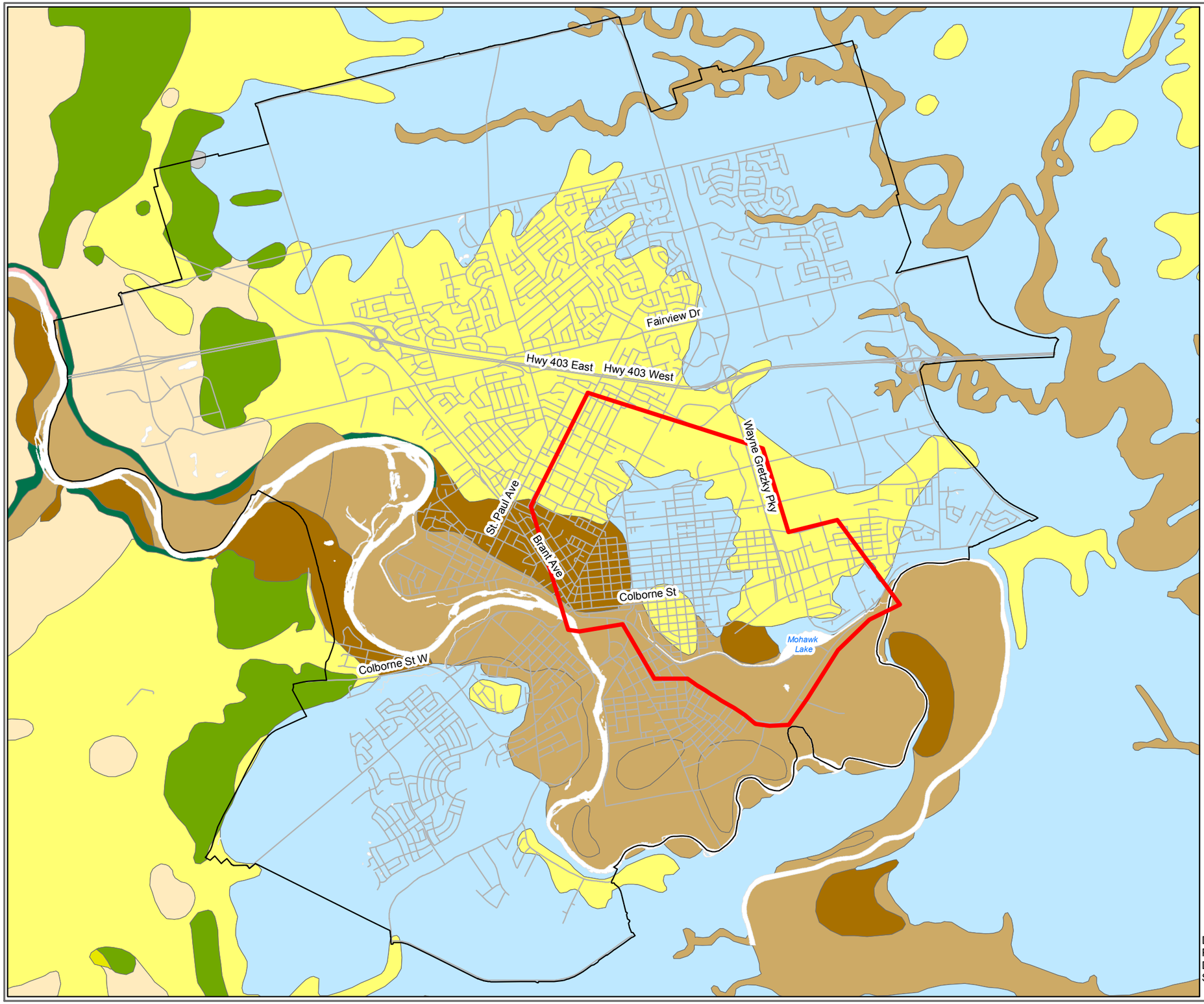
Older alluvial terrace remnants, consisting of gravel and sand make up the southwest portion of the drainage area within the city core and a pocket on the north side of the canal in the Glebe lands where it empties into the lake. The latter location has had some aggregate extraction in the past followed by landfilling activities.

Central and north areas of the drainage area located in the city core and areas on the north side of Mohawk Lake and canal are underlain by glacial-age Lake Warren and younger glaciolacustrine deep water deposits comprised of stratified to varved silt and clay with minor sand and locally overlain by a veneer of sand. A pocket in the south central and peripheral areas in the northwest, north, northeast and east drainage area are underlain by Lake Warren and younger glaciolacustrine sands with some silt of shallow water and deltaic origin.

The Mohawk Lake Sediment Dredging Pilot Testing – Terms of Reference (Gore and Storrie, 1994) includes borehole logs from locations within the lake footprint. The boreholes were completed by Golder Associated for Gore and Storrie. The Mohawk Lake Rehabilitation Plan Sediment Management Assessment-Presentation at 15th International Symposium on Lake, Reservoir and Watershed Management (Gore and Storrie, 1995) further discusses the results of the boreholes and indicates that the lower layer, as well as the layers of silt, sand and sand and gravel, are considered to pre-date development of the area.

Bedrock

A review of the MNDM Map 2544, Bedrock Geology of Ontario, Southern Sheet (MNDM, 1991) shows the study area is underlain by Upper Silurian age bedrock of the Salina Formation, comprised typically of limestone, dolostone, shale, sandstone, gypsum and salt. Ontario Ministry of Northern Development, Mines and Forestry (MNDMF) Preliminary Map P.1049, Bedrock Topography Series, Brantford Area (MNDMF, 1975), shows the regional bedrock surface sloping towards the east and southwest. As indicated in Phase 1 and 2 Environmental Assessment Reports completed for 347 Greenwich St. and 66 Mohawk St. (CH2MHill, 2013 and 2014), the bedrock surface elevation in the vicinity of these properties, which are in the central portion of the study area, ranges from 175 to 183 masl. The overburden thickness in the area is expected to be in the range of 20-25m thick (Gore and Storrie, 1995).



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Study Area
- Municipal Boundary
- Waterbody
- Road Centerlines

Surficial Geology

- Older alluvial Deposits
- Modern alluvial deposits
- Organic deposits
- Paleozoic bedrock
- Stone-poor, carbonate-derived siltyto sandy till
- Glaciolacustrine-derived silty o clayey till
- Undifferentiated older till and stratified sediment
- Ice-contact stratified deposits
- Glaciofluvial deposits
- Massive-well laminated
- Coarse-textured glaciolacustrine deposits
- Littoral-foreshore deposits

Figure: 5.9

Surficial Geology

0 0.5 1 2

Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Sources: MNDM
City of Brantford

Aquafor Beech Limited

5.4.2 Field Study Scope and Methodology

Geotechnical and hydrogeological assessments were completed as part of the Characterization Study to provide general characterization of the stratigraphy and sub-surface conditions of the areas surrounding Mohawk Lake and canals. Soil Engineers Ltd. (SEL) was retaining to completed the geotechnical and hydrogeological investigations. The investigation consisted of boreholes and monitoring wells established at ten (10) locations distributed throughout the Mohawk Lake and canal areas as displayed in **Figure 5.10**.

Drilling of the boreholes/monitoring wells were completed on August 7th, 8th and September 4th, 2018. The gap in drilling dates was a result of field adjustments made as a result of park access restrictions identified following the original confirmation of the drilling locations and the subsequent utility locate clearances required. The installation date of each borehole is summarized in **Table 5.2**.

The boreholes included the installation of groundwater monitoring wells at all ten (10) locations in addition to continuous water level loggers in order to assess the hydrogeological conditions within the Mohawk Lake area. The ten (10) boreholes were drilled with varying depths from 5.0 - 6.5 m depending on the location. At three (3) of the ten (10) locations, nested wells were installed with both a shallow groundwater monitoring well and an adjacent deeper monitoring well to quantify the hydraulic gradient and expected flow patterns.

The borehole and monitoring well construction were completed by a licensed well contractor, DBW Drilling Ltd., under the full-time supervisions of a geotechnical technician from Soil Engineers Limited (SEL). SEL also logged the soil sub-strata encountered during borehole advancement, groundwater conditions and collected representative soil samples for textural classification. The boreholes were drilled using continuous flight power augers. Detailed descriptions of the encountered subsurface soil and groundwater conditions are presented on the borehole and monitoring well logs in **Appendix A-1.**

The following section discusses the findings. Logs of the borehole taken at the time of drilling can be found in Soil Engineers Ltd.

THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Borehole Location (ID)
- Outfalls
- Storm Gravity Mains
- Waterbodies
- Property Parcels
- Study Area

Figure: 5.10

Geotechnical Borehole Locations

0 50 100 200
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

5.4.3 Results, Discussion & Conclusions

The following section described the soil sub-strata encountered during borehole advancement and general textural classification of the strata during drilling. In general, beneath the existing layer of topsoil or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits. The sub-soils encountered indicate that the subsurface conditions in the area are complex due to the Quaternary glacial processes and the depositional environment that were created from the Grand River. A key plan and the interpreted geological cross sections are presented in **Figure 5.11**, **Figure 5.12,** and **Figure 5.13**.

Topsoil (BH/ MWs 1S, 1D, 2, 4S, 4D, 7S and 7D)

Topsoil, approximately 80 to 100 mm thick, was observed at the ground surface at the BH/ MWs 1S, 1D, 2, 4S, 4D, 7S and 7D locations.

Earth Fill (All BH/MWs)

Earth fill was encountered beneath the topsoil layer, or at the ground surface, at all of the BH/MW locations. The fill was generally brown in colour and consisted of fine to medium grained sand, or silty sand having traces of gravel. At the BH/MW 6, 7S and 7D locations, the earth fill encountered was brown to black in colour, consisting of organics, sand and glass fragments, which emitted a strong odour. The thickness of this unit generally ranged from 0.6 to 3.0 m. At BH/MW 7D, the earth fill was encountered from a depth of 0.1 mbgs to the maximum investigated depth of 6.5 m. A lower unit of earth fill was encountered at BH/MW 3, at a depth of 4.6m. The fill was grey in colour, consisting of silty clay with some organics, and having a strong odour. This unit extended to the maximum investigation depth of 5.0 m at the BH/MW 3 location.

Silty Clay (BH/MWs 1S, 1D, 2, 4S, 4D, 5R and 6)

Silty clay, was encountered at depths ranging from, 2.3 to 4.6 mbgs at BH/MWs 1S, 1D, 2, 4S, 4D, 5 and 6 locations. It was brown to grey in colour, soft to stiff in consistency, having traces of sand and gravel, with traces of organic material and gravel. A lower unit of silty clay was encountered at a depth of 6.1 mbgs at the BH/MW 1D location. The thickness of the silty clay layer ranged from 0.1 to 2.3 m at BH/MWs 1S, 1D, and 6 locations, where it extended to the maximum investigated depth of 6.5 m at the BH/MW 2 and 4D locations. The lower unit encountered in BH/MW 1A extended to the maximum investigated depth of 6.5 m. The moisture content for this silty clay unit ranged from 6% to 33%, indicating damp to very moist conditions.

Silt (BH/MWs 1S and 1D)

Silt, was encountered at a depth of 2.5 mbgs beneath the silty clay unit at the BH/MWs 1S and 1D locations. It was brown in colour and compact to dense in consistency. The unit was 2.1 m thick at BH/MW 1D and at BH/MW 1S, where it extends to the maximum borehole depth of 5.0 m. The moisture content for the sandy silt unit ranges from 17% to 19%, indicating moist conditions.

Sandy Gravel (BH/MW 5R)

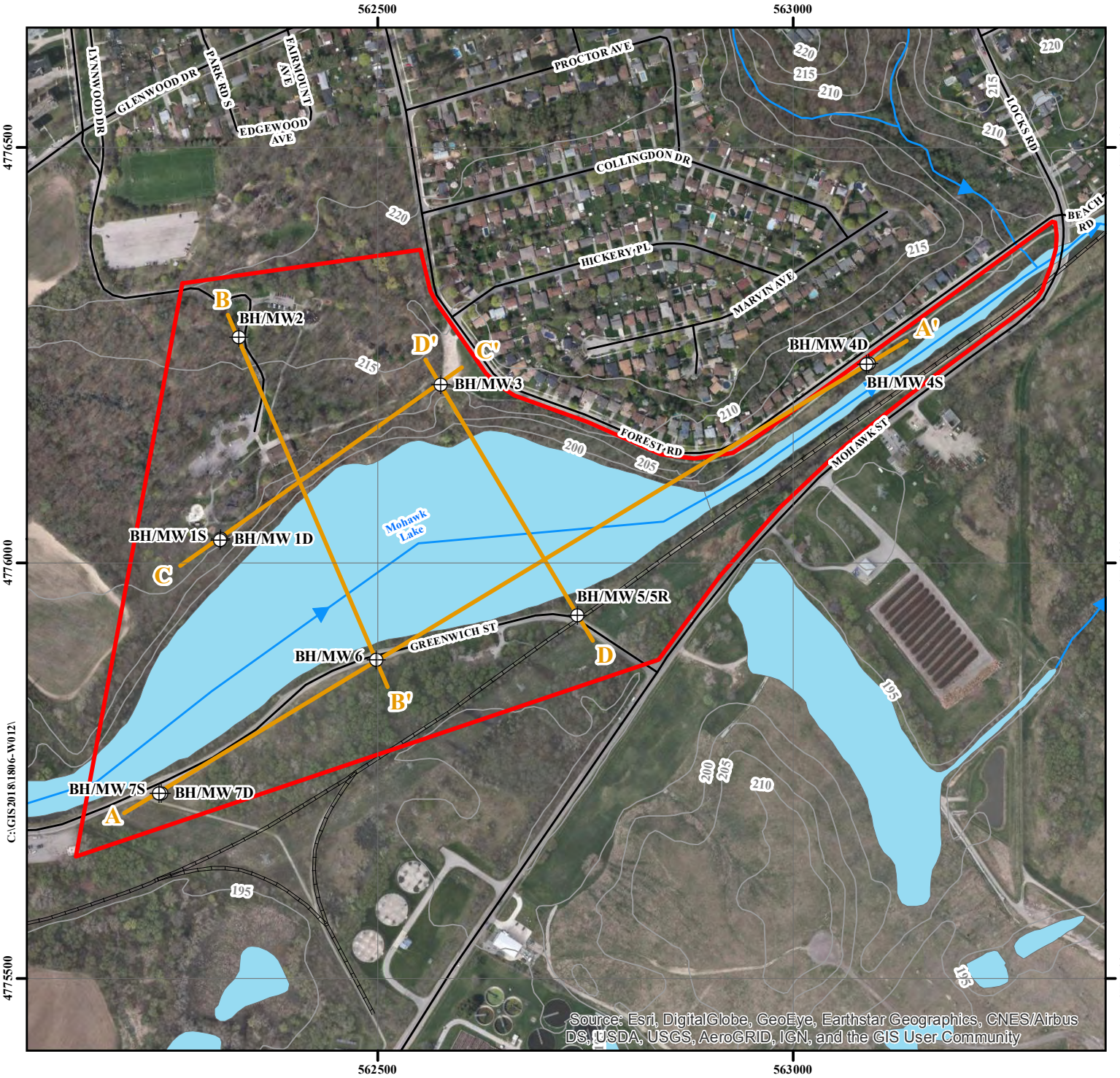
Sandy gravel, was encountered at a depth of 4.6 mbgs, beneath the silty clay unit at the BH/MW 5R location. It was brown in colour and compact in consistency, having some silt with traces of clay. This unit extended to the maximum investigated depth of 6.5 m. The moisture content for the sandy gravel unit ranged from 20% to 23%, indicating moist conditions. The estimated permeability for the sandy gravel unit at BH/MW 5R, at a depth of 4.57 mbgs was about 10-5 m/sec. Grain size analysis was performed on one (1) sample from BH-5R, the plotted gradation can be found in **Appendix A-1**.

Silty Sand (BH/MWs 1D and 6)

Silty sand was encountered at depth of 4.6 mbgs, at BH/MWs 1D and 6 locations. It was brown to grey in colour, was loose to very loose in consistency, having a trace of clay. The unit was 1.5 m thick at BH/MW 1D where it extended to the maximum investigated depth of 6.5 m at the BH/MW 6 location. The moisture content for the silty sand unit ranged from 17% to 31%, indicating moist to very moist conditions. The estimated permeability for the silty sand unit at BH/MW 6, at a depth of 6.1 mbgs was about 10-6 m/sec. Grain size analysis was performed on one (1) sample from BH-6, the plotted gradation can be found in **Appendix A-1**.

Organics (BH/MW 3)

A layer of organic material, was encountered at a depth of 3.0 mbgs at the BH/MW 3 location. It was black in colour, and contained wood debris. It was approximately 1.6 m thick. The moisture content for the retrieved soil sample was 50%, indicating saturated conditions.



Approximate Boundary of Subject Site

Borehole with Monitoring Well

Waterbody

Watercourse

Local Road

Railway

A A' Cross-Section Direction

200 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 4, 2019

Scale:

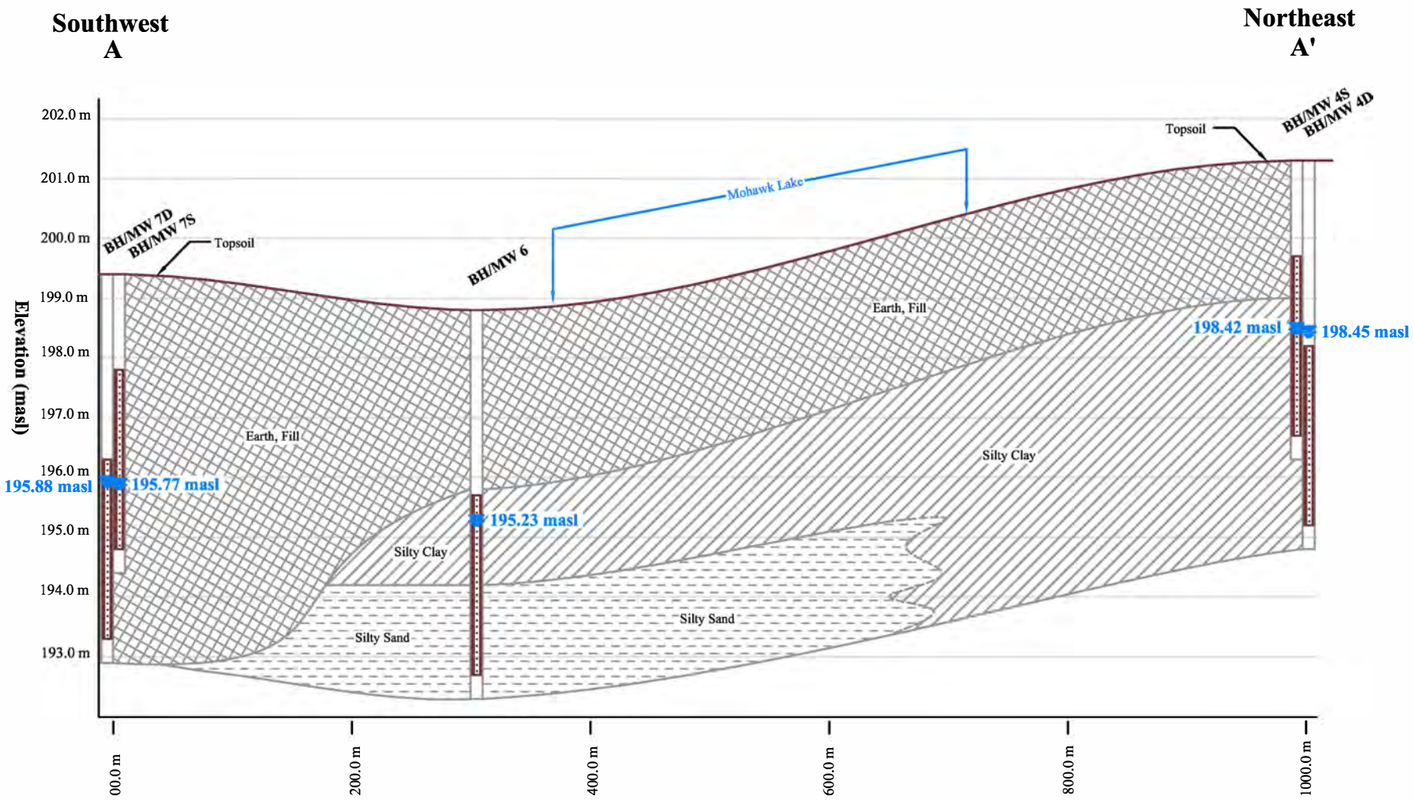
0 30 60 120 180 240 300

Metres

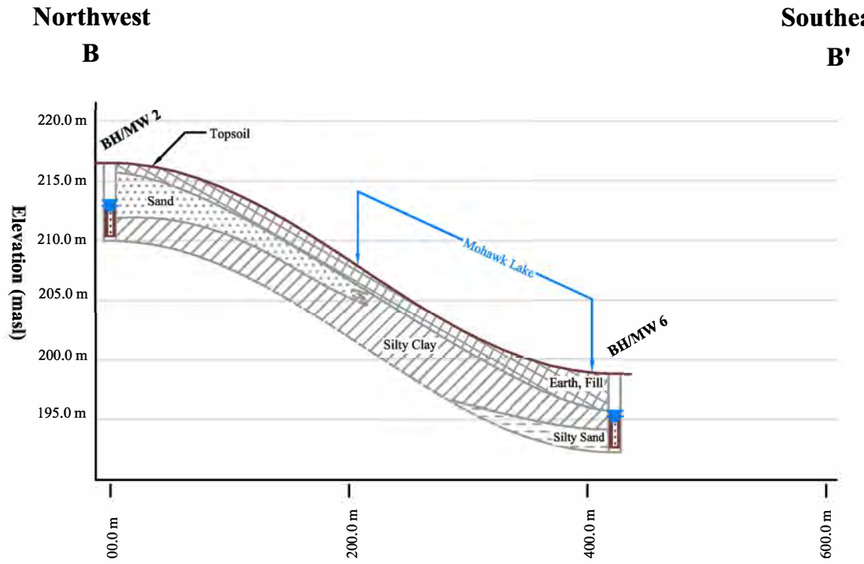
Drawing No. 7-1

Figure: 5.11

Figure: 5.12



Section A-A'
(V. Scale: 1:100)



Section B-B'
(V. Scale: 1: 500)

Earth, Fill
Silty Clay
Sand
Silty Sand
Screen
Water Table

C:\Projects\2018 Jobs\1812-W012

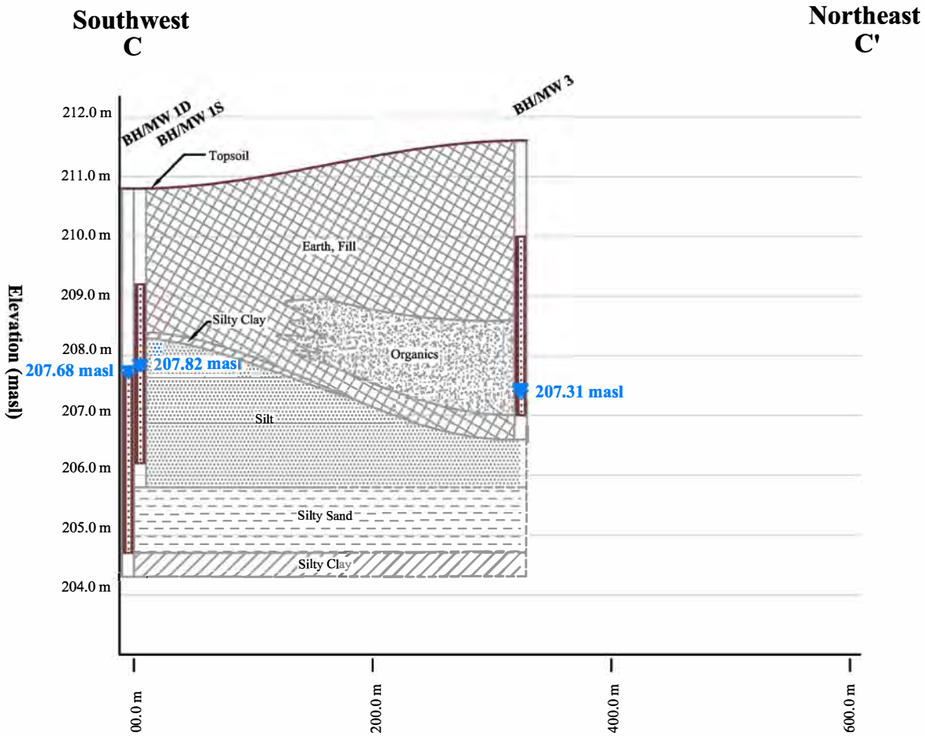
Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (A-A' and B-B')

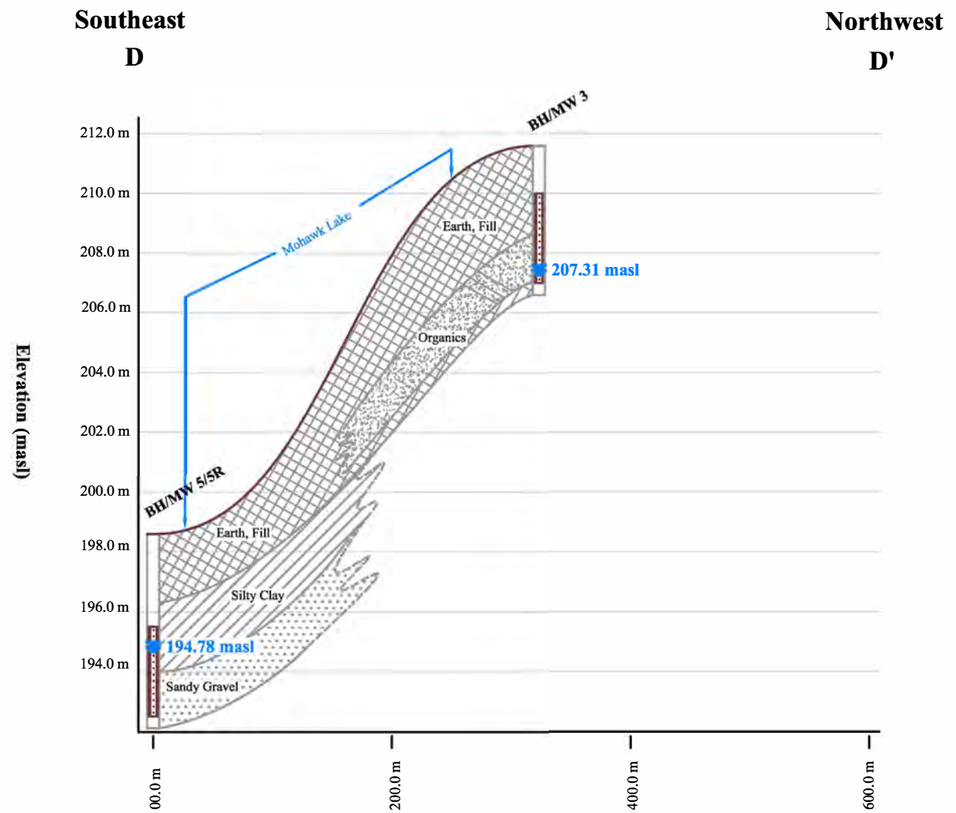
Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	7-2A

Figure: 5.13



Section C-C'
(V. Scale: 1:100)



Section D-D'
(V. Scale: 1: 200)

C:Projects/2018 Jobs/1812-W012

- Earth, Fill
- Silt
- Silty Clay
- Silty Sand
- Organics
- Sandy Gravel
- Screen
- Water Table

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (C-C' and D-D')

Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	7-2B

5.5 HYDROGEOLOGY/GROUNDWATER

The following section summarizes the general hydrogeological conditions in the study area where sub-surface investigations including environmental site assessments and landfill studies have been undertaken, and includes information describing geologic units identified as aquifers and aquitards, static water levels, groundwater flow direction, hydraulic conductivity and flow velocity and possible groundwater discharge zones.

5.5.1 Background

Groundwater in and around the City of Brantford generally flows radially to the south, southwest and east following the general topography (Terraqua, 1990). Aquifers in the general vicinity of City of Brantford are low yielding and of poor quality and as such are not drinking water sources (Golder Associates, 1994).

Environmental investigations on the grouping of former industrial properties located at 347 Greenwich St, 66 Mohawk St. and 22 Mohawk St. (CH2MHill, 2014), found an unconfined shallow aquifer of mainly sand and gravel varying in thickness of 2.0 - 5.5m extending to depths of 3.5 - 6.0m below ground surface (bgs). Underlying this was silty clay/clayey silt and considered an aquitard where vertical movement of groundwater was impeded. The groundwater table was found to range in depth from 2.0 - 3.5 across the three properties.

Hydraulic conductivities (K) in the aquifer ranged from $1.8x10^{-3}$ to $7.5x10^{-6}$ m/s translating into a horizontal linear flow velocity ranging from 4 - 53m/yr. K values in the aquitard ranged from $8.2x10^{-7}$ to $8.7x10^{-10}$ m/s, a 3-4 order of magnitude lower than that of the aquifer which will result in a tendency for groundwater to flow mostly horizontal. Groundwater flow direction was determined to be mostly to the south and southwest except for the north portion of 347 Greenwich St. which flowed radially from a water table high point in the center north towards the canal.

A series of landfill investigations have been completed for several former landfills located throughout the surrounding areas of Mohawk Lake which provide some additional information with respect to local groundwater characteristics. **Figure 5.14** demonstrates several historical and existing landfill locations as detailed in the Gore and Storrie, 1991 report. The following groundwater characteristics are identified are as follows:

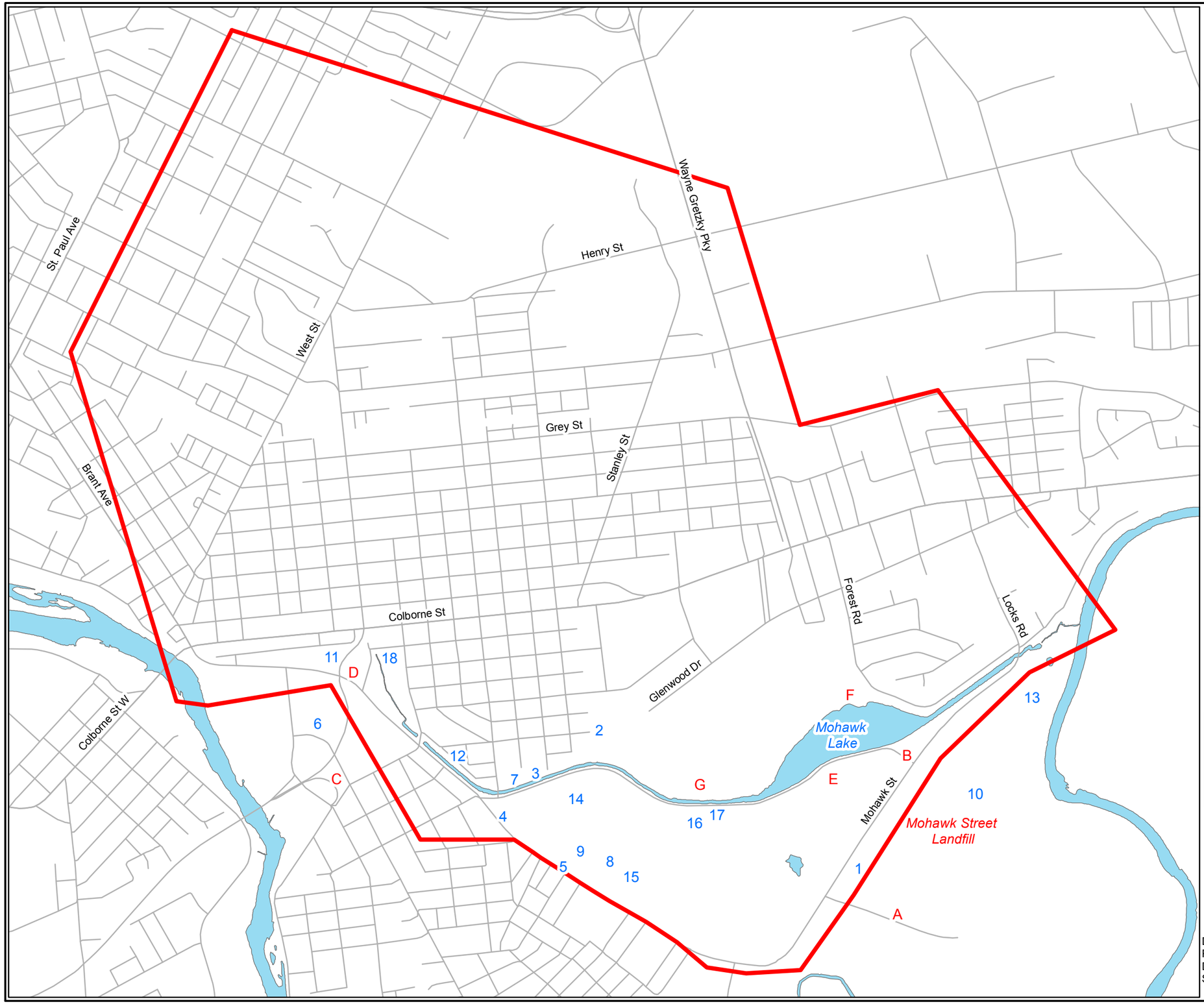
- Landfill A – Located 400m south of the lake at the Brantford WPCP the groundwater table was recorded at 3-5m bgs
- Landfill B - At the corner of Mohawk and Greenwich, 30-50m south of the lake the groundwater table ranged from 1.0-2.5m bgs with flow to the southeast
- Landfill E – Immediately south of and adjacent to the top two thirds of the Lake, groundwater was found at 4.0m bgs, lower than the surface elevation of the lake indicating a southward flow of groundwater away from the Lake
- Landfill G - In the Glebe lands 250m west of the Lake and 60m north of the canal the water table was recorded at 3.0 -5.0m bgs and flows south toward the lake and canal
- Mohawk Landfill – About 200m south of the Lake on the south side of Mohawk Dr. groundwater radiates in a west, south and east direction away from the lake towards the Grand River

Previous reports have also identified potential groundwater inputs to Mohawk Lake. Previous recordings of temperature-depth profiles identified potential (cold) groundwater springs feeding into the deepest

portion of Mohawk Lake along its northeastern shore with water temperature measured to be 6°C cooler than the surface water (17.2 vs. 23°C) (Sandilands, 1972).

Investigations in Shallow Creek Park, a mostly filled in part of the former canal turning basin located at the west end of the canal, by Terraqua in 1990 found that "the groundwater appears to flow west and southwest across the site, from the embankment toward Eastward Creek and Grand River". They found that the level of Eastward Creek was above the groundwater table thus it was losing water and that "the main zone of potential off-site groundwater migration is the south boundary of the property" (i.e., the Shallow Creek Park area). (Terraqua, 1990)

Intake protection zones from the local Source Protection Plan (SPP) are shown in **Figure 5.15.**



Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Road Centerlines
- Waterbody
- Study Area
- A-G Abandoned Landfills
- 1-18 Industrial Properties

Figure: 5.14

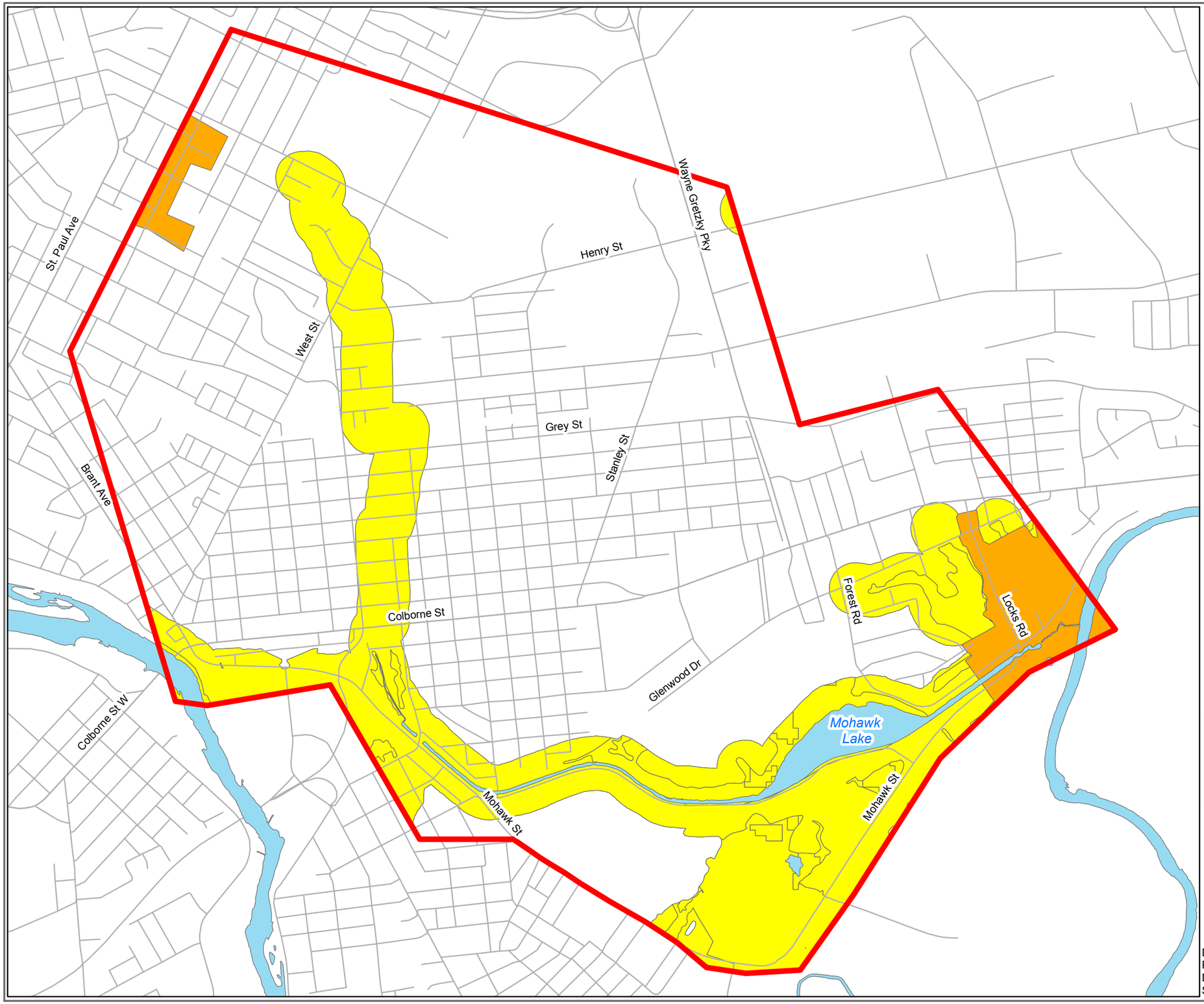
Potential Contamination Sources

0 0.25 0.5 1
Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford
Gore & Storrie

Aquafor Beech Limited



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Road Centerlines
- Waterbody
- Study Area

IPZ Zone Type

- 2
- 3

Figure: 5.15

Intake Protection Zone

0 0.25 0.5 1

Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

5.5.2 Field Study Scope and Methodology: Hydrogeological Monitoring

The scope of work for the Hydrogeological Study completed as part of the Characterization Study is summarized below:

- Installation of ten (10) monitoring wells within the study area;
- Monitoring well development and manual groundwater level measurements at the ten (10) monitoring wells;
- Instrumentation of all monitoring wells with data loggers to continuously monitor the shallow water table and any responses to precipitation received;
- Estimation of the range of values for hydraulic properties (i.e. hydraulic conductivity, infiltration) for the groundwater bearing subsoil strata using Single Well Response Tests and grain size analysis;
- Characterization of the stratigraphy, hydrostratigraphy and groundwater quality; and,
- Evaluation of the horizontal and vertical gradients for local groundwater to assess any losing or gaining status for local shallow groundwater relative to Mohawk Lake, including areas of groundwater discharge and recharge

Borehole and Monitoring Well Installation

The hydrogeological monitoring program included the drilling of ten (10) boreholes with depths of 5.0 - 6.5 m within the close vicinity of Mohawk Lake and installation of groundwater monitoring wells at seven (7) selected locations to confirm the hydrogeological conditions. There are three (3) locations with nested sets of groundwater monitoring wells with both a shallow groundwater monitoring well and an adjacent deeper monitoring well. These nested wells were installed to assist with the determination of any vertical groundwater gradient in the vicinity of the lake, and whether there is groundwater discharge or recharge to/from the Lake and canals.

Borehole drilling and monitoring well construction was conducted on August 7th, 8th and September 24th, 2018. As mentioned in previous sections, the gap in drilling dates was a result of field adjustments made as a result of park access restrictions identified following the original confirmation of the drilling locations and the subsequent utility locate clearances required. On October 23rd, 2018 it was discovered that BH/MW-5 was impacted during a vehicular collision rendering it unusable (see **Figure 5.27**) and no continuous data from the monitoring equipment was able to be recovered. A new borehole was drilled in the same location on January 8th, 2019 (BH/MW-5/5R). Borehole locations are demonstrated on **Figure 5.10.** The borehole and monitoring well construction were completed by a licensed well contractor, DBW Drilling Ltd., under the full-time supervisions of a geotechnical technician from Soil Engineers Limited (SEL). SEL also logged the soil sub-strata encountered during borehole advancement and collected representative soil samples for textural classification. The boreholes were drilled using continuous flight power augers. Detailed descriptions of the encountered subsurface soil and groundwater conditions are presented on the borehole and monitoring well logs in **Appendix A-1.**

The wells were comprised of 50-mm diameter PVC riser pipe and screen sections and were installed in accordance with 0. Reg. 903. The tops of each well were housed in a monument protective casing, with the exception of BH/MW-5/5R, which was installed with a steel cap that sat flush with the ground level. Three (3) locations had nested sets of groundwater monitoring wells with both a shallow groundwater monitoring well and an adjacent deeper monitoring well. These nested wells were installed to assist in the determination of the vertical groundwater gradient in the vicinity of the lake, to determine if there was groundwater discharge towards the Mohawk Lake, from the shallow aquifer, or if the lake lost water to recharge the shallow aquifer system.

These wells were strategically placed to enable interpretation of a hydrogeostratigraphic profile across the lake area, to determine background groundwater elevations, groundwater flow pattern, and to characterize the background groundwater quality in the vicinity of the Lake.

The UTM coordinates at the borehole locations, together with the monitoring well construction details are summarized in the table below, provided by SEL (**Table 5.2**).

Table 5.2: Borehole/Monitoring Well Installation Details

Well ID	Installation Date	UTM Coordinates		Monitoring Well Depth (mbgs)	Screen Interval (mbgs)	Casing Diamter (mm)
		East (m)	North (m)			
BH/MW-1S	August 7, 2018	562310	4776028	4.6	1.52-4.6	50
BH/MW-1D	August 7, 2018	562311	4776029	6.1	3.1-6.1	50
BH/MW-2	September 4, 2018	562333	4776272	6.1	3.1-6.1	50
BH/MW-3	August 7, 2018	562576	4776215	6.1	3.1-6.1	50
BH/MW-4S	August 7, 2018	563089	4776239	4.6	1.52-4.6	50
BH/MW-4D	August 7, 2018	563091	4776240	6.1	3.1-6.1	50
BH/MW- 5/5R	August 8,2018* January 8,2019	562740	4775937	6.1	3.1-6.1	50
BH/MW-6	September 4,2018	562498	4775883	6.1	3.1-6.1	50
BH/MW-7S	August 8, 2018	562237	4775723	4.6	1.52-4.6	50
BH/MW-7D	August 8, 2018	562239	4775723	6.1	3.1-6.1	50

Notes: meters below ground surface (mbgs)
*BH/MW-5 well destroyed and replaced on January 8, 2019

Groundwater Level Monitoring

Aquafor Beech Ltd installed HOBO U20 water level loggers on August 20th and September 6th, 2018 in each of the ten (10) monitoring wells to continually record the groundwater elevations over the study period and determine the seasonal groundwater level fluctuations (See **Appendix A-2**). For the purposes of QA/QC, staff from SEL conducted manual groundwater measurements in the monitoring wells on a monthly basis from September 2018 to August 2019 to record the static and seasonal groundwater table fluctuations.

After the vehicular incident at BH/MW-5/5R discussed above, the original level logger and data were unable to be utilized and a new level logger was installed at BH/MW-5/5R on February 15th, 2019.

Single Well Response Tests

All of the deeper monitoring wells (6.1 mbgs), with the exception of BH/MW-3, underwent development in preparation for single well response testing (SWRT) to estimate the hydraulic conductivity (K) for saturated subsoil strata at the depths of the monitoring well screens. Well development involved the purging and removal of several casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the well screens, thereby improving the transmissivity of the subsoil strata formation at the well screen depths. Development and subsequent SWRT could not be performed at BH/MW-3, due to the insufficient volume of groundwater within the well throughout the monitoring period.

The SWRT involved the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The rate at which the water level recovered to static conditions (falling head) was tracked using the level logger, and manually using a water level tape. The rate at which the water table recovered to static conditions was used to estimate the K value for the groundwater-bearing strata formation at the well screen depth interval. The SWRT's were completed on October 25th, 2019 and on June 19th, 2019.

The K values derived from the SWRT's provided an indication of the yield capacity for the groundwater-bearing soil strata at the well screen depths, and may be used to estimate the flow of groundwater through the water-bearing subsoil strata.

Groundwater Quality Sampling Methodology

Water quality samples were collected once from each of the monitoring wells to characterize the water quality, potential contaminants and sources of possible pollutants. Sampling parameters for the groundwater samples included inorganics and nutrients, metals, pH, volatile organic compounds, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, and BTEX (benzene, toluene, ethyl benzenes, and xylenes).

Following the completion of the monitoring well development on September 18th, 2018 by SEL, Aquafor Beech Ltd. completed water quality sampling on October 23rd, 2018. Given that the groundwater quality sampling was completed following the development of the wells, a low flow sampling procedure was applied (see **Figure 5.16**). This method involved extracting groundwater at rates comparable to ambient groundwater flow so that the drawdown of the water level was minimized and the mixing of stagnant water with water from the screened intake area in a well was reduced. The timing of the groundwater

sampling was completed shortly following the development of the monitoring wells in order for the sampling results to be made available in time for the delivery of the Draft Characterization Report in October 2018.

A Heron dipper-T water level meter was used to determine the water level in each well and a Geotech Peristaltic Pump with quarter inch polyethylene tubing was used to collect the groundwater. Prior to sampling at each monitoring well, new polyethylene tubing was attached to the pump and both the level meter and the tubing were rinsed thoroughly with distilled water. The tubing was then lowered to an elevation where it would sit roughly in the middle of the screened groundwater column. The pump was then run for approximately 5-10 minutes to purge some of the stagnant groundwater as water level was continually monitored to ensure the drawdown was minimal. Sampling bottles were then filled with sufficient volume to eliminate air bubbles or as directed by the sample. For certain metal samples, 45-micron filters were used on the water before filling the sample bottle.

Figure 5.16: Groundwater sampling at BH-6

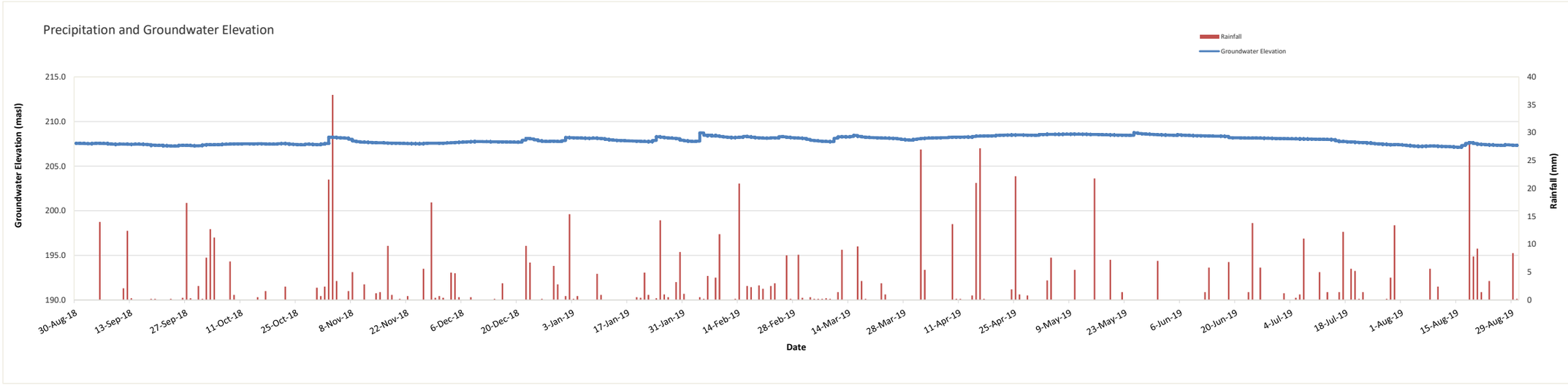
5.5.3 Results, Discussions & Conclusions

The following section summarizes the results for the continuous groundwater level monitoring, SWRT's, and the groundwater quality monitoring.

Groundwater Level Monitoring

HOBO U20 water level loggers were installed at each of the ten (10) monitoring wells to record groundwater levels over an entire year. Data was collected from the installation dates noted above (August 20th and September 6th, 2018) to August 30th, 2019 and compared against rainfall data from the Brantford Airport Climate Station (Station ID 6140942). For QA/QC purposes, staff from SEL also completed manual groundwater measurements on a monthly basis from September 2018 to August 2019, the results of which provided in **Appendix A-1**. The only station without a full year of groundwater data was MW-5R (February 15th to August 30th, 2019) due to the complications discussed above. **Figure 5.17-5.23** display the results from the continuous groundwater level monitoring.

Chart B-1
Groundwater Levels BH/MW 1S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



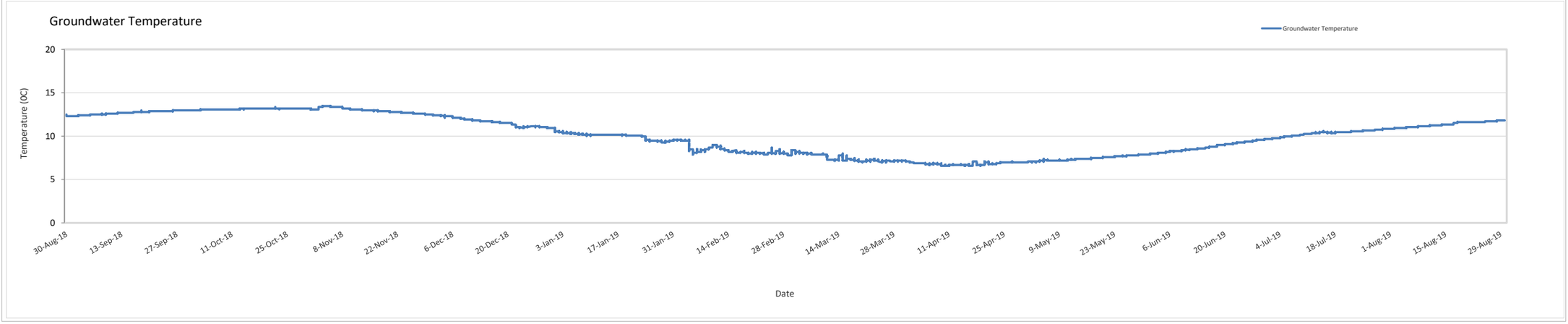
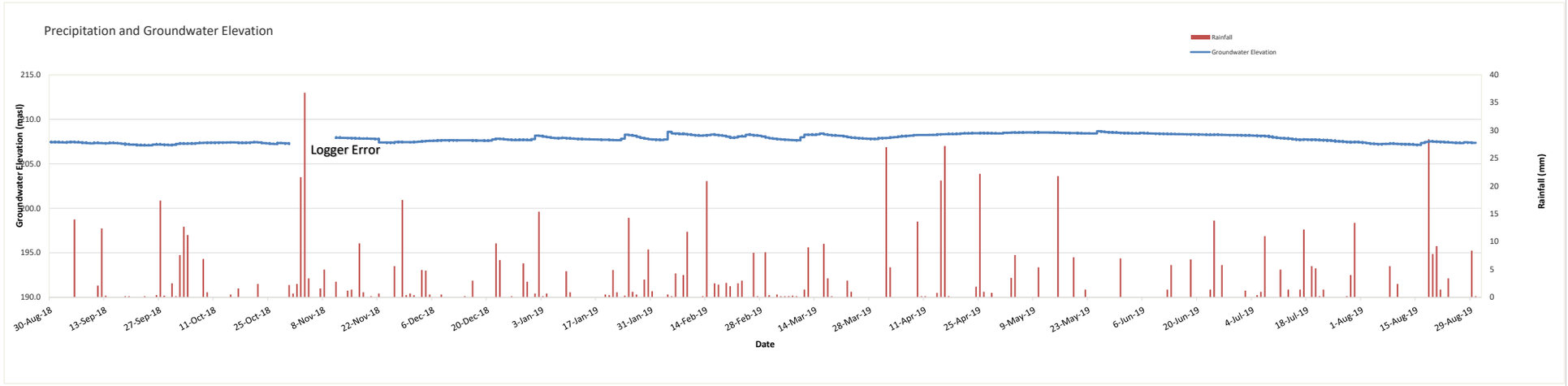


Chart B-2
Groundwater Levels BH/MW 1D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



Logger Error

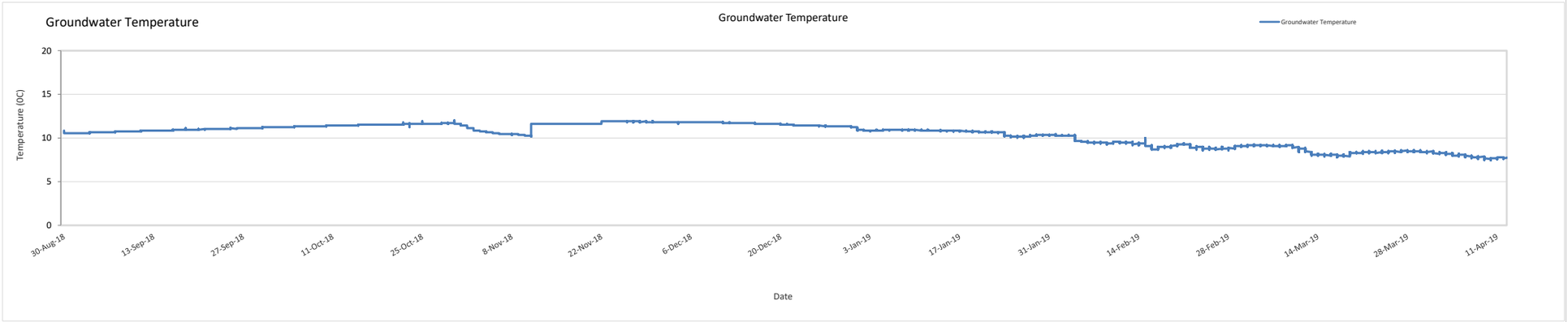
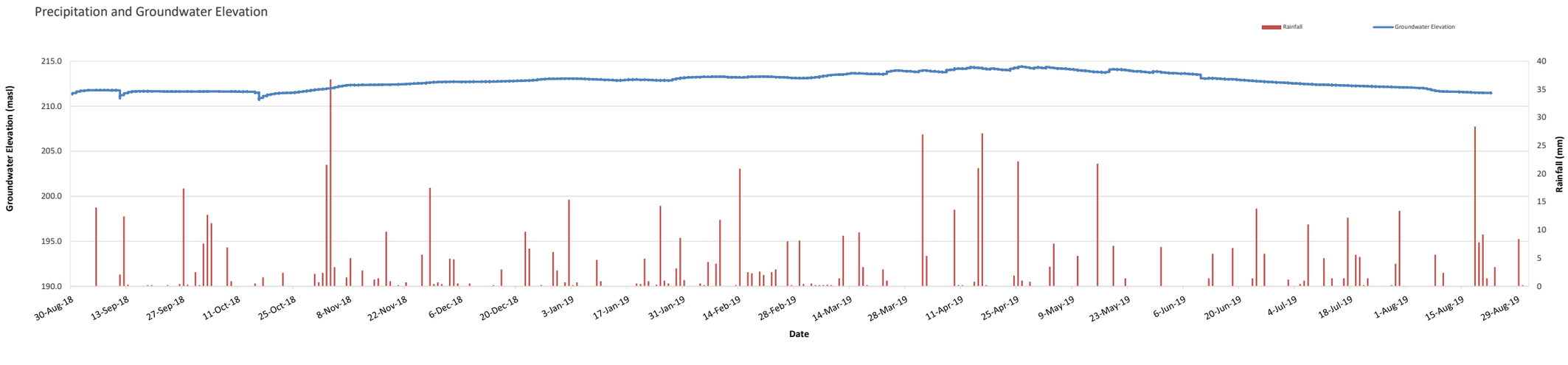


Chart B-3
Groundwater Levels BH/MW 2
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



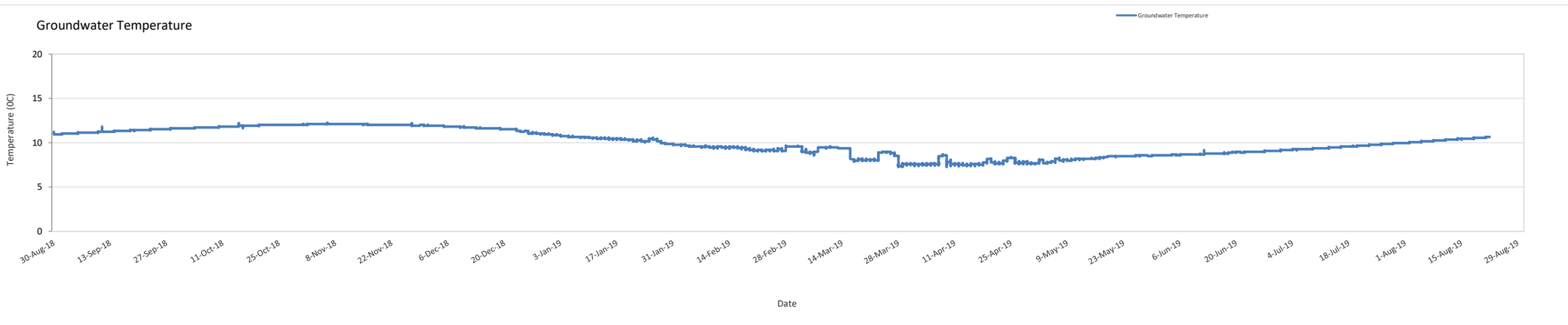
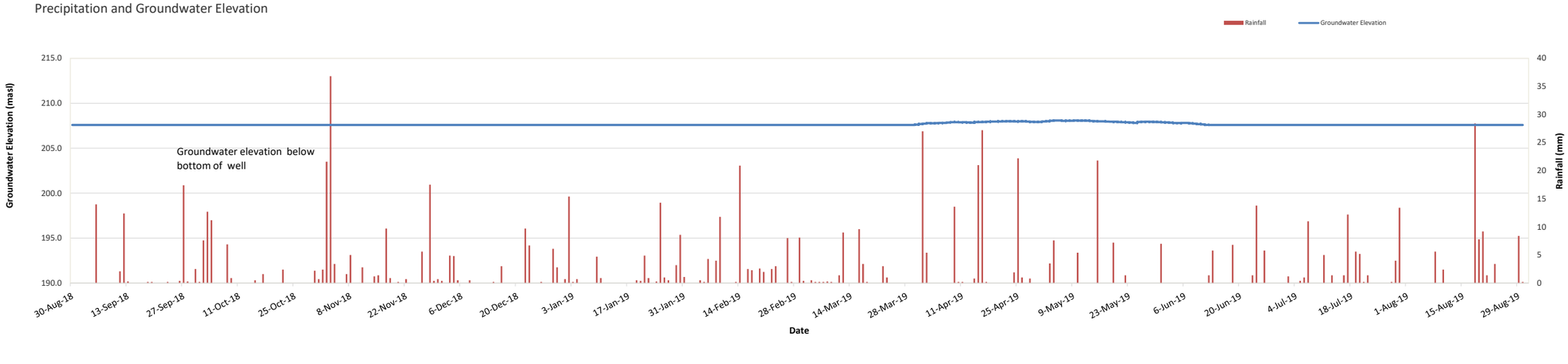


Chart B-4
Groundwater Levels BH/MW 3
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



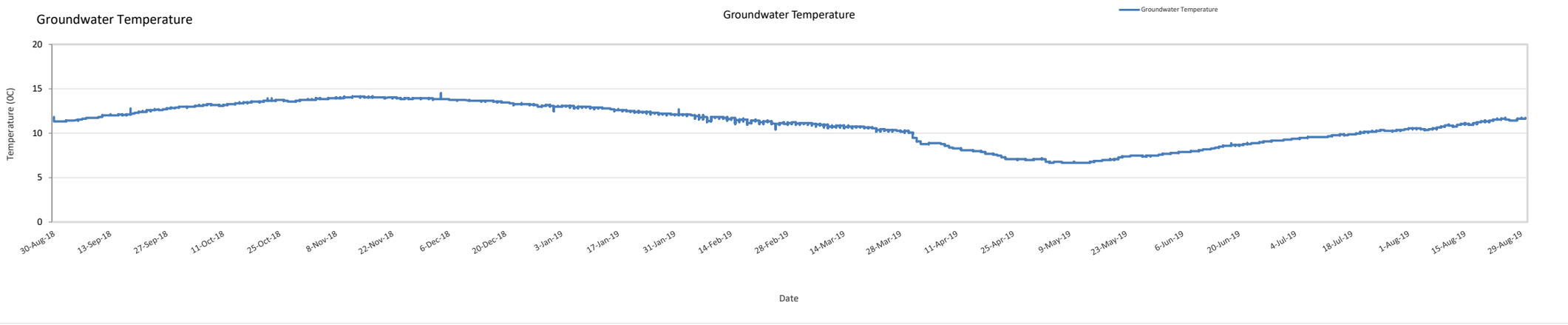
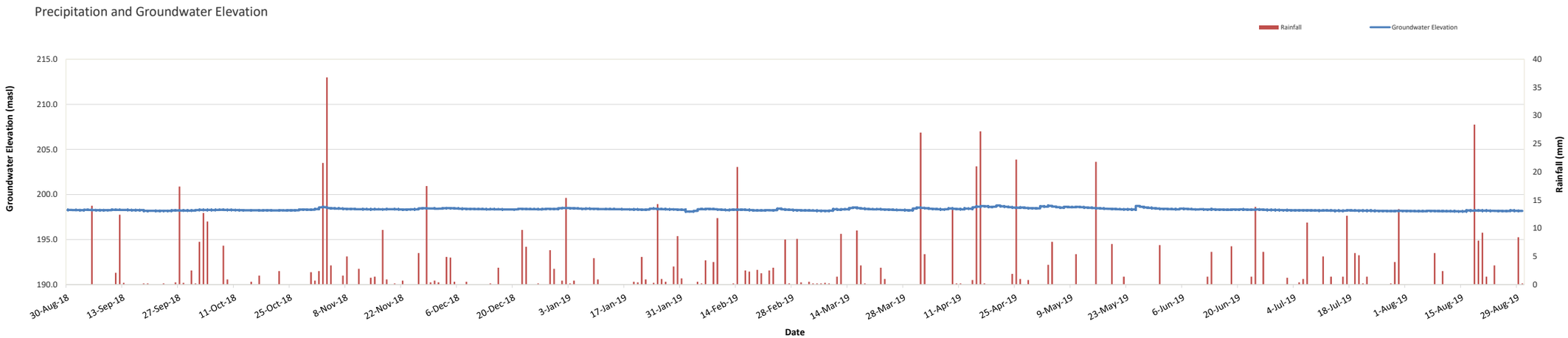


Chart B-5
Groundwater Levels BH/MW 4S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30,2019



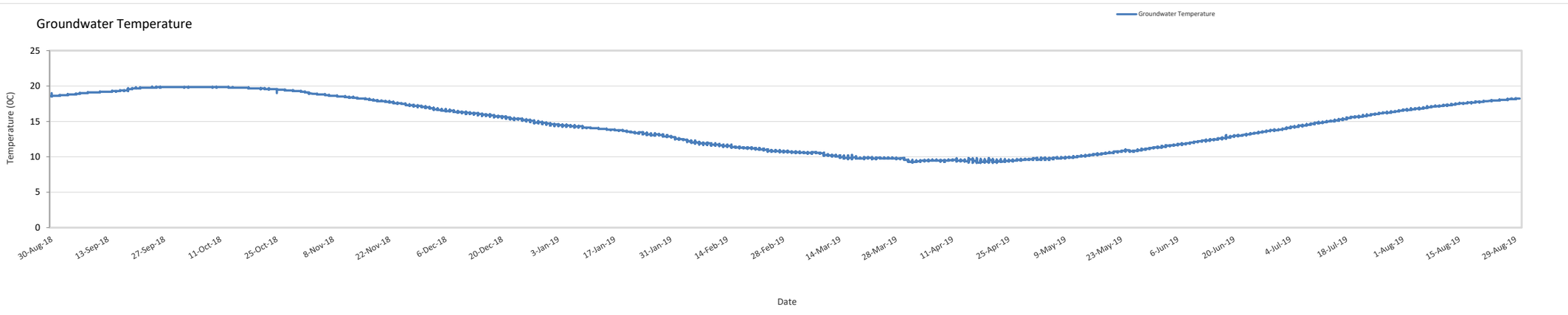
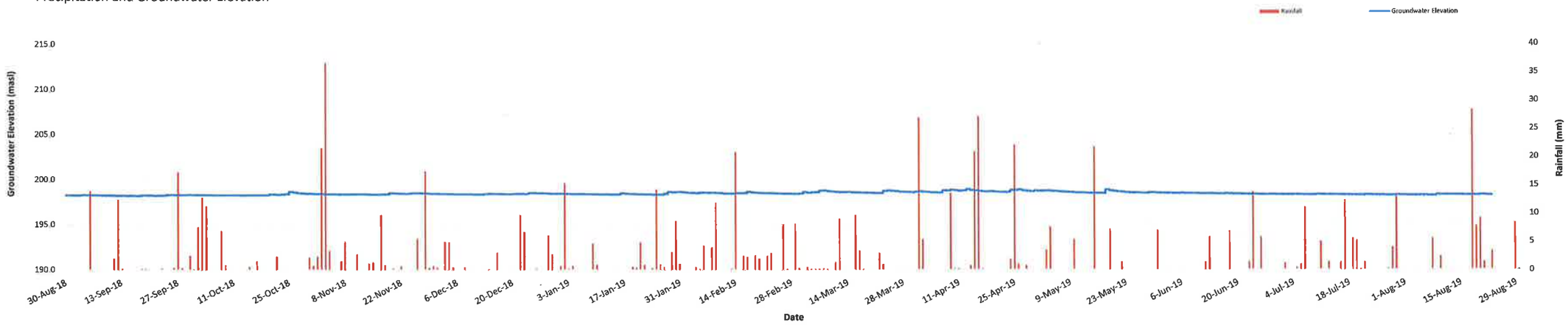


Chart B-6
Groundwater Levels BH/MW 4 D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019

Precipitation and Groundwater Elevation



Groundwater Temperature

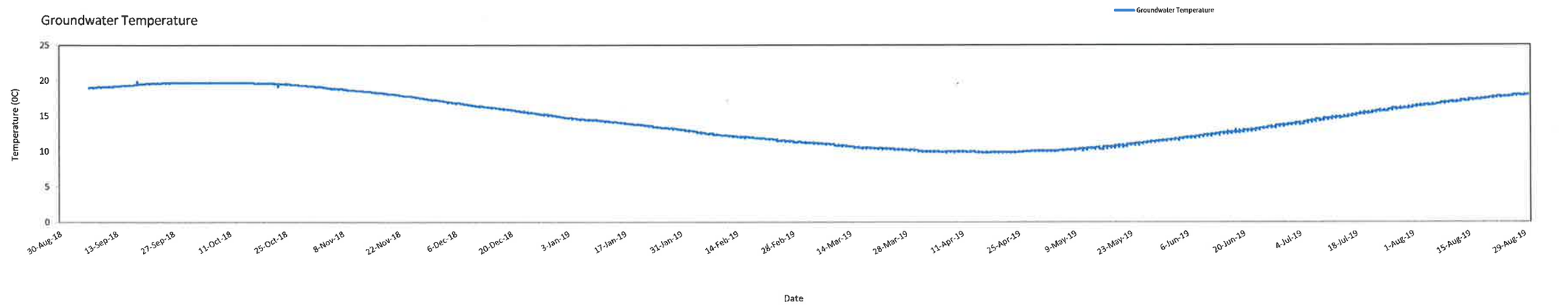
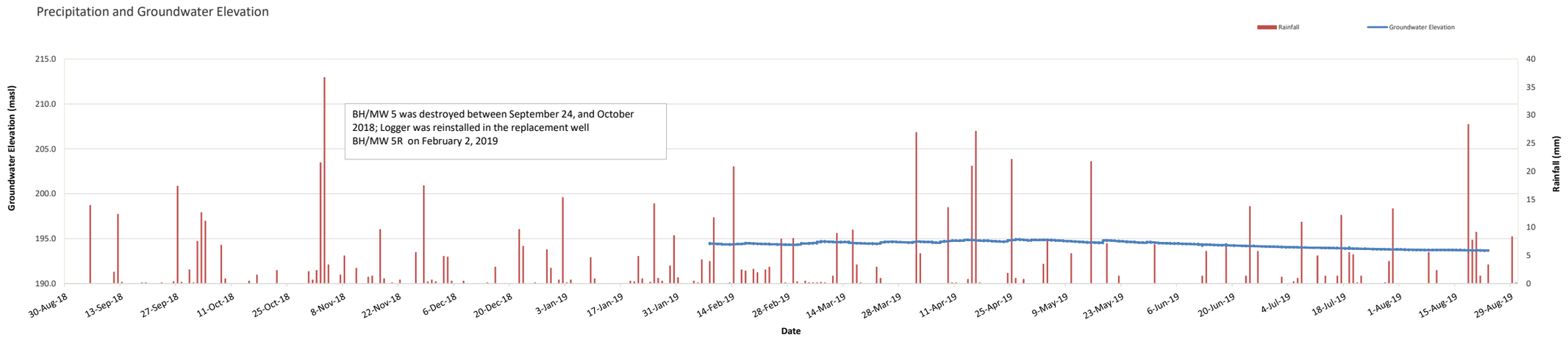


Chart B-7
Groundwater Levels BH/MW 5R
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



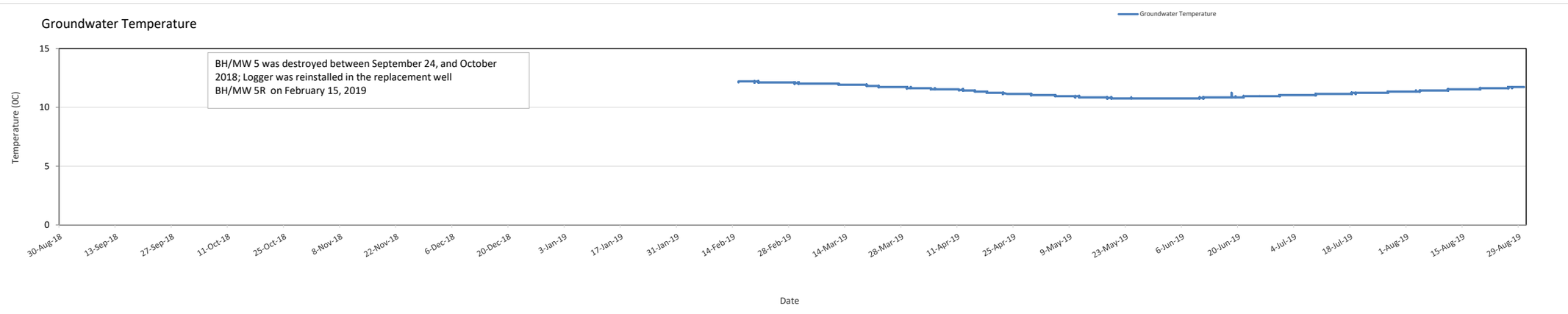
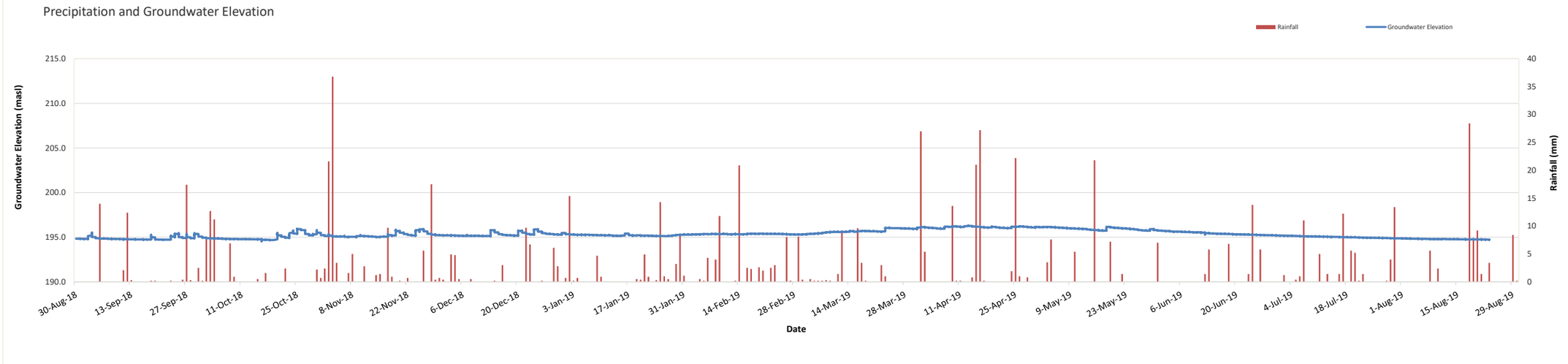


Chart B-8
Groundwater Levels BH/MW 6
Groundwater Logger Monitoring Data, September 9, 2018 to August 30, 2019



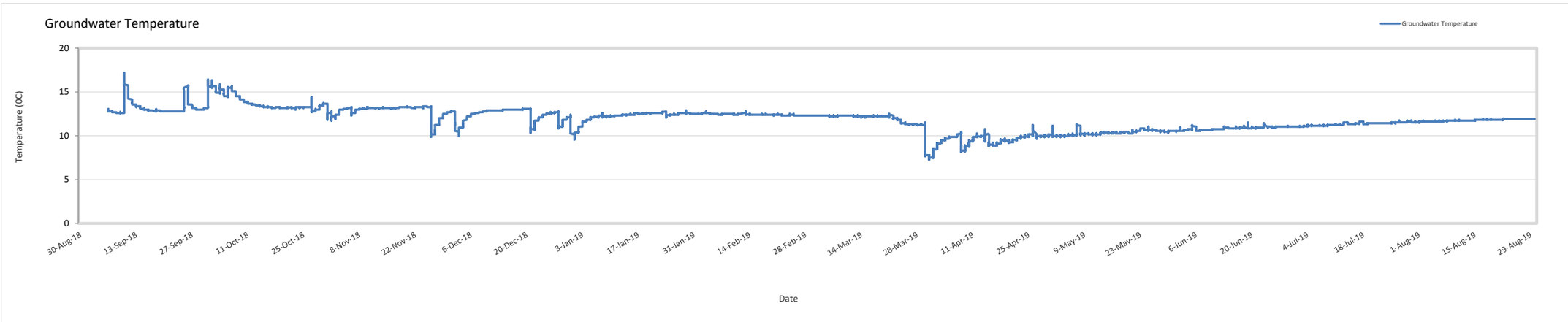
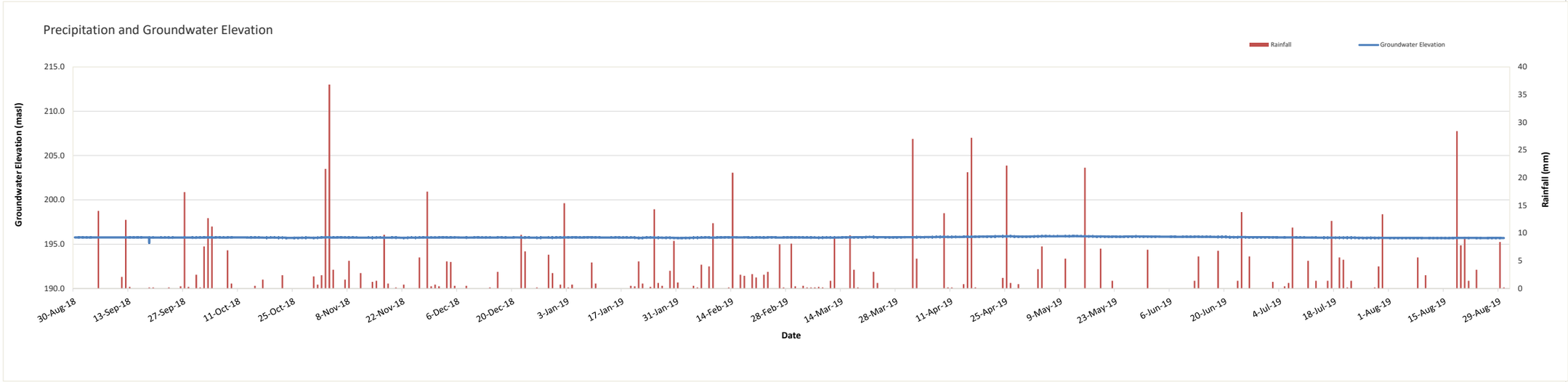


Chart B-9
Groundwater Levels BH/MW 7S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



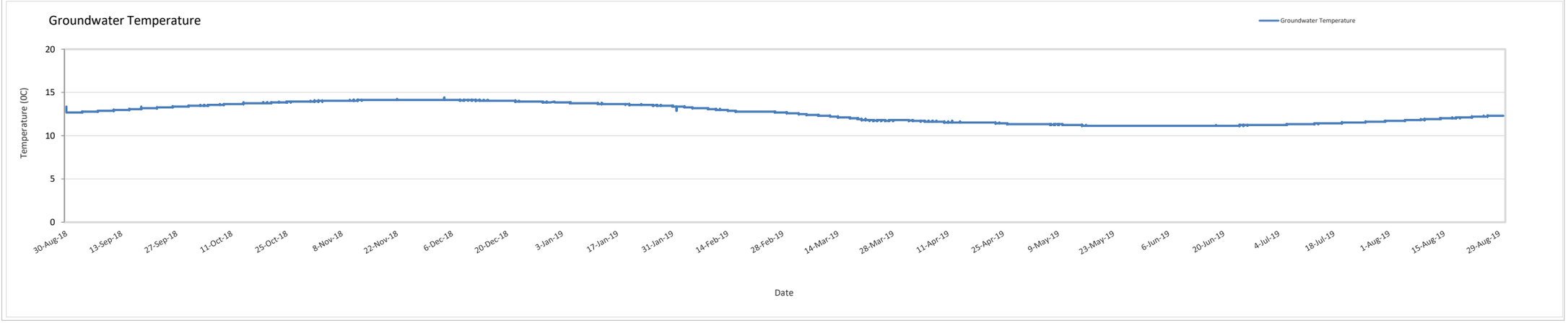
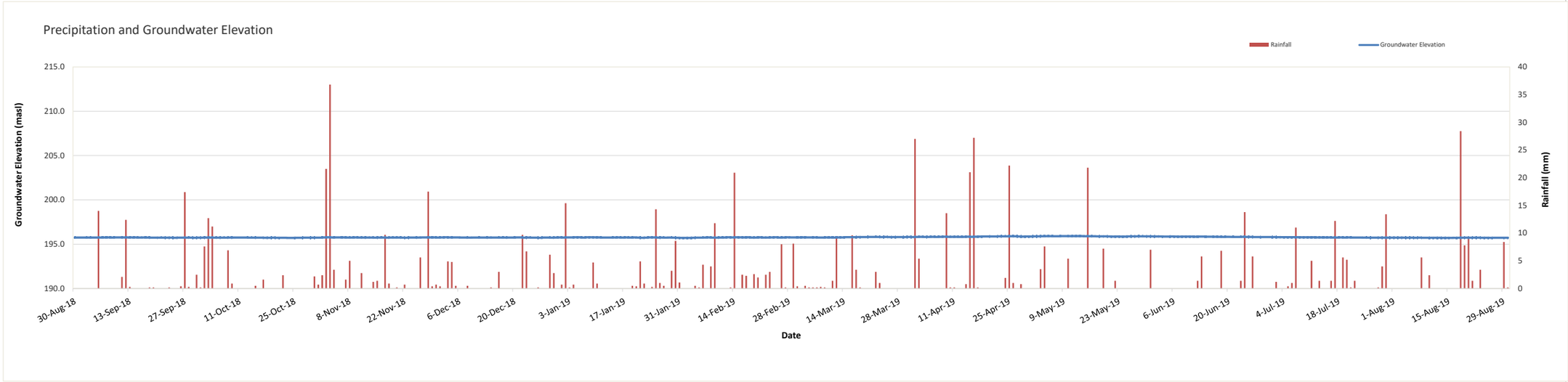


Chart B-10
Groundwater Levels BH/MW 7D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



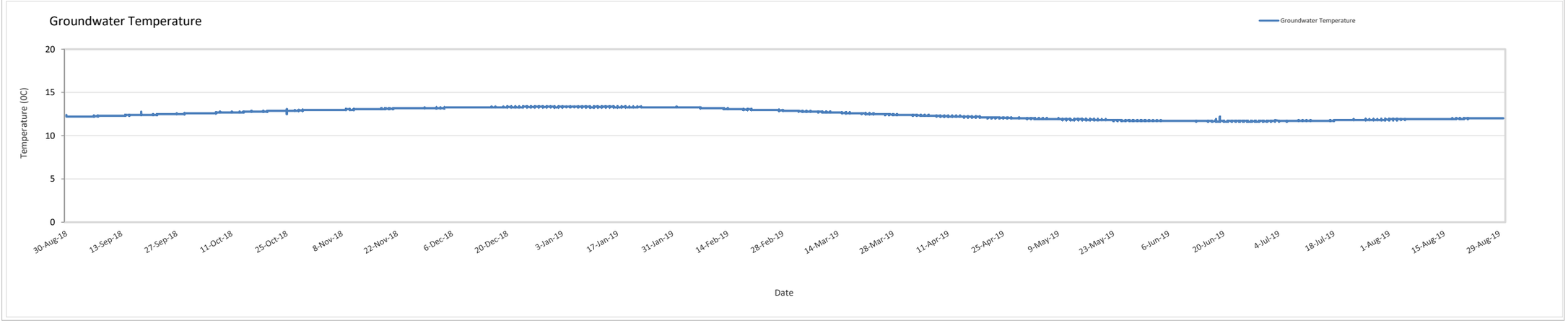


Figure 5.27: Condition of BH/MW-5 after collision (Pictures taken October 23, 2018)

Single Well Response Tests (SWRT's)

SWRT's were conducted at BH/MW 1D, 4D, and 5/5R in October, 2018 and at BH/MW 2, 6, and 7D in June, 2019. Full results from each test are provided in **Appendix A-1**, with a summary of the findings shown below in **Table 5.3**.

Table 5.3: Summary of SWRT Results

Well ID	Ground Elevation (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Screened Sub-Soil Strata	Hydraulic Conductivity (K) (m/s)
BH/MW-1D	210.75	6.1	6.5	3.1-6.1	Silt, Silty Sand/Silty Clay	4.4×10^{-8}
BH/MW-2	216.49	6.1	6.5	3.1-6.1	Sand/Silty Clay	1.5×10^{-5}
BH/MW-4D	201.32	6.1	6.5	3.1-6.1	Silty Clay	5.4×10^{-6}
BH/MW-5/5R	198.58	6.1	6.5	3.1-6.1	Silty Clay/Sandy Gravel	2.5×10^{-7}
BH/MW-6	198.76	6.1	6.5	3.1-6.1	Silty Clay/Silty Sand	4.1×10^{-5}
BH/MW-7D	199.36	6.1	6.5	3.1-6.1	Earth Fill	1.4×10^{-6}

Notes:
- meters below ground surface (mbgs)
- meters above sea level (masl)

The Hazen Equation Method was also adopted to estimate K for different subsoil layers which may contain higher groundwater levels during the seasonal (spring) period, which are primarily above the well screen depths.

The Hazen Equation method relies on the interrelationship between hydraulic conductivity and effective soil particle grain size, *d*10, (mm) for the sub-soil media. This empirical relation predicts a power-law relation with *K*, as follow:

$$K = Ad_{10}^2$$

where;
d_{10}: Value of the soil grain size gradation curve (mm) as determined by sieve analysis, whereby 10% by weight of the soil particles are finer and 90% by weight of the soil particles are coarser.
A: Coefficient; it is equal to 1 when K is in m/s and d_{10} is in mm

The Hazen Equation K estimation provides an indication for the yield capacity for groundwater-bearing subsoil strata at the depths where the soil samples that underwent grain size analyses were collected. Two (2) soil samples for grain size analysis were collected during the borehole drilling, one (1) from the sandy gravel unit observed at BH/MW-5/5R, and one (1) from the silty sand unit observed at BH/MW-6. The results of the Hazen method, determined K estimates are provided in **Table 5.4** below.

Table 5.4: Summary of Hazen Equation Estimated K Results

Well ID	Sample Depth (mbgs)	Sample Elevation (masl)	Description of Soil Strata	D_{10} (mm)	Hydraulic Conductivity (K) (m/s)
BH/MW-5/5R	4.57	194.01	Sandy Gravel, some silt, and a trace of clay	0.04	1.6×10^{-5}
BH/MW-6	6.1	192.66	Silty sand, a trace of clay	0.01	1.0×10^{-5}

Notes: - meters below ground surface (mbgs)
- meters above sea level (masl)

Compared to the results from the SWRT's, the Hazen Equation method calculated a lower K value for the silty sand layer at BH/MW-6 than the K value estimated from the SWRT. The K value calculated for the sandy gravel layer at BH/MW-5/5R was greater than the K value estimated from the SWRT.

Groundwater Quality Monitoring

The following section summarizes the groundwater quality results. The exceedances found at each monitoring station are summarized in **Table 5.5**. A full results table of the water quality results from each monitoring well can be found in **Appendix A-3**. No samples were taken at BH/MW-3 due to insufficient well volumes or at BH/MW-5/5R because it had been destroyed at the time of sampling.

Out of the 8 monitoring wells sampled, only 5 showed exceedances:

- BH/MW-1D had one slight exceedance of Zinc
- BH/MW-2 had three exceedances of PAHs (Methylnaphthalenes and Phenanthrene) and F2 hydrocarbons
- BH/MW-6 had exceedances in Chloride, Barium, F2 and F3 hydrocarbons, and Phenanthrene
- BH/MW-7S had exceedances in Barium, F3 hydrocarbons and in seven different PAHs (Anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Phenanthrene, Pyrene)
- BH/MW-7D had exceedances in Barium and Phenanthreneu.

Table 5.5: Results from Groundwater Quality Sampling

Parameter	Detection Limits	Units	Groundwater Standards of O.Reg. 153/04 (Table 1)	Sample Date: October 23, 2018							
				Sample ID							
				BH/MW-1S	BH/MW-1D	BH/MW-2	BH/MW-4D	BH/MW-4S	BH/MW-6	BH/MW-7S	BH/MW-7D
Anions and Nutrients (Water)											
Chloride (Cl)	0.50	mg/L	790	64.4	76.4	854	145	165	956	772	<2.5
Dissolved Metals (Water)											
Barium (Ba)-Dissolved	0.10	ug/L	610	27.9	29.1	188	198	220	811	1160	818
Beryllium (Be)-Dissolved	0.10	ug/L	0.5	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Zinc (Zn)-Dissolved	1.0	ug/L	160	85.9	179	107	54.2	29.9	91	69	26
Hydrocarbons (Water)											
F2 (C10-C16)	100	ug/L	150	<100	<100	560	<100	<100	900	110	<100
F3 (C16-C34)	250	ug/L	500	<250	<250	<250	<250	<250	990	570	<250
Polycyclic Aromatic Hydrocarbons (Water)											
Anthracene	0.020	ug/L	0.1	<0.020	<0.020	0.041	<0.020	<0.020	0.062	0.147	0.029
Benzo(a)pyrene	0.010	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.048	<0.010
Benzo(b)fluoranthene	0.020	ug/L	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.172	<0.020
Chrysene	0.020	ug/L	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.241	<0.020
Fluoranthene	0.020	ug/L	0.4	<0.020	<0.020	<0.020	<0.020	<0.020	0.027	0.475	0.053
1+2-Methylnaphthalenes	0.028	ug/L	2	<0.028	<0.028	9.1	0.03	<0.028	1.68	1.32	0.831
1-Methylnaphthalene	0.020	ug/L	2	<0.020	<0.020	6.55	0.030	0.020	0.730	0.748	0.476
2-Methylnaphthalene	0.020	ug/L	2	<0.020	<0.020	2.54	<0.020	<0.020	0.950	0.576	0.355
Phenanthrene	0.020	ug/L	0.1	<0.020	<0.020	0.655	<0.020	<0.020	0.536	1.05	0.304
Pyrene	0.020	ug/L	0.2	<0.020	<0.020	0.094	<0.020	<0.020	0.192	0.500	0.044

Exceedance
Possible Exceedance

Discussions and Conclusions

The groundwater levels recorded at the monitoring wells showed variable levels of fluctuation over the 1-year monitoring period. Half of the wells (BH/MW-1S, BH/MW-1D, BH/MW-2, BH/MW-5, and BH/MW-6) had water level fluctuations ranging from 1.2m to 2.9m over the course of the year, while the other half (BH/MW-3, BH/MW-4D, BH/MW-4S, BH/MW-7D, BH/MW-7S) all had much smaller fluctuations in groundwater level ranging from 0.2m to 0.7m. Unsurprisingly, the peaks for each well came in the early spring months and water levels gradually decreased to a minimum in the summer. BH/MW-3 was dry for most of the year except for a 2-month period from April-May, with water levels quickly decreasing back to dry conditions by mid-June. Water levels at the nested BH/MW-7 sites were the most stable, only showing approximately 20cm in water level fluctuation while BH/MW-2 had the largest difference between the observed highest and lowest water level with a fluctuation of approximately 2.9m over the year.

By using the groundwater level measurements recorded in the monitoring wells, SEL was able to interpret the shallow groundwater flow patterns for the Mohawk Lake area (**Figure 5.28**). The groundwater levels indicated that the shallow groundwater flows in southernly directions from an interpreted high groundwater area located north of Mohawk Lake. On the south side of Mohawk Lake, the shallow groundwater continued to flow in a southernly direction, likely toward the Grand River. This is consistent with the groundwater flow trends that Terraqua observed during their study in 1990.

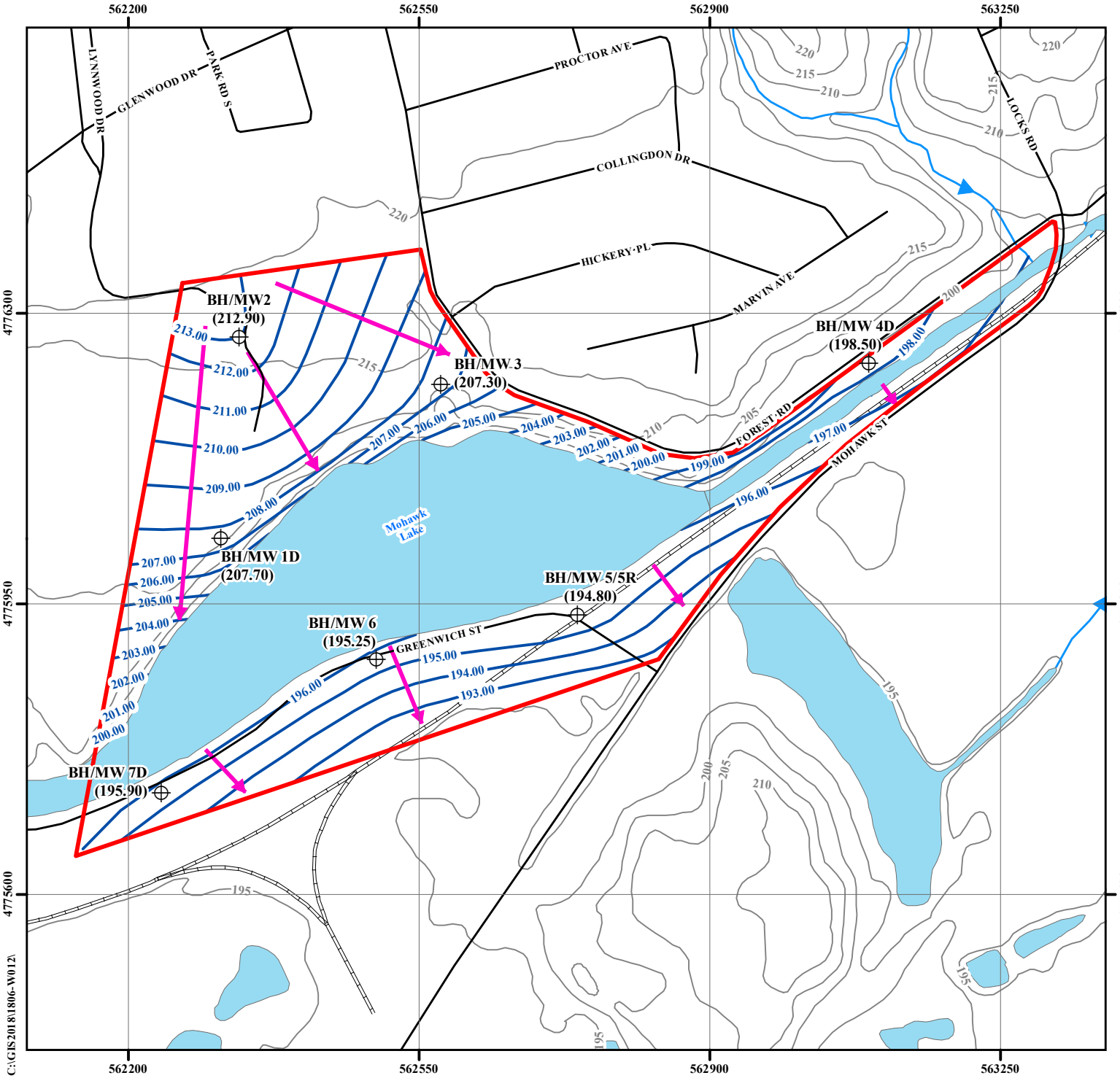
The Hazen Equation hydraulic conductivity (K) results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. The area north of Mohawk Lake, in the vicinity of BH/MW-1D and 1S are underlain by relatively permeable sand and silt layers. The groundwater gradient in this area is interpreted to be downward, with the groundwater from the shallow aquifer recharging the deeper aquifer system. Conversely, the south side of the Lake is an area dominated by an upwards migration of groundwater and is said to be under discharging conditions, which are a significant source of water replenishment to the adjacent Lake and canal system. Given the relatively high permeabilities of the sub-soils surrounding Mohawk Lake, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities and groundwater recharge to Mohawk Lake from the deeper aquifer system is likely.

Groundwater temperatures in the monitoring wells ranged from 6.82°C to 13.86°C. The warming and cooling trend reflects the annual seasonal cycle, with a cooling trend observed from fall (October-November) to late spring (April-May); after which a gradual warming trend was observed throughout the summer months. Groundwater temperatures in the monitoring wells located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could be due to the fact that the area south of the lake is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

The groundwater quality results displayed exceedances at 5 of the 8 monitoring wells sampled. BH/MW-1D only had one slight exceedance of zinc while nearby BH/MW-2 had exceedances of PAHs, and F2 hydrocarbons. As displayed in **Figure 5.14**, there were two (2) historic landfill site on the northern side of Mohawk Lake (F, G). Since there are no similar exceedances seen at BH/MW-1S or BH/MW-1D, the pollutants seen at BH/MW-2 may just be a small pocket of contaminants that could have originated from those historical landfills or industrial areas. Exceedances of Chloride, Barium, F2 and F3 hydrocarbons, and the PAH phenanthrene were observed at BH/MW-6. BH/MW-7S had exceedances of Barium, F3 hydrocarbons, and seven different PAHs (Anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Phenanthrene, Pyrene). BH/MW-7D, which is approximately 1.5m deeper than BH/MW-7S,

only had 2 exceedances in Barium and in the PAH phenanthrene. BH/MW-6, 7S, and 7D are all located near a historical landfill (**Figure 5.14**, E) and there are both active and historical industrial sectors located nearby as well. It is possible that the nearby industrial sector has contributed to the shallow groundwater pollution in this area. It is noted that Table 1 of O. Reg 153/04 has the most stringent standards for full depth background site conditions. Table 9 of O. Reg 153/04 provides standards for generic site conditions for use within 30m of a water body in non-potable groundwater which applies to the majority of the monitoring wells (with the exception of BH/MW-2, which is further than 30m from a waterbody). Using Table 9 there were fewer exceedances with only the petroleum hydrocarbons still exceeding the standard (Table 1 and 9 have the same petroleum hydrocarbon standards).

The results and discussion above are based on the draft Hydrogeological Report provided by SEL (See **Appendix A-1**). The final report will be published under a separate cover and include a more broad discussion of the groundwater characteristics surrounding Mohawk Lake and provide further comparative assessments with previously completed studies.



N

Approximate Boundary of Subject Site

Borehole with Monitoring Well

Interpreted Shallow Groundwater Flow Direction

Interpreted Shallow Groundwater Level Elevation (masl)

Waterbody

Watercourse

Local Road

Railway

200 Topographic Contour (masl)

198.50 Average Shallow Groundwater Level Elevation (masl)

Soil Engineers Ltd.

Title: Shallow Groundwater Flow Pattern Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 4, 2019

Scale:

0 30 60 120 180 240 300

Metres

Drawing No. 8

5.6 DRAINAGE SYSTEM AND STORMWATER MANAGEMENT

The following section summarizes and describes the drainage area and network characteristics and stormwater management controls within the study area. The majority of the information summarized in the following section was based on existing background information reviewed.

The scope of the Environmental Assessments completed as part of the Characterization Study provided minimal supporting information of the drainage area and network characteristics and stormwater management controls with the study area. Information obtained through the Environmental Assessments which was deemed relevant was noted.

5.6.1 Background

Drainage Area Characteristics to Mohawk Lake

The Mohawk Lake drainage area is comprised of multiple land use types, including low and medium residential, commercial, industrial, and recreational/park/open space usage which ranged in percent impervious from 28% - 70% (Gore & Storrie Ltd., 1995).

The central and northern portions of the drainage area are largely built out with some industrial sites suitable for long term redevelopment. The southeast portion is mainly composed of residential and employment uses with major open space along the canal. Open spaces include Mohawk Park and other parkland which account for approximately 73ha of drainage area providing the community with a large recreational area. There is also a brownfield site along Greenwich Street south of Mohawk Canal that is in the planning process for redevelopment. The eastern end of the study area abutting the Grand River is heavily wooded.

The existing land use composition of the study area is displayed in **Figure 5.4**. Note: **Section 5.12.2**, **Figure 5.129** refined the existing land use and addressed noted data gaps within the City's GIS information noted in **Figure 5.4**. **Table 5.6** summarizes the total drainage area contributing to Mohawk Lake and Canals whereas **Figure 5.29** shows the respective drainage area mapping.

Table 5.6: Contributing Drainage Areas to Mohawk Lake and Canal System

Drainage Area	Area(ha)
Area draining to West Canal	702.7
Area draining directly to the Lake	52.0
Area draining to East Canal	84.5
Total Area Draining to Mohawk Lake	754.7

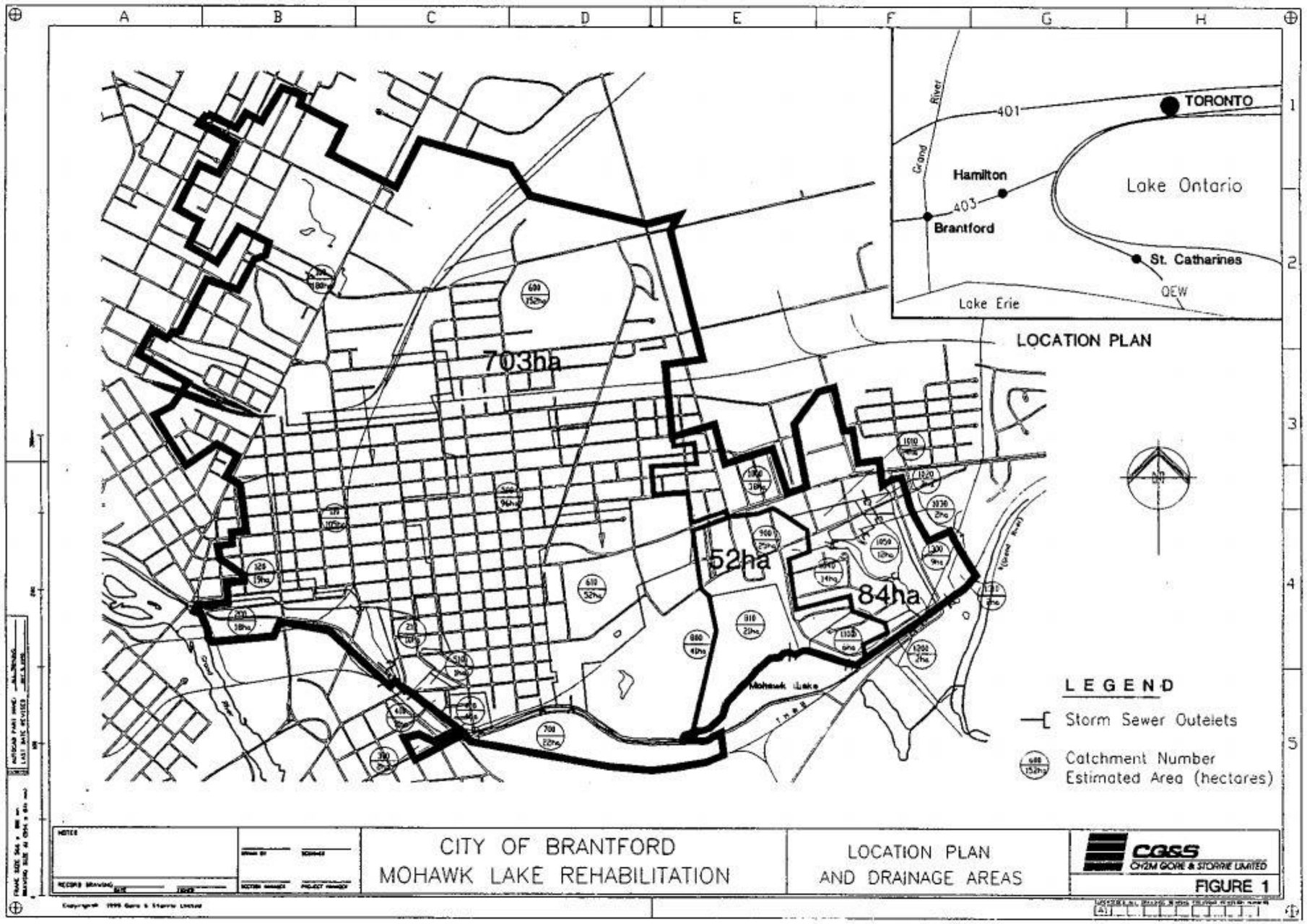


Figure 5.29: Mohawk Lake Drainage Area Mapping (Gore and Storrie, 1995)

Storm Sewer (Minor) System

Per the Storm Flow Monitoring and System Model Calibration Study (Aquafor Beech, 2018), the study area is serviced by a separated sewer system where storm and sanitary flows are conveyed in separate storm and sanitary sewers. Sanitary flows are conveyed to the wastewater treatment facility. The storm sewer system is designed to carry rainfall runoff and other drainage (excess rain and groundwater from impervious surfaces such as paved streets, parking lots, sidewalks and roofs) to natural waterways and waterbodies. A schematic illustrating a typical separated sewer system is provided below.

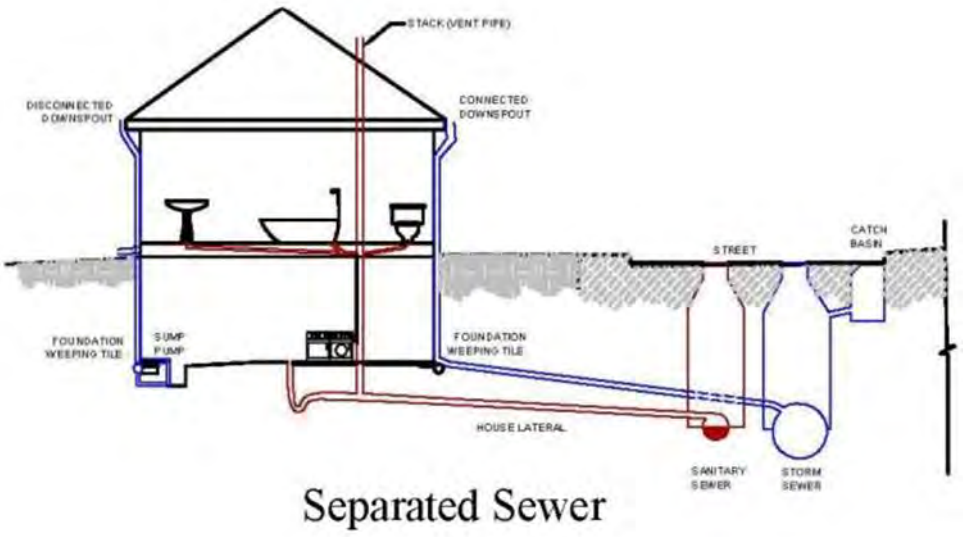


Figure 5.30: Technical Schematic of a Separated Sewer System

The City of Brantford's storm sewer system consists of a gravity system that follows local topography, together with one pumping station. There are approximately 428km of storm sewers throughout the City through which the majority of the City's stormwater system drains directly to the Grand River or the Grand River tributaries of Mohawk Lake, Fairchild, and D'Aubigny Creek. Within the study area, there are 96km of storm sewers (1,700 pipes) as well as three open drains / creeks that convey storm runoff directly into the Mohawk Lake and canal system which ultimately outlets into the Grand River.

In the older areas of the City, including the majority of the Mohawk Lake subwatershed, the majority of the natural streams have been enclosed and now form part of the storm sewer systems; these areas are also strictly conveyance-based systems with little or no peak flow control.

For example, East Ward Creek was a small stream flowing through Brantford that originally discharged into the Grand River. Historically, the Creek experienced flooding annually, and also had low flow problems due to:

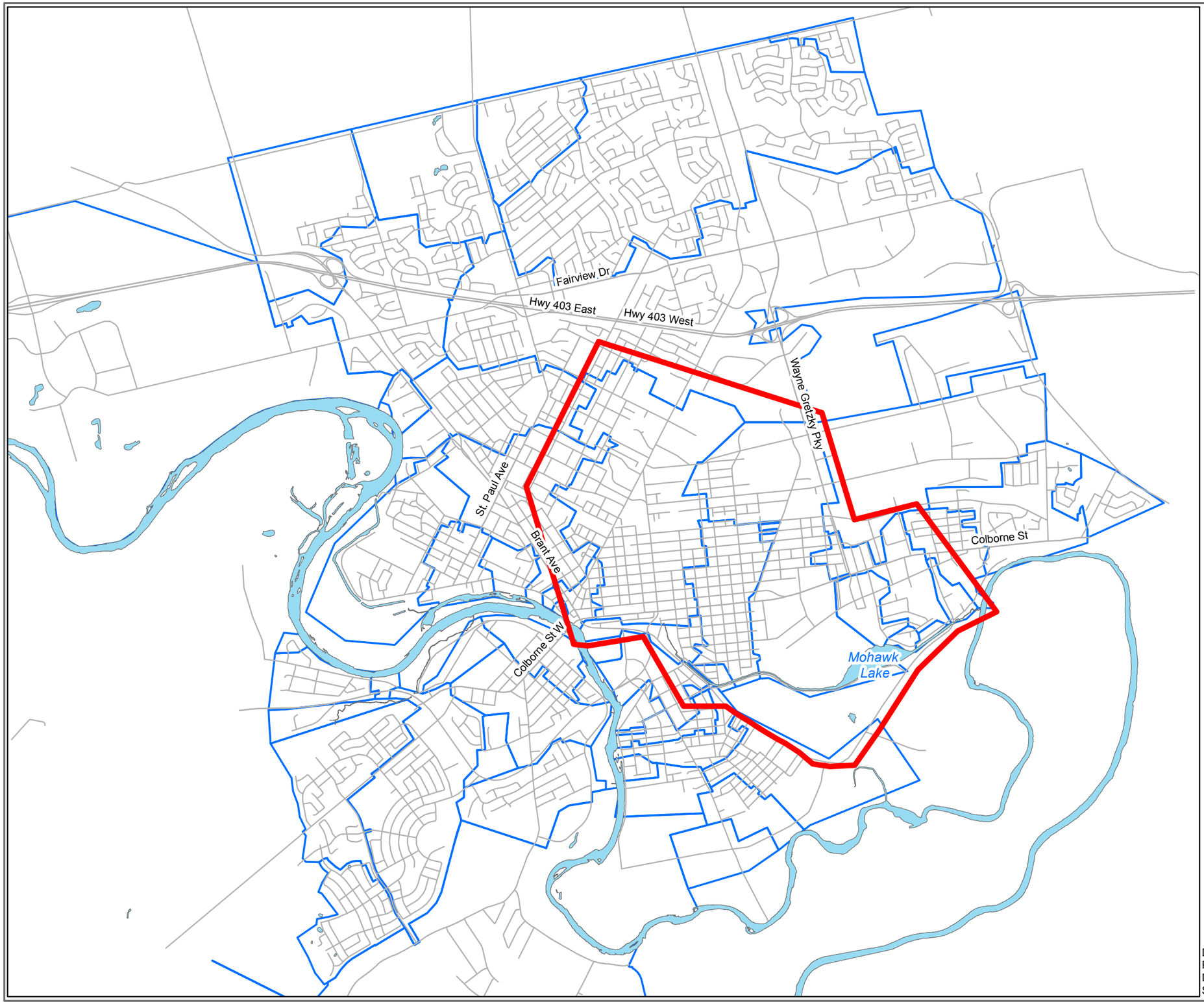
- Flooding due to increased runoff from urban development;
- Channel restrictions which produced shallow flooding without useful flood storage for peak flow reduction; and,
- Low flow conditions with some industrial wastes were typical in dry weather.

To address the water quantity and associated quality issues, East Ward Creek was enclosed in a concrete pipe large enough to carry away storm runoff without flooding under 10-year storm conditions. The East Ward Creek now discharges into the upstream end of the West Canal and outflows into Mohawk Lake. The East Ward Creek drainage area is approximately 740 acres with a historical gradient of 0.55% gradient through the City of Brantford (GRCA, 1965).

Figure 5.31 and **Figure 5.32** demonstrate the storm sewer catchments and storm sewer network located within the City of Brantford and those specific to the Mohawk Lake catchment area. **Figure 5.33** and **Figure 5.34** demonstrate the storm sewer outfalls which contribute to the Mohawk Lake/Canal drainage network as shown in the 1995 Mohawk Lake Stormwater Management Study by Gore and Storrie. Many of these major outfalls correspond to those identified within the Storm Flow Monitoring and System Model Calibration Study completed by Aquafor Beech, 2018 and were consistent with the topographic surveys and visual assessment completed as part of the 2018 Environmental Assessments.

Figure 5.35 shows the remaining storm sewer outfalls of smaller diameters likely associated with stormwater conveyance systems for smaller catchments from individual properties.

Details of the outfall drainage are discussed in **Section 5.7**.



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Road Centerlines
- Waterbody
- Stormwater Sewer Catchments
- Study Area

Figure: 5.31

Stormwater Sewer Catchments

0 0.5 1 2

Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Stormwater Sewer Structure

- Flow Meter
- Stormwater Sewer Discharge Points
- Stormwater Sewer Mains
- Road Centerlines
- Stormwater Open Drainage
- Study Area
- Waterbody

Figure: 5.32

Stormwater Sewer Network & Outfall Locations

0 0.25 0.5 1

Kilometers

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

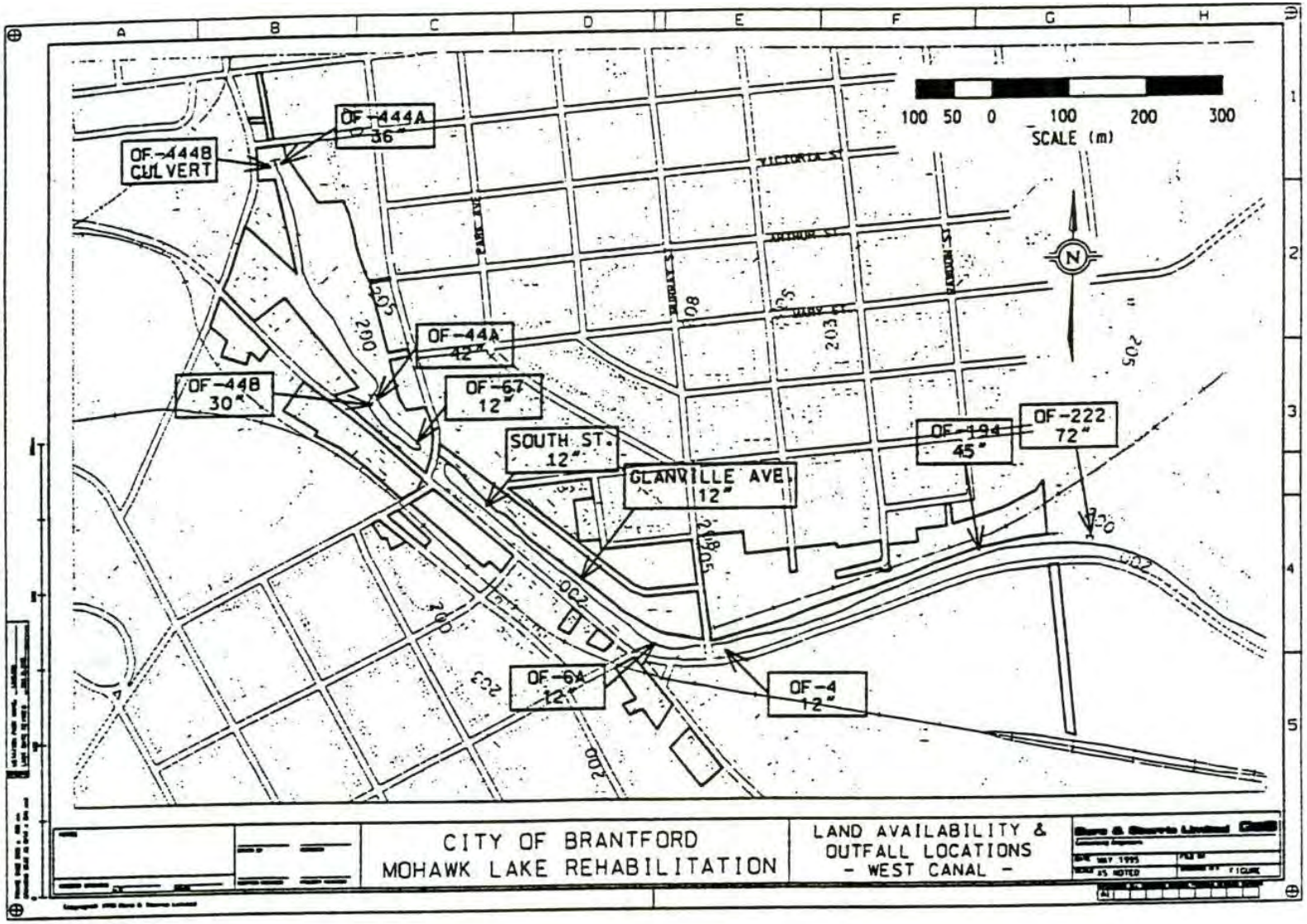


Figure 5.33: Mohawk Lake and West Canal Outfall Locations

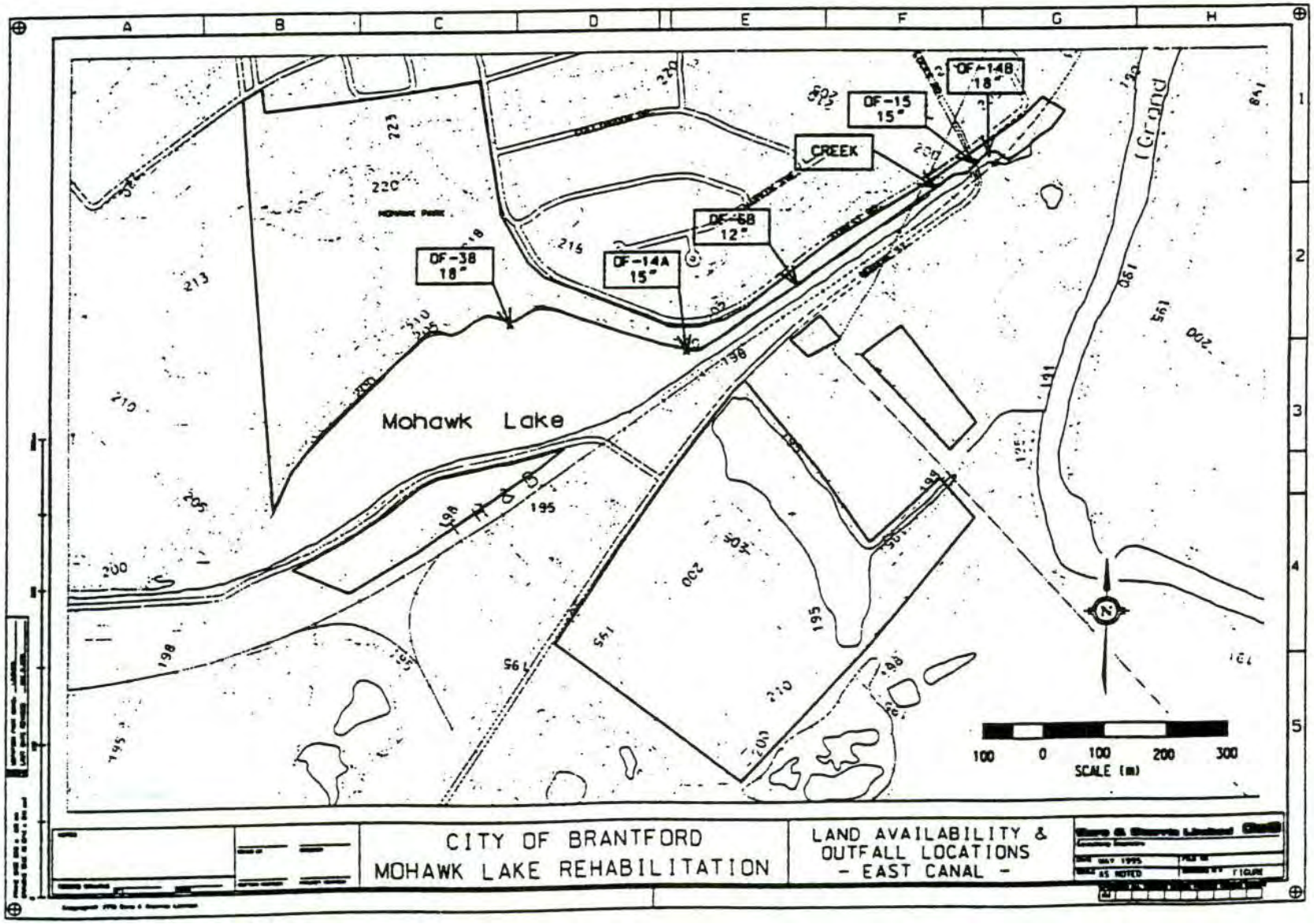


Figure 5.34: Mohawk Lake and East Canal Outfall Locations

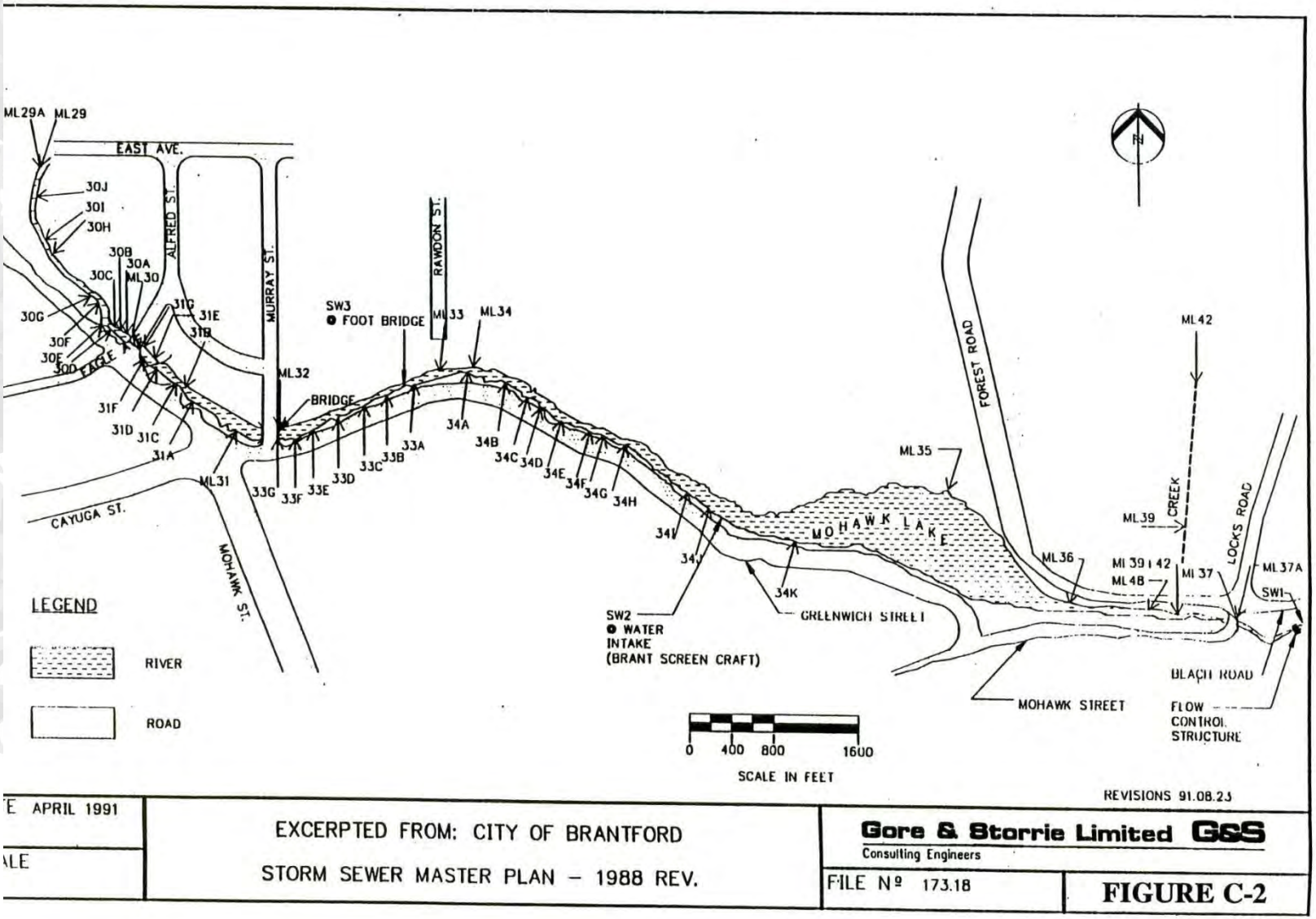


Figure 5.35: Additional Mohawk Lake and Canal Outfall Locations

Tributaries of the Mohawk Lake Subwatershed

Within the Mohawk Lake subwatershed there are two tributaries in addition to the short remaining section of East Ward Creek which discharges from the storm sewer network to the West Canal. At this time, the names of the tributaries are unknown, and therefore have been identified at Tributaries 1 and 2 (**Figure 5.36**).

Figure 5.36: Tributaries 1 and 2 within the Mohawk Lake catchment

Tributary 1 is a small drainage feature that flows from north of Glenwood Drive, through Mohawk Trail Park, to the confluence with the canal immediately upstream of Locks Road. The tributary has two branches; the main branch starts from a storm sewer outlet south of the plaza at 781 Colborne East, and then flows south, under Glenwood Drive. The headwaters of the secondary branch are within the residential community east of Forest Road, between Glenwood Drive and Proctor Avenue. The secondary branch flows in a southeast direction through Mohawk Trail Park, and confluences with the main branch just upstream of Marvin Avenue. The main branch of Tributary 1 is approximately 750m long and the secondary branch is approximately 600m long. The majority of Tributary 1 is City owned, with some localized exceptions.

Tributary 2 is another small drainage feature that drains from Glenwood Drive, through a small forest, under Beach Road, to the Grand River. As with Tributary 1, Tributary 2 has two branches; the main branch starts from a storm sewer outlet at Glenwood Drive (northeast of the intersection with Chester Street), and then flows south through forest lands. The headwaters of the secondary branch are within the forested lands southwest of St. Peter's and Brantford Christian Schools on Calvin Street. The secondary branch flows in a southwest direction through the forest, and confluences with the main branch just upstream of Lloyd Street. The main branch of Tributary 2 is approximately 650m long and the secondary branch is approximately 150m long. Tributary 2 is entirely contained within privately owned lands, with the exception of the area at the confluence with the Grand River. Several land owners responded to the

request for land access and granted permission to assess, however there were large sections of Tributary 2 where land owners did not respond.

The MNRF Ontario Flow Assessment Tool (OFAT) was used to gain a general understanding of the watercourse and subcatchment characteristics. A brief summary of the information obtained is provided below in **Table 5.7**. Please note that these values are cursory estimates, and do not consider the sewershed characteristics.

Table 5.7: Summary of Catchment Characteristics for Tributaries 1 and 2 (MNRF OFAT)

Parameter	Tributary 1	Tributary 2
Catchment Area (km^2)	1.14	0.32
Average Elevation within Catchment Area (m)	221.35	218.64
Maximum Elevation within Catchment Area (m)	228.60	222.76
Average Land Slope (%)	1.76	3.12
Length of Watercourse (km)	2.45	1.37
Maximum Elevation within Channel (m)	226.88	222.63
Minimum Elevation within Channel (m)	197.29	198.66
Average Channel Slope (%)	1.21	1.75
Mean Annual Temperature (°C)	8.2	8.2
Average Annual Precipitation (mm)	929	929
Land Use (%)		
Deciduous Treed	8	18
Community/Infrastructure	91	82
Other	< 1	NA

Major System

The major drainage system is the route stormwater would follow when the capacity of the minor system has been exceeded. The major systems may be comprised of roadways, swales, ponds, man-made channel, and natural stream and valleys. The function of this system is to minimize property damage and loss of life. The major system for the Mohawk Lake subcatchment generally follows the road network and general topography of the subwatershed. The higher topographic areas occur within the northern extents of the subwatershed areas and decrease in elevation towards Mohawk Lake and canals and ultimately the Grand River.

Existing Stormwater Management

According to the Storm Flow Monitoring and System Model Calibration Study (Aquafor Beech, 2018), there are thirty-two (32) stormwater detention facilities located throughout the City; however, none of these stormwater detention facilities are located within the Mohawk Lake subwatershed according to the City's Master Servicing Plan, 2014. Also, no Oil-Grit Separator (OGS) Units or sub-surface storage systems have been identified within the subwatershed. As such, it is assumed based on available background information that no upstream stormwater management controls exist within the Mohawk Lake subwatershed.

Upon review of the 1995 Mohawk Lake Stormwater Management Study (Gore and Storrie) and other previous reports, Mohawk Lake inadvertently serves as a stormwater management facility for the

subwatershed; however, was never formally designed to provide water quality control to meet Provincial Water Quality design standards per the MOE SWMPD (2003). The Lake and canals accept stormwater discharge from a number of, generally untreated, storm sewer outfalls which release collected drainage from the municipal storm sewer network and local storm sewer networks from bordering properties.

5.7 HYDROLOGY

Hydrology is the science which deals with the flow of water from precipitation events to drainage systems, receiving watercourses and to the groundwater system. The following section summarizes the general hydrologic conditions of the Mohawk Lake subwatershed based on information collected as part of the background review process, monitoring data collected during the completion of the Mohawk Lake Characterization Study and subsequent analyses.

5.7.1 Background

Canal and Lake Hydrology

Per the Mohawk Lake Stormwater Management Study completed by Gore & Storrie in 1995, an OTTHYMO model was developed to estimate flow rates within the lake and canal system for the purpose of evaluating several remedial design alternatives developed as part of the study. The purpose of the computer modelling was to estimate catchment outflows and flow rates through the lake and canal system for storm events with return periods of 5 to 100 years, as well as the Regional storm event (Hurricane Hazel). The model considered the existing development conditions within the catchment areas at the time of the model development.

Results from the OTTHYMO model provided cumulative peak flows entering and exiting the system from the individual stormsewer outfalls situated along the lake and canals. The results are provided in **Table 5.8**. The locations of the individual outfalls are shown in **Figure 5.37**.

Table 5.8: Estimated Inflow/Outflow Modelling of Mohawk Lake

Storm Event	Peak Inflow to Mohawk Lake from the West Canal (m^3/s)	Peak Lake Outflow (m^3/s)
2-year	19.7	4.8
5-year	28.5	7.4
25-year	48.1	13.5
100-year	62.8	17.6
Regulatory Flood (H. Hazel)	74.5	61.2

The peak lake outflow values were based on OTTHYMO reservoir routing using a stage-discharge rating curve developed from HEC-2 modelling of the lake outlet control structure that was completed by Philips Planning + Engineering Ltd in 1989. The stage-discharge rating curve was developed by Philips Planning + Engineering Ltd for the purpose of the 1989 design of the east canal outlet structure. The stage-discharge rating curve was related to the 9m wide weir at the outlet structure near Locks Road and the hydraulic loss experienced at the Locks Road bridge. The original modelling, stage-discharge rating curve, and report was requested for review but was not available within existing records.

In 2017, Aquafor Beech Ltd. and Thompson Flow Investigation Inc. developed a calibrated InfoSWMM model for the City of Brantford storm sewer system which included the entire storm sewer network, end-of-pipe controls, 1 pumping station, culverts, and open drains (ditches). Flow monitoring was carried out at 15 locations across the storm sewer system for a period of 1 year (2016-2017) to provide data for the model calibration. As part of the study, the City established a three-station rain gauge network to collect rainfall data. The three (3) permanently installed heated tipping bucket rain gauges were located on rooftops of City owned facilities. These rain gauges collect data using a 5-minute time step. The rain gauges are located at the following facilities:

- Brantford Tourism Centre (TCT) at 399 Wayne Gretzky Pkwy

- Water Treatment Plant (WTP) at 324 Grand River Av.
- Brantford Wastewater Treatment Plant (WWTP) at 385 Mohawk St.

The location of each rain gauge can be found in **Figure 5.39**. Currently, available datasets have been received for all three stations from August 2016 to July 2019.

Rainfall events used for calibration purposes were selected based on total rainfall amounts 15 mm or greater that were relatively consistent for each of the three gauges. Eleven (11) flow monitoring stations were calibrated to four rainfall events while the remaining four (4) stations were calibrated to less than four events due to data recording issues (uneven flow depths and velocities, battery issues, damage or stolen unit). The storm events used for calibration purposes are shown in **Table 5.9** below.

Table 5.9 Flow Monitoring Results

Rain Gauge	Ground Conditions Prior to Event	WTP		WWTP		TCT	
Event		Amount (mm)	Peak I (mm/h)	Amount (mm)	Peak I (mm/h)	Amount (mm)	Peak I (mm/h)
02-Oct-16	Wet	23.6	43.2	11.8	9.6	-	-
03-Nov-16	Wet	15.6	16.8	12.6	12	12.4	14.4
20-Apr-17	**Wet**	**43.4**	**60**	**47.8**	**60**	**47.2**	**28.8**
01-May-17	Wet	19	19.2	19.6	31.2	20.4	16.8
21-May-17	**Dry**	**17.8**	**31.2**	**17**	**43.2**	**14.4**	**38.4**
13-Jul-17	**Dry**	**46.2**	**81.6**	**31.2**	**50.4**	**34**	**69.6**
17-Aug-17	**Dry**	**24**	**57.6**	**22.2**	**31.2**	**22.2**	**40.8**

*The events highlighted in bold are those selected events where the rainfall depth totals exceeded 15mm across all of the rain gauges with relatively high rainfall intensities

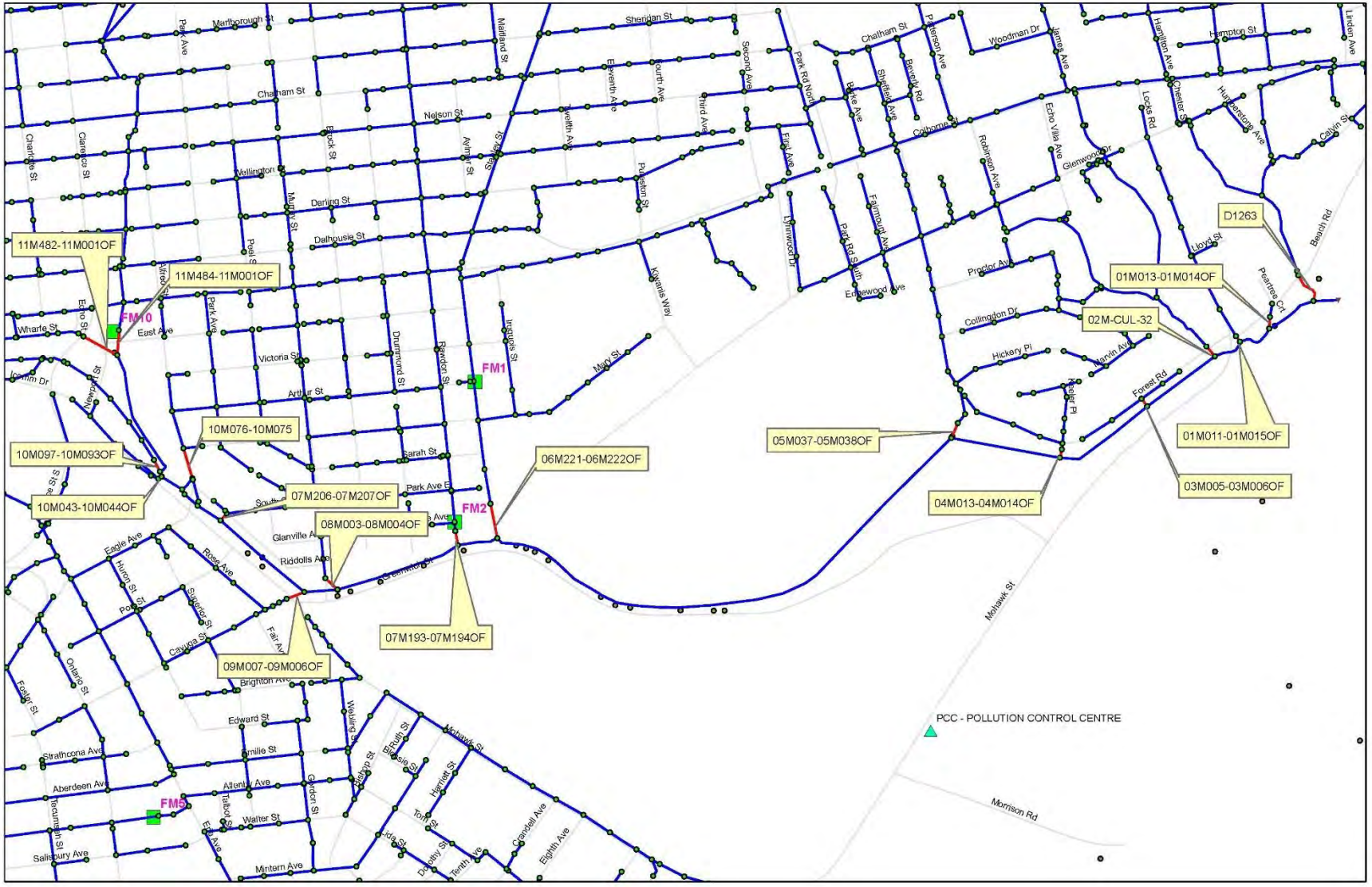


Figure 5.37: City of Brantford Storm Sewer Network Model

Water Budget for Mohawk Lake

As part of the Mohawk Lake Stormwater Management Study, (Gore and Storrie, 1995) an analysis was completed which aimed at estimating the typical or average number of water exchanges or flushing that the lake experienced in a given year and to estimate the volume of lake water displaced by surface runoff from individual rainfall/runoff events. The analysis was generally completed with the goal of better understanding the lake hydrology and potential impact of stormwater discharge on lake quality.

Table 5.10 shows the results of the analysis completed by Gore and Storrie, 1995. The results indicated that about 82% of the annual lake inflow was surface runoff from the 755 ha that drain to the west canal and lake via storm sewers and East Ward Creek. The remaining 18% was estimated as baseflow and seepage from the surrounding groundwater table.

Based on water budget computations, the annual volume of flow through Mohawk Lake was estimates at approximately 3,300,000 m^3, although it was suggested by the report that lake bed seepage loss was not considered. While the total lake and canal storage volume was estimated at 200,000 m^3, at the time of the reporting, a 16 to 17 rate of exchange per year was determined, assuming complete mixing. It was expected that larger events, such as the 5-yr event, could potentially displace the entire lake volume.

Table 5.10: Overview of Lake Budget, Average Year

Parameter	Volume
Surface Runoff draining to the Canal and Lake	2,748,000 m^3
Groundwater Seepage into the lake, or into channels and sewers that drain to the canal and lake	589,000 m^3
Total inflow to the lake	3,337,000 m^3
Approximate Lake volume at normal water level	200,000 m^3

5.7.2 Field Study Scope and Methodologies

Rainfall Monitoring

Per the Term of Reference, Aquafor Beech Ltd installed one (1) additional rainfall monitoring station on the roof top of the Pollution Control Centre located at 180 Greenwich St on June 13th, 2018 (**Figure 5.39**). The site location was selected based on its close proximity to Mohawk Lake, that the site was a municipally owned location, and safe and suitable access to the roof top was available. The rainfall monitoring station was installed to support the WWTP weather station with more site-specific rainfall data.

The rainfall monitoring station, installed as shown in **Figure 5.38,** consisted of a Model TB3 Rain gauge tipping bucket by Hydrological Service Pty Ltd. It was configured to continuously collect data on a 15-minute interval. The tipping-bucket rain gauge was connected to a E348-S-UCD-M001 Pulse Input Adaptor with contact closure leading to a HOBO Micro Station Logger E348-H21-USB.

To protect the station from potential damage during winter weather conditions, the rainfall monitoring station was decommissioned from December 2018 to April 2019, and reinstated in the same location described above in May 2019. Monitoring continued at this location until July 2019.

Figure 5.38: Rainfall Monitoring Station located on the Pollution Control Facility at 180 Greenwich St. Brantford, Ontario

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Proposed Meteorological Station Locations
- Existing Meteorological Station Locations
- Watercourse
- Road Centerlines
- Property Parcels
- Study Area
- Waterbodies

Figure: 5.39

Meteorological Station Locations

0 0.25 0.5 1

Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford
Gore & Storrie

Aquafor Beech Limited

Flow Monitoring

Per the Term of Reference, Aquafor Beech Ltd installed three (3) streamflow gauges on May 26th, 2018 for the purpose of estimating flow through the Mohawk Lake and canal system and further calibrating the hydrologic model.

The flow monitoring program included the completion of the following tasks at the three (3) specific locations throughout the Mohawk Lake and canal system:

1. Rating Curve Development; and,
2. Continuous water level/flow monitoring

The following sections describe the site selection process, methodology and status of the discrete flow measurements and continuous water level/flow monitoring.

Flow Monitoring Locations

The locations of the flow monitoring stations are shown on **Figure 5.40**. General descriptions of flow monitoring station locations and justification for site selection are as follows:

1. FM-4: Located within the existing gabion-lined channel of East Ward Creek approximately 50m downstream of the East Ward Creek outfalls. This location was established to monitor outflows from East Ward Creek which contributes significant flows to the west canal and Mohawk Lake.

2. FM-3 (identified as FM-3/2 in subsequent sections): This site location was intended to estimate west canal flows prior to entering Mohawk Lake. However, land access permissions and confirmation of access requirements at the onset of the monitoring program were ongoing for several properties around Mohawk Lake and canal system. As a result, FM-3 was installed as far east within the west canal as possible as shown in **Figure 5.40** which was downstream of the 1125mm Rawdon St. storm sewer outfall but upstream of the 1800mm Stanley St. storm sewer outfall.

   Following the clarification of land access permission and requirements by the City, a secondary monitoring location (Former FM-2) was established downstream of FM-3 and the 1800mm outfall from Stanley St. in order to supplement data collected at FM-3 (see **Figure 5.41**). This station was established for two (2) reasons:

   - The location had more defined canal cross-sections which would assist the collection of single discrete flow measurements and rating curve development.
   - The location was downstream of all major outfalls.

   The continuous flow logger at FM-3 was maintained so the continuous data that had previously been recorded prior to the establishment of FM-2 could potentially be utilized. Given its close proximately and low canal gradient the use and interpretation of the FM-3 data may be valuable in filling data gaps at FM-2.

   FM-2 was carried forward as the primary flow monitoring location in the downstream limits of the west canal.

3. FM-2: Originally located under the Locks Road bridge crossing within the east canal, the location was selected to determine outflows from the Mohawk Lake system. Following preliminary trials to complete single discrete flow measurements at FM-2, the low gradient and width of the channel section caused major discrepancies in the flow measurements. Because of this, station FM-1 was established. The equipment at FM-2 was re-located to a position approximately 100m downstream of FM-3 to better serve data collection within the west canal.

4. FM-1: Located downstream of the Mohawk Lake flow control structure within the gabion lined section of the watercourse prior to the outlet at the Grand River. The location was established to monitor flows discharged from the lake and canal system.

5. ATM-1: Attached to the abutment of the Locks Road bridge to collect changes in atmospheric pressure and temperature in order to calibrate the flow loggers.

Rating Curve Development

In order to accurately develop rating curves for each of the flow monitoring locations, spot-flow measurements were collected for low-flow (i.e., driest period of the summer), mean annual (i.e., early summer or fall) and high-flow (i.e., spring) conditions. Five (5) single discrete flow measurements were taken and staff gauges were installed to aid in development of rating curves for each flow monitoring location.

A SonTek Acoustic Doppler Velocimeter (ADV) FlowTracker was used to undertake the spot-flow measurements, following the same flow measurement procedure that the Water Survey of Canada recommends (Water Survey of Canada, 2015). Spot-flow measurements were taken at the appropriate intervals depending on the size of the channel/watercourse. For the watercourses with larger cross-sections (i.e. canals), field measurements were taken at approximately 0.3m – 0.5m intervals. For watercourse sections with smaller cross-sections (i.e. gabion lined sections), measurements were taken at intervals as small as 0.1m-0.2m.

THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Atmospheric Monitoring Station
- Flow Monitoring Station
- Storm Gravity Mains
- Waterbodies
- Property Parcels
- Study Area

Figure: 5.40

Atmospheric & Flow Monitoring Locations (Original)

0 125 250 500

Meters

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Atmospheric Monitoring Station
- Flow Monitoring Station
- Storm Gravity Mains
- Waterbodies
- Property Parcels
- Study Area

Grey St
Stanley St
Forest Rd
Locks Rd
Glenwood Dr
Mohawk St
Mohawk St
Mohawk Lake
FM-04
FM-03
FM-02
FM-01
ATM-1

Figure: 5.41

Atmospheric & Flow Monitoring Locations (Revised)

0 125 250 500
Meters

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Continuous Flow Monitoring

HOBO U20 water level loggers (pressure transducer) were utilized to record the varying water levels at all established flow and water level monitoring locations. Data was collected monthly and was recorded at 15-minute intervals.

Figure 5.42: Flow Monitoring Well 2 assembled in a stilling well and an ABS conduit housing unit

As shown in **Figure 5.42**, stilling wells and submersible housings were assembled using ABS conduit to house and protect the HOBO U20 loggers from the elements. Perforations were made in the wells and housings to ensure that the water level loggers would be freely exposed to varying water pressures. The reference logger recording ambient air temperature and barometric pressure was secured to the abutment of the Locks Road bridge.

Staff gauges (water level measuring device) were installed at each continuous flow monitoring location. A staff gauge reading was recorded during single discrete flow measurements. The depth of the logger and time were also noted during single discrete flow measurements. The collection of the readings and single discrete flow measurements were used to develop relationships between flow rate and stage (i.e. rating curve) and ultimately convert the continuous water level data into continuous flow data.

Continuous water level data collected by HOBO U20 water level loggers recorded water level as pressure in pounds per square inch (psi). The actual water column above the submerged water level loggers [DG(t) in meters at time t] was determined by the following expression:

$$[1]\ DG(t) = [PG(t) - PA(t)]/\gamma$$

where PG(t) is the pressure (in kPa, or kN/m^2) measured by the submerged logger along the channel bottom at time t, PA(t) is the atmospheric pressure (in kPa) measured by the reference logger (which is not submerged in water) at time t, and γ is the specific weight of water (in kN/m^3), which is typically about 9.81 kN/m^3.

The actual DG(t) values were then converted to stage [H(t) in m] as follows:

$$[2]\ H(t) = DG(t) + \Delta HCOR$$

where ΔHCOR is the correction applied to the time-series of the water column (DG(t)) values using the staff gauge readings recorded at the time of the single discrete flow measurements. The developed rating curves shall be used to convert corrected water levels H(t) to a continuous flow timeseries for each monitoring location.

5.7.3 Field Studies Results

The following section summarizes the meteorological and flow monitoring results collected during the monitoring period including the provisional 8-month monitoring period which was completed from November 2018 to June 2019.

Rainfall Monitoring

Data from the tipping bucket located at 180 Greenwich St was collected monthly but due to theft of equipment some data was lost from the monitoring program. The tipping bucket was also dismantled for the winter from December 2018 to April 2019. Due to the reasons listed above rainfall data gaps for the Greenwich tipping bucket consist of the following:

- Missing data from June 13th, 2018 to August 13th, 2018
- Missing data from December 5th, 2018 to April 30th, 2019

Daily and monthly precipitation amounts were summarized in **Figure 5.43** and **Figure 5.44** based on the data available from the Greenwich street monitoring station. For the purposes of QA/QC, five (5) seasonal rainfall events measured at the Greenwich station were compared to data collected from Environment Canada and the three permanent rain gauges established by the City of Brantford as part of the Stormwater Flow Monitoring and System Model Calibration Study (Aquafor Beech Ltd. and Thompson Flow Investigations Inc., 2017) (**Table 5.11**). Comparisons were made between selected events represented varying depths of precipitation exceeding 15mm throughout the seasons. The comparison was completed to verify that the data collected at the Greenwich station was reasonable and determine which station would be best suited to fill data gaps associated with the Greenwich station as identified previously. Complete meteorological data sets were necessary to complete continuous model simulations.

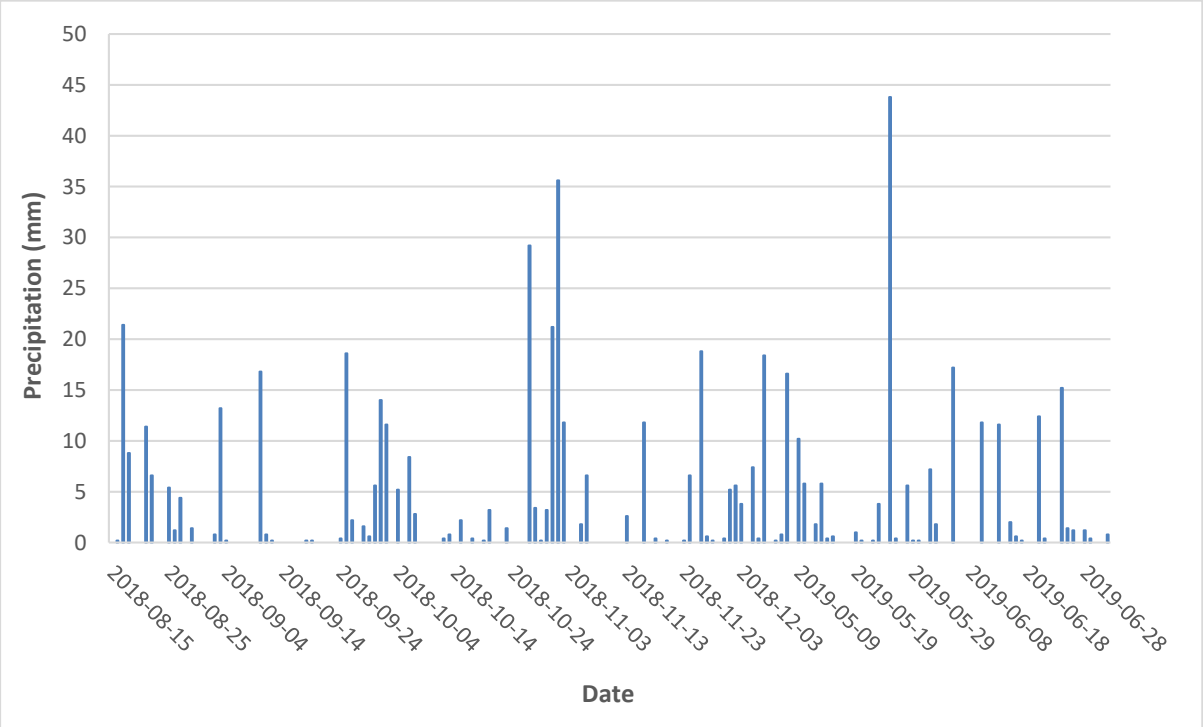


Figure 5.43: Daily rainfall summary collected from Greenwich Street monitoring station

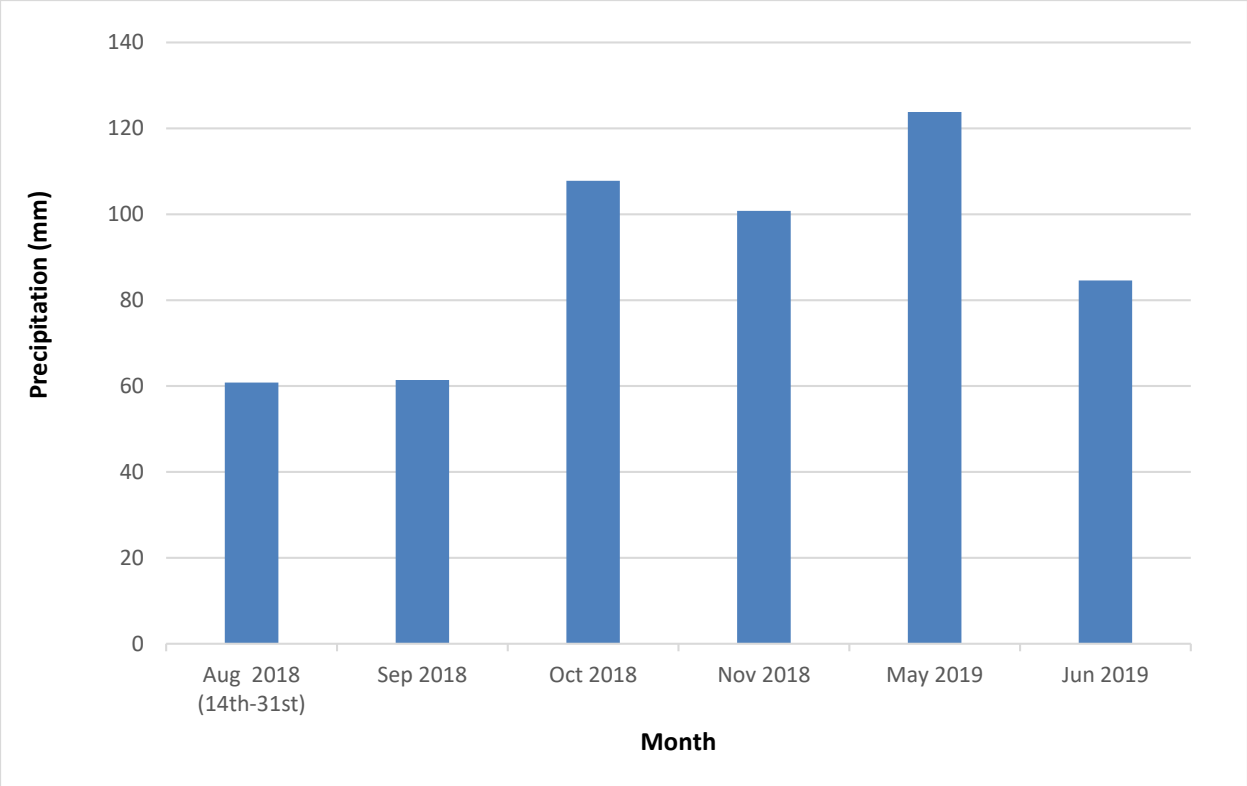


Figure 5.44: Monthly rainfall summary collected from Greenwich Street monitoring station

Table 5.11 Comparison of Rainfall Events (over 48-hr period) between Brantford Monitoring Stations

Monitoring Station	August 17-18, 2018	September 25-26, 2018	October 1-2, 2018	May 25-26, 2019	June 5-6, 2019
Greenwich Monitoring Station	30.2	20.8	25.6	44.2	17.2
Environment Canada Brantford Airport	28.7	17.8	23.9	40.8	17.3
Water Treatment Plant	35.2	17.2	27	32.4	13.0
Brantford Tourism Centre	15.6	19.5	32	54.6	25.8
Wastewater Treatment Plant	30.6	18.2	21.6	47.2	22.6

Flow Monitoring

Flow at FM-1, FM-3/2, and FM-4 was measured on five (5) separate occasions using the ADV Flowtracker. Staff attempted to complete field measurements during different types of flow conditions (i.e. low flow, mean flow, high flow, etc.) to collect a wider range of data to aid in the development of the rating curves. However, multiple complications and limitations were encountered during the course of the flow monitoring program including:

- Urban Flow Response: During the completion of single discrete flow measurements ('spot-flows') at FM-4, water levels increased and decreased significantly and quickly while flow measurements were recorded. As a result, single-discrete flow measurements collected at FM-4 have not produced a reliable rating curve (R^2 = 0.0463).

- Flow Characteristics of Canals: Due to the low gradient of the canals and attenuating nature of the lake, flow through the canals occurs at very low velocity. During rainfall events, outfall flows entering the canals result in canal water levels increasing with minimal changes in velocity. A rating curve for FM-3/2 has been developed (**Figure 5.47**); however, the correlation between depth and flow is poor (R^2 = 0.1863).

- Equipment Theft: Field equipment thefts occurred during the monitoring program including individual loggers from their housings and a computer which resulted in data losses. The lost data set which impacted the flow monitoring program included:
    - Data from the continuous loggers from monitoring stations FM-1, FM-3/2, FM-4, and ATM-1 from the installation date, May 26th to August 13th, 2018
    - Data from the continuous Hobo logger at FM-4 from August 22th 2018 to September 27th, 2018

Due to the complications and data losses listed above, a well-correlated rating curve was only able to be developed for FM-1 (R^2 = 0.966) (see **Figure 5.45**). Using this curve, continuous flows were able to be calculated at FM-1 (see **Figure 5.46**) from August 15th, 2018 to June 18th, 2019 (this includes the 8-month provisional monitoring period). Although reliable rating curves were unable to be developed for FM-3/2 and FM-4, the water level at these locations was continuously recorded for the duration of the study period including the 8-month provisional monitoring period (**Figure 5.48, Figure 5.49, Figure 5.51**).

Due to the inability to develop accurate rating curves for FM-3/2 and FM-4 alternative approaches at characterizing the flow regimes within the west canal were explored. The following approaches were explored as means of estimating flow volume through the west canal and entering Mohawk Lake.

1. A stage-storage analysis of the lake and canals was completed using the results of the Bathymetric and Topographic surveys. Comparisons between the water level fluctuations recorded at the FM3/2 location and stage-storage relationship was considered in order to estimate the total volume of inflow to the west canal and lake system over the 10-month monitoring period (August 15th, 2018 to June 18th, 2019). The volume of the system was incrementally interpolated from the stage-storage relationship using the water level elevation recorded at FM-3/2. However, because FM-3/2 was located near two large outfalls, the site experienced large increases (0.2-0.8m) in water level during events, which were not representative of the corresponding water level

changes in the lake and east canal. As such, the approach vastly overestimated the volume of water entering the west canal and lake system. The approach was not carried forward.

2. To obtain more accurate flow and inflow volumes estimates entering the Mohawk Lake system, the InfoWorks (converted from InfoSWMM) model developed as part of the Characterization Study was utilized (See subsequent sections for model details). The flow regimes in the west canal and lake were characterized using InfoWorks model outputs for the cumulative flow rates from the existing stormwater outfalls which discharge to the canals and lake. Continuous modelling results were based on the rainfall data collected from the Greenwich station and others. Rainfall data from the Wastewater Treatment Plant station was used for the winter months (December 2018-April 2019) when the Greenwich station was decommissioned. Based on the model, the maximum flow within the west canal at FM-3/2 was approximately 14.8m^3/s, however, the hydrograph developed for the location demonstrated flow rates which typically ranged below 5.0m^3/s for the majority of the monitoring period. The maximum flow near FM-4 was approximately 10.1m^3/s, but similar to FM-3/2, the hydrograph developed for the location demonstrated flow rates which typically ranged below 5.0m^3/s. **Figure 5.50** and **Figure 5.52** demonstrate the hydrograph developed for the FM-3/2 and FM-4 using the InfoWorks model. Model results also estimated total runoff volumes to Mohawk Lake and canals from the storm sewer system. The results are demonstrated in subsequent sections and compared with results of previous studies.

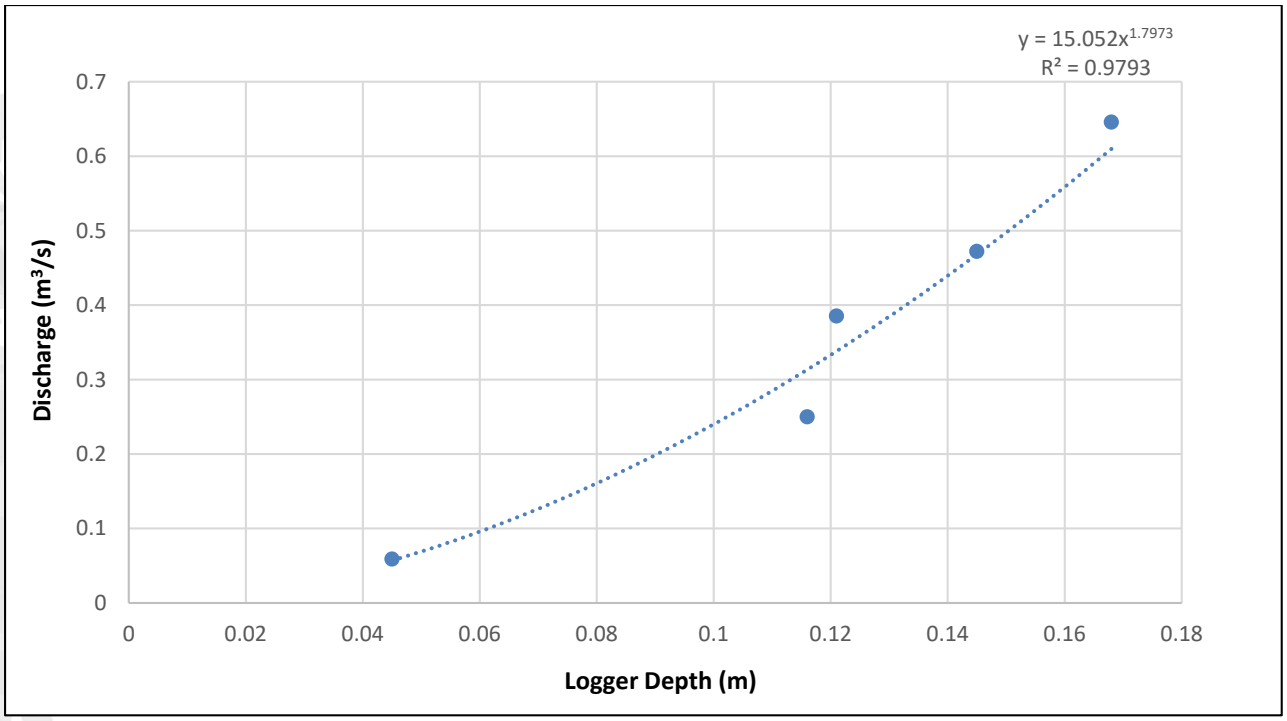


Figure 5.45: Rating Curve for FM-1

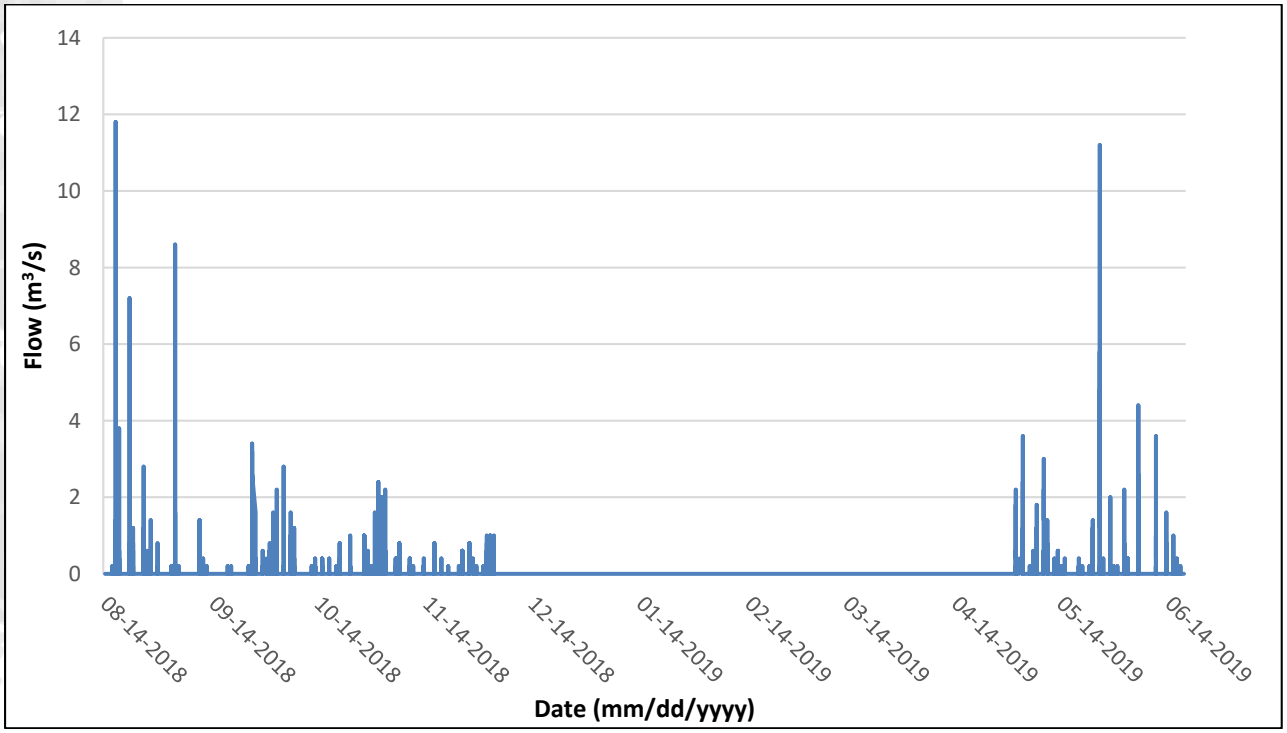


Figure 5.46: Continuous Flow Monitoring for FM-1

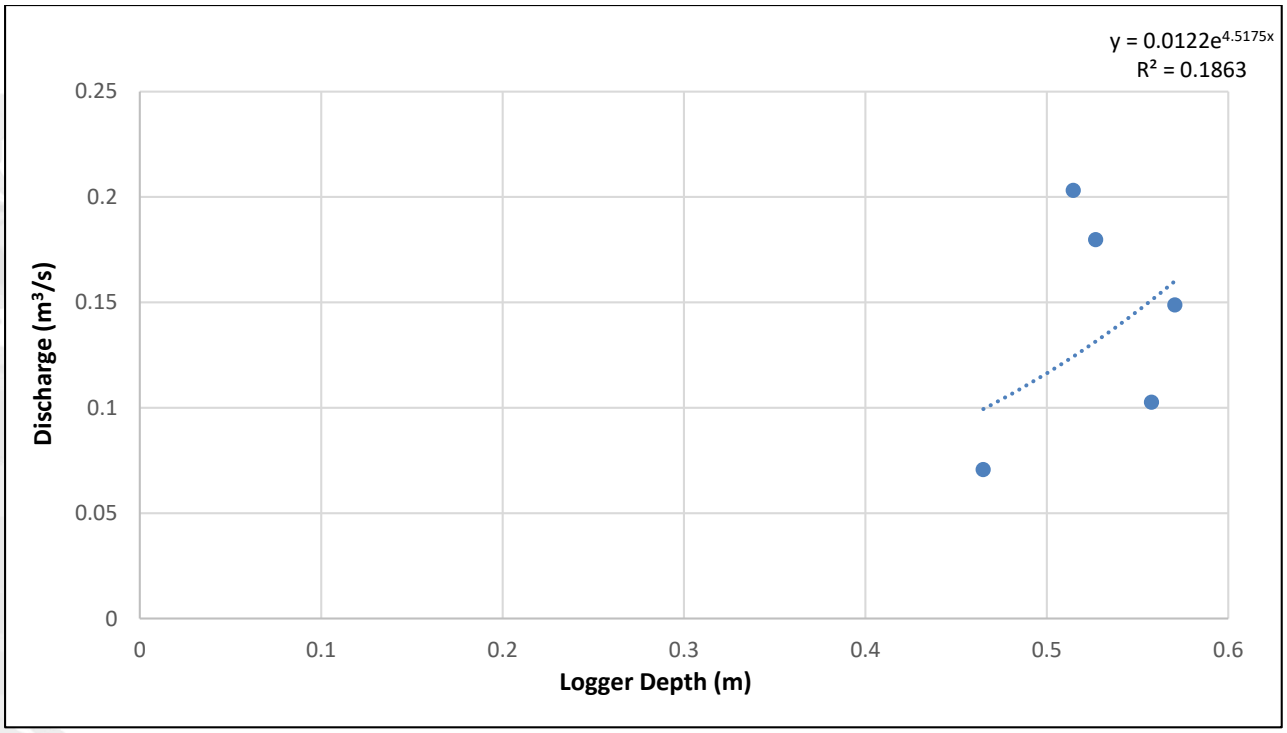


Figure 5.47: Rating Curve for FM-3/2

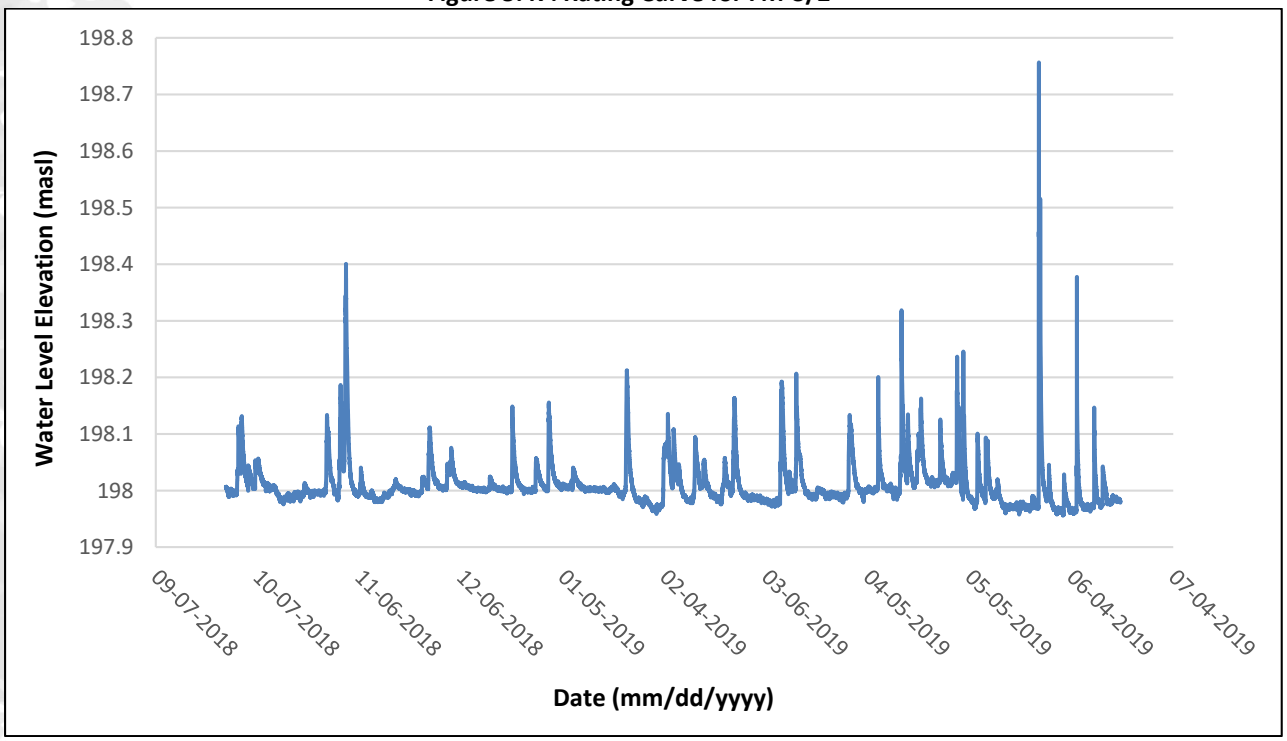


Figure 5.48: Continuous Water Level at FM-2 in meters above sea level (masl)

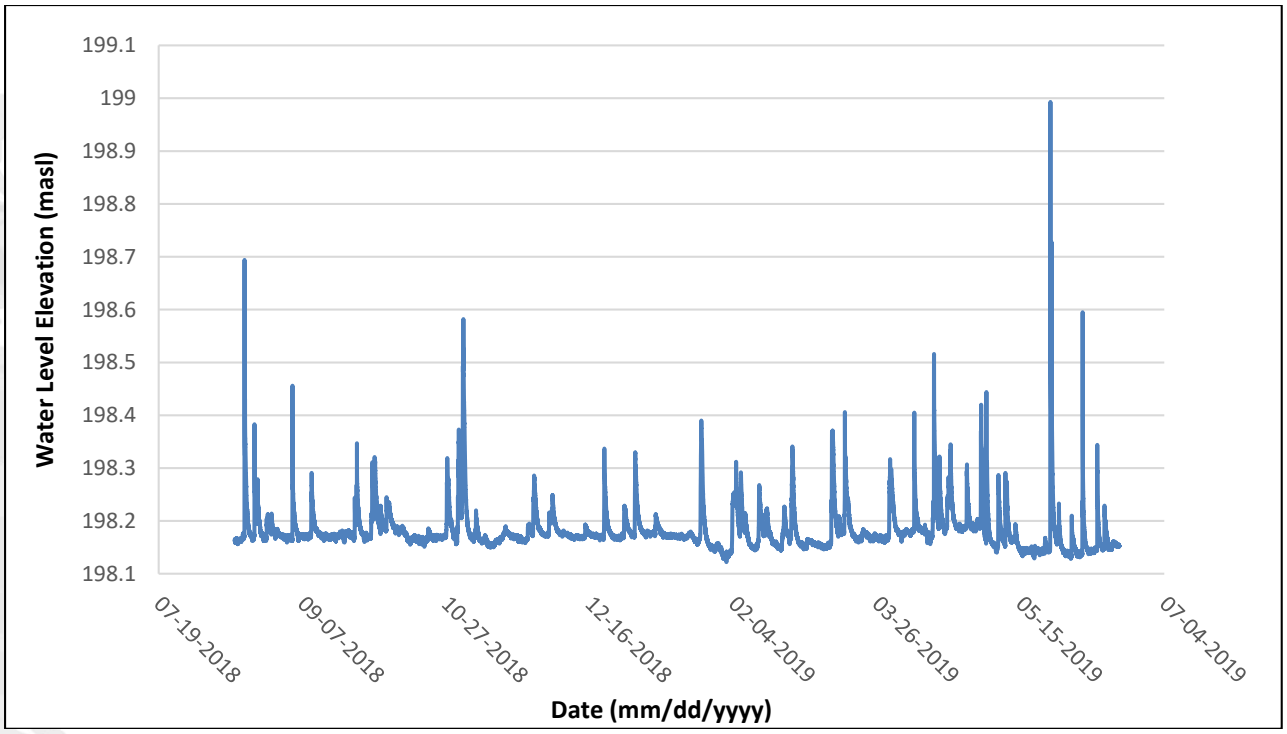


Figure 5.49: Continuous Water Level at FM-3 in meters above sea level (masl)

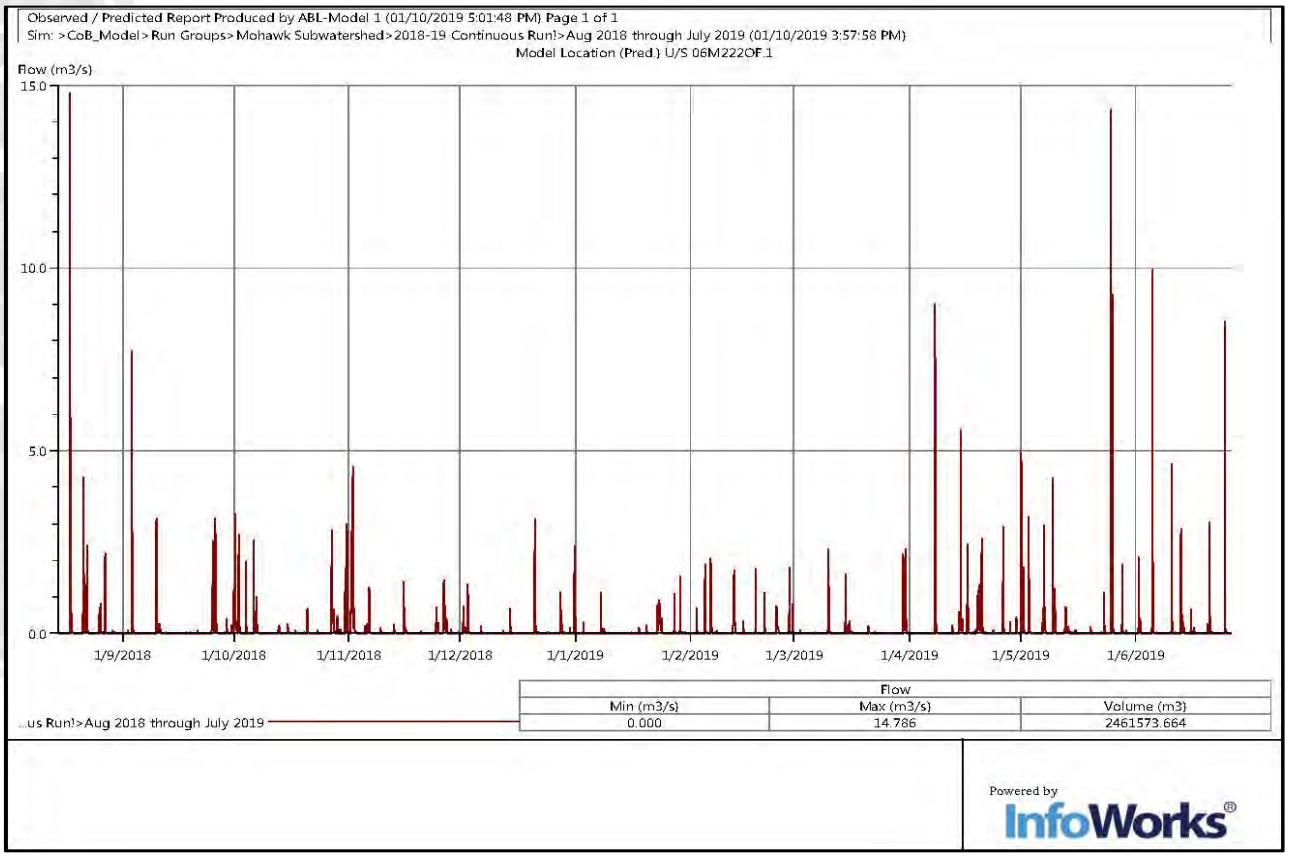


Figure 5.50: InfoWorks hydrograph for West Canal at FM-3/2

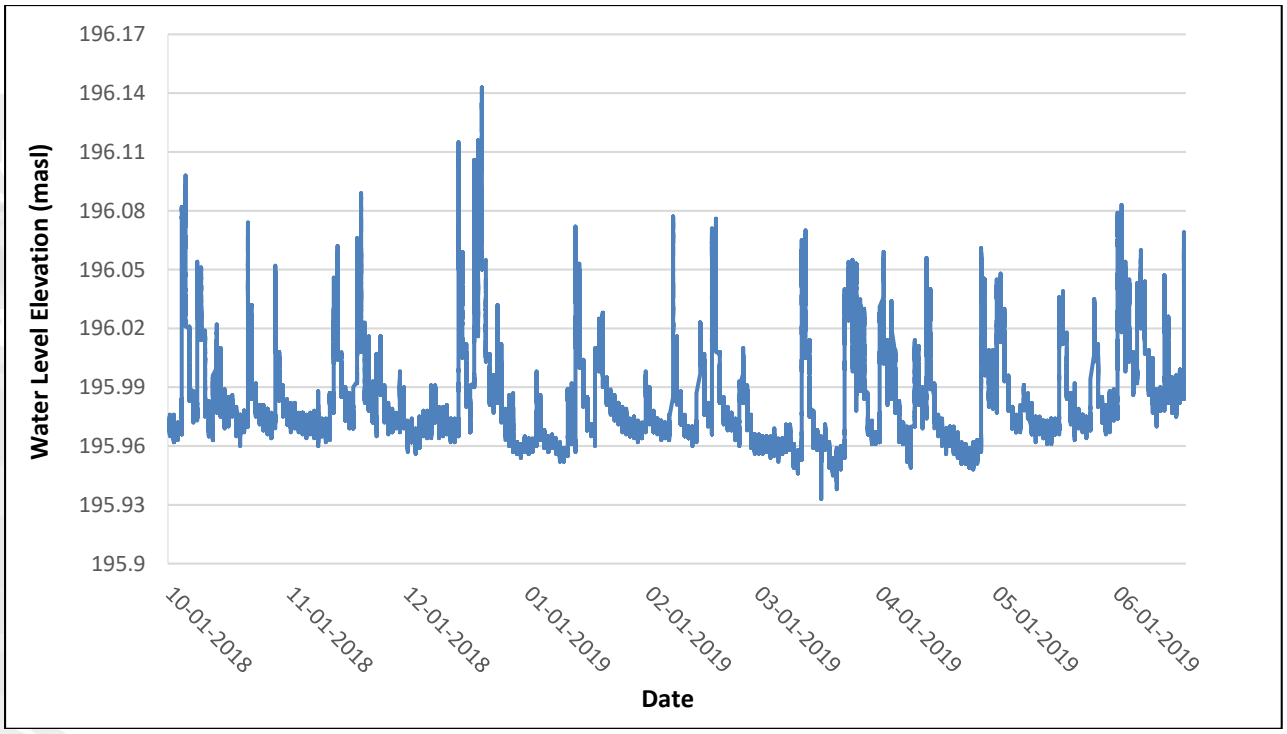


Figure 5.51: Continuous Water Level at FM-4 in meters above sea level (masl)

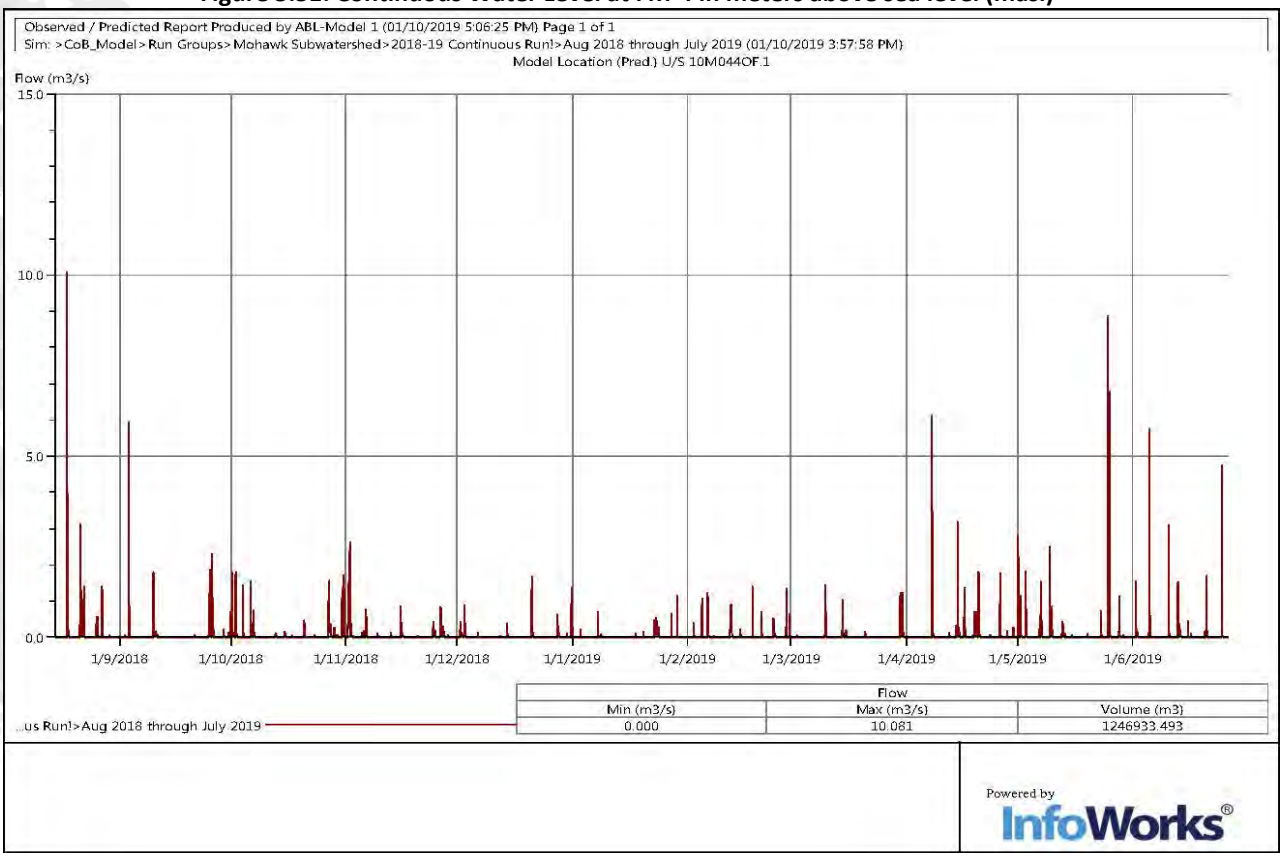


Figure 5.52: InfoWorks Hydrograph for West Canal at FM-4

5.7.4 Discussion & Conclusions: Field Studies

Rainfall Monitoring

As shown in **Table 5.11,** the rainfall measurements collected by the meteorological station established above the Pollution Control Building (Greenwich Station) were similar to the values recorded by the surrounding Brantford weather stations located at the Brantford Airport, the Water and Wastewater Treatment Plants, and the Brantford Tourism Center. Data gaps listed in the previous section for the Greenwich station were completed using the data from the Brantford Wastewater Treatment Plant.

Rainfall records were segmented into rainfall events using a twelve (12) hours inter-event period, as defined below:

- A rainfall record preceded by twelve (12) hours with no rainfall records was considered the start of a storm event.
- A rainfall record followed by a period of twelve (12) hours with no rainfall records was considered the end of a storm event.
- The total rainfall depth is the sum of all rainfall records within the same storm event.
- The total rainfall depth is greater than 2mm.

Over the duration of the study (August 15th, 2018 to June 18th, 2019), sixty (60) rainfall events occurred totaling 771.8 mm. Of these events, 47% were less than 10mm, 43% were between 10 and 25mm, and only 10% exceeded the 25mm (90th percentile) rainfall event. Environment Canada climate records provide an average annual precipitation for Brantford of 867.3mm between the years of 1981-2010. Adding the additional precipitation recorded by the WWTP weather station from June 19th to August 16th, 2019 to the study period total above gives an annual total of 867mm.

Flow Monitoring

The outlet structure of Mohawk Lake – directly upstream of flow monitoring station FM-1 – flowed constantly throughout the monitoring program. During rainfall events, ranging from 14 - 25mm, there was no significant increase in water depth within the outfall channel where FM-1 is located. However, the velocity and corresponding discrete flow measurements recorded in the channel were variable ranging from 0.2498m^3/s to 0.6458m^3/s during rainfall events. Based on the rating curve and continuous data collected at FM-1, the estimated cumulative volume discharged from Mohawk Lake and into the Grand River over the 10-month monitoring period from August 15th, 2018 to June 18th, 2019, was estimated at 3,572,000m^3. Extrapolating this volume to an annual total results in a volume of approximately 4,286,000m^3. The results presented in the Gore & Storrie 1995 report estimated 3,337,000m^3 of annual total flow.

To further characterize the hydrologic conditions of Mohawk Lake, a water balance approach was utilized to estimate flow and flow volume inputs to the lake and canal system. The calibrated InfoWorks model was used to estimate the total inflow volume entering the lake and canal system from numerous stormwater outfall locations from August 15th, 2018 to June 18th. **Figure 5.53** shows the outfall locations where the total outflow hydrographs were generated for the 2018-19 continuous event within the InfoWorks model. These locations were all upstream of FM1 located downstream of storm sewer outfall 01M014OF. The model calculated total flow and volume based on Manning's equation at both the upstream and downstream ends of each conduit leading to the outfall node. Flows and volumes that were generated at each outfall are summarized in **Table 5.12**.

Most of the inflow from the storm sewer outlets, 92%, enters the Mohawk Lake and Canal system in the West Canal. Within the West Canal, the outfalls at the upper end of Shallow Creek Park (11M482 & 11M484), Rawdon Street Outfall (07M193), and Stanley Street Outfall (06M221) provide significant outflow (locations on **Figure 5.53**) with peak flows ranging from 1.49 to 10.52 m^3/s. Based on the InfoWorks model results for each of these outfalls (**Appendix B**), the total estimated inflow volume to the lake and canal system during the ten (10) month monitoring period was 2,549,000m^3. Extrapolating this volume to an annual total would resulted in a volume of approximately 3,060,000m^3. The Gore & Storrie 1995 results indicated a total annual surface runoff input of 2,748,000m^3.

Based on the outlet volume estimated at FM-1 and the input volume from the InfoWorks model, over the 10-month monitoring period, estimates demonstrated that more water leaves (29%) the system through the Mohawk Lake outlet structure than enters the system through the existing stormsewer network. Previous studies (Gore and Storrie 1995) estimated groundwater inputs account for 18% of the flows which discharge from the system. Results of the 2018/2019 monitoring support previous findings which suggest that the Mohawk Lake and canals are subject to significant groundwater inputs from the surrounding areas and aquifers. These results align with findings of the hydrogeological study which noted that several areas of groundwater are under discharge conditions which are a significant source of water replenishment to the adjacent lake and watercourse.

Similar to previous studies, consideration of evapotranspiration and seepage from Mohawk Lake and canals was not considered, and as such the groundwater contributions to the system could potentially be greater than current estimates.

Table 5.12: Summary of InfoWorks Results at Outfall Locations

Outfall (InfoWorks Model)	Volume (m^3)	Maximum Flow (m^3/s)
East Canal		
01M011.1	9,431	0.19
01M013.1	5,809	0.12
02M055.1	90,855	1.21
02M064.1	45,324	0.55
02M070.1	7,129	0.12
02M094.1	14,624	0.29
02M106.1	3,378	0.08
03M005.1	17,414	0.29
Total	**193,966**	**2.85**
Lake		
04M013.1	4,975	0.11
05M037.1	14,575	0.37
Total	**19,550**	**0.48**
West Canal		
06M221.1	302,569	5.66
07M193.1	744,265	3.65
07M206.1	9,230	0.18
08M003.1	21,133	0.23
09M007.1	14,197	0.18
10M043.1	10,711	0.08
10M076.1	19,389	0.39
10M097.1	91,851	0.66
11M482.1	13,2062	1.49
11M484.1	990,461	10.52
Total	**2,335,869**	**23.04**
Cumulative Total	**2,549,385**	**-**

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- U/S MH for Outfall Conduits
- Flow Monitoring Station
- Outfall Conduits
- Watercourse
- Storm Gravity Mains
- Property Parcels
- Storm Shed
- Waterbodies
- Study Area

Figure: 5.53

Outfall Sewer Locations

0 125 250 500

Meters

N

Date: October 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

5.7.5 Hydrologic Modelling Scope and Methodologies

The existing storm sewer model that was developed as part of the Master Servicing Plan (MSP) using the InfoSWMM modelling platform was further calibrated by Aquafor Beech Ltd as part of the Stormwater Flow Monitoring and System Model Calibration Study in 2016/17 using rainfall and continuous flow monitoring data collected from within the storm sewer system at fifteen (15) locations. Only eight (8) of the existing fifteen (15) flow monitoring locations were located within the Mohawk Lake sub-drainage area and data from these flow monitoring locations were used to re-calibrate the model as well as determine if further flow monitoring was required.

The InfoSWMM stormwater system model is an "all-pipe" model including both trunk and local storm sewers totaling approximately 428 km (6,400 pipes). The storm sewer network was constructed using the City's GIS database, with synchronized model elements, and included all detention structures, control structures, and outfalls within the City's existing system. The scope of the hydraulic model was developed using the following criteria:

- "All-Pipes" model (Storm sewer >200mm in diameter and the downstream conveyance system)
- Includes significant ditches and culverts (ditch and culvert survey)
- Include City's detention structure
- Excludes catch basins, catch basin leads, private storm systems and services
- Catchment areas defined on a storm sewer level
- System outlets to Grand River and other major creeks (Model boundary)

The model's storm sub-catchment areas were delineated and assigned through an automated process utilizing the City's available contours data and catch basin and inlet locations. Sub-drainage area hydrologic runoff characteristics were estimated using available land use, land cover, soil, vegetation, and topographic data.

The InfoSWMM model version 14.5 (later upgraded to 14.6) was used by Aquafor Beech to conduct an initial evaluation of the model as well as the calibration and validation runs. The following limitations were noted in the master model:

- Catch basin information (number and type) was not included;
- Percent connectivity for roof runoff to the sewer system was not included for each subcatchment area;
- Storm subcatchment areas were delineated based on contours draining to a receiving node with no major system defined;
- Foundation drain connections could not be confirmed and neither could the connection policy be confirmed;
- Stormwater management facilities were characterized and included in the model;
- Open naturalized channels area included in the model network and defined by a cross section constant for the entire length of the channel (e.g. Mohawk Channel and Mohawk Lake area defined by the same transect) but not part of the model calibration;
- Investigation of land use within a flow monitor catchment area to adjust impervious values and depression storage was based on Google Earth and land use data provided by the City.

Calibration of the InfoSWMM model was undertaken in the previous study using four (4) rainfall events, however in a few cases, the collected rainfall and flow monitoring data could be utilized for only 2 to 3 events to calibrate due to either the flow monitor not recording flow data or flow data was recorded prior

to the start of rainfall data collection from the City precipitation gauges that came online in October, 2016. Calibration was achieved through the identification and adjustment of the following key parameters:

- drainage area;
- percent imperviousness; and,
- depression storage.

The 2017 Aquafor Beech calibrated hydrologic/hydraulic (H&H) storm sewer model was used to form the base network for the Mohawk Lake sub-drainage area and model used as part of the Characterization Study. The study area was isolated from the rest of storm sewer system by establishing boundary conditions at the edge of each of the subcatchment areas within the sub-drainage area. All outfalls to the Mohawk canal and lake system were assumed as free outfalls where backwater conditions were not included.

2018 Model Scenarios

The calibrated H&H model was used for the Characterization Study and Mohawk Lake sub-drainage area to simulate the flow within the storm system and its connectivity from source to end-of-pipe and through the canal and Mohawk Lake to the Grand River. Event-based simulations included return periods for the 2-year through Regional design storm that were generated using PCSWMM (**Appendix B**).

Figure 5.37 showed the various outfall locations along the canal and lake system where flows into the system were analyzed based on 2017 event data. **Figure 5.54** shows the locations where the canal and lake flows were assessed for peak flow and volume for the following design events:

- 2-Year, 24-hour Chicago Event
- 5-Year, 24-hour Chicago Event
- 10-Year, 24-hour Chicago Event
- 25-Year, 24-hour Chicago Event
- 50-Year, 24-hour Chicago Event
- 100-Year, 24-hour Chicago Event
- Regional Storm – Hurricane Hazel

Recorded rainfall event data was used to assess the continuous canal and lake flow volume for the following period:

- August 15th, 2018 through June 18th, 2019

Figure 5.54 shows the assessed locations for the design events as well as the assessment for the aforementioned monitoring periods.

Node	Design Events - Maximum Flow (m^3/s)						
	2yr	5yr	10yr	25yr	50yr	100yr	Regional
West Canal							
10M044OF	4.96	6.27	8.03	10.27	12.27	13.99	17.43
06M222OF	9.01	11.58	14.58	18.40	22.04	25.37	33.52
Lake							
05M038OF	9.35	12.17	15.30	19.26	22.98	26.27	34.36
04M014OF	8.82	11.39	14.31	18.16	21.91	25.33	34.48
East Canal							
JCT62	9.35	12.10	15.19	19.43	23.78	27.78	40.17
JCT194	9.66	12.53	15.72	20.19	24.86	29.21	44.63
OUTFALL							
JCT74	9.66	12.53	15.72	20.19	24.86	29.21	44.63

Figure: 5.54

Model Parameters

InfoSWMM model subcatchments are generated from the DEM and routes rainfall runoff to the downstream node. Flow times are calculated using Manning's equation with a Manning's roughness assigned to the impervious and pervious areas.

As noted previously, the calibrated model has several limitations that include a lack of a clearly defined major system and no catch basin inlet rating curves where flow is routed into the minor system. The calibrated minor system model included outfall nodes and open drain conduits with cross sections assigned based on a combination of topology and contour information as constructed from the MSP modelling component.

Adjustments to key parameters identified as critical to flow routing were input and adjusted to increase the travel time for runoff entering the minor system and reduce the likelihood of over prediction of the outflow into the canal and lake system. The parameters that were added/adjusted are summarized below:

Manning's Roughness

The velocity of overland flow is dependent on the surface roughness of the catchment. A lower surface roughness value will result in a high surface runoff velocity.

Typical Manning's Roughness Coefficients for various surfaces are listed below:

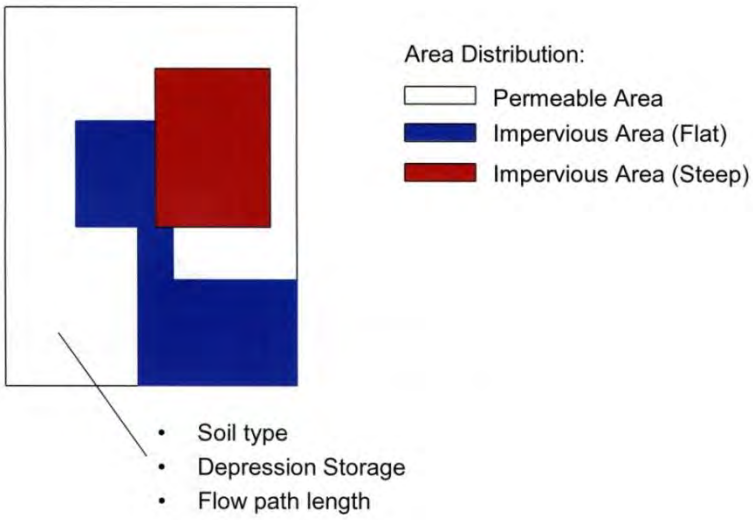
Table 5.13: Manning's Roughness Coefficient for Various Surfaces

Surface Type	Manning's Roughness Coefficients
Impervious surface: (e.g.: Asphalt)	0.014 = 1/70
Pervious small infiltration area: (e.g.: Clays)	0.033 = 1/30
Pervious medium infiltration area: (e.g.: Clayey Silt)	0.083 = 1/12
Pervious large infiltration area: (e.g.: Sandy soils)	0.410 = 1/2.5

In the model, Manning's roughness coefficient for impervious and pervious areas were raised for each subcatchment area in the Mohawk Lake subwatershed based on land use and accounting for a lack of a formal major system; these values ranged from 0.1 to 0.45.

Flow Length

The length of the flow path was used as a means of approximating the lag time observed between the commencement of rainfall and the occurrence of flows in the storm sewer system. In cases where the sub-catchment area drains directly to a sewer which was modeled the travel time from the sub-catchment area to the sewer needed to be defined. In cases where the sub-catchment area drains to a sewer which is not modeled then the travel time in the sewer also had to be determined.



Three (3) examples which illustrate how the flow path length was determined are provided below:

Example No. 1: A single storm sewer segment (included in model) located in the sub-catchment area

For impervious areas – roof and flat areas, Manning's "n" values are approximately equal to the Manning's "n" for the storm sewer.

Flow path length = (2/3)l + L

Where:

L: storm sewer segment length

l: length of building lot

For pervious areas – grass area Manning's "n" (assuming to be 30) is 80/30 = 2.67 larger, and therefore the equation will be

Flow path length = (2/3)l * 2.67 + L

Example No. 2: Storm sewer segments (not included in model) connected to other storm sewer segment (included in model) located in the sub-catchment area

For impervious and pervious areas – the calculation formula is the same as Example No.1 and simply picks the longest distance running along the sewer segments as "L".

Example No. 3: Rural or agricultural area

For rural areas – overland (grass) area Manning's "n" (assuming we use 4), therefore the length (l) has to be multiplied by 80/4 = 20

Flow path length = (2/3)l * 20 + L

Where:

L: storm sewer segment length

l: longest distance in area

Outlined below is a simple way to determine the small "l" value

For	Residential	l = 40m
	Institutional	l = 200m
	Office	l = 100m
	Commercial	l = 60 m
	Warehouse	l = 150m
	Industrial	l = 150m

Open Space, determining the "l" value may require measurements (200m is the default value).

Horton's Infiltration

Infiltration is the water loss to the lower storage caused by the porosity of the catchment surface. Surface infiltration was simulated using the Horton equation, which is a widely accepted method. Three (3) input parameters are required:

- Horton Initial Infiltration [mm/hr] – defines the maximum rate of infiltration (Horton) for the specific surface type. The default value depends on the surface type.
- Horton Limiting Infiltration [mm/hr] – defines the minimum rate of infiltration (Horton) for the specific surface type. The default value depends on the surface type.
- Horton's Exponent – time factor "characteristic soil parameter" [s-1]. Determines the dynamics of the infiltration capacity rate reduction over time during rainfall. The actual infiltration capacity is made dependent of time since the rainfall start only. The default value depends on the surface type.

Additionally, the following input parameter was also assigned based on the available literature through XPsolutions (now Innovyze):

- Horton Maximum Infiltration Volume [mm] - Max infiltration volume is accumulative. The infiltration rate becomes zero once max volume is attained. Zero in the max volume cell means that no max volume will be attained.
- Initial Moisture Deficit (mm)This parameter represents the depth of rain required to "wet" the surface of the land type. No storage or runoff can occur until the wetting losses have been satisfied. The default value was used and will need to be adjusted in the next phase.

The following table summarizes the Horton's infiltration parameters assigned to the subcatchment areas in the study area.

Table 5.14: Horton's Infiltration Parameters

Parameter	Impervious	Pervious
Horton Initial Infiltration (mm/hr)	-	270
Horton Limiting Infiltration (mm/hr)	-	25
Horton Decay (1/hour)		2
Maximum Infiltration Volume (mm)		60
Initial Moisture Deficit (mm)	0.25	

The infiltration parameters chosen used guidance based on existing soil conditions, the Ontario Soils Survey and global infiltration parameters from Innovyze.

Several iterations of the design storm events were modeled until the results were reasonably in agreement with the calibrated model's outflows to the canal and lake system.

Conversion to InfoWorks

The InfoSWMM 14.6 model was converted to InfoWorks ICM 9.5 during the completion of the Characterization Study. InfoWorks provides several attributes which are not available in InfoSWMM including:

- The ability to incorporate HEC-RAS;
- The option to model a wider range of alternatives, including Low Impact Development (LID) measures;
- The option to separate different types of impervious areas (i.e. directly connected impervious vs. indirectly (disconnected downspouts) connected areas);
- The ability to make global changes to the model (i.e. upgrade all 300mm pipes to 450 pipes);
- The option of using different equations for calculating infiltration;
- Reduced run time; and,
- Enhanced opportunities to integrate with GIS.

Model calibration was confirmed using the 2018 MSP flow monitoring results (following the same process as the InfoSWMM calibration); the calibration at select flow monitors (locations as shown in **Figure 5.37**) within the Mohawk Lake subwatershed is summarized in **Table 5.15**. The comparison showed some inconsistencies which are likely attributable to methods used to define percent impervious and infiltration.

Table 5.15: InfoWorks Calibration Results

Flow Monitor	Maintenance Hole ID	Storm Sewer Segment ID	Initial Calibration	Parameter Adjustment	Final Calibration
1	06M207	06M207-06M219	Fair	Increased initial abstraction by +5 mm	Good
2	07M192	07M192-07M176SF	Fair		Good
10	11M574	11M484-11M001OF	Poor		Fair

Observed and predicted calibration values within +/-20% are considered good while calibration results showing greater than +/- 50% difference are considered poor.

As the majority of the predicted flows where high, a global adjustment of + 5 mm for initial abstraction was performed to increase the volume of rainfall stored to reduce the difference between the observed and predicted flows to within 20%. Good calibration was achieved at FM1 and FM2 while calibration of FM10 was fair as it was within +20% and +50% of the observed values.

The InfoWorks model was updated with a ten-month continuous rainfall event dataset recorded by Aquafor Beech Ltd at the Greenwich Street weather station for the period from August 2018 through June 2019. The Greenwich Street rain gauge was decommissioned for a portion of the study period from December 2018 through April 2019; rainfall data for this period was supplemented with data from the City's rain gauge station at the wastewater treatment plant to form a complete ten-month dataset.

5.7.6 Results and Discussion: Modelling

Design Events

The 2-year through 100 and Regional storm events were run to estimate the inflows into and through the canal and lake system from the surrounding drainage area. These results were used as inputs to the Hydraulic model (Geo-HEC-RAS) for the purpose of floodplain characterization and to verify areas within the storm sewer system where surcharging occurred during the 2yr, 5yr and 10yr storm events. Large events were not mapped as the level of service for typical minor systems would be exceeded under such conditions.

Previous studies have developed models to quantify the net inflows into the Canal and Lake as well as outflows to the Grand River. For consistency purposes, the outfalls and tributaries within the InfoSWMM model were correlated to the corresponding locations in the Mohawk Lake Stormwater Management Report (Gore & Storrie 1995).

A key difference to note between the 1995 study and the InfoSWMM model is that the InfoSWMM model output shows total inflow into each node from upstream. Generally, the individual outfall inputs into the west canal and lake system upstream are similar between InfoSWMM model and the modelling results completed as part of the Stormwater Management Report (Gore & Storrie 1995).

For incorporation into the GeoHECRAS model and development of floodplain mapping, the InfoSWMM model results were routed through specific outfall nodes through the Canals and Lake to determine the accumulation of flows through the system. Locations for flow inputs into the GeoHECRAS model were refined down to those that best represented the west canal, Mohawk Lake and the east canal. The corresponding peak flow results are summarized in **Table 5.16** and are referenced in **Figure 5.54**.

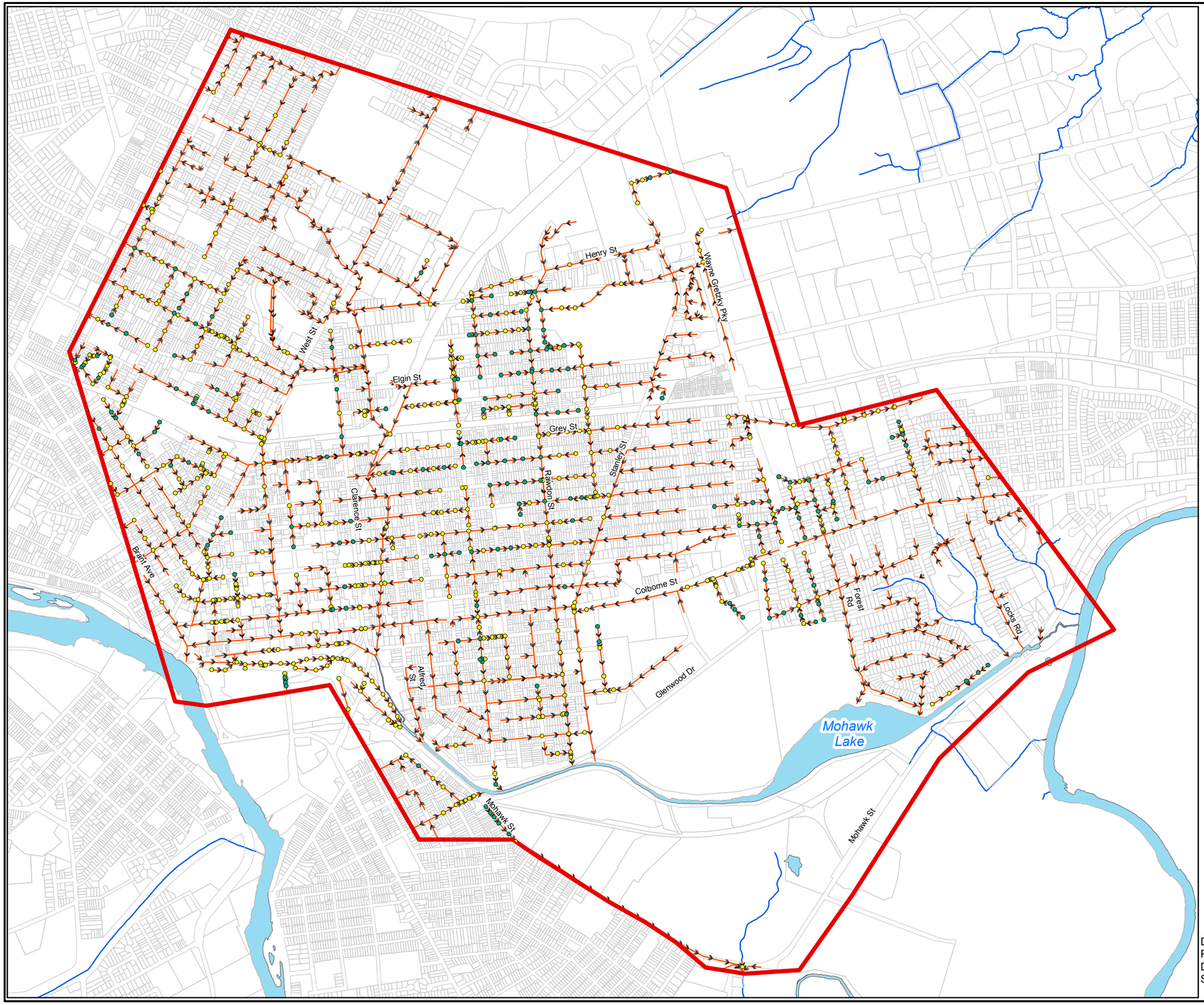
Table 5.16: Design Storm Peak Flows

Node	Design Events - Maximum Flow (m^3/s)						
	2yr	5yr	10yr	25yr	50yr	100yr	Regional
West Canal							
10M044OF	4.96	6.27	8.03	10.27	12.27	13.99	17.43
06M222OF	9.01	11.58	14.58	18.40	22.04	25.37	33.52
Mohawk Lake							
05M038OF	9.35	12.17	15.30	19.26	22.98	26.27	34.36
04M014OF	8.82	11.39	14.31	18.16	21.91	25.33	34.48
East Canal							
JCT62	9.35	12.10	15.19	19.43	23.78	27.78	40.17
JCT194	9.66	12.53	15.72	20.19	24.86	29.21	44.63
OUTFALL							
JCT74	9.66	12.53	15.72	20.19	24.86	29.21	44.63

The results show an increase in flow from the 2 year through 100-year storm events and a significant increase with the Regional event based on the full range of Hurricane Hazel. These results represent total flows in the canal and lake system routed through each node and into the outfall node at JCT74. 10M044OF represents the input at the top end of the canal and lake system from the sewershed.

The above outputs were fed into the GeoHECRAS model that contained the surveyed canal and lake cross sections to predict the flooding potential along the canal and lake system that is discussed in the **Section 5.8.3**.

Although significant portions of the minor system are deficient showing a state of surcharge under the 2-year, 5-year and 10-year design events, there is a general lack of any flooding issues reported and the (informal) major system seems to be, in general, sufficient to convey overland flow drainage up to a 5-year event. **Figure 5.55, Figure 5.56** and **Figure 5.57** depict the entirety of the stormwater collection system as well as the locations of surcharged sewers during the 2 year through 10-year storm event as per the calibrated H&H model.



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Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Surcharged Manholes
- Above Pipe Crown
- Storm Conduits
- Watercourse
- Property Parcels
- Waterbody
- Study Area

Figure: 5.55

Surcharge Sewers - 2 Year Storm Event

0 0.25 0.5 1
Kilometers

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Surcharged Manholes
- Above Pipe Crown
- Storm Conduits
- Watercourse
- Property Parcel
- Waterbody
- Study Area

Figure: 5.56

Surcharge Sewers - 5 Year Storm Event

0 0.25 0.5 1

Kilometers

N

Date: February 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Surcharged Manholes
- Above Pipe Crown
- Storm Conduits
- Watercourse
- Property Parcel
- Waterbody
- Study Area

Figure: 5.57

Surcharge Sewers - 10 Year Storm Event

0 0.25 0.5 1

Kilometers

N

Date: February 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Recommendations

Several recommendations have been provided for the EA study:

1. A major system model should be incorporated to route flows according to the urban sewershed rather than based on topology; this will require re-delineation of the storm sewer subcatchment areas to reflect urban drainage patterns (i.e. curb and gutter). Catch basin type should be confirmed for each street and incorporated into the model accounting for slope, grate type and lead size;

2. LiDAR data is recommended to refine the ground model and to generate the overland flow paths. This can be done in the 1D InfoWorks model with the surface elevations at each node inferred directly from the LiDAR ground model.

5.8 HYDRAULICS

As per the Terms of Reference, a geo-referenced HEC-RAS model was developed for Mohawk Lake and Canals and floodlines were created for the 2-100 year design storm and the Regional storm distribution (Hurricane Hazel). The following section summarizes and describes the hydraulic features of the study site based on available background information, field surveys, and modelling exercises completed as part of the Characterization Study.

5.8.1 Background

In 1989 Philips Planning + Engineering Ltd designed and modelled the control structure for the East Canal utilizing a HEC-2 model. This report and model were not available for review, however the Mohawk Lake Stormwater Management Study completed by Gore & Storrie in 1995 provided some information with regards to the 1989 HEC-2 model.

The Stage-Discharge rating curve used by Philips Engineering as part of the 1989 design of the East Canal outlet structure was used in the 1995 OTTHYMO model (as discussed in **Section 5.7.1**). This discharge rating curve was related to the 9m wide weir at the outlet structure near Locks Road and the hydraulic loss experienced at the Locks Road bridge. The storage rating curve was developed based on a lake surface area of 12.5 hectares and lake depths corresponding to the stage-discharge rating curve, and is presented in **Figure 5.58**.

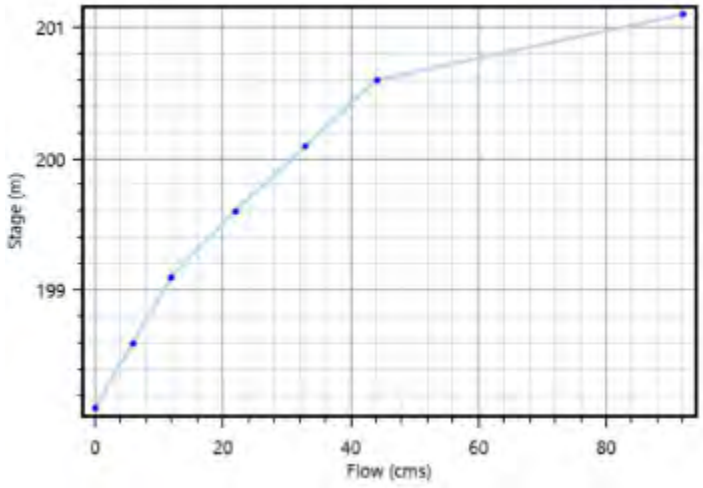

Figure 5.58: Mohawk Canal Outlet Structure Rating Curve (Gore & Storrie, 1995)

While no floodlines of Mohawk Lake were found in any background documentation, the regulatory flood level results of the 1989 HEC-2 model are summarized below:

Location	Regulatory Flood level *(from HEC-2 modelling results provided by Phillips Planning + Engineering Limited)*
Lake outlet structure	200.52 m
Downstream side of Locks Road	200.83 m
Upstream side of Locks Road	201.07 m

Source: Mohawk Lake Rehabilitation Project, Mohawk Lake Stormwater Management Study – DRAFT for the City of Brantford (Gore & Storrie Ltd., 1995)

Mohawk Lake and the canals are within the regulatory jurisdiction of the Grand River Conservation Authority (GRCA) as established in 2008, and as such, Under Ontario Regulation 150/06, the GRCA regulates all development within their jurisdiction in and near rivers, streams, floodplains, wetlands, steep slopes and the Lake Erie shoreline. The GRCA has developed regulatory engineered flood hazard mapping for the Grand River, Mohawk Lake and canals, corresponding to the limits of the regulatory flood, plus a 5m allowance. The flood hazard limits were downloaded from the Grand River Information Network (GRIN) and are shown in **Figure 5.61.**

GRCA does not have a hydraulic model for the Mohawk Lake and canal system, however they do have a hydraulic model for the Grand River through Brantford. Furthermore, **Figure 5.61** and **Figure 5.62** demonstrate that it is possible that Mohawk Lake and parts of the canals are within the flood limits of the Grand River, and therefore the flood limits will be impacted by both the Grand River and the Mohawk Lake sytem.

Dykes have been constructed to protect development within the Grand River flood plain. The GRCA is responsible for the maintenance and management of the dyke system. The City of Brantford Waterfront Master Plan has identified the location of the dyke system, as seen in **Figure 5.59**. The dykes also support the continuous trail and linear park around the waterfront corridor (**Figure 5.60**). The City of Brantford plans to enhance the dyke by establishing a meadow and prairie community.

The regulated area around Mohawk Lake and the canals has been designated as a Special Policy Area, meaning that some development would be permitted within this area which would not be permitted outside of Special Policy Areas (see **Figure 5.61**). According to the City of Brantford Official Plan, the Special Policy Area includes all areas of the floodplain land within the City that are largely developed and are protected by dykes. The Official Plan establishes this Special Policy Area to permit the continuation of the historical pattern of development in these areas in order to limit the social and economic hardship which would result from the prohibition of development. There are limitations on development within this area, further outlined in the Official Plan.

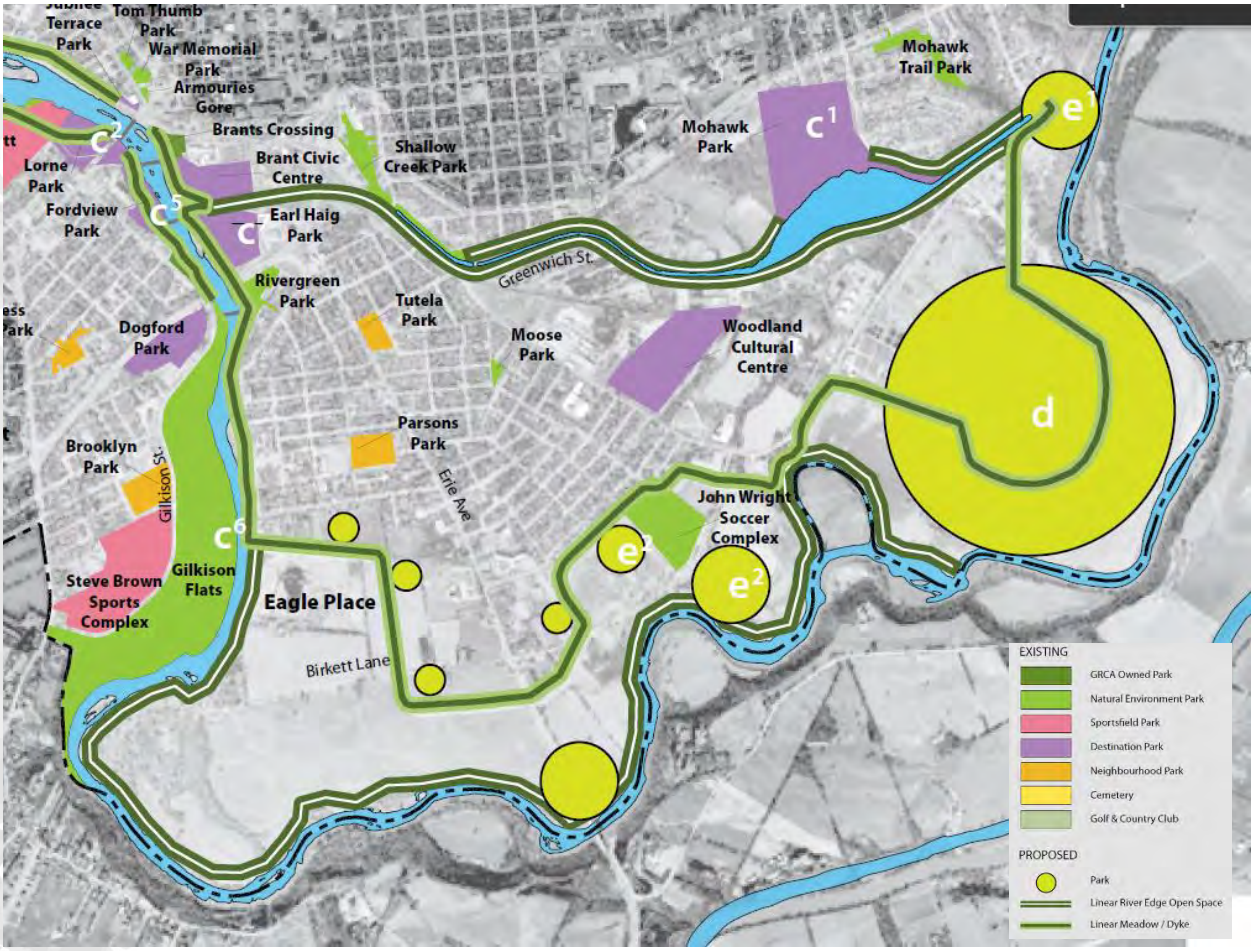

Figure 5.59: Dyke System, Waterfront Master Plan

Figure 5.60: Waterfront Dyke Uses

Figure 5.61: Study area showing limits of GRCA Flood Hazards Colours show the Flood Hazard Designation

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Study Area
- Waterbody
- Regulatory Floodplain

Henry St
West St
Grey St
Stanley St
Forest Rd
Locks Rd
Glenwood Dr
Mohawk Lake
Mohawk St
Mohawk St

Figure: 5.62

GRCA Regulatory Floodplain

0 0.25 0.5 1
Kilometers

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

5.8.2 Field Study Scope and Methodologies

As per the Terms of Reference, a topographic survey was required to develop hydrologic and hydraulic modelling for the study area. The original topographic survey plan included cross-sections every 20m along the length of the lake and canals extending to the tops of banks. However, in support of the development of floodplain mapping and a GeoHECRAS model, several cross-sections were reallocated to crossing locations in order to obtain more detail of the local topography around the crossing structures. It was important to the GeoHECRAS model to define the conditions directly upstream, downstream and through each crossing structure. As a result, cross-sections were located at 5.0m, 15.0m and 40.0m intervals on both the upstream and downstream sides, and at the centerline of each crossing. Cross-section spacing was adjusted to 20-40m along the straight sections of the canals where the continuity of the grading was generally consistent. **Figure 5.63** displays the cross-sections completed as part of the topographic surveys.

Table 5.17 provides a topographic survey shot list completed during the surveying. All outfalls and crossing structures including structure type, opening dimensions, invert/obvert elevations, and spill elevations were surveyed. **Figure 5.64, Figure 5.65, Figure 5.66**, and **Figure 5.67** demonstrate the typical points taken at each structure depending on its type and configuration.

The results of the topographic survey were also used to create a longitudinal profile of the canal and tributaries. This was used to identify changes in the channel slope and the limits of morphologic features (e.g., riffles and pool). This data was also used as part of the geomorphic assessment to complete the reach delineation, channel classification and erosion assessment.

The topographic survey, along with the bathymetric data discussed in **Section 5.11.2**, was used to create accurate cross-sections to define the configuration and dimensions of the lake and canals in the GeoHECRAS model.

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Topographic & Bathymetric Survey Cross Sections
- Watercourse
- Road Centrelines
- Study Area
- Property Parcels
- Waterbody

Figure: 5.63

Topographic & Bathymetric Work Plan

0 150 300 600

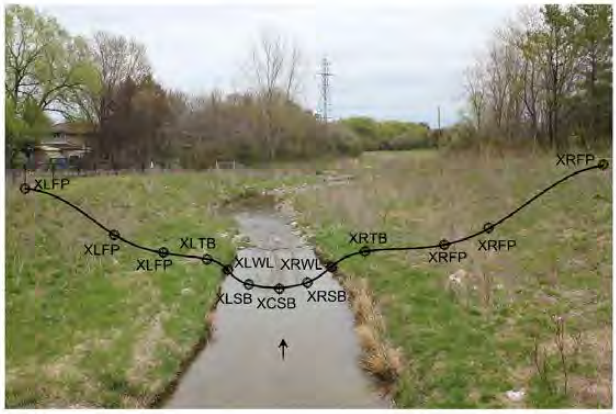
Meters

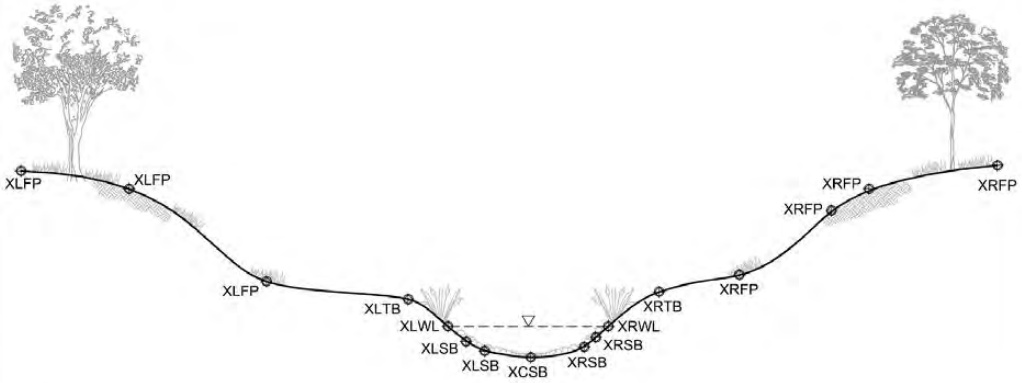
N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

TYPICAL STRUCTURE BOUNDING SECTION AND CHANNEL SECTION



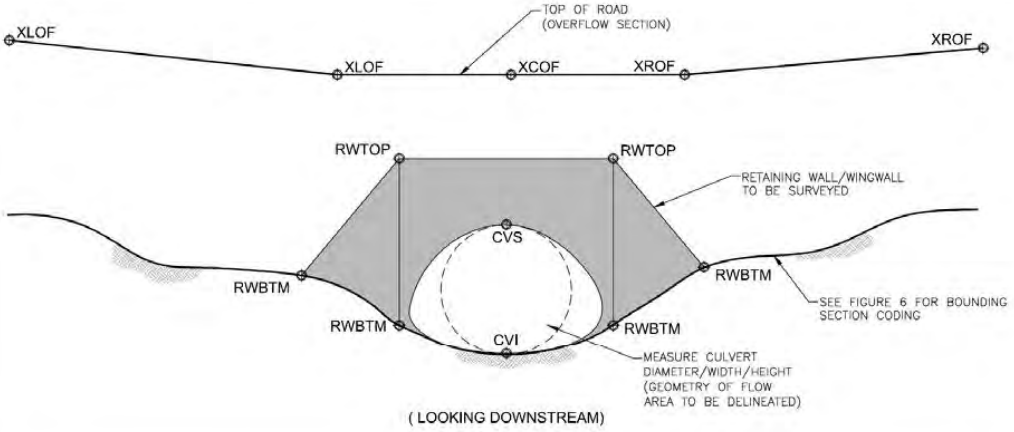


TYPICAL SURVEY CODES	
CODE	DESCRIPTION
XLFP	LEFT FLOODPLAIN
XLTB	LEFT TOP OF CHANNEL BANK
XLWL	LEFT EDGE OF WATERLINE
XLSB	LEFT CHANNEL STREAM BED
XCSB	STREAMBED CENTRELINE
XRSB	RIGHT CHANNEL STREAM BED
XRWL	RIGHT EDGE OF WATERLINE
XRTB	RIGHT TOP OF CHANNEL BANK
XRFP	RIGHT FLOODPLAIN

FIGURE 8

Figure 5.64: Typical Structure Bounding Section and Channel Section

TYPICAL CIRCULAR AND ARCH CULVERTS

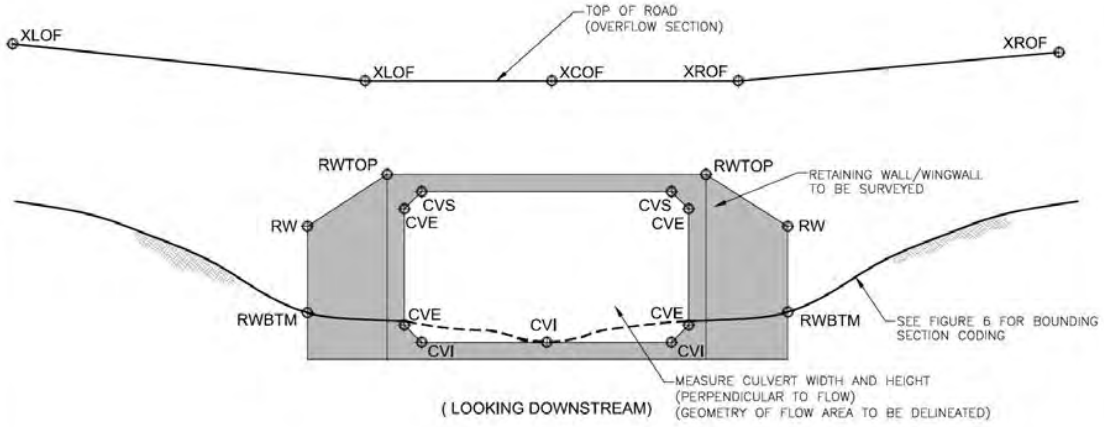


TYPICAL SURVEY CODES	
CODE	DESCRIPTION
CVI	CULVERT INVERT
CVS	CULVERT SOFFIT
RWBTM	BOTTOM OF RETAINING WALL/WINGWALL
RWTOP	TOP OF RETAINING WALL/WINGWALL
XLOF	TOP OF OVERFLOW SECTION LEFT
XROF	TOP OF OVERFLOW SECTION RIGHT
XCOF	TOP OF OVERFLOW SECTION CENTRE

FIGURE 9

Figure 5.65: Typical Circular and Arch Culverts

TYPICAL STRUCTURE SPAN LESS THAN 3m

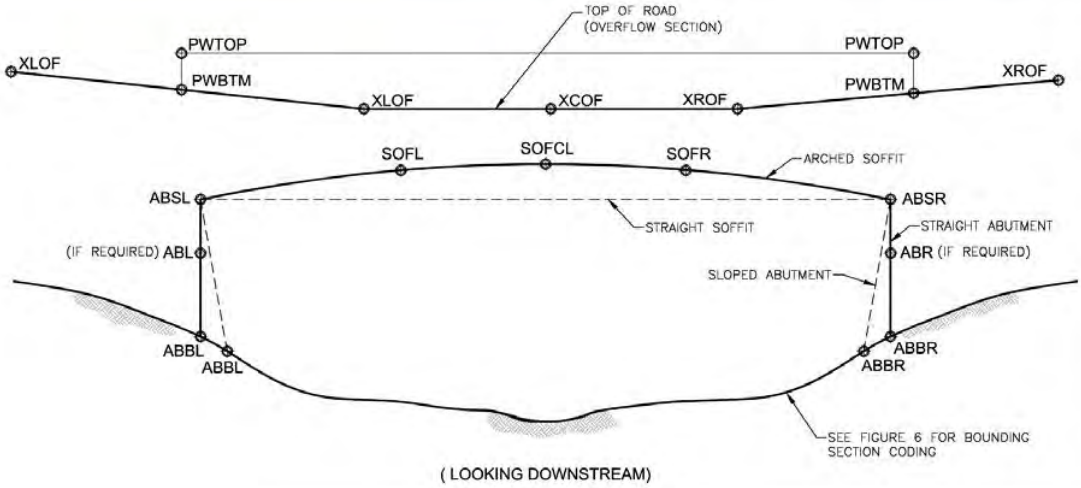


TYPICAL SURVEY CODES	
CODE	DESCRIPTION
CVI	CULVERT INVERT
CVS	CULVERT SOFFIT
CVE	CULVERT EDGE (ABUTMENT)
RWBTM	BOTTOM OF RETAINING WALL/WINGWALL
RWTOP	TOP OF RETAINING WALL/WINGWALL
RW	RETAINING WALL/WINGWALL
XLOF	TOP OF OVERFLOW SECTION LEFT
XROF	TOP OF OVERFLOW SECTION RIGHT
XCOF	TOP OF OVERFLOW SECTION CENTRE

FIGURE 10

Figure 5.66: Typical Structure Span Less than 3m

TYPICAL STRUCTURE SPAN GREATER THAN 3m



TYPICAL SURVEY CODES	
CODE	DESCRIPTION
ABBL	ABUTMENT BOTTOM LEFT
ABBR	ABUTMENT BOTTOM RIGHT
ABSL	ABUTMENT SOFFIT LEFT
ABSR	ABUTMENT SOFFIT RIGHT
ABL	ABUTMENT LEFT EDGE
ABR	ABUTMENT RIGHT EDGE
PWTOP	PARAPET WALL TOP
PWBTM	PARAPET WALL BOTTOM
SOFL	SOFFIT LEFT
SOFR	SOFFIT RIGHT
SOFCL	SOFFIT CENTRE
XLOF	TOP OF OVERFLOW SECTION LEFT
XROF	TOP OF OVERFLOW SECTION RIGHT
XCOF	TOP OF OVERFLOW SECTION CENTRE

FIGURE 11

Figure 5.67: Typical Span Greater than 3m

Table 5.17 Topographic Survey Shot List

STRUCTURES	Manholes
	Catch basins
	Ditch Inlet Catch Basins
	Outfalls (inverts and obverts)
	Boreholes/Monitoring Wells
	Headwalls
ROADWAYS	Sidewalk
	Front & Back of Curb
	Edge of Pavement
	Centreline of Road
	Centre of Intersection
CROSSINGS	Parapet Wall Top
	Parapet Wall Bottom
	Top of Overflow Section/Bridge
CROSS SECTIONS	Cross section stake
	Ground Elevations (minimum of 10m grid). Min. 5m grid for areas of significant grade changes
	Top of Slope
	Top of Bank
	Bottom of Bank
	Water's Edge
OTHER	Driveways, access roads and pedestrian paths
	Building corners

5.8.3 Modelling Scope and Methodologies

A hydraulic model was developed to understand the potential flooding impact of Mohawk Lake and canals within the Mohawk Lake subwatershed. The model was developed using GeoHECRAS™, which is an integrated software that utilizes both GIS and HEC-RAS in model development. This was used to produce a one-dimensional, georeferenced HEC-RAS model for the lake and canals. The contours provided by the City of Brantford were used to generate the digital elevation model (DEM). This DEM was utilized to develop the geometry for the model and each cross-section was then supplemented with topographic survey data for the low flow channel dimensions. A summary of the HEC-RAS model geometry is included in **Appendix C**.

Each of the culverts and road crossings along the lake and canals were included in the hydraulic model with the exception of the Drummond Street Pedestrian Bridge which was closed indefinitely due to deterioration and therefore inaccessible for data collection. Inverts and obverts were collected as part of the topographic survey and other parameters such as material type, headwall structures and sediment blockages were also noted.

The Manning's roughness for the channel were obtained from literature for Manning's values used in HEC-RAS models (Chow, 1959). **Table 5.18** presents the Manning's values that were used within the model.

Table 5.18 Manning's Values Used in HEC-RAS Model

Conditions	Value
Channel	
Clear gravelly channel	0.035
Vegetated channel	0.05
Bedrock	0.025
Overland	
Swamp lands	0.06
Forests or Dense Brush	0.08
Grass Lands	0.055
Manicured Grass Lands	0.045
Bedrock	0.025
Pipes	
Concrete	0.013
CSP	0.024
Corrugated PVC	0.023

The design flows for the model were obtained from the calibrated hydrologic model for four (4) different nodes along the canal, as described in **Section 5.7.6**. The design storms of the 2 to 100-year floods, as well as the Regional Storm Hurricane Hazel were included in the hydraulic model. The flow values generated by the hydrologic model within Mohawk Lake and canals were presented previously in **Table 5.16**.

A stage-discharge relationship for the Mohawk Lake outlet was used to model the structure downstream of the Mohawk Lake. This rating curve was obtained from the 1995 Mohawk Lake Stormwater Management Study by Gore & Storrie, and is presented in **Figure 5.68**.

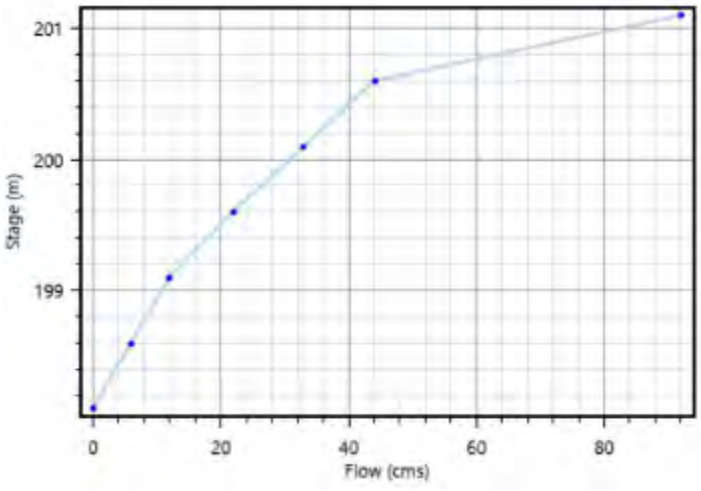


Figure 5.68: Mohawk Canal Outlet Structure Rating Curve (Gore & Storrie, 1995)

Using the GeoHECRAS software, floodlines were generated for the 2 -100 design storm and the Regional Storm Hurricane Hazel and then manually refined to define the estimated limits of the flood. The floodlines and the buildings which are located within the flood limits are presented in **Figure 5.70** and **Figure 5.71**.

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Flow Nodes
- River
- Cross Sections
- Roadway Crossings

Figure: 5.69

Hydraulic Model Cross sections & Flow Nodes

0 130 260 520

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Hazel Flood Extent
- Roadway Crossings
- Infrastructure in Flood Limit
- Buildings in Flood limit

Figure: 5.70

Regional Storm Floodplain

0 90 180 360

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech limited

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

- 100 year Results Extent
- 50 year Results Extent
- 10 year Results Extent
- 5 year Results Extent
- 2 year Results Extent

Figure: 5.71

2 - 100 Year Percipitation Event

0 65 130 260

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

5.8.4 Results, Discussion & Conclusions

In reviewing the floodlines and profiles for the various storm events evaluated, the following observations were made for Mohawk Lake and canals:

- The flood limits remain in the canal corridor, with the majority of the flooding occurring to the south of Mohawk Lake.
- Six (6) buildings and the entire Brantford Wastewater Treatment Plant are within the Regional (Hurricane Hazel) flood limits.
- Under the Regional flood conditions two (2) roads (Mohawk Street and Greenwich Street) are overtopped.
- It is noted that no culvert or bridge overtopped under Regional flood conditions.
- It should be noted that the number of buildings within the flood limits were identified based on the GIS building layer provided by the City. Only commercial buildings and primary residential buildings (i.e., not sheds or garages) were included in the count for the GIS layer provided.

The 1989 HEC-2 Regional flood results produced by Philips Planning + Engineering Ltd were compared to the 2018 GeoHEC RAS flood results. **Table 5.19** identifies several discrepancies between the floodline results.

Table 5.19 2018 GeoHEC RAS Flood Results vs. 1989 HEC-2 Flood Results

Location	Regional Flood Level (1989 HEC-2 modelling results)	2018 GeoHECRAS Hurricane Hazel Flood Level
Lake Outlet Structure (XS 1240)	200.52m	199.22
Downstream of Locks Rd (XS 1332)	200.83m	199.27
Upstream of Locks Rd (XS 1485)	201.07m	199.36

The comparison was based on the 1995 Gore & Storrie summary of the 1989 Phillips Engineering HEC-2 model results. Since the 1989 model results and report were not available, the model set-up, parameters, and the locations of these elevations cannot be confirmed thereby reducing the accuracy of this comparison.

The Mohawk Lake floodplain extends within the Special Policy Area indicated on GRCA's Grand River floodplain; this area is protected from the Grand River by a dyke system but will still flood from Mohawk Lake during a Regional storm. Flooding in these areas could be exacerbated by local runoff trapped behind the dykes, by groundwater upwelling in the sandy soils when the river is high, or failure of the dyke system.

5.9 GEOMORPHOLOGICAL ASSESSMENT

Mohawk Lake and the canal system are situated within the Grand River valley, the largest river drainage system in southern Ontario. The drainage area of the Grand River at Brantford is 5200 km^2, and the river valley has incised about 30 – 40 m below the surrounding upland areas over about the last ten thousand years. The surficial sediments of the upland areas are dominated by glacial lake and till deposits (**Figure 5.9**), and notably there are significant sources of sand and silt within the surface geology in and around the Grand River valley at Brantford (downstream of the Galt Moraine and within Norfolk Sand Plain). This geomorphological context is relevant for assessing the fluvial processes of tributaries draining to Mohawk Lake, and specifically for providing insights into the historic and future sediment supplies to the canal system.

Field and desktop methods have been undertaken to complete a geomorphological assessment of Mohawk Lake, the adjoining canal system, and the tributaries that drain to the lake. This task has also included an erosion assessment to identify erosion hazards surrounding the lake generally, along with the identification of specific erosion problems that pose risks to municipal infrastructure, the public, and the environment. A key question that the geomorphological assessment is helping to address is: *what are the effective strategies to manage and reduce future sediment loadings to the canals and lake?* The potential strategies to consider in this report and to be further assessed in later phases of the study are:

1. **Stormwater Management** – use of SWM flow criteria to control erosion and sediment transport *to* the canals and lake system from tributary inputs and *through* the canal and lake system;
2. **Stream Restoration** – stabilization of tributary channel instability and erosion in open alluvial channels, including risks due to the deterioration of channel engineering structures; and
3. **Other Sediment Sources** – identification and management of other sediment sources from local surface drainage adjacent to the canals, from ephemeral gullies on the north slope, and from the upstream urban storm water sewer network.

5.9.1 Background

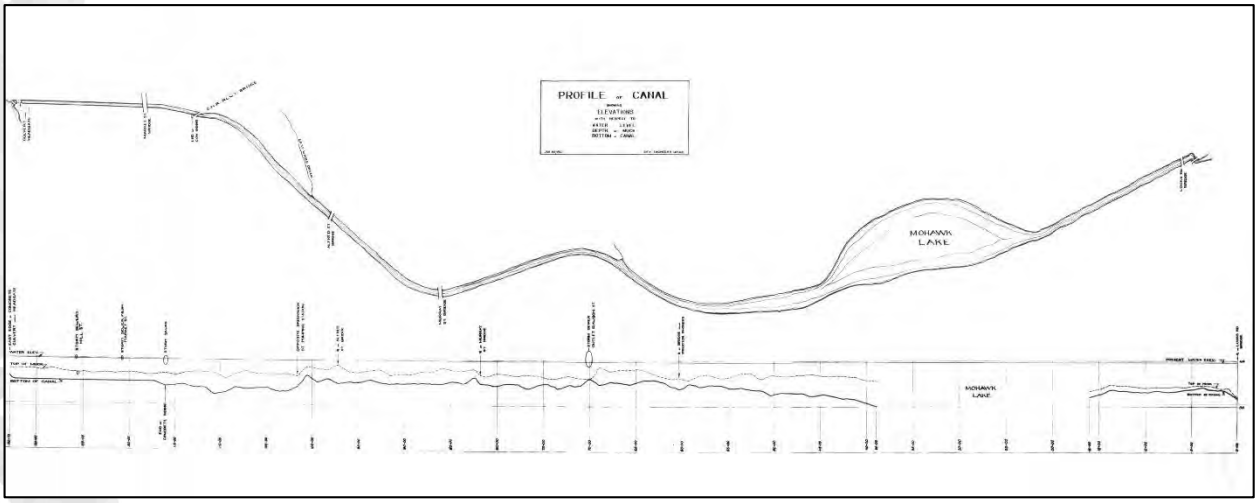
Of the many background reports available and dating back over seven decades, a few select reports and relevant findings are summarized in this section as a foundation for the geomorphological assessment. Several of the reports describe the long term, on-going issues with sediment deposition within the lake and canals. It was noted that sands that were used by the foundries were deposited along the banks of the canals, which were eventually washed into the canals and lake. It is expected that this is also a primary source of the lake pollutants. Other reports note that the expected supply of sediment is from the storm sewer outlets, however there is no data to assess the source.

The Mohawk Lake Rehabilitations Options Letter for the City of Brantford emphasized a focus on rehabilitating fisheries within the lake and canals. It makes technical recommendations for the bathymetry of the lake and incorporating coarse bed material into the channel to improve habitat conditions. These modifications to the watercourse could also have significant impacts on the systems hydraulics and sediment transport capacity.

Ecological Services for Planning (1994) reported the sediment depths within Mohawk Lake varied up to a maximum of 2.3 m, and depths of over 1 m were observed in the canals. The upper 0.3 m of the sediment profile was noted to consist of poorly consolidated, organic material, and the underlying material was observed to be compact, dark brown, silty sand. The total volume of sediment was estimated in 1994 to be 60,000 tonnes (dry) or 300,000 m^3 in-place. The report provides several recommended plans for

sediment removal from the lake and canals, generally involving dry excavation or dredging. Most plans also include a recommendation for end-of-pipe sediment control, generally a sediment retention pond. There is limited discussion regarding managing the source of the sediment.

The 1950 Canal Investigation by the City of Brantford provided a longitudinal profile of the canals, which is shown below. This provided some insight into the slope of the channel bed, and some areas of sedimentation at that time. While the bed elevation and slope vary over the length of the canals, the water surface is nearly flat through the length of the canals, even in the most upstream sections over 3 km upstream of the canals outlet. *This indicates that in 1950 the outlet of the canal system (east end) was at nearly the same elevation as the inlet from the Grand River (west end), providing very little energy to move sandy sediments downstream through the canal system except during large flooding events (interpretation added for this current report).*



Profile of the Mohawk Lake Canals (City of Brantford, 1950)

Within the reports reviewed, there are no reported concerns with erosion along the canals or lake, however it is apparent that the GRCA has identified erosional hazards within the study area. The study area is within the GRCA jurisdiction, and much of the Mohawk Lake, canals and tributaries has been identified as Riverine Erosion Hazard lands, due to oversteepened banks (Source: Grand River Information Network, GRIN). Based on current provincial regulatory practices, no development is allowed within the Riverine Erosion Hazard Zones, but with some exceptions.

The background reports outline the concerns of historic sediment loading to the lake and canals, however the problem has not been sufficiently studied to date. Geomorphological approaches are relevant to this issue in the consideration of sediment sources, and the assessment of the fluvial processes of erosion and transport that deliver sediment to the canals and lake. While much of the loading is expected to be coming directly from stormwater outlets, the sources and rates of loading are critical information for assessing the success of long-term sediment controls and management plans for the canals and lake. Sediment loading was modeled as part of the 1995 Mohawk Lake Stormwater Management Study; however, the analysis was based on empirical relationships as there was no sediment data available, and no calibration or verification was undertaken. To date, no long-term sediment transport monitoring program has been implemented, and continuous sampling of suspended sediments would be one approach to help evaluate current and future sediment loadings to the lake. While the geomorphic assessment will help to address potential sediment sources, a comprehensive understanding of sediment loading to the system will be

imperative at later stages for designing long-term, stable solutions for rehabilitating the Mohawk Lake system. In an attempt to further to understand the historical morphology and sediment transport characteristics that have existed with Mohawk Lake and canal system, radiocarbon dating (Lead-210 testing) of the existing sediment was undertaken as part of the completion of the Characterization Study. The Lead-210 and radiocarbon dating can potentially provide insights into the sediment loading and sediment accumulation history within the lake.

5.9.2 Field Study Scope and Methodologies

This section outlines the scope and methodologies for the geomorphological assessment, and the associated erosion assessment. The geomorphological and erosion assessments include both desktop and field methods as listed below.

Desktop Methods

Background – background reports, data, and base mapping were reviewed to document study area conditions and provide insights into the geomorphological context, and specifically the fluvial and hillslope processes in the landscape.

Historical assessment – in addition to the background reports and data (especially 2017 orthophotos, surface geology, and topography), historical aerial photographs were acquired and analyzed for the years 1945 and 1961. The historic images were studied using stereoscopic photogrammetry and the digital images were georeferenced in GIS. The historical assessment of the aerial photographs provide evidence to understand the geomorphological context of Mohawk Lake and to support interpretations of historic inputs of sediment to the lake and canal system. The historic images could not be used to evaluate specific areas of erosion, channel migration, or erosion rates, due to insufficient scale, resolution, and channel/bank visibility in the images.

Reach Delineation and Classification – stream reach delineation was completed for the tributaries and was verified during field walks. While reach delineation criteria differs when dealing with maintained canals/ditches and lake shorelines, there are some systematic methods available in literature and provincial guidelines to divide-up such systems for the purposes of restoration and hazard management.

Geomorphic stream reaches are relatively uniform lengths of channel in terms of hydrology, slope, boundary materials, and vegetation that control dominant geomorphic processes and sediment transport dynamics. In other words, the physical channel processes and resulting stream morphology are relatively consistent over the length of the reach as compared the differences between adjacent reaches. While in practice this requires that reaches be discretely divided by “reach breaks”, in reality reach changes may be abrupt or may transition gradually depending on changes in the controlling variables. For example, a sudden change in channel slope may cause an abrupt change in channel processes and thus represent a distinct reach break. In contrast, a gradual change in the boundary materials (increasing or decreasing sand supply for example) would result in a gradual change in channel processes and the mapped reach break would only approximate the location of this transition.

The stream reach delineation methods applied for the tributaries of Mohawk Lake are consistent with industry standards, with specific reference to Montgomery and Buffington (1997) and TRCA (2004). For reach delineation around the lake and canals, the Technical Guidelines to the Natural Hazards Policy (3.1) of the Provincial Policy Statement of the Planning Act (Watershed Science Centre and Ontario Ministry of Natural Resources, 2001; herein referred to as the MNR 2001 guidelines) provide a point of reference for assessing shoreline erosion and flooding hazards, but these guidelines should not be treated as strictly

applicable for this study (i.e., they are not intended to apply to inland lakes < 100 km^2). The MNR (2001) guidelines define criteria for assessment of shoreline flooding and erosion hazards, including:

- **Flooding Hazards:** 100-year flood level, wave uprush, and other water related hazards (shipping, ice, wood/debris)
- **Erosion Hazards:** erosion allowances, stable slope allowances, and dynamic beaches

To delineate shoreline reaches around Mohawk Lake, variations in shoreline geometry, height, steepness, vegetation, and the presence of artificially engineered banks/structures were considered. Similar considerations were used for the canal banks, but also with the additional fluvial criteria of water depth and bed material characteristics, including the presence of sediment bars. To further help with the assessment and interpretation of the canals as a modified fluvial system, Rhoads and Herricks (1996) provide a standard framework for classifying canals and headwater ditches (**Appendix D-1**).

Field Methods

Field walks were completed for tributaries, including the canals and lake from the confluence with the Grand River to the upstream storm sewer outlets. Visual observations and photographs were also collected from within the canals and lake as part of other study tasks (boats and waders), and the photos were reviewed for the geomorphological assessment. As part of the initial field inventory, stream reach breaks and channel morphologies (dimensions and boundary characteristics) were documented. The geomorphological field assessment specifically included the following sub-tasks:

- Rapid Geomorphic Assessments (RGA) of the tributary (and canal outflow) channels;
- Photographic inventories of the tributary (and canal outflow) channels;
- Mapping of existing erosion control and channel engineering structures; and
- Erosion site observations to inform the erosion risk assessment.

As a tool to help evaluate the existing geomorphic conditions within the fluvial systems, Rapid Geomorphic Assessments (RGA, MOE, 1999) were completed for applicable stream reaches. The RGA protocol uses a series of visual indicators to determine whether the stream is stable or in adjustment based on an index score. The stability of the channel is assessed by adjustments in slope and elevation; either an increase elevation due to sediment deposition (i.e., aggradation) or a decrease in elevation due to bed erosion (i.e., degradation). Evidence of increases in bank-to-bank channel width (i.e., widening) and changes in the planform regime (planimetric form adjustment) are also part of the RGA method. **Table 5.20** summaries the stability classifications associated with the RGA stability index scores.

Table 5.20: Rapid Geomorphic Assessment Descriptions Based on Stability Index Value (MOE, 1999).

Stability Index Value	Stability Class	Description
0 - 0.25	Stable	Channel morphology is within the expected range of variance for stable channels of similar type. Channels are in good condition with minor adjustments that do not impact the function of the watercourse.
0.25 - 0.40	Transitional	Channel morphology is within the expected range of variance but with evidence of stress. Significant channel adjustments have occurred and additional adjustment may occur.
0.40 - 1.0	In Adjustment	Metrics are outside of the expected range of variance for channels of similar type. Significant channel adjustments have occurred and are expected to continue.

Erosion Assessment Methods

Erosion sites were identified as reaches or locations with erosional issues that pose a risk to surrounding infrastructure or public health and safety that might require intervention to mitigate the risk. Furthermore, erosion sites can in some cases also be identified as having an impact on the larger reach-scale health of the stream (or canal-lake) system. Erosion sites were visually identified in the field and locations were recorded on study area maps. The approximate extents of the erosion sites were measured, and photographs of the sites were taken and cross-referenced.

To standardize the erosion risk and environmental opportunities during the field assessments, a semi-quantitative technical scoring methodology was used to give each reach and/or erosion site a score out of 100, with larger scores representing sites with high levels of erosion risk and/or higher degrees of environmental opportunity. A summary of the technical field scoring for erosion sites is as follows:

Erosion Risk Type and Proximity (50%) – highest for critical infrastructure close to the channel

Erosion Extent and Vulnerability (20%) – highest for larger sites more susceptible to further erosion

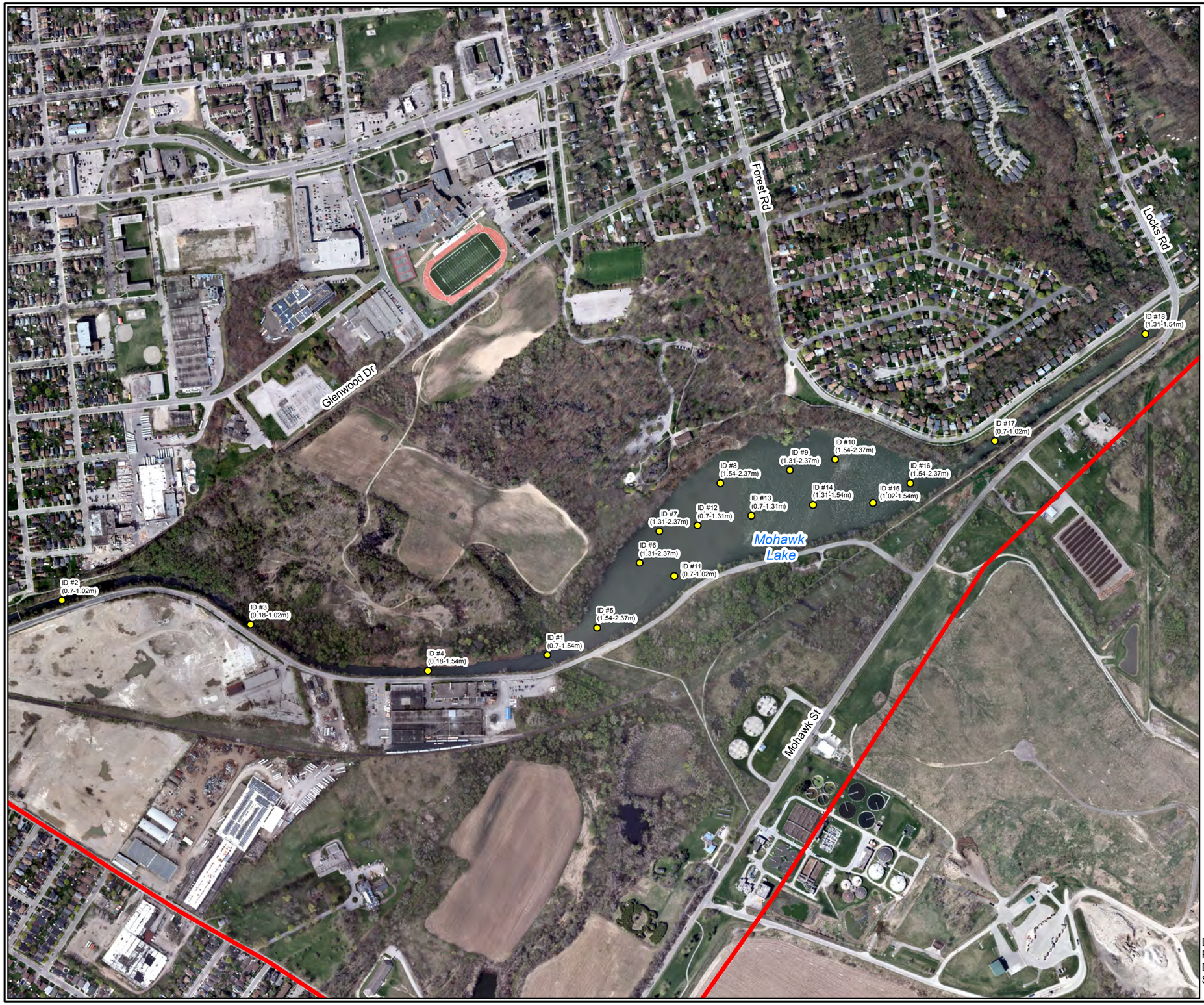
Environmental Opportunity (30%) – highest for low quality habitat, balanced with lower potential impacts to aquatic and riparian habitat from disturbance if engineering and construction is required to mitigate the erosion

The total score out of 100 provides a semi-quantitative measure of risk and opportunity to guide subsequent decisions regarding stream restoration opportunities for the revitalization plans of Mohawk Lake, the canal, and their tributaries.

General assessments of erosion hazards and recommended mapping procedures are to be provided on a reach basis for the tributary channels, and considered for the canals as applicable. Review of historical aerial photography did not allow for detailed evaluations for lateral channel or canal adjustments, thus historical erosion rates are not available and are likely of limited value given the overall stability of the fluvial systems over the period of record. Provincial references for river and stream erosion hazards include the MNR (2001, 2002) and TRCA (2004) guidelines for erosion, stable slope, and meander belt allowances, however other methods are also available in the scientific literature (e.g., Brion *et al.,* 2014). Should stormwater management flow criteria be considered of value for evaluating sediment loading to the canal and lake system, a fluvial erosion threshold analysis may be completed in later phases of the study.

Lead 210 Testing and Radiocarbon Dating

Pollutech Enviroquatic Limited was retained to complete the 2018 Mohawk Lake and Canals sediment sampling program. As part of the sediment characterization, two (2) cores were collected from the bottom sediment of Mohawk Lake by staff from Pollutech at locations 8 and 14 (**Figure 5.72**) on October 12th, 2018. These samples represented about 2.0m of unconsolidated sediment, with a final recovery length of approximately 1.2m. The two recovered cores were each sectioned into fifty (50) sub-samples, each 2 cm thick, made continuously from 0 to 80 cm (40 samples), and then skipping 2 cm sections every second sample from 80 to 120 cm (10 additional samples). The core from location 14, including all its sub-samples, was analyzed using geochronology tools, including: Lead-210, Radium-226, Cesium-137, and Radiocarbon C^{14}. The dating process is outlined in **Appendix F-3**.



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Sediment Sampling Locations
- Study Area

Figure: 5.72

Sediment Sampling Locations

0 95 190 380

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

5.9.3 Results

Historical aerial photographs were acquired and analyzed for the years 1945 and 1961. In addition, the 2017 orthophotography, surface geology mapping (**Figure 5.9**), and topography (digital elevation model, DEM) were also reviewed to interpret the historical and geomorphological context of Mohawk Lake and the canal system. The historic images were studied using stereoscopic photogrammetry and the digital images were georeferenced in GIS. The historical assessment of the aerial photographs provides evidence to understand the geomorphological context of Mohawk Lake and to support interpretations of historic inputs of sediment to the lake and canal system. The historic images could not be used to evaluate specific areas of erosion, channel migration, or erosion rates (as noted above).

Geomorphological Context

Mohawk Lake and the canal system are situated within the Grand River valley, the largest river drainage system in southern Ontario. The drainage area of the Grand River at Brantford is 5200 km^2, and the river valley has incised about 30 – 40 m below the surrounding upland areas over about the last ten thousand years. The surficial sediments of the upland areas are dominated by glacial lake and till deposits (**Figure 5.9**), and notably there are significant sources of sand and silt within the surface geology in and around the Grand River valley at Brantford (downstream of the Galt Moraine and within Norfolk Sand Plain). This geomorphological context is relevant for assessing the fluvial processes of tributaries draining to Mohawk Lake, and specifically for providing insights into the historic and future sediment supplies to the canal system.

A remnant scar of ancient river meandering, Mohawk Lake covers about half of an older oxbow lake cut-off from the Grand River. With reference to the digital elevation model (**Figure 5.73**) and the historic aerial photographs (**Figure 5.74**), the oxbow scars within Grand River floodplain are evident. Prior to European settlement and canal construction (in the 1800s), this abandoned channel of the Grand River was situated within a few metres thick of sandy alluvial floodplain material and the isolated oxbow lake would have been naturally filling with organic matter. This would also include encroachment of marsh and wetland species as the lake filled up with sediment. It is possible that there was still standing water (at least seasonally) within the oxbow lake prior to European settlement, but this cannot be confirmed.

Given the extent of glacial lake sediment in the upland areas and the alluvial floodplain materials of the Grand River valley, there is an abundance of silty and sandy materials surrounding Mohawk Lake. The historic conditions presented in **Figure 5.74** are annotated with the various source inputs of sediment to the lake and canal systems including the canal inlet from the Grand River; a number of tributary channels and ephemeral gullies; and local inputs from industry and transportation activities. As Branford continued to change and develop from 1945 to 2017, and more stormwater drainage was piped to outfalls, sources of sandy materials have continued to find their way to the lake. Specific sources of sediment from the urban drainage network are uncertain, but the general surface geology of the landscape may provide distributed background-level inputs within the City. It is also undetermined what the relative contributions have been from the various sources over the last several decades.

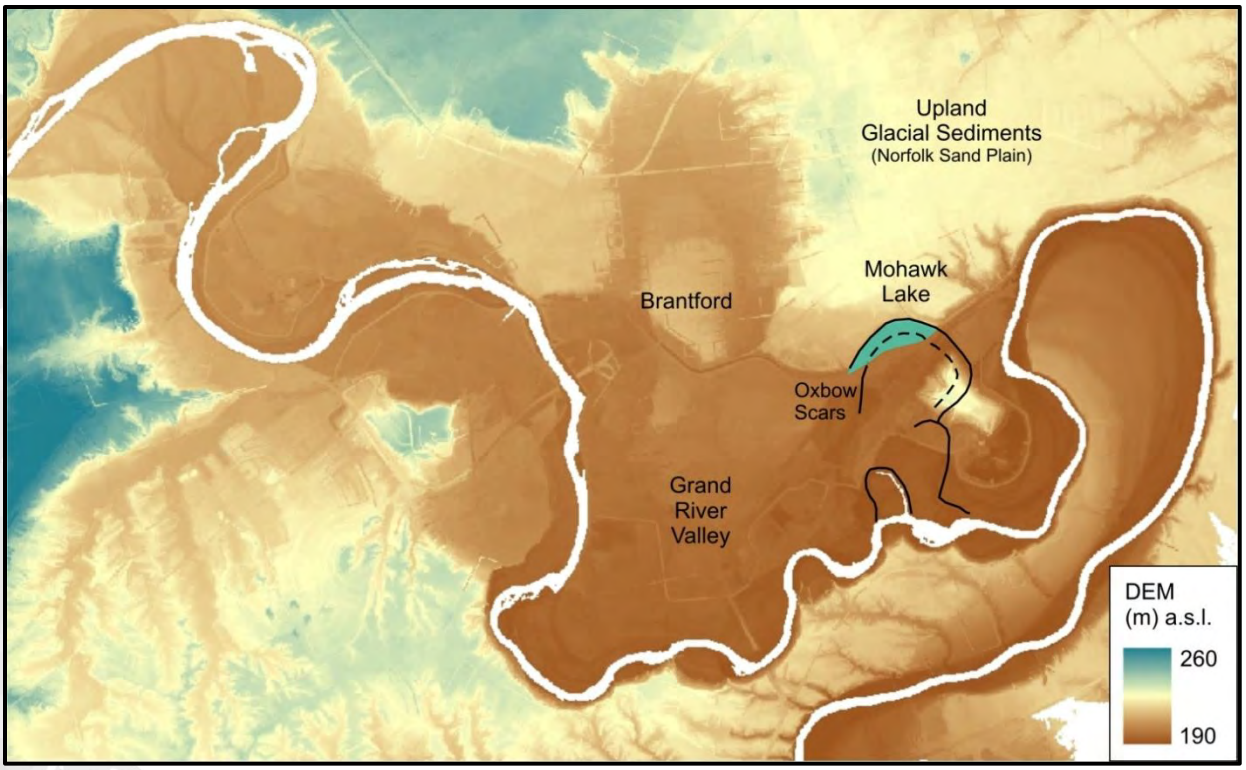


Figure 5.73: Digital Elevation Model of Grand River Valley at Brantford Showing Location of Mohawk Lake

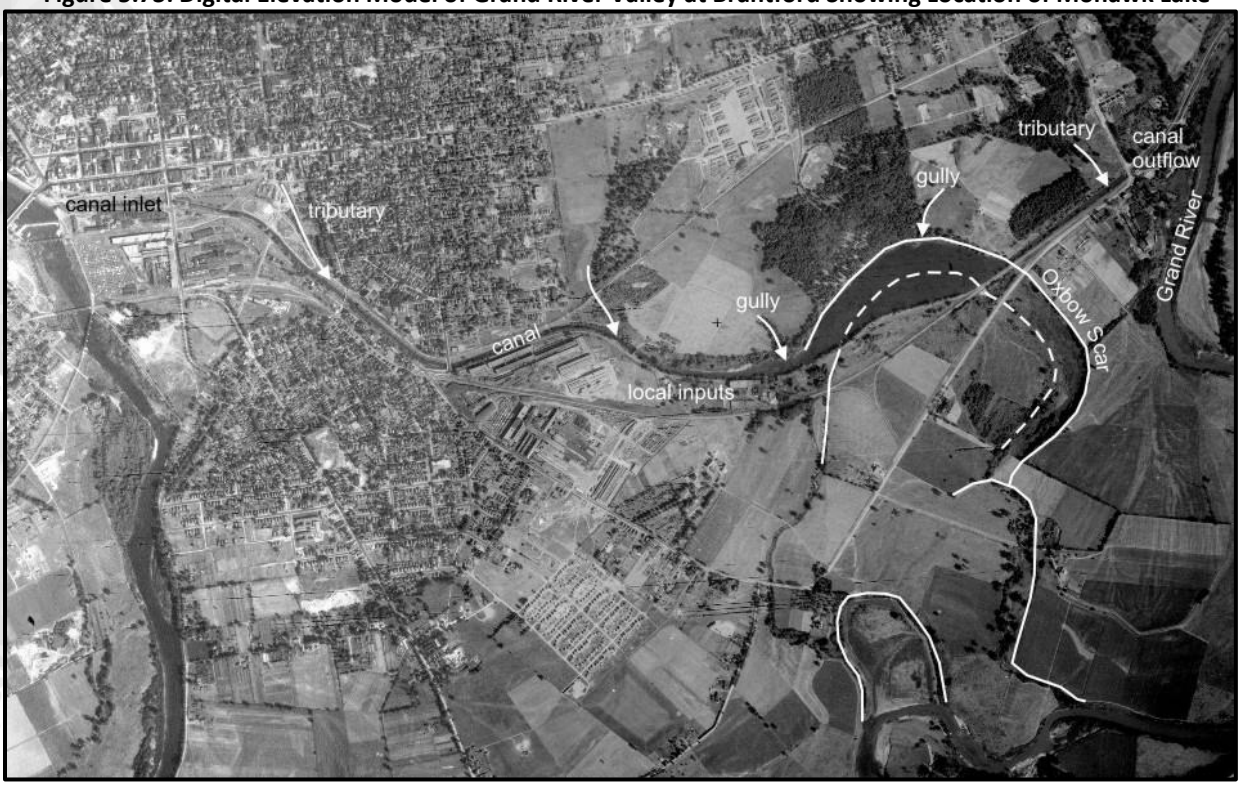


Figure 5.74: Historical aerial imagery from 1945 showing Mohawk Lake and the Canal in Brantford

Reach Characterization

The Mohawk Lake drainage system has been delineated into six (6) stream reaches and eight (8) canal-lake reaches (**Figure 5.75**). The tributary and outflow channel reach conditions are summarized in **Table 5.21** and the canal-lake reaches are summarized in **Table 5.22**. The photographic inventory for all of the reaches is provided in **Appendix D-2**. The results of the Rapid Geomorphic Assessments are provided below with the erosion assessment.

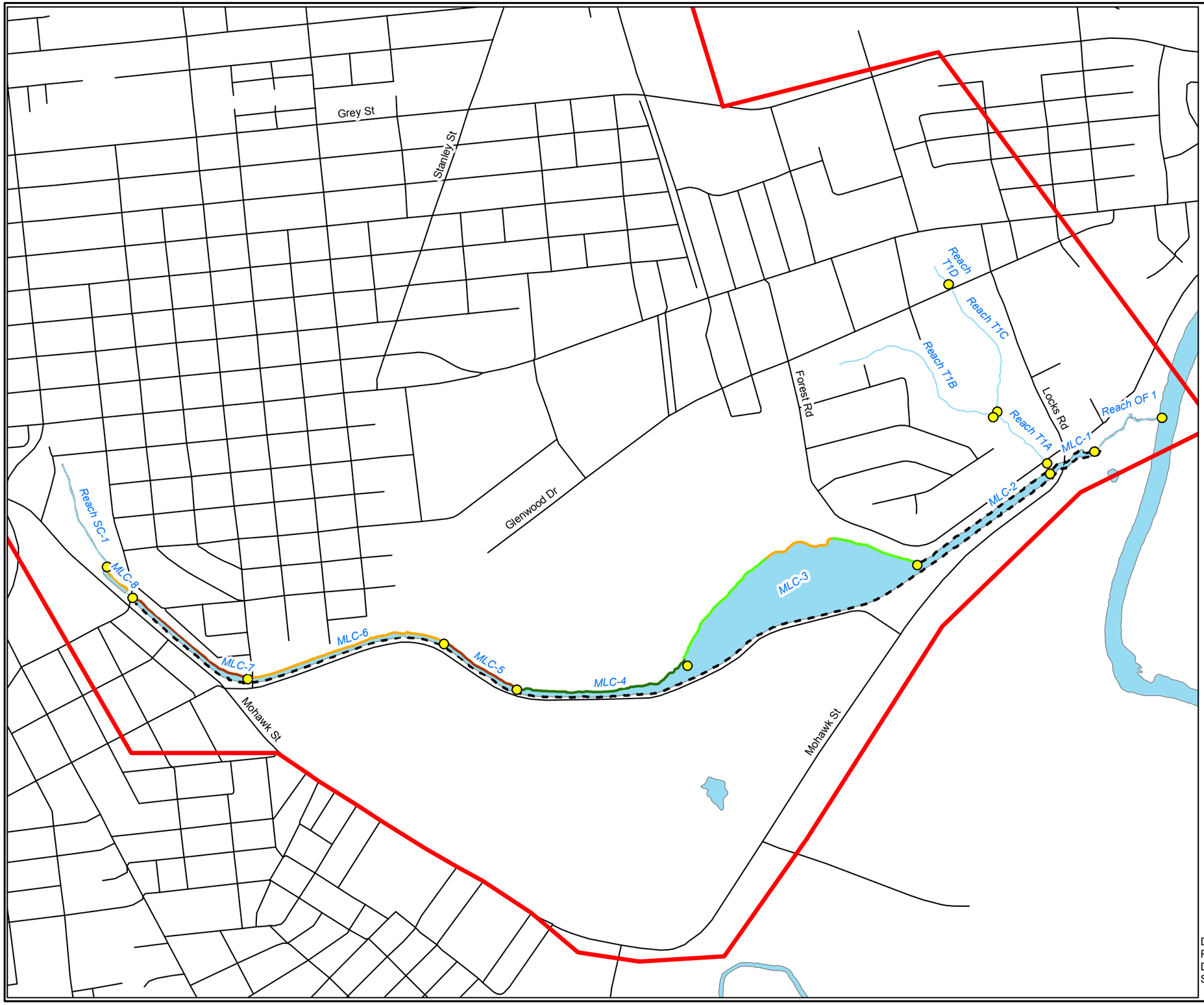
None of the tributary or outflow channels are fully alluvial, and all have undergone considerable channel modifications and engineering. Shallow Creek upstream and the outflow channel downstream of the canal both contain a mixture of alluvial and engineered sections of various generations and treatment types, including gabion baskets, armourstone walls, rip-rap, and roundstone cobbles/boulders. The drainage channels of Tributary 1 have also been highly engineered with roundstone beds (clean, poorly graded) with locally installed armourstone banks and weirs. In contrast, the most upstream reach of Tributary 1 (T1d, north of Glenwood Drive) exhibited more exposed alluvial (and glacial) materials with considerable evidence of instability, erosion, and failure of engineered structures.

The channel materials and dimensions for the tributary and outflow reaches are quite variable and do not represent natural channel conditions. Coarse bed materials are generally over-sized and non-native, while finer sandy and silty materials may be locally sourced from the channel bed and banks, but are more generally supplied from the upstream urban drainage network.

Table 5.21: Reach Inventory for Tributaries and Outflow Channel.

Name	Reach ID	Description	Channel Dimensions		Boundary Materials
			Width (m)	Depth (m)	
Shallow Creek	SC-1	**Mixed:** alluvial channel with engineered structures in fair to poor condition	5.0-5.3	0.5-0.9	**Bed:** gravel, sand, rip-rap, cobble roundstone **Banks:** stone structures, rooted soil, local clay
Tributary 1	T1a	**Engineered channel:** with roundstone bed, armourstone banks/weirs	5.3-5.4	0.7-0.8	**Bed:** cobble roundstone **Banks:** armourstone, native soil
	T1b	**Engineered channel:** with roundstone bed, armourstone banks/weirs	3.0-3.5	0.4-0.5	**Bed:** cobble roundstone **Banks:** armourstone, native soil
	T1c	**Engineered channel:** with roundstone bed, armourstone banks/weirs	3.0-3.5	0.4-0.5	**Bed:** cobble roundstone **Banks:** armourstone, native soil
	T1d	**Mixed:** alluvial channel with gabion/rip-rap stone and debris, clay (till) exposed on bed	1.5 - 2.0	0.3 - 0.5	**Bed:** exposed silt-clay, gravel and sand, rip-rap and gabion stone debris **Banks:** bare soil, stone debris, exposed silt-clay
Outflow Channel	OF-1	**Mixed:** alluvial channel with rip-rap grade control rapids and historic weir	5.0-6.0	0.8-0.9	**Bed:** gravel and sand, rip-rap debris **Banks:** stone/concrete structures, rooted soil, local gravel

Mohawk Lake And Mohawk Canal Characterization Study



Legend

- ReachBreaks
- Artificial Bank Slope for Canal Channel
- Artificial Bench Shoreline Access
- Mixed Artificial Banks and Natural Slope
- Natural Riparian Bench Shoreline Marsh
- Natural Slope and Shoreline
- Road Centrelines
- Waterbody
- Study Area

Figure: 5.75

Reach Mapping

0 160 320 640

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

As an engineered system with a long history of impacts, the reaches of Mohawk Lake and the canal are predominantly artificial and variations are not expressly due to natural variations in fluvial geomorphology. The identified canal and lake reaches are mapped in **Figure 5.75** and summarized in **Table 5.22**, including the variability in average wetted dimensions for the canal reaches. In addition to the canal width criteria, a general assessment of the shoreline bank type was used to delineate reach variation throughout the canal and lake system (with some consideration of the MNR, 2001 guidelines). While the south embankment was classified as an "Artificial Bank Slope", portions of the north bank were instead classified as:

- Artificial Bench, Shoreline Access
- Mixed Artificial Banks and Natural Slope
- Natural Slope and Shoreline
- Natural Riparian Bench, Shoreline Marsh

Based on the Rhoads and Herricks (1996) canal and ditch classification system (**Appendix D-1**), most of the canal reaches were classified as a Type 1 channels which are straight trapezoidal channels with uniform beds (reaches MLC-1 to 6), typically due to recent maintenance (i.e., dredging within recent decades). However, the low-energy backwater conditions throughout much of the canal may not allow for sediment bar formation as the sediment deposits and bedforms are continuously submerged even if some sediment is being transported. As water depth decreases upstream, most of the bed material continues to be a roughly uniform surface (i.e., lacks bedforms and emergent bars). Reaches MLC-7 and 8 have been classified as Type 2 channels which have developed emergent sediment bars. Overall, much of the "fluvial" variability in the canal comes from the increasing distance upstream of the outflow control structure (i.e., backwater), and conversely from the increasing distance downstream of the sediment supply delivered by the urban stormwater outfall and open-channel in Shallow Creek Park.

Table 5.22: Reach Inventory for Mohawk Lake and Canal.

Location	Reach ID	Length (m)	Wetted Dimensions		Shoreline Bank Type (Figure 5.75)	Canal Class[1]
			Width (m)	Depth (m)		
East Canal	MLC-1	170	33-35.5	0.8-1.2	**North:** Artificial bank **South:** Artificial bank	**Type 1** Backwater
East Canal	MLC-2	460	42-44.1	1.0-1.2	**North:** Artificial bank **South:** Artificial bank	**Type 1** Backwater
Mohawk Lake	MLC-3	820	54-250	1.0-2.3	**North:** Natural/access **South:** Artificial bank	Lake
West Canal	MLC-4	470	36.6-37.6	0.8-1.0	**North:** Natural bench **South:** Artificial bank	**Type 1** Backwater
West Canal	MLC-5	350	30.0-31.5	0.7-1.0	**North:** Mixed bank **South:** Artificial bank	**Type 1** Uniform bed
West Canal	MLC-6	530	33.2-34.1	0.3-1.2	**North:** Artificial bench **South:** Artificial bank	**Type 1** Uniform bed
West Canal	MLC-7	450	32.7-38.4	0.3-0.4	**North:** Mixed bank **South:** Artificial bank	**Type 2** Sediment bars
West Canal	MLC-8	110	23.3-30.9	0.2-0.3	**North:** Artificial bench **South:** Artificial bank	**Type 2** Sediment bars

1. Rhoads and Herricks (1996) ditch classification types (**Appendix D-1**)

Erosion Assessment

As part of the Mohawk Lake characterization study and geomorphological assessment, the erosion assessment includes mapping of channel engineering works (i.e., existing erosion controls) and erosion sites. Erosion sites were identified as reaches or locations with erosional issues that pose a risk to surrounding infrastructure or public health and safety that might require intervention to mitigate the risk. Long term erosion hazards for stream and canal reaches are generally referenced to provincial guidelines to direct relevant detailed assessments in future studies as required.

Results of the Rapid Geomorphic Assessments (RGAs), along with erosion and sediment source assessments, are summarized in **Table 5.23** for the tributary and outflow reaches. The location of three identified erosion sites are generally mapped in **Figure 5.76**, with detailed mapping of erosion and channel engineering structures provided in **Figure 5.77, Figure 5.78, and Figure 5.79**. Locations of local erosion and undercut banks within the canal and lake have also been mapped on **Figure 5.76**.

The RGA stability of Shallow Creek (SC-1) and the outflow channel (OF-1) were assessed as "Transitional" reaches with moderate levels instability and erosion due to engineering and urban impacts. Each of these reaches were documented as erosion sites (#1 and #3, respectively) due to local bank erosion and deterioration of engineered channel structures. Most of stream reaches for Tributary 1 have been engineered using cobble roundstone in the channels, with armourstone weirs for grade control and armourstone walls for local bank protection. The RGA stability scores for Tributary 1 reaches were assessed as "Stable" (T1a and T1b), "Transitional" (T1c), and "Unstable" (T1d). Documented evidence of instability in T1a, T1b, and T1c was primarily due to local scour around armourstones and failure of some armourstone weirs in Reach T1c. The documented instability in the Tributary 1 reach upstream of Glenwood Drive (T1d)—Erosion Site #2—is due to failure of a stormwater outfall structure and channel scour downstream of the outfall, which has also resulted in hillslope instability.

Key issues for each erosion site are summarized below and the associated photographic inventory is provided in **Appendix D-3**. Field scoring for the erosion site risks and opportunities are provided in **Table 5.24**. Erosion Site #2 was identified as having the highest level of risk.

Erosion Site #1 – Shallow Creek Park (Reach SC-1), **Figure 5.77**

- Engineered bank structures in fair to poor condition, gabion baskets undercut and locally leaning into the channel, with local areas of bank erosion
- Evidence of sand supply from sources upstream in storm sewer network
- Environmental opportunity to restore aquatic habitat, but would require significant disturbance of riparian vegetation

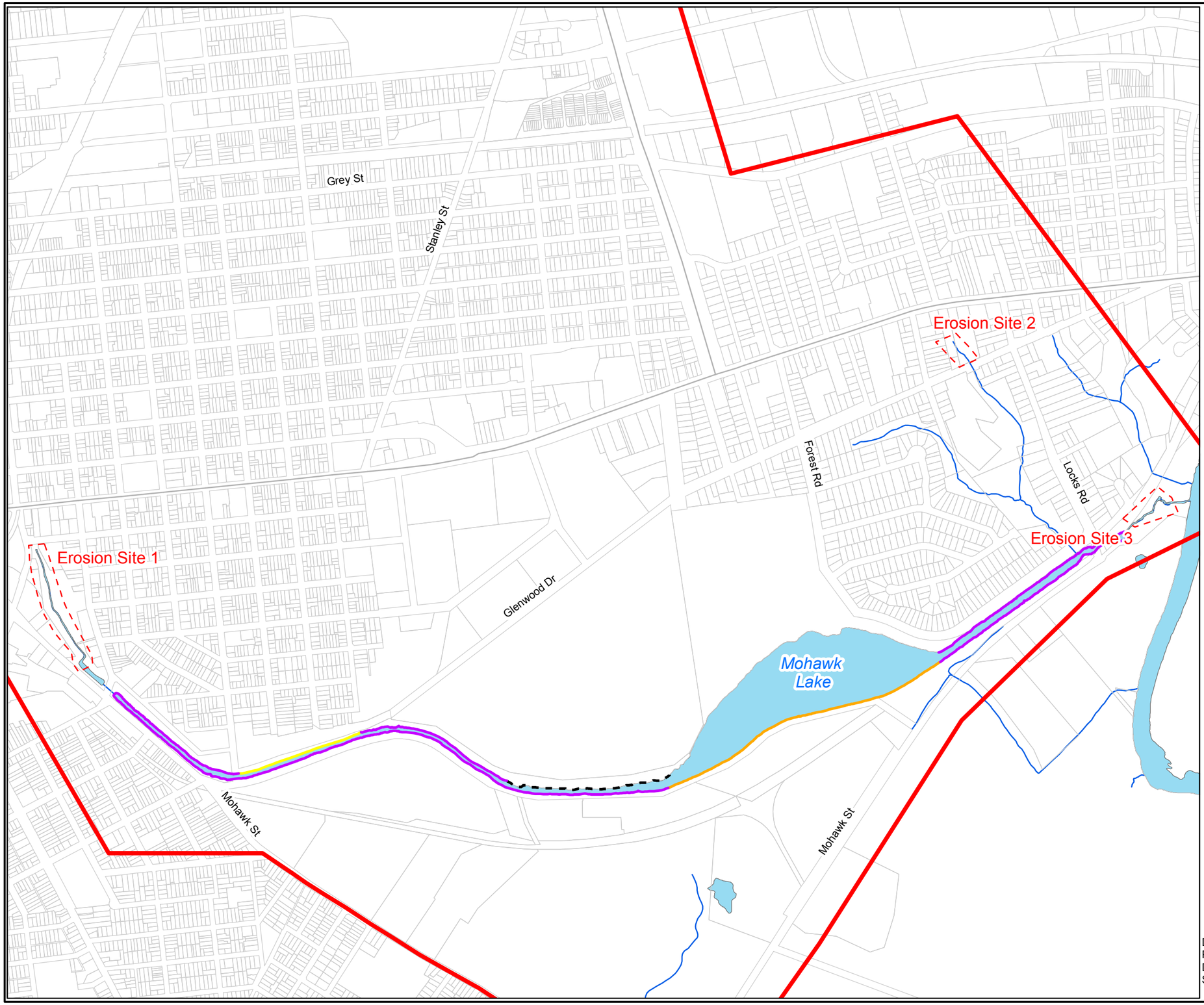
Erosion Site #2 – Tributary 1 at Glenwood Drive (Reach T1d), **Figure 5.78**

- Channel entrenched, excessive bank erosion, and channel incised into glacial materials
- Over-steepened slope, geotechnical hazards adjacent to apartment building and parking lot
- Failure of gabion basket outfall structure, rip-rap and debris causing bank erosion

Erosion Site #3 – Outflow Channel (Reach OF-1), **Figure 5.79**

- Deteriorated condition of masonry stone weir structure
- Locally undermined stone and concrete structures
- Debris on channel banks and bed, with local bank erosion
- Environmental opportunity to restore aquatic habitat, but would require significant disturbance of riparian vegetation

Mohawk Lake And Mohawk Canal Characterization Study



Legend

Bank Assessment

- Artificial Slope with Locally Undercut Banks
- Artifical Slope with Locally Eroded Banks
- Artifical Banks
- NULL
- Watercourse
- Road Centerlines
- ErosionSites
- Study Area
- Property Parcels
- Waterbody

Figure: 5.76

Erosion Sites

0 150 300 600

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Mohawk Lake And Mohawk Canal Characterization Study

Erosion Site #1:
- local bank erosion;
- gabion baskets undermined and leaning;
- sand sediment supply from upstream urban drainage.

Sand deposition noted in outfall culvert and pipe evidence of sediment supply from urban drainage network

Gabion baskets undermined and leaning into the channel

Bank erosion a local source of sediment to canal

Sand stored locally in bars and transported downstream; long-term continous sources likely from upstream drainage

Gabion Basket wire beginning to rot and walls undermined

Roundstone on banks and bed providing grade control

Roted gabian baskets on slope covered in soil and heavily rooted by trees and shrubs

Deep scour pool at entrance to canal

East Ave
Clarence St S
Newport St
Victoria St
Alfred St
Park Ave
Arthur St
Greenwich St

KEY MAP

Hwy 403 West
Hwy 403 East
Wayne Gretzky Pky
Brant Ave
Colborne St
N
1:80,000

Legend

- Outfalls
- Stone Grade Control
- Road Centrelines
- Cross Section
- Storm Gravity Mains
- Contours
- Study Area
- Property Parcels
- Building Footprint
- Waterbody

Areas of Concern

- Armourstone
- Bank Erosion
- Concrete Blocks
- Gabion Baskets
- Roundstone

Figure: 5.77

Shallow Creek & Erosion Site #1

0 15 30 60
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Mohawk Lake And Mohawk Canal Characterization Study

Erosion Site 2

Erosion Site #2:
- channel erosion;
- failed gabion baskets;
- unstable slope hazard.

CSP Culvert in poor condition

Failure of some armourstone weirs

Banks locally protected with amourstone walls

Organic matter and sediment accumulation

Stream bed of tributary channels entirely lined with imported roundstone

CSP culvert in fair condition

Concrete apron in fair to poor condition perched 10-20 cm above canal water surface

Colborne St
Robinson Ave
Echo Villa Ave
Glenwood Dr
Chester St
Humberstone Ave
Locks Rd
Lloyd St
Pearltree Crt
Proctor Ave
Collingdon Dr
Hickery Pl
Marvin Ave
Forest Rd
Mohawk St

Legend

- Outfalls
- Watercourse
- Cross Section
- Road Centrelines
- Storm Gravity Mains
- Culvert
- Contours
- BuildingFootprint
- Property Parcels
- Waterbody
- ErosionSites
- Study Area

Areas of Concern

- Armourstone Weir
- Failed Armourstone Weir
- Stone Grade Control
- Armourstone Bed
- Armourstone Banks
- Bank Erosion
- Concrete Wall
- Gabian Baskets
- Grouted Stone/ Concrete Wall
- Island
- Rip Rap
- Roundstone Bed
- Step Pool Cascade
- Unstable Slope Hazard
- Wooden Baskets

KEY MAP

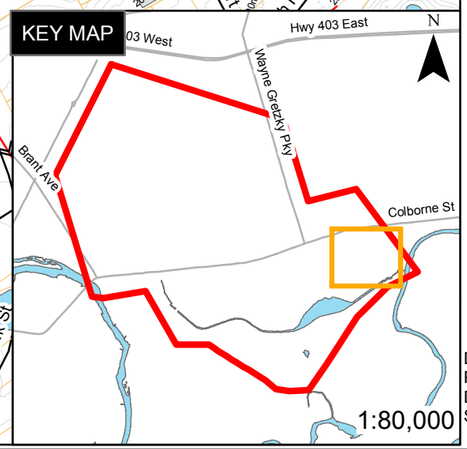


Figure: 5.78

Tributary 1 & Erosion Site #2

0 37.5 75 150
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Erosion Site 3

Erosion at sharp bend in channel

Historic weir at risk of failure; grouted stone and concrete debris

Rip-rap in channel

Backwater from Grand River

Bank erosion and rotted wood structures

Bank erosion into terrace, a source of gravel to channel

Concrete slabs

Gabian baskets in good to fair condition

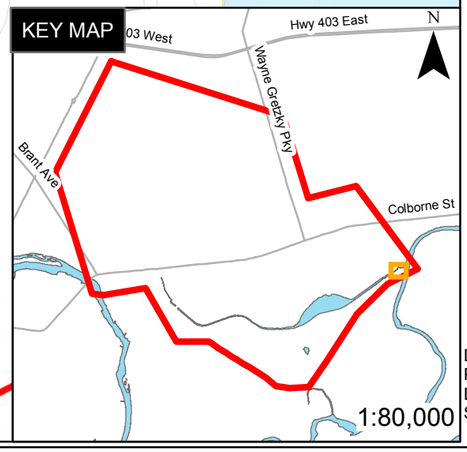
Mohawk Lake Canal Outlet structure

XS1

Pearltree Crt

Beach Rd

KEY MAP



Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Stone Grade Control
- Armourstone Weir
- Cross Section
- Road Centrelines
- Contours
- Waterbody
- Study Area
- Culvert
- Erosion Sites
- Property Parcels
- Building Footprint

Areas of Concern

- Bank Erosion
- Concrete
- Gabian Baskets

Figure: 5.79

Outflow Channel & Erosion Site #3

0 5 10 20

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Table 5.23: Reach Stability (RGA) for Tributaries and Outflow Channel.

Name	Reach ID	Reach Stability (RGA)[1]	Erosion Assessment	Sediment Source Assessment
Shallow Creek	SC-1	**Transitional** Stability Index = 0.38 **Dominant Process:** Widening	**Erosion Site #1:** Local bank erosion and deterioration of channel structures; moderate risk to park and canal; low risk to infrastructure	**Moderate sediment source** of fine material with local erosion and sand bed transporting sediment to canal; **long-term sediment source** from upstream urban drainage network
Tributary 1	T1a	**Stable** Stability Index = 0.18 **Dominant Process:** Degradation locally around structures	**Minor erosion** locally around roundstone bed and armourstone banks	**Minor sediment source** based on conveyance of upstream sediment sources
	T1b	**Stable** Stability Index = 0.18 **Dominant Process:** Degradation locally around structures	**Minor erosion** locally around roundstone bed and armourstone banks; local scour around storm outfalls and at armourstone weirs	**Minor sediment source** based on conveyance of upstream sediment sources
	T1c	**Transitional** Stability Index = 0.29 **Dominant Process:** Degradation locally around structures	**Moderate erosion** locally around roundstone bed and armourstone banks; failure of multiple armourstone weirs; locally steep hillslopes along private properties	**Moderate source** of fine sediment to downstream reaches and the canal
	T1d	**Unstable** Stability Index = 0.62 **Dominant Process:** Degradation	**Erosion Site #2:** Extensive bed and bank erosion, failed structures; **high risk** to property and infrastructure	**Moderate sediment source** of fine sediment to downstream reaches and the canal
Outflow Channel	OF-1	**Transitional** Stability Index = 0.32 **Dominant Process:** Degradation	**Erosion Site #3:** Local bank erosion and deterioration of channel structures; moderate risk to infrastructure and environment	**Moderate sediment source** of gravel and sand sediment to the Grand River

1. Rapid Geomorphic Assessment (RGA) – see **Section 5.9.2, Table 5.20.**

Table 5.24: Erosion Site Field Scoring for Risk and Opportunity by Reach

Reach ID	Risk Type, Proximity (50%)	Erosion Vulnerability (20%)	Environmental Opportunity (30%)	Total Score	Erosion Site
SC-1	35	12	20	67	Erosion Site #1
T1a	25	5	15	45	-
T1b	25	5	15	45	-
T1c	25	10	15	50	-
T1d	40	16	25	**81**	**Erosion Site #2**
OF-1	30	12	25	67	Erosion Site #3

Erosion Hazard Assessment

The Technical Guidelines to the Natural Hazards Policy (3.1) of the Provincial Policy Statement of the Planning Act (MNR 2001, 2002) provide direction for assessment of erosion, hillslope, and shoreline hazards. Assessment of river and stream *"meander belt"* erosion hazards can also be supported by scientific literature (e.g., Piégay et al., 2005; Brion et al., 2014), guidelines from other jurisdictions (e.g., Rapp and Abbe, 2003 [Washington State]; Kline and Dolan, 2008 [Vermont]), and Ontario conservation authority reports (e.g., TRCA, 2004). For each reach identified with the study area, the primary and secondary long-term erosion hazards are listed in **Table 5.25**. This inventory will help direct mapping of the geomorphic hazard constraints to support establishment of development limit criteria in future reports, but additional detail geotechnical studies may also be recommended in some cases.

Due to steep channel gradients, reaches OF-1 and T1d are associated with scour and degradation erosion hazards (i.e., vertical erosion). Evidence of hillslope instability and geotechnical hazards were identified in reaches T1d and T1c, with the highest risk noted in Reach T1d upstream of Glenwood Drive. The long-term erosion hazards due to lateral channel migration (i.e., meander belt) are most prominent in Reach SC-1 within Shallow Creek Park. Slope stability has been classified as a secondary hazard in most other reaches (OF, T1, and MLC reaches) due to only minor evidence of slope instability documented in the field, but detailed geotechnical studies would be required to confirm risks. General shoreline hazard assessments (MNR, 2001) could also provide some value for management of embankments within the canal and lake reaches (MLC-1 to MLC-8), but these provincial guidelines do not strictly apply in this case.

Table 5.25: Long-Term Erosion Hazards by Reach – Primary and Secondary.

Reach IDs	Primary hazard	Secondary Hazards
OF-1	Erosion hazard (scour/degradation)	Slope stability (geotechnical) Erosion hazard (meander belt)
MLC-1 to MLC-8		Slope stability (geotechnical) Shoreline erosion, flood effects
SC-1	Erosion hazard (meander belt)	
T1a		Slope stability (geotechnical) Erosion hazard (meander belt)
T1b		Slope stability (geotechnical) Erosion hazard (meander belt)
T1c	Slope stability (geotechnical)	Erosion hazard (meander belt)
T1d	Slope stability (geotechnical)	Erosion hazard (scour/degradation)

Lead 210 and Radiocarbon Dating

As part of the sediment quality investigations completed for Mohawk Lake, one (1) core was submitted for lead-210 and radiocarbon dating. The results of this testing are summarized below:

- Top 30 centimetres of sediment (~20 cm core depth) deposited in the last 55 years;
- Top 40 – 50 centimetres of sediments (~30 cm core depth) deposited in the last 90 years;
- Pb-210 sedimentation rate is in the range of 0.3 to 0.5 cm/yr (0.1 - 0.2 g cm-2 yr-1);
- Radiocarbon (14C) sedimentation rate is about 0.65 cm/yr for the last ~300 years; and
- Recommended average sedimentation rate is about 0.5 ± 0.1 cm/yr (~0.2 g cm-2 yr-1).

The results of the Lead 210 testing indicate that the top 50 cm of sediment currently in Mohawk Lake has been deposited in the last 90 years, and of that 50 cm 60% of the deposits have occurred in the last 55 years. Based on the age model completed as part of the Lead 210 testing analysis, the sediment accumulation rate follows a linear regression.

5.9.4 Discussion and Conclusions

The geomorphological context of Mohawk Lake is relevant for assessing the fluvial processes of tributaries draining to Mohawk Lake, and specifically for providing insights into the historic and future sediment supplies to the canal system. While erosion hazards within the study area are not generally severe or extensive, a number of erosion sites, long-term erosion hazards, and environmental stream restoration opportunities have been identified and characterized. The field characterization results from the geomorphological and erosion assessments have identified the following priorities for mitigating the short and long-term risk of erosion within the study area:

5. **Erosion Site #2** on Tributary 1 (Reach T1d) upstream of Glenwood Drive is **high priority** from a risk management perspective. *Immediate steps should be taken to mitigate this risk.*
6. **Erosion Sites #1 and #3** (reaches SC-1 and OF-1) were assigned lower field scores for erosion risks, but they have some environmental restoration and sediment mitigation opportunities. These sites should be considered for future restoration and erosion mitigation as part of the overall revitalization plan for Mohawk Lake.
7. **Tributary 1** generally has local erosion issues with the deterioration of previous roundstone and armourstone engineering works. This watercourse should be monitored for further deterioration of the existing erosion control measures, and a geotechnical risk assessment is recommended for one location in Reach T1c (see **Figure 5.78**).
8. **Mohawk Lake and Canals** were visually assessed for evidence of existing bank instability, including locally undercut banks along the shorelines. The canal and lake embankments were generally considered geomorphologically stable, but detailed geotechnical assessments should be considered to confirm risks where local evidence of bank instability (and shoreline undercuts) has been identified.

As the top 30 cm of sediment have been deposited in the last 55 years, the results of the Lead 210 indicate that the sediment within Mohawk Lake has remained in place after entering the Mohawk Lake and Canal sytem. While the inlet connection to the Grand River was closed in 1983, the sediment accumulation continued on a linear trend indicating that the main source of sediment to the system consists of that produced by erosion and stormwater runoff. Using the recommended average sedimentation rate of 0.5 ± 0.1 cm/year, in the next 40 years an additional 20cm of sediment is estimated to accumulate in Mohawk

Lake and the Canals. These sedimentation accumulation results can be applied in later phases to determine the efficiency of dredging the system. Future studies should incorporate these results into remediation and revitalization workplans for Mohawk Lake and Canals.

The key study question introduced in **Section 5.9** for the geomorphological assessment was: *what are the effective strategies to manage and reduce future sediment loadings to the canal and lake?* Based on the results of the geomorphological assessment described above, the potential strategies to address this question have been evaluated and prioritized to help guide future phases of the Mohawk Lake revitalization project.

1. *Importance of identifying and managing "other sediment sources" in the Mohawk Lake watershed.*
    - The results of the Lead 210 testing indicate that in the next 40 years an additional 20cm of sediment will accumulate in Mohawk Lake and the Canals.
    - Evidence for sediment sources from erosion in tributary channels is not sufficient to account for the largest portion of the sediment loading to the lake. The following observations were made for the Shallow Creek tributary in particular:
        - Evidence for sources of sand supply coming from storm sewer network upstream of outfall in Shallow Creek Park (sand within culvert pipes)
        - Mobile sand bed in channel, but minimal bank sources of sand within reach
    - Existing sediment sources should be investigated within the existing urban storm sewer drainage network.
        - Pollution monitoring results, discussed in **Section 5.12**, found high TSS concentrations during some dry events.
    - Existing sources should also be investigated for local internal drainage surrounding the lake, adjacent roads, and ephemeral gullies along the north slope of the lake and canal.
2. *Stream restoration to mitigate erosion within tributary reaches (Erosion Sites #1 and #2) would provide some marginal benefits to reduce sediment supply and delivery to the lake.*
    - With local bank erosion and deterioration of engineered structures, Reach SC-1 (Erosion Site #1) is a marginal source of sediment to the canal and lake.
    - Channel instability in Tributary 1, Reach T1d (Erosion Site #2) is a source of sediment to downstream reaches, but the sediment loading potential to the lake is considered low due to the relatively short length of the reach and the buffering effects of downstream reaches. This tributary also enters the canal downstream of the lake.
3. *Assessment of flow criteria to manage erosion using stormwater management controls alone will not address sediment sources or sufficiently attenuate storage and sediment transport within the canal and lake system.*
    - Transportation of sand and finer sediments by open-channel flow and fluvial processes is not effectively mitigated by modifying SWM discharges over short tributary reach lengths (specifically Reach SC-1).
    - Sediment attenuation, storage, and flushing within the canal-lake system would require substantive physical modifications to the canal.

- The effectiveness of changes in SWM to reduce sediment loading will be limited without 1) addressing the "other sediment sources" and 2) implementing "stream restoration" strategies as discussed above.

The above geomorphological assessment provides a basis to help direct future phases of the Mohawk Lake revitalization project and to recommend additional studies for consideration to evaluate and mitigation the primary erosion and sediment loading issues identified.

5.9.5 Recommendations

The following recommendations are submitted based on the results of the geomorphological assessment of Mohawk Lake in the City of Brantford:

- Identification and mitigation sediment sources from the urban drainage network that may currently be the primary source of sediment loading the lake, and thus is a critical issue to reduce future sediment supply.
- A suspended sediment monitoring program is an essential undertaking to understand the sources and timing of current sediment loading to the lake.
- Erosion Site #2 is recommended for immediate attention by City staff to mitigate the documented erosion risks. Erosion Sites #1 and #3 may be considered for future works associated the overall Mohawk Lake revitalization project.
- To augment and support the recommended erosion mitigation works and erosion hazard assessments a number of detailed geotechnical investigations should be considered.
  - For detailed engineering design to mitigate risk at Erosion Site #2, Reach T1d.
  - For risk assessment of local geotechnical hillslope hazards in Reach T1c (see **Figure 5.78**).
  - For stability of embankments along the canal, especially where local slope erosion and undercut banks have been identified (see **Figure 5.76**).

5.10 NATURAL HERITAGE

The City of Brantford's goal for the natural environment is to "sustain and enhance significant natural environments in the community" (City of Brantford, 2016, p. Section 6.2.4). Identifying the features and functions of the natural environment within the study area and applying applicable natural heritage planning policies are essential steps in ensuring the protection, conservation, and enhancement of the Natural Heritage System (NHS). The NHS is defined as:

> "a system made up of *natural heritage features and areas*, and linkages intended to provide connectivity (at the regional or site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species, and ecosystems. These systems can include *natural heritage features and areas*, federal and provincial parks and conservation reserves, other natural heritage features, lands that have been restored or have the potential to be restored to a natural state, areas that support hydrologic functions, and working landscapes that enable ecological functions to continue. The Province has a recommended approach for identifying *natural heritage systems*, but municipal approaches that achieve or exceed the same objective may also be used." (MMAH, 2014)

Figure 5.80: Mohawk Canal (photo credit: Plan B Natural Heritage)

An initial review of available background information was completed prior to field studies; the results of this review are summarized in the following sections. The completed field studies built upon the existing body of knowledge contained within these reports and provide a more detailed and holistic characterization of the ecological form and function of the NHS within and adjacent to the study area. Known information on the aquatic and terrestrial natural environment within the study area is described in **Subsections 5.10.2 and 5.10.2**, while applicable natural heritage planning policies and mapping are provided in **Section 5.10.1**.

5.10.1 Natural Heritage Planning Policies

The following subsections present an overview of the natural heritage planning policy framework relevant to the project. This overview discusses natural heritage and natural hazards polices that are enforced by the City and by GRCA; polices and requirements pertaining to federal and provincial legislation (such as those related to Species at Risk) may also apply, but these are discussed elsewhere in this report.

City of Brantford's Official Plan (2016)

The City of Brantford identifies five (5) components of its NHS, as follows:

- Environmental Protection Policy Areas;
- Environmental Control Policy Areas;
- Adjacent Lands;
- Wetlands; and,
- Mineral Resource Areas.

The City has identified Environmental Protection Policy Areas, Environmental Control Policy Areas, and wetlands in the study area (**Figure 5.81** and **Figure 5.82**). These policy areas are mapped in Schedules 3-1 and 3-3 in the City's Official Plan (OP). Environmental Protection Policy Areas include the following (City of Brantford, 2016):

- significant areas of natural and scientific interest;
- habitat of endangered and threatened species;
- Provincially Significant Savannahs;
- Provincially Significant Wetlands;
- ravines with watercourses;
- significant forested areas;
- the Regulatory Flood Plain of the Grand River, D'Aubigny Creek and the tributaries of Fairchild Creek, a vegetative buffer zone along its course; and,
- areas of significant groundwater discharge.

Environmental Control Policy Areas "contain sensitive natural features such as steep slopes, streams, wetlands, areas of groundwater discharge and representative tree cover, and are designated on the basis of being comprised of fish habitat, significant woodlands, significant wildlife habitat, significant Areas of Natural and Scientific Interest, natural linkages, and locally significant prairies and savannahs" (City of Brantford, 2016, p. Section 8.3.1). Wetlands in the study area are part of the Mohawk Lake and Oxbow Wetland Complex (Evaluated - Other) and other non-evaluated wetlands (**Figure 5.82**).

Adjacent lands are defined as lands contiguous to a NHS feature or area where it is likely that development or site alteration would have negative impact(s) on the NHS feature or area (MMAH, 2014). The City of Brantford defines the extent of adjacent lands from an NHS feature or area as follows (**Table 5.26**):

Table 5.26: Adjacent Lands widths for each NHS feature or area in the City of Brantford

NHS Feature or Area	Extent of Adjacent Lands (m)
Environmental Protection Policy Area	50
Environmental Control Policy Areas	50
Fish Habitat	30
Provincially Significant Wetlands (PSWs)	120
Other wetlands >2 ha	120
Wetlands 0.5 to <2 ha	30
Habitat of Endangered and Threatened Species	50 unless otherwise specified by habitat regulations under the ESA (2007)

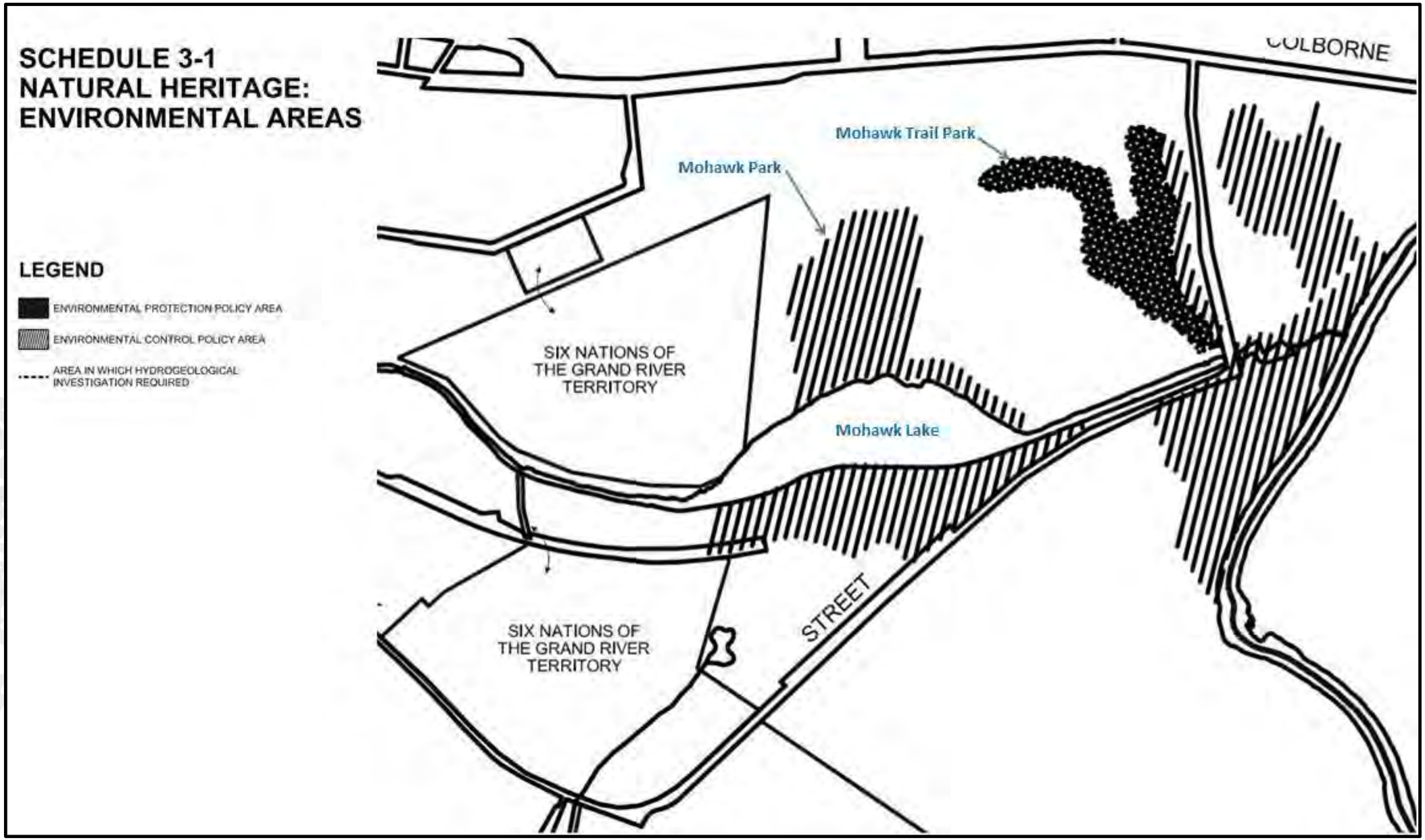


Figure 5.81: Natural Heritage Areas (Schedule 3-1 of the OP)

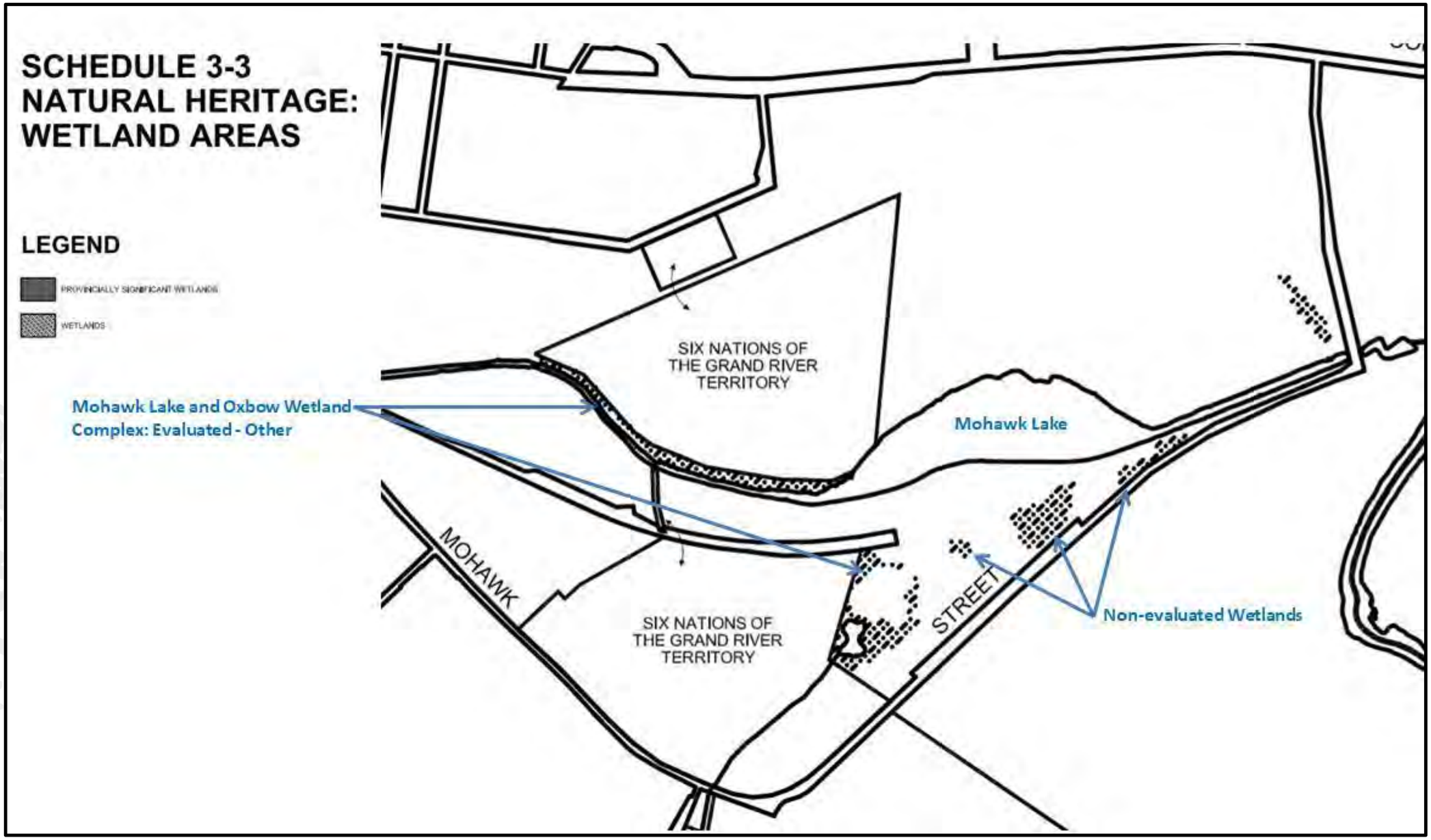


Figure 5.82: Natural Heritage Wetland Areas (Schedule 3-3 of the OP)

Grand River Conservation Authority Policies

All wetlands and their associated areas of interference are regulated by the Grand River Conservation Authority (GRCA) under the Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation (Ontario Regulation 150/06). The GRCA's Wetland Policy (GRCA, 2003) is based on four guiding principles:

I. Wetlands are critical to sustaining surface and groundwater quality and quantity and therefore, essential to the well-being of humans and all other forms of life in the Grand River watershed.
II. Wetlands are core components of the natural heritage system of the Grand River watershed.
III. Wetlands will be managed on a watershed and subwatershed basis.
IV. Wetland loss will be avoided.

There are prohibitions to development within regulated flood zones. Prohibited developments within O. Reg. 150/06 are described as follows:

2. (1) Subject to section 3, no person shall undertake development or permit another person to undertake development in or on the areas within the jurisdiction of the Authority that are,

(a) adjacent or close to the shoreline of the Great Lakes-St. Lawrence River System or to inland lakes that may be affected by flooding, erosion or dynamic beaches, including the area from the furthest offshore extent of the Authority's boundary to the furthest landward extent of the aggregate of the following distances:

(i) the 100 year flood level, plus the appropriate allowance for wave uprush as specified in the most recent document entitled "Shoreline Management Plan for Lake Erie" available at the head office of the Authority,

(ii) the predicted long term stable slope projected from the existing stable toe of the slope or from the predicted location of the toe of the slope as that location may have shifted as a result of shoreline erosion over a 100-year period,

(iii) where a dynamic beach is associated with the waterfront lands, the appropriate allowance inland to accommodate dynamic beach movement as specified in the most recent document entitled "Shoreline Management Plan for Lake Erie" available at the head office of the Authority, and

(iv) an allowance of 15 metres inland;

(b) river or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse, the limits of which are determined in accordance with the following rules:

(i) where the river or stream valley is apparent and has stable slopes, the valley extends from the stable top of bank, plus 15 metres, to a similar point on the opposite side,

(ii) where the river or stream valley is apparent and has unstable slopes, the valley extends from the predicted long term stable slope projected from the existing stable slope or, if the toe of the slope is unstable, from the predicted location of the toe of the slope as a result of stream erosion over a projected 100-year period, plus 15 metres, to a similar point on the opposite side,

(iii) where the river or stream valley is not apparent, the valley extends the greater of,

(A) the distance from a point outside the edge of the maximum extent of the flood plain under the applicable flood event standard, plus an

allowance not to exceed 15 metres, to a similar point on the opposite side, and

(B) the distance from a watercourse or the predicted meander belt of a watercourse, expanded as required to convey the flood flows under the applicable flood event standard, plus 15 metres, to a similar point on the opposite side;

(c) hazardous lands;

(d) wetlands; or

(e) other areas where development could interfere with the hydrologic function of a wetland, including areas within 120 metres of all provincially significant wetlands and wetlands greater than or equal to 2.0 hectares in size, and areas within 30 metres of wetlands less than 2.0 hectares in size. O. Reg. 150/06, s. 2 (1); O. Reg. 57/13, s. 1 (1-3).

Portions of the study area are located within lands regulated by the GRCA (**Figure 5.83**), and as such development is prohibited unless it is determined by the GRCA that the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected by the development. O. Reg. 150/06, s. 3 (1).

According to O. Reg. 150/06, s 5, no person shall straighten, change, divert or interfere in any way with the existing channel of a river, creek, stream or watercourse or change or interfere in any way with a wetland, unless permission is given by the GRCA.

The GRCA administers the Fill, Construction and Alteration to Waterways Regulation set out under the terms of the Conservation Authorities Act. The Regulation states that permission must be obtained from the GRCA to construct any building or structure or permit any building or structure to be constructed in or on a pond, swamp or in any area susceptible to flooding during a regional storm.

As wetlands, valleylands, upland, and Mohawk Lake and associated floodplain are within the regulated limit of the GRCA, permits from the GRCA are required for works within regulated lands.

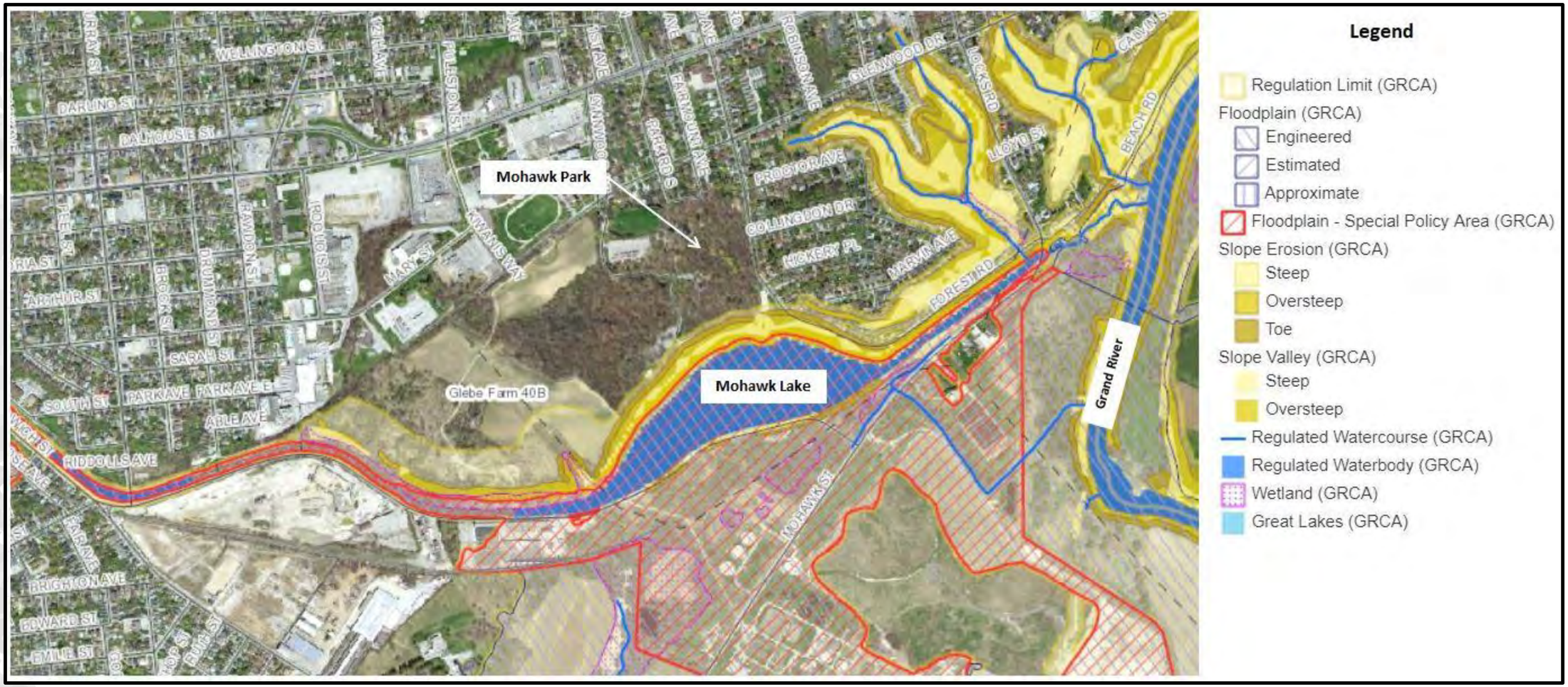


Figure 5.83: GRCA Regulated Areas

5.10.2 Background: Aquatic Ecology

The subsections below present the findings of the background review relevant to aquatic ecology completed to date. In general, historical fish and benthic macroinvertebrate survey data existed, but the data was not current. In addition, aquatic habitat has been historically described but was not surveyed using a protocol that can be replicated for accurate comparison with future results.

Fish Community

Existing data outlining the fish community within Mohawk Lake was collected in 1972 and 1993 and is therefore somewhat outdated. There are no existing fish records for the canals. As part of GRCA sampling conducted in Sandilands (1972), fish were collected within the lake using a seine net. All fish captured were warm water species that are tolerant of disturbance and contamination. Most of these species were of the family Cyprinidae (carps and minnows) and are capable of foraging for food within detritus. The only fish species present during 1972 field surveys that feeds on aquatic invertebrates and insects was Pumpkinseed (*Lepomis gibbosus)*. No predator or game fish were present in the lake, which indicates water quality, at the time of survey, was not suitable for their propagation.

According to the Gore and Storrie Limited (1995) report, Mohawk Lake contains a remarkable diversity of desirable warm water game fish and forage fish species. The species captured by the GRCA in 1993 by electrofishing included only larger specimens and no minnow species. The species captured showed a healthy balance of top-level predators, mid-level predators, and bottom-dwelling omnivores and planktivores. Young Pumpkinseed were captured during benthic macroinvertebrate surveys along the coarse littoral substrate. However, despite the richness of fish species, results from electrofishing as well as earlier studies show a thriving population of the invasive Common Carp (*Cyprinus carpio*). Common Carp often create very turbid conditions, due to their foraging activities, which can elevate nutrient concentrations and uproot macrophytes. It was estimated that carp comprise at least half of the total fish population in Mohawk Lake. Fish species captured as part of Sandilands (1972) and Gore and Storrie (1995) are listed in **Table 5.27**. Many of these species have been confirmed by the MNRF as occurring in Mohawk Lake (2018).

Table 5.27: Fish Species Historically Captured in Mohawk Lake

Species Name		Species Status			
Scientific	**Common**	**SARA**	**ESA**	**G-Rank**	**S-Rank**
Ambloplites rupestris	Rock Bass			G5	S5
Catostomus commersoni	White Sucker			G5	S5
Cyprinus carpio	Common Carp			G5	SNA
Lepomis gibbosus	Pumpkinseed			G5	S5
Luxilus cornutus	Common Shiner			G5	S5
Micropterus dolomieu	Smallmouth Bass			G5	S5
Micropterus salmoides	Largemouth Bass			G5	S5
Moxostoma spp.	Redhorse Sucker				
Notemigonus chrysoleucas	Golden Shiner			G5	S5
Perca flavescens	Yellow Perch			G5	S5
Pimephales notatus	Bluntnose Minnow	NAR	NAR	G5	S5
Pimephales promelas	Fathead Minnow			G5	S5
Pomoxis nigromaculatus	Black Crappie			G5	S4

Previous studies indicate that spawning substrates for fish are limited within the study area. Silt is not desirable for spawning fish since it can smother eggs. Additionally, nursery habitat for juvenile fish is lacking. Emergent macrophytes are also scarce. The high turbidity within the lake causes a disadvantage to native game fish present since many of them feed by sight. Under turbid conditions, fish must rely on movement and sound to detect prey. Unfortunately, these conditions are advantageous for the invasive Common Carp.

Results collected in 1993 showed that no toxic bioaccumulation is present in game fish that were tested, and no eating restrictions were placed on the fishery at that time. No fish kills have been reported in the lake based on the background information provided to date.

Current Department of Fisheries and Oceans (DFO) Species at Risk mapping indicates critical habitat for Eastern Sand Darter (*Ammocrypta pellucida* – federally Threatened and provincially Endangered) and Round Pigtoe (*Pleurobema sintoxia* - Endangered) is present in the Grand River downstream of Mohawk Lake. Other aquatic SAR that were noted to be present or potentially present in the Grand River at this location included: Silver Shiner (*Notropis photogenis* - Threatened), Black Redhorse (*Moxostoma duquesnei* - Threatened), and Wavy-rayed Lampmussel (*Lampsilis fasciola* – federally Special Concern and provincially Threatened). Although these species are likely not present within Mohawk Lake or the canals, the quality of the water entering the Grand River from the lake is an important consideration to these sensitive species.

Benthic Macroinvertebrate Community

As part of GRCA sampling conducted in 1972, benthic macroinvertebrate collections were conducted within the lake and below the outlet in the canals. No invertebrates were caught in the lake. Typically, high organic muds are densely populated with aquatic worms and midge larvae, and the absence of these organisms suggests the presence of heavy metals. In the creek below the outlet structure at the Eastern end of the canal, invertebrates were present (midge larvae, worms, leeches, snails, clams, caddisflies). All invertebrates were pollution tolerant. The water quality flowing into the Grand River via the canal was described as poor to fair.

According to Gore and Storrie Limited (1995), benthic macroinvertebrates were collected along the littoral zone (part of a lake or river that is close to the shore) and the profundal zone (deep zone, located below the range of effective light penetration). A higher degree of diversity was noted in the littoral zone (scuds, aquatic sowbugs, damselfly nymphs). All species collected are considered tolerant to organic pollution, with the exception of certain mayflies and caddisflies which are relatively intolerant. The presence of such species suggests that the water quality within the littoral zone is within the acceptable range for most warm water fauna. In the profundal zone, only midge larvae and aquatic worms were captured. Red colouring of these individuals indicated low dissolved oxygen conditions. This suggests that the nature of the lake bottom sediment provides habitat only to organisms that are adapted to reduced dissolved oxygen conditions.

Aquatic Habitat

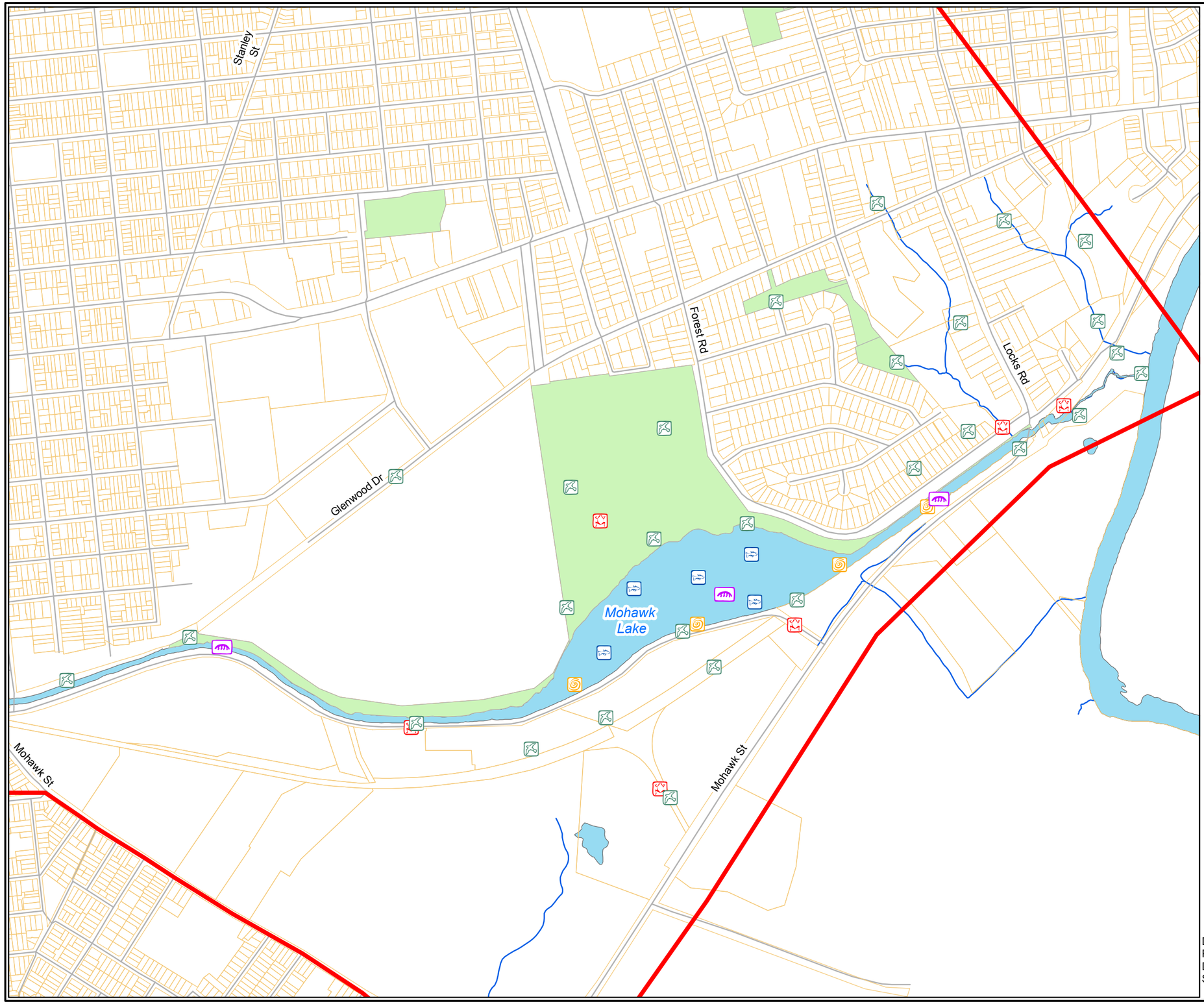
Habitat descriptions are included in the GRCA surveys conducted in 1972 and 1993. However, survey protocols consistent with present day standards were not followed making comparisons somewhat more challenging. In general, the littoral zone of the lake contained coarse substrates that extended to approximately 1 m offshore, and changed to silt beyond this zone. Water within the lake was highly turbid throughout. Macrophyte growth was limited due to the excessive turbidity and lack of sunlight availability. The aquatic habitat within the canal was not described.

5.10.3 Field Study Scope and Methodologies: Aquatics

Fish community, benthic macroinvertebrate, and aquatic habitat surveys were completed as part of the Characterization Study. The following provides details of the Aquatic Resources work plan:

Fish Surveys

Fisheries surveys within Mohawk Lake were conducted using four minnow traps and a fyke net. Backpack electrofish and seine net surveys were not conducted due to the conditions of both the canals and the lake. Sediment depth, turbidity and cover made for unsampleable conditions using standard backpack electrofishing and/or seine net protocols. Over a period of five days total, the fyke net was set at various locations within the lake and canal, as illustrated in **Figure 5.84.** Minnow traps were set around the edges of the lake at various locations. The net and traps were checked the following morning and fish were identified, counted, measured and released. Traps were not left unattended for longer than 24 hours, as per the License to Collect Fish for Scientific Purposes. Typical locations of trap settings are displayed in **Figure 5.85** and **Figure 5.86.**



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Aquatic Habitat Survey Stations
- Benthic Macroinvertebrate Survey Stations
- Fish Community Survey Stations
- Breeding Bird Survey Stations
- Frog Community Survey Stations
- Road Centrelines
- Watercourse
- Property Parcels
- Recreational Areas
- Waterbodies
- Study Area

Figure: 5.84

Aquatic and Terrestrial Monitoring Locations

0 0.125 0.25 0.5

Kilometers

N

Date: September 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Figure 5.85: Typical location of minnow trap (red buoy)

Figure 5.86: Typical location of fyke net (red buoys)

Benthic Macroinvertebrate Surveys

Benthic macroinvertebrate sampling was conducted by the travelling kick and sweep method (following the Ontario Benthos Biomonitoring Network (OBBN): Lake Protocol) around the edges of the lake and within the canals, as illustrated on **Figure 5.84**. Three replicates were conducted as outlined by the OBBN Lake Protocol. Pictures of the three sites are shown in **Figure 5.87, Figure 5.88,** and **Figure 5.89**. All samples were identified to Family Level, and indices calculated to describe the habitat of benthic invertebrates and water quality. Indices include species richness, % chironomidae, % EPT, Shannon-Weiner Diversity Index, Hilsenhoff Biotic Index (FBI) and the Percent Model Affinity Index (PMA).

Figure 5.87: OBBN Replicate 1

Figure 5.88: OBBN Replicate 2

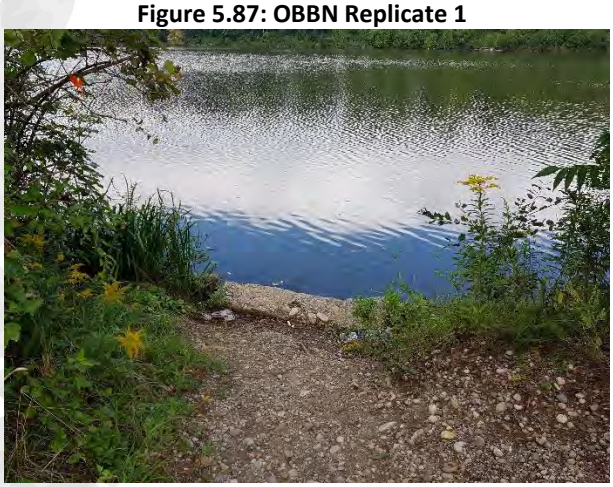


Figure 5.89: OBBN Replicate 3

Aquatic Habitat Surveys

Within wadable areas of the canal(s), aquatic habitat was assessed using Section 4: Module 2 of Ontario Stream Assessment Protocol (OSAP) for Point-Transect Sampling for Channel Structure, Substrate and Bank Conditions. Information collected included parameters such as channel morphology measurements, bank undercuts and instream cover, point source impacts, flow regime characteristics, substrate, critical habitats, and riparian cover and shading. Sampleable areas were limited to the northern-most canal, as water and sediment depth made the southern-most canal unsampleable and OSAP cannot be conducted within lakes. For areas that were unsampleable, a visual habitat assessment was conducted to describe the same parameters assessed using OSAP protocol. Approximate site locations are shown on **Figure 5.84.**

Additionally, dissolved oxygen and temperature was measured within the lake. These parameters were measured using a YSI Professional Plus multi-parameter probe across three transects. Transects were chosen using points that were easily identifiable from ortho-imagery. Transect 1 was the most upstream

within the lake and Transect 3 was the most downstream, as shown in **Figure 5.90**. At five evenly spaced points along each transect, the probe was lowered at half-meter depths to create a profile across the lake.

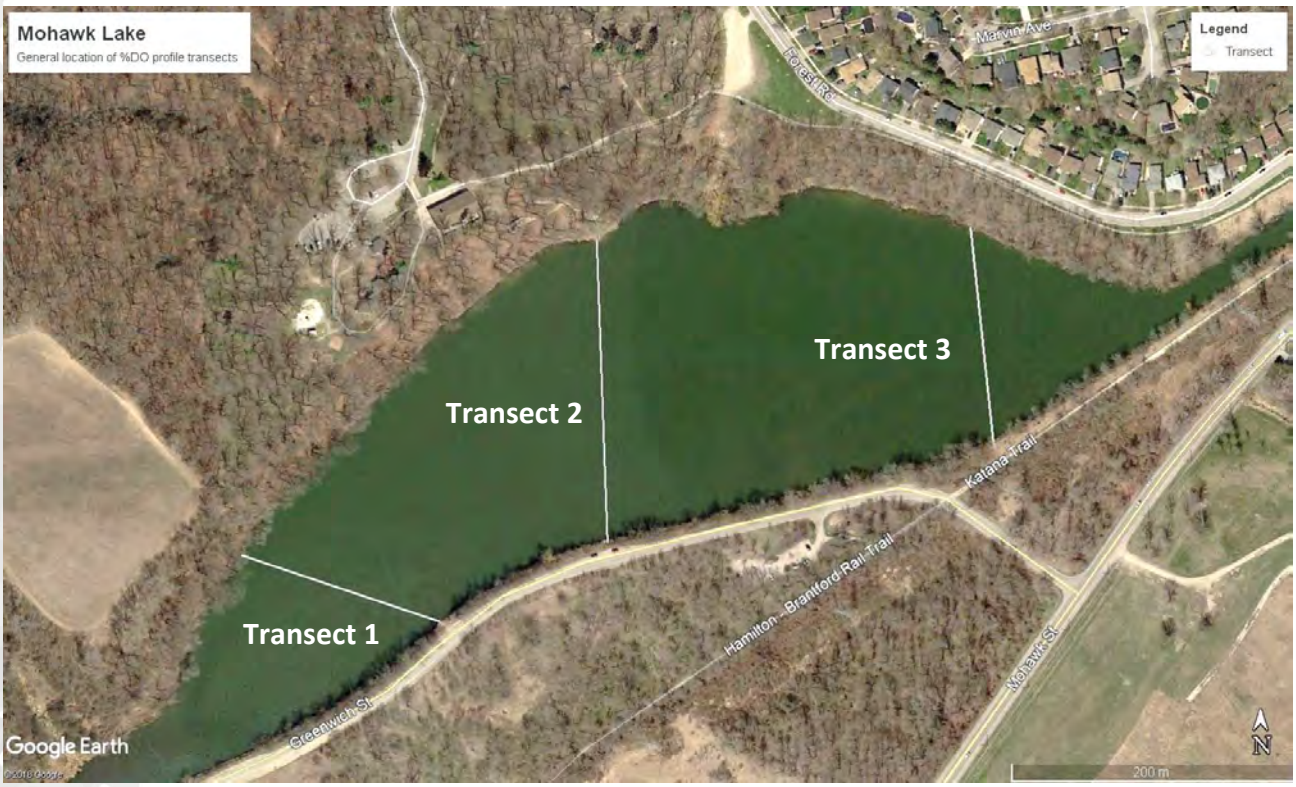


Figure 5.90: Dissolved Oxygen Transects

5.10.4 Results: Aquatics

The subsections below present the findings of the aquatic field surveys completed to date.

Fish Surveys

Over five days total between September 9th and September 21st, 2018, the nets were set and processed for a total of four times at various locations throughout the lake and canals. In general, fish community results were similar to those observed in background data. Two new species were observed however, including Bluegill (*Lepomis macrochirus*) and Creek Chub (*Semotilus atromaculatus*). Results can be seen in **Table 5.28.** Overall, 353 total fish and eight different species were captured and released. Common Carp (*Cyprinus carpio*) were also observed in abundance however none were captured during the surveys.

No at-risk fish species, as listed under federal or provincial SAR legislation, were identified during the surveys.

All fish species handled, as shown in **Table 5.28**, are listed with their rarity for Ontario (S-Rank, as assigned by the Natural Heritage Information Centre). Of the eight species, seven have a rank of S5, indicating that they are Secure (common, widespread or abundant). One species (Black Crappie) has a ranking of S4, indicating that they are common and apparently secure.

Table 5.28: Fish Survey Results

Scientific Name	Common Name	Ranking				Count					
		COSEWIC	COSSARO	G-Rank	S-Rank	Fyke	MT01	MT02	MT03	MT04	Total
Pomoxis nigromaculatus	Black Crappie			G5	S4	127	0	0	0	0	**127**
Ambloplites rupestris	Rock Bass			G5	S5	3	0	0	0	0	**3**
Micropterus salmoides	Largemouth Bass			G5	S5	1	0	0	0	0	**1**
Lepomis gibbosus	Pumpkinseed			G5	S5	24	0	0	0	0	**24**
Lepomis macrochirus	Bluegill			G5	S5	183	2	3	2	3	**193**
Semotilus atromaculatus	Creek Chub			G5	S5	1	0	0	0	0	**1**
Pimephales notatus	Bluntnose Minnow	NAR	NAR	G5	S5	3	0	0	0	0	**3**
Catostomus commersoni	White Sucker			G5	S5	1	0	0	0	0	**1**
Total						**343**	**2**	**3**	**2**	**3**	**353**

Species observed in these studies demonstrate a community which has intermediate tolerance to water quality. These species also indicate a cool-warmwater thermal regime. Of the species observed, Bluegill (*Lepomis macrochirus*) was the most abundant (55%), Black Crappie (*Pomoxis nigromaculatus*) was the second-most abundant (36%) and Pumpkinseed (*Lepomis gibbosus*) was the third-most abundant (7%). These species are displayed in **Figure 5.91, Figure 5.92,** and **Figure 5.93.**

Figure 5.91: Bluegill (*Lepomis macrochirus*)

Figure 5.92: Black Crappie (*Pomoxis nigromaculatus*)

Figure 5.93: Pumpkinseed (*Lepomis gibbosus*)

Benthic Macroinvertebrate Surveys

On September 13th, 2018, benthic macroinvertebrates sampling was conducted. **Table 5.29** below summarizes the metrics calculated for the organisms collected at each site. For Taxa Richness, % EPT, % Scraper, % Shredder, % Clinger, % Omnivore and the Shannon-Weiner Index, a larger value implies a healthy biological community and low values imply reduced health (Jones, 2007; Barbour et al, 2009). For % Oligochaeta, % Chironomidae, % Isopoda and FBI, a lower value implies a healthier community (Jones, 2007; Barbour et al, 2009). In the case of % Collector-Filterer, % Collector-Gatherer, % Predator and % Diptera, critical values lie at both extremes (Jones, 2007; Barbour et al, 2009). Therefore, these metrics were not used as an indication of better water quality between sites. However, they are useful to note habitat differences and changes in habitat quality over time, which suggests a change in water quality. Since the PMA method has a specific threshold, it is the one measurement that can provide a definitive definition of an unimpaired stream/waterbody. A waterbody is considered impaired if a PMA value less than 39.1 is observed.

Sampling was not conducted within the profundal zone as bathymetric surveys confirmed the presence of high quantities of organic mud/silt and %DO profiling confirmed very low dissolved oxygen levels. This supports background findings and suggests that only midge larvae and worms are present in the profundal zone. Overall, 341 total organisms and 18 different organisms were sampled within the study site. Results are comparable with background results as discussed above. The PMA values suggest that the waterbody is not impaired, as all values are well above the 39.1 threshold. Furthermore, the results from Replicate 2 – the site which was furthest from either canal – showed the highest taxa richness and highest FBI. Replicate 2 also showed results with zero indices indicating the worst water quality, whereas both Replicate 1 (closest to West Canal) and 2 had multiple indices indicating the worst water quality. This suggests that water quality is poorest within the canals.

Table 5.29: Benthic Macroinvertebrate Survey Results

	Rep1	Rep2	Rep3	Total
Total Number of Organisms	105	105	131	341
Taxa Richness	6	12	10	18
% Oligochaeta	10.48	4.76	2.29	5.57
% Diptera	85.71	48.57	35.11	54.84
% Chironomidae	60.00	48.57	35.11	46.92
% Isopoda	0.00	0.95	12.21	4.99
% EPT	0.00	0.95	1.53	0.88
% F-C	0.00	0.00	0.00	0.00
% G-C	60.95	50.48	47.33	52.49
% Pred	85.71	51.43	35.88	56.01
% Scr	0.95	2.86	0.00	1.17
% Shr	0.95	0.00	0.00	0.29
% Omni	0.00	1.00	2.00	3.00
% Clinger	0.95	5.71	2.29	2.93
Shannon-Weiner Diversity	0.45	0.56	0.57	0.51
FBI	6.39	6.31	6.64	6.46
PMA	54.49	79.45	76.31	80.32

Indicates best water quality
Indicates second best water quality
Indicates worst water quality
Exceeds PMA threshold

Aquatic Habitat Surveys

On September 13th, 2018, aquatic habitats within the Lake and canals were assessed. Results from the assessment are displayed in **Table 5.30** and Field Observations are displayed in **Appendix E-1.** Photographs of the site(s) are displayed in **Figure 5.94** through **Figure 5.105**.

Table 5.30: Aquatic Habitat Survey Results

Habitat Characteristics		General Flow Regime	Site Location	Site Characteristics	Habitat Description	Substrate Composition	Bank Stability	Instream and Riparian Vegetation	Fish Barriers and Other Disturbances
Site	MH01: West Canal	Permanent	MH01 is the furthest, most upstream site located approximately 490 m downstream of the Murray St bridge and.	Site length is 40.0 m. Average wetted width at the time of sampling was 13.09 m. The average depth was 318 mm and the maximum depth sampled was 690 mm.	This site is extremely uniform and mainly consists of a long run with a very deep pool at the upstream extent. This deep pool is a result scouring from the stormwater outfall on the right bank. Instream cover was low (20%), consisting of macrophytes, unembedded rocks, and embedded rocks, and wood. Vegetation was sparse, consisting moss (70%), macrophytes (20%) and overhanging terrestrial vegetation (10%).	This site mainly consisted of sand, gravel and cobble with some larger boulders scattered throughout. For that reason, the mean point particle size was 3.3 mm and the mean maximum particle size was 27.4 mm. The substrate was poorly sorted.	The right bank is more stable than the left. Four undercuts fell on sampled transects, ranging from 80 mm – 720 mm, the largest being on the left bank. Bank stability is lowest on the left bank near the upstream end, as the stormwater outfall is resulting in large scale scouring and banks higher than 2 m. Bank treatments were observed on the left bank throughout the reach in the form of a vegetated buttress.	Very little instream vegetation was present throughout this site, consisting of 70% moss. Riparian vegetation was also poorly distributed. The right bank had much more vegetation than the left despite the vegetated bank treatments observed on the left.	A number of road crossings fall upstream of this site which could be sources of contaminants. Adjacent land use consists of a well used walking trail and road right-of-way, with a residential and industrial area beyond. A number of outfalls exist along the banks which could also be sources of contaminants. A log jam is present downstream of the site although should not be considered a fish barrier.
	MH02: Mohawk Lake	Permanent	MH02 is located in the middle of the study site and within Mohawk Lake itself. Due to the OSAP protocol, the site was unsampleable and will be described in full as it extends from the opening of the northern canal to the opening of the southern canal.	Site length is approximately 790 m. Wetted width is approximately 223 m. According to bathymetric surveys, the deepest point of the lake is 3.5 m from top of water to top of sediment and 5.87 m from top of water to bottom of sediment.	This site is in a lacustrine setting. Instream cover is limited to the littoral zone where fallen trees and overhanging vegetation dominate. The littoral zone contains coarse substrate consisting of gravels and cobbles, extending approximately 1 m offshore. Beyond the 1 m littoral zone, substrate consists of silt up to depths of nearly 2.5 m. Water is highly turbid due to high sedimentation. This also limits aquatic vegetation to the littoral zone where rooted macrophytes are present.	This site mainly consisted of silt extending upwards of 2.5 m in depth, with larger, coarser substrate limited to the littoral zone. This is likely resulting from the adjacent rip-rap bank treatments. The substrate was very poorly sorted.	Bank stability is quite high throughout the site with little to no erosion force due to slow moving water. Banks are well vegetated, specifically on the right bank with well-established deciduous trees. Coarse substrate on the left bank suggests bank treatment in the form of rip-rap.	Instream vegetation was present although limited to the littoral zone due to sediment depths within profundal zone. Rooted macrophytes were present where sediment allowed. Riparian vegetation was well established on the right bank while the left bank had a much narrower and disturbed riparian zone due to its proximity to Greenwich Street.	A number of road crossings fall upstream of this site which could be sources of contaminants. Adjacent landuse consists of a well used walking trail and park, with a residential and industrial area beyond. A landfill is located on the left bank approximately 300 m away from the lake. No fish barriers were observed.
	MH03: East Canal	Permanent	MH03 is the furthest, most downstream site. Due to the OSAP protocol, the site was unsampleable and will be described in full as it spans from the lake to the concrete outfall approximately 100 m downstream of the Mohawk St bridge.	Site length is approximately 618 m. Wetted width is approximately 24.5 m. According to bathymetric surveys, the deepest point of the site is 1 m from top of water to top of sediment and 3.37 m from top of water to bottom of sediment.	This site is similar to that of the lacustrine setting demonstrated at MH02, however much narrower and shallower. Instream cover is mainly limited to the littoral zone where fallen trees and overhanging vegetation dominate. Some rooted macrophytes extend towards the middle of the canal, however sedimentation and siltation limit the extent. A small percentage of unembedded wood, overhanging bank and riparian vegetation also provide cover.	This site mainly consisted of silt extending upwards of 2.5 m in depth, with larger, coarser substrate limited to the littoral zone. This is likely resulting from the adjacent rip-rap bank treatments. The substrate was very poorly sorted.	Both banks demonstrate very poor stability with very steep banks and leaning terrestrial vegetation. This extends for the entirety of the reach.	Instream vegetation was present although limited to the littoral zone due to sediment depths within the middle of the lake. Rooted macrophytes were present where sediment allowed. Riparian vegetation was established on both banks, though limited in depth due to the proximity to Forest Road on the right bank and Greenwich Street on the left.	A major road crossing (Mohawk St) is located within the site which could be a source of contaminants. A number of outfalls exist along the banks which could also be sources of contaminants. Adjacent landuse consists of residential on the right and industrial with a landfill located approximately 100 m away from the left bank. A substantial fish barrier is located at the downstream extent, consisting of a top-draw dam.

Figure 5.94: MH01 - D/S looking U/S

Figure 5.95: MH01 - D/S looking D/S

Figure 5.96: MH01 - U/S looking U/S

Figure 5.97: MH01 - U/S looking D/S

Figure 5.98: MH02 - Left Bank

Figure 5.99: MH02 - Left Bank

Figure 5.100: MH02 - Right Bank

Figure 5.101: MH02 - Right Bank

Figure 5.102: MH03 - Left Bank

Figure 5.103: MH03 - Left Bank

Figure 5.104: MH03 - Right Bank

Figure 5.105: MH03 - Right Bank

Dissolved Oxygen and Temperature Profiling

On September 19th, 2018, surveys were conducted to profile the Dissolved Oxygen (%DO) and temperature throughout the lake. Results from the profiling survey are displayed in **Figure 5.106**.

%DO was observed to decrease as the depth increased, which is typical in lacustrine environments. Transects 1 and 2 had similar readings although Transect 2 was 0.5 m deeper, allowing for one more reading and continued to demonstrate the downward trend in %DO. Transect 3 had a similar first reading

as 1 and 2, however a sharper decline in %DO was observed with much lower %DO values. This could indicate an influx of groundwater, or it could indicate that as the lake widens, water becomes less oxygenated from diminishing channel flow.

Temperature also observed a downward trend as depth increased. This is also typical in lacustrine environments. Transect 1 had slightly higher temperature values than 2. Transect 3 observed lower temperature values than Transects 1 and 2. As Transect 3 is the deepest of the three transects, it is inconclusive as to whether the lower temperatures are due to water depth or due to an influx of groundwater, as the %DO profiling results may suggest.

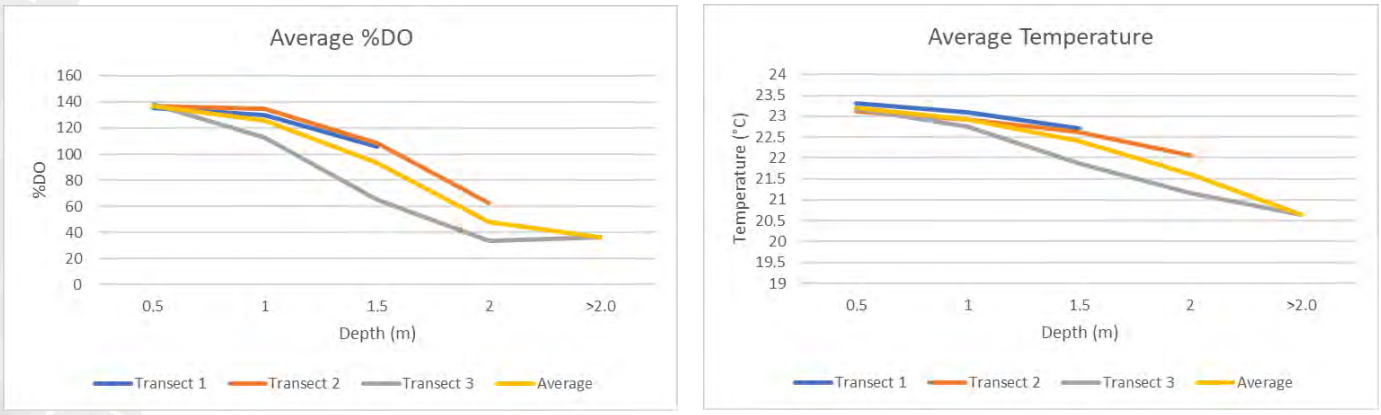


Figure 5.106: Average %DO and Temperature Profiles

5.10.5 Discussions and Conclusions: Aquatic Ecology

Overall, results from the aquatic ecology surveys support background documentation. Fish surveys observed species that demonstrate a cool-warmwater community which has intermediate tolerance to water quality. Benthic macroinvertebrate surveys indicate that Mohawk Lake and the canals are not impaired, although the canals demonstrate poorer water quality than within the lake itself. Aquatic habitat surveys confirmed that the highest quality habitat is limited to the littoral zones extending approximately 3 m beyond the edge of water. Beyond the littoral zone and into the profundal zone, aquatic habitat is impaired and influenced by the high quantity of organic mud and silt reaching depths of nearly 2.5 m. This deep sediment and findings from benthic macroinvertebrate sampling suggest very low dissolved oxygen levels within the profundal zone. This is supported by dissolved oxygen profiling as %DO was low near the top of sediment and assumed to be zero within the sediment. %DO and temperature was however lowest at the Eastern end of the lake which could indicate an influx of groundwater.

5.10.6 Background: Terrestrial Ecology

The subsections below present brief summaries of the findings of the background review. In general, site-specific and detailed data was lacking, therefore the presence of NHS features and areas could not accurately be identified and assessed following the background review stage. Many of the data gaps identified were addressed following the completion of additional surveys undertaken in 2018 as part of the Characterization Study. Completed biophysical studies included the following:

- Breeding bird surveys;
- Amphibian calling surveys;
- Incidental observations of wildlife including reptiles, lepidopterans, odonates, mammals, etc.; and,
- Botanical and vegetation community surveys.

Flora

The background review process revealed that there was insufficient data to determine the botanical species inhabiting the study area. Information was to be fulfilled as part of 2018 surveys.

A review the available background information indicated that prairie remnants were present within the study area (Plan B Natural Heritage). In Ontario, prairie and savannah habitats are considered rare vegetation community types and are often home to rare species of plants and animals. This information was to be verified as part of the 2018 surveys.

Vegetation Communities

Past vegetation communities identified within the study area were not completed to a level of detail that allowed for the identification of significant vegetation communities and/or habitat for SAR and other Species of Conservation Concern (SOCC) and their habitats. Vegetation communities assessed as part of the Characterization Study was completed in accordance with the Ecological Land Classification Protocol for Southern Ontario (Lee et al., 1998) on lands within the study area where permission to enter was granted (**Figure 5.95**).

Species at Risk and other Species of Conservation Concern

The location(s) of SAR and other SOCC and their habitats within the study area following the completion of the background review were generally unknown. This information was collected as part of the 2018 biophysical surveys.

Significant Wildlife Habitat (SWH)

The existing SWH could not be completely assessed following the background review process as there was insufficient data to determine the presence of SWH for the majority of criteria. Specific surveys for flora, vegetation communities, amphibians, reptiles, fish, and birds (e.g. songbird and waterfowl); completed in 2018, guided the identification of SWH within the study area.

5.10.7 Field Study Scope, Methodologies and Results: Terrestrial Ecology

The subsections below present the methodologies and protocols followed as part of the biophysical surveys that were undertaken on August 22nd and September 5th, 6th, 7th and 12th, 2018, findings of the detailed field surveys, and general discussions.

Vegetation Communities

Vegetation communities were assessed in accordance with the *Ecological Land Classification Protocol for Southern Ontario* (Lee, et al., 1998) on lands within the study area to which permission to enter was granted (**Figure 5.107**). Additional information was gathered through background information review, aerial image interpretation, and roadside assessments, as needed to fill data gaps. Contrary to **Figure 5.107,** it should be noted that the majority of the ravines associated with the triburaries which discharge to the East Canal are City-owned lands and were assessed.

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Watercourse
- Road Centrelines
- Waterbodies
- Recreational Areas / City Owned
- Study Area

Permission Granted

- No response
- No
- Yes

Figure: 5.107

Access Permission

0 125 250 500

Meters

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

The field work completed within the study area in 2018 identified 26 ELC polygons comprised of 23 vegetation community types. Five (5) of the ELC polygons represent complex communities (i.e., patterns of two or more ecosites or vegetation types forming a mosaic that cannot be mapped at the level of resolution being employed).

The study area contained a wide variety of community types ranging from highly disturbed industrial lands to agricultural fields, areas used recreationally (trails, etc.), and natural forests and wetlands.

One of the vegetation community type is considered to be provincially significant: Fresh – Moist Lowland Black Walnut Deciduous Forest (S2S3). This community type was found in three (3) locations:

- Community 6: this narrow linear community was confined to the steep slope along the north edge of Mohawk Lake between Mohawk Lake and Forest Road.
- Community 18: This small forested block was located south of Mohawk Lake, between the hydro corridor and Mohawk Street (note that this area was only assessed from the edge, as permission to enter was not granted)
- Community 20: Complexed with willow (*Salix sp.*) dominated lowland forest associated with the valley lands north of Beach Road and the Grand River shoreline south of Beach Road.

Prairie habitats, which are rare in Ontario and have potential to occur in the broader landscape, were specifically searched for during the field surveys undertaken in 2018; no prairie habitats were identified within the study area.

Figure 5.109 shows the delineation of all 26 vegetation polygons. The Vegetation Communities Table provided in **Appendix E-2** lists each polygon, its ELC type, dominant vegetation composition, relevant soils information, and representative photos. The ELC field data forms are included in **Appendix E-3**.

Mohawk Lake and Oxbow Wetland Complex

The Mohawk Lake and Oxbow Wetland Complex wetland evaluation, which was last updated in 2000, resulted in an overall score of 525. The score breakdown is as follows:

- Biological: 113 points
- Social: 116 points
- Hydrological: 203 points
- Special Features: 93 points

According to the Ontario Wetland Evaluation, Southern Manual (MNRF, 2014), a wetland is considered provincially significant if it has a cumulative score of 600 or if it scores 200 or more points in the Biological or Special Features categories.

A review of the species list within the wetland evaluation (Ross, 2000) revealed records of species that were not listed as SAR at the time of the evaluation but have since been uplisted, specifically, the Eastern Wood-pewee (Special Concern). In addition, recent records of two additional SAR (Snapping Turtle – Special Concern, and Blanding's Turtle – Threatened) using habitat within Mohawk Lake and/or Mohawk Canal have been provided by the MNRF (**Figure 5.108**). If taken into consideration in an update to the existing wetland evaluation, these observations would increase the score of the Special Features category by 230-330 points (i.e. 150-250 points attributed to Blanding's Turtle, depending on the species' use of Mohawk Lake; and 80 points for Snapping Turtle and Eastern Wood-pewee, collectively), thus raising the overall wetland score to over 600 points. **As such, should the Mohawk Lake and Oxbow Wetlands evaluation be updated to include recent SAR records, the results of the evaluation would change the status of the wetland complex making it a Provincially Significant Wetland (PSW)**.

Figure 5.108: Blanding's turtle (photo credit: Ash Baron)

An update to the wetland evaluation would also present an opportunity to consider the addition of a small wetland located between the Grand River and the south side of the Mohawk Canal, in which Snapping Turtle and Midland Painted Turtle (*Chrysemys picta*) were observed by Aquafor Beech Ltd. staff. Any update to the wetland evaluation or boundaries may require field verification in cooperation with MNRF and/or GRCA; this may be identified as a requirement of future development and/or rehabilitation work within this area.

This change in wetland status has implications from a planning policy perspective. Namely, the wetland, including smaller wetlands within the wetland complex, would be considered Environmental Protection Policy Areas, and adjacent lands would be defined as those within 120 m of the wetland; as opposed to its current status as an Environmental Control Policy Area, through which adjacent lands are considered to be those within 30-120 m of the wetland, depending on the size of the wetland polygon. **Figure 5.110** shows the current extent of the wetland complex, as mapped in the existing evaluation (Ross, 2000). For the purpose of fulfilling future project phases, it is recommended that existing wetland evaluations be updated according to the Ontario Wetland Evaluation, Southern Manual (MNRF, 2014).

THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Vegetation Community Boundaries

Study Area

Polygon Number	ELC CODE	Vegetation Community Type
1	SWD3-3 / SWD1	Swamp Maple Mineral Deciduous Swamp/ Oak Mineral Deciduous Swamp Complex
2	FOD2-2	Dry - Fresh Oak - Hickory Deciduous Forest
3	OAO	Open Aquatic
4	CGL-2(2008)	Parkland
5	FOD6-5	Fresh - Moist Sugar Maple - Hardwood Deciduous Forest
6	FOD7-4	Black Walnut Lowland Deciduous Forest
7	CUW1	Mineral Cultural Woodland
8	FOD2-4	Dry - Fresh Oak - Hardwood Deciduous Forest
9	FOD7	Fresh - Moist Deciduous Lowland Forest
10	CUM1-1	Dry - Moist Old Field Meadow
11	CUW1 / CUT1 / CUM1-1	Mineral Cultural Woodland/Mineral Cultural Thicket/Dry-Moist Old Field Meadow Complex
11 INC	FOD7-3	Fresh - Moist Willow Lowland Deciduous Forest
12	SWD4-1	Willow Mineral Deciduous Swamp
13	MAMM1-12(2008)	Common Reed Graminoid Mineral Meadow Marsh
14	CUW1	Mineral Cultural Woodland
15	CUW1	Mineral Cultural Woodland
16	FODM7-7(2008)	Fresh - Moist Manitoba maple Lowland Deciduous Forest
17	CUM1-1(2008)	Dry - Moist Old Field Meadow
18	FOD7-4	Black Walnut Lowland Deciduous Forest
19	MAS2-1	Cattail Mineral Shallow Marsh
20	FOD7-3/FOD7-4	Willow Lowland Deciduous Forest / Black Walnut Lowland Deciduous Forest Complex
20 INC	FOD2-4	Dry - Fresh Oak - Hardwood Deciduous Forest
21	SAF1-3	Duckweed Shallow Aquatic
22	CUW1/CUS1	Mineral Cultural Woodland / Mineral Cultural Savannah Complex
23	FODM8-3(2008)	Fresh - Moist Cottonwood Deciduous Forest
24	SAS1	Submerged Shallow Aquatic
25	MAM3-2	Reed Canary Grass Organic Meadow Marsh
26	CUT1/CUM1-1	Mineral Cultural Thicket / Dry - Moist Old Field Meadow
26 INC A	MAS2-1	Cattail Mineral Shallow Marsh
26 INC B	MAM2-10	Forb Mineral Meadow Marsh

Figure: 5.109

Ecological Land Classification

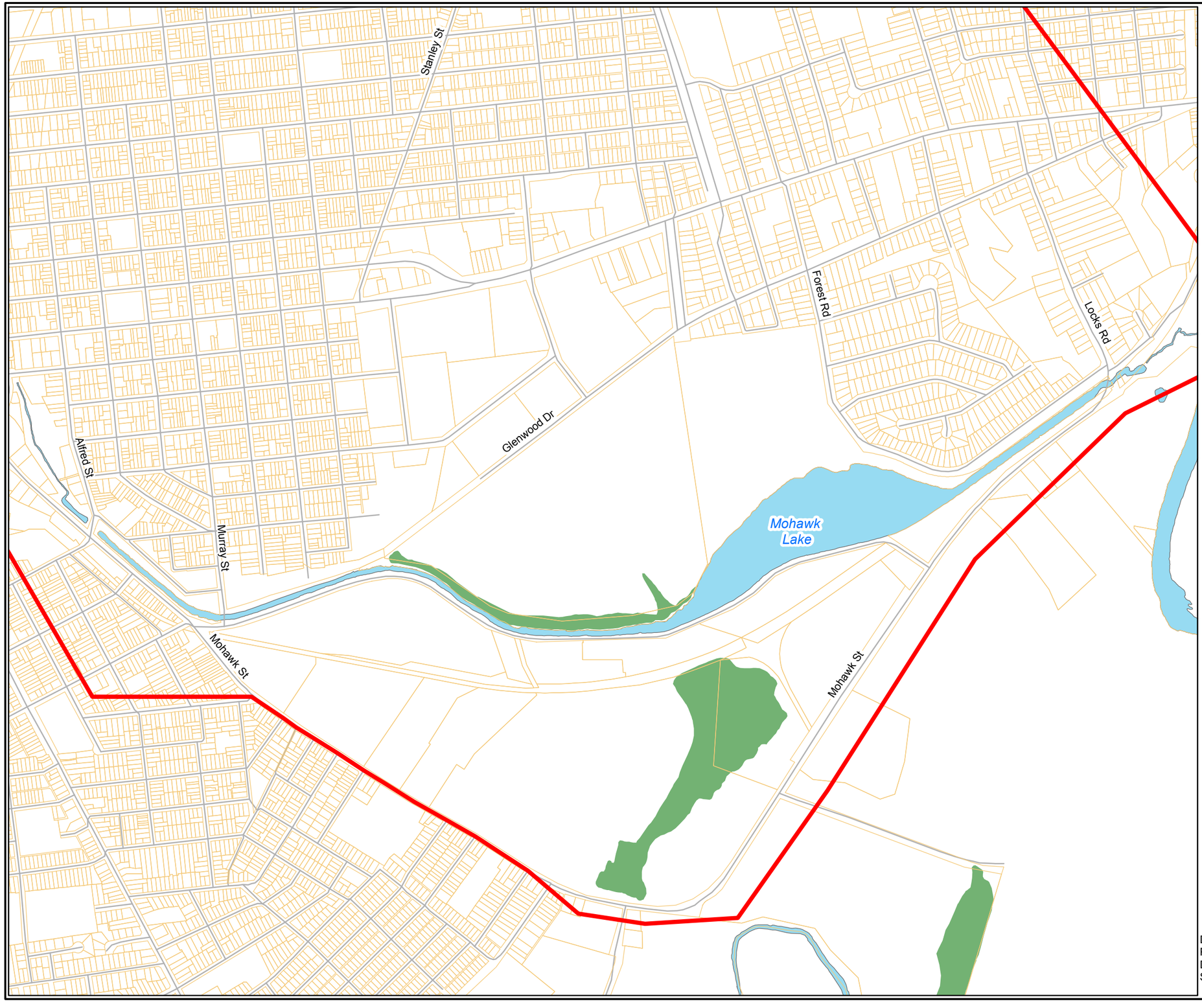
0 150 300 600

Meters

N

Date: September 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Study Area
- Property Parcels
- Provincially Significant Wetlands (MNRF)
- Road Centrelines
- Waterbody

Figure: 5.110

Provincially Significant Wetlands

0 150 300 600

Meters

N

Date: September 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford, MNRF

Aquafor Beech Limited

Flora

A botanical inventory was conducted in concert with vegetation community surveys to create an inventory of vascular plant species within the study area and to assess whether significant flora was present. The area search method was used to identify vascular plants in the study area. As the inventory was conducted in summer / early fall conditions, most species were identified through ample distinguishing features. Those species that could not be identified to species were identified to genus. In total, 260 species were identified to species level with an additional 15 identified to genus. Of the 260 species, 179 (69%) are native; the other 81 (31%) are introduced. No SAR were found during the botanical inventory. Three provincially significant species (S1-S3) were identified:

- Ohio Buckeye (*Aesculus glabra*) (S1);
- Tall Boneset (*Eupatorium altissimum*) (S1); and
- Pignut Hickory (*Carya glabra*) (S3).

These species are discussed further in **Section 5.10.8**.

Three species considered to be locally rare in Brant County (Oldham, 2017) were also recorded during the field surveys in 2018:

- Carpenter's Square (*Scrophularia marilandica*) (locally rare) was identified in Community 3, along the north edge of Mohawk Lake where a steep forested slope abuts the shoreline.
- Columbia Watermeal (*Wolffia columbiana*) (locally rare) was identified in Community 21, a small ponded area within Community 20.
- Pale-leaved Wood Sunflower (*Helianthus strumosus*) was identified in Community 10, where a small patch (~20 stems) was found along the edge of Commmunity 2.

The majority of species recorded are considered to be common and secure (S4-S5, no other designations).

A number of the introduced species recorded are also considered to be invasive. Particularly prevalent throughout the study area is Common Buckthorn (*Rhamnus cathartica*), an aggressively growing shrub that has spread into the understory in many communities throughout the study area. Other invasive species present include Garlic Mustard (*Alliaria petiolata*), Common Reed (*Phragmites australis*), and Periwinkle (*Vinca minor*). Previous studies have also made note of invasive species in the area and have recommended invasive species management plans and habitat restoration opportunities within terrestrial ecosystems in the study area (City of Brantford Waterfront Master Plan, 2010).

An annotated list of the vascular plants recorded within the study area is contained in **Appendix E-4**.

Breeding Bird Surveys

Breeding bird surveys were completed by Terrastory Environmental Consulting Inc. ("Terrastory") in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al., 2001). Twenty-eight point count survey stations were established to cover the full variety of bird habitats occurring in the study area (where permission to enter had been granted), with emphasis on habitats with a higher potential to support significant species and/or in portions of the study area that may occur within or adjacent to future areas of disturbance.

A total of 62 bird species were recorded during the breeding bird surveys, as listed in **Table 5.31** below. The highest observed breeding evidence for each species is provided, with the lowest evidence being

"observed" (i.e., observation or flyover with no evidence of breeding activities or behaviours) and the highest being "confirmed". Survey results and breeding status broken down by location are provided in Terrastory's Breeding Bird Survey Results document provided in **Appendix E-5**. Of the species listed in the table below, four (4) are Species at Risk and one (1) is considered provincially rare. A map of station locations and significant findings is provided in **Figure 5.111**.

Table 5.31 Breeding Bird Survey Results

Species Name		Species Status				Highest Breeding Status
Scientific	Common	SARA	ESA	G-Rank	S-Rank	
Agelaius phoeniceus	Red-winged Blackbird			G5	S4	Confirmed
Ardea herodias	Great Blue Heron			G5	S4	Observed
Baeolophus bicolor	Tufted Titmouse			G5	S4	Possible
Bombycilla cedrorum	Cedar Waxwing			G5	S5B	Possible
Branta canadensis	Canada Goose			G5	S5	Possible
Buteo jamaicensis	Red-tailed Hawk	NAR	NAR	G5	S5	Observed
Buteo platypterus	Broad-winged Hawk			G5	S5B	Observed
Butorides virescens	Green Heron			G5	S4B	Observed
Cardinalis	Northern Cardinal			G5	S5	Probable
Cathartes aura	Turkey Vulture			G5	S5B	Observed
Chaetura pelagica	Chimney Swift	THR	THR	G4G5	S4B S4N	Observed
Coccyzus americanus	Yellow-billed Cuckoo			G5	S4B	Possible
Colaptes auratus	Northern Flicker			G5	S4B	Possible
Columba livia	Rock Pigeon			G5	SNA	Observed
Contopus virens	Eastern Wood-pewee	SC	SC	G5	S4B	Probable
Corvus brachyrhynchos	American Crow			G5	S5B	Observed
Cyanocitta cristata	Blue Jay			G5	S5	Probable
Dryocopus pileatus	Pileated Woodpecker			G5	S5	Possible
Dumetella carolinensis	Gray Catbird			G5	S4B	Probable
Empidonax minimus	Least Flycatcher			G5	S4B	Confirmed
Empidonax traillii	Willow Flycatcher			G5	S5B	Probable
Geothlypis trichas	Common Yellowthroat			G5	S5B	Possible
Hirundo rustica	Barn Swallow	THR	THR	G5	S4B	Confirmed
Hydroprogne caspia	Caspian Tern			G5	S3B	Observed
Hylocichla mustelina	Wood Thrush	THR	SC	G4	S4B	Probable
Icterus galbula	Baltimore Oriole			G5	S4B	Confirmed
Icterus spurius	Orchard Oriole			G5	S4B	Probable
Larus argentatus	Herring Gull			G5	S5B S5N	Observed
Larus delawarensis	Ring-billed Gull			G5	S5B S4N	Observed
Leuconotopicus villosus	Hairy Woodpecker			G5	S5	Possible
Lophodytes cucullatus	Hooded Merganser			G5	S5B S5N	Observed

Species Name		Species Status				Highest Breeding Status
Scientific	Common	SARA	ESA	G-Rank	S-Rank	
Melanerpes carolinus	Red-bellied Woodpecker			G5	S4	Probable
Melospiza melodia	Song Sparrow			G5	S5B	Confirmed
Molothrus ater	Brown-headed Cowbird			G5	S4B	Probable
Myrarchus crinitus	Great Crested Flycatcher			G5	S4B	Possible
Pandion haliaetus	Osprey			G5	S5B	Confirmed
Passer domesticus	House Sparrow			G5	SNA	Probable
Passerina cyanea	Indigo Bunting			G5	S4B	Probable
Petrochelidon pyrrhonota	Cliff Swallow			G5	S4B	Possible
Phalacrocorax auritus	Double-crested Cormorant	NAR	NAR	G5	S5B	Observed
Pheucticus ludovicianus	Rose-breasted Grosbeak			G5	S4B	Confirmed
Picoides pubescens	Downy Woodpecker			G5	S5	Probable
Poecile atricapillus	Black-capped Chickadee			G5	S5	Probable
Polioptila caerulea	Blue-gray Gnatcatcher			G5	S4B	Possible
Quiscalus quiscula	Common Grackle			G5	S5B	Confirmed
Sayornis phoebe	Eastern Phoebe			G5	S5B	Confirmed
Setophaga petechia	Yellow Warbler			G5	S5B	Probable
Setophaga ruticilla	American Redstart			G5	S5B	Probable
Sitta carolinensis	White-breasted Nuthatch			G5	S5	Probable
Spinus tristis	American Goldfinch			G5	S5B	Probable
Spizella passerina	Chipping Sparrow			G5	S5B	Confirmed
Stelgidopteryx serripennis	Northern Rough-winged Swallow			G5	S4B	Probable
Sturnus vulgaris	European Starling			G5	SNA	Confirmed
Tachycineta bicolor	Tree Swallow			G5	S4B	Possible
Thryothorus ludovicianus	Carolina Wren			G5	S4	Probable
Troglodytes aedon	House Wren			G5	S5B	Probable
Turdus migratorius	American Robin			G5	S5B	Confirmed
Tyrannus	Eastern Kingbird			G5	S4B	Probable
Vireo gilvus	Warbling Vireo			G5	S5B	Probable
Vireo olivaceus	Red-eyed Vireo			G5	S5B	Probable
Zenaida macroura	Mourning Dove			G5	S5	Probable

Legend

Study Area

Study Area

Site Assessments

Breeding Bird Survey Stations

Significant Natural Features - Terrastory

Significant Birds and Bird Habitats

- Barn Swallow - Confirmed Breeding (Active Nests)
- Eastern Wood-pewee - Possible Breeding
- Eastern Wood-pewee - Probable Breeding
- Wood Thrush - Probable Breeding
- Osprey - Confirmed Breeding (Active Nest)
- Turkey Vulture Roost

Note:
Breeding bird locations are depicted on this figure as points, which represent the approximate centre of their breeding territory as suggested by vocalizations and/or observations during breeding bird surveys on June 9, 11, 20, 21, and 22/2018. The "true" centre of the depicted breeding territories may differ somewhat from the locations on this figure, and may change interannually.

TERRASTORY
environmental consulting inc.

1:9,000	0 125 250 375 m

N	Project No.: 1821	By: TK	Date: June 2018

Orthophotograph Date: April 2016

Location: Mohawk Lake, City of Brantford

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
-Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

Figure 5.111 Significant Birds and Bird Habitats documented by Terrastory.

eBird

Records obtained from eBird.org (2017), an online database of public observations, lists 62 species previously observed at the Mohawk Lake birding "hotspot", 31 of which were not captured during the breeding bird surveys described above. Of these 31, three are considered to be of Special Concern in Ontario, and one (1) is considered provincially rare.

An annotated list of the 31 bird species obtained from eBird which are additional to those observed by Terrastory during field studies is contained in **Table 5.32**. Observation dates range from 1992 to 2017. As observations made at any time of the year may be submitted to ebird, this list is not necessarily a representation of breeding birds in the study area but includes many species that would be present as migrants or winter residents. However, any species that was observed during the core breeding season (June-July) could potentially be breeding in the area.

Table 5.32: Additional Bird Observations Obtained From eBird.org

Species Name		Ranking				Present in Breeding Season (June-July)
Scientific	**Common**	**SARA**	**ESA**	**G-Rank**	**S-Rank**	
Aix sponsa	Wood Duck			G5	S5	
Anas crecca	Green-winged Teal			G5	S4	
Anas platyrhynchos	Mallard			G5	S5	
Anas strepera	Gadwall			G5	S4	
Aythya marila	Greater Scaup			G5	S4	
Bubo virginianus	Great Horned Owl			G5	S4	
Bucephala albeola	Bufflehead			G5	S4	
Certhia americana	Brown Creeper			G5	S5B	
Charadrius vociferus	Killdeer			G5	S5B S5N	Y
Fulica americana	American Coot	NAR	NAR	G5	S4B	
Haemorhous mexicanus	House Finch			G5	SNA	
Haliaeetus leucocephalus	Bald Eagle	NAR	SC	G5	S2N S4B	
Junco hyemalis	Dark-eyed Junco			G5	S5B	
Lanius excubitor	Northern Shrike			G5	SNA	
Larus californicus	California Gull			G5	SNA	
Larus fuscus	Lesser Black-backed Gull			G5	SNA	
Larus glaucoides	Iceland Gull			G5	S4N	
Larus hyperboreus	Glaucous Gull			G5	S4N	
Larus marinus	Great Black-backed Gull			G5	S2B	
Megaceryle alcyon	Belted Kingfisher			G5	S4B	Y
Melanerpes erythrocephalus	Red-headed Woodpecker	THR	SC	G5	S4B	
Melospiza georgiana	Swamp Sparrow			G5	S5B	Y
Mergus merganser	Common Merganser			G5	S5B S5N	
Oreothlypis ruficapilla	Nashville Warbler			G5	S5B	
Oxyura jamaicensis	Ruddy Duck			G5	S4B S4N	

Species Name		Ranking				Present in Breeding Season (June-July)
Scientific	Common	SARA	ESA	G-Rank	S-Rank	
Plectrophenax nivalis	Snow Bunting			G5	SNA	
Podiceps auritus	Horned Grebe	SC	SC	G5	S1B S4N	
Regulus calendula	Ruby-crowned Kinglet			G5	S4B	
Troglodytes hiemalis	Winter Wren			G5	S5B	
Vireo solitarius	Blue-headed Vireo			G5	S5B	
Zonotrichia albicollis	White-throated Sparrow			G5	S5B	

Mammals

Several common mammal species were observed incidentally during field surveys in 2018, including: Eastern Grey Squirrel (*Sciurus carolinensis*), Eastern Chipmunk (*Tamias striatus*), and White-tailed Deer (*Odocoileus virginianus*). While surveys targeting mammals were not undertaken as part of this study, and background information regarding mammals in the area is lacking, given the habitat types present within the study area, additional species such as Groundhog (*Marmota monax*) Red Fox (*Vulpes vulpes*), Coyote (*Canis latrans*), Red Squirrel (*Sciurus vulgaris*), Virginia Opossum (*Didelphis virginiana*), Raccoon (*Procyon lotor*), Skunk (*Mephitis mephitis*), Meadow Vole (*Microtus pennsylvanicus*), Eastern Cottontail (*Sylvilagus floridanus*), bats, and the domestic housecat (*Felis catus*) are likely present.

Throughout 2017, a local resident conducted surveys throughout the study area and reported their observations to the GRCA which included: Beavers (*Castor canadensis*), Eastern Cottontail, feral and domestic cats, Red Fox, Muskrats (*Ondatra zibethicus)*, Virginia Opossum, Raccoons, squirrels, and White-tailed Deer.

Herpetofauna

Amphibian call surveys were conducted near wetlands within the study area to determine the presence and significance of breeding amphibian habitat within the study area. Surveys followed the standard protocol set out by the Marsh Monitoring Program (Bird Studies Canada, 2009). Surveys were conducted on still nights, typically during or immediately after rain. Parameters recorded during each survey include date, time, air temperature, wind speed, degree of cloud cover and level of precipitation and are summarized in **Table 5.33**. Amphibian call survey field data forms are located in **Appendix E-6**.

As illustrated in **Figure 5.112**, a total of six (6) stations were surveyed. Stations 1 and 4 were located along Mohawk Canal, at opposite ends of Mohawk Lake. Station 2 was located facing the swamp adjacent to Mohawk Park. Station 3 was located facing the upstream valley at the east end of Mohawk Lake, just west of Locks Road. Station 4 faced a cattail shallow marsh and an open aquatic pond. Station 5 faced a low-lying section of Manitoba Maple forest, which recieves temporary flooding.

At each call survey station, the intensity and number of calling amphibians were measured using call level and abundance codes, as outlined in the MMP. Codes are as follows:

Level 1: Calls are not simultaneous and calling individuals can be counted;
Level 2: Some calls are simultaneous but individual calls are distinguishable;
Level 3: Calls are continuous and overlapping.

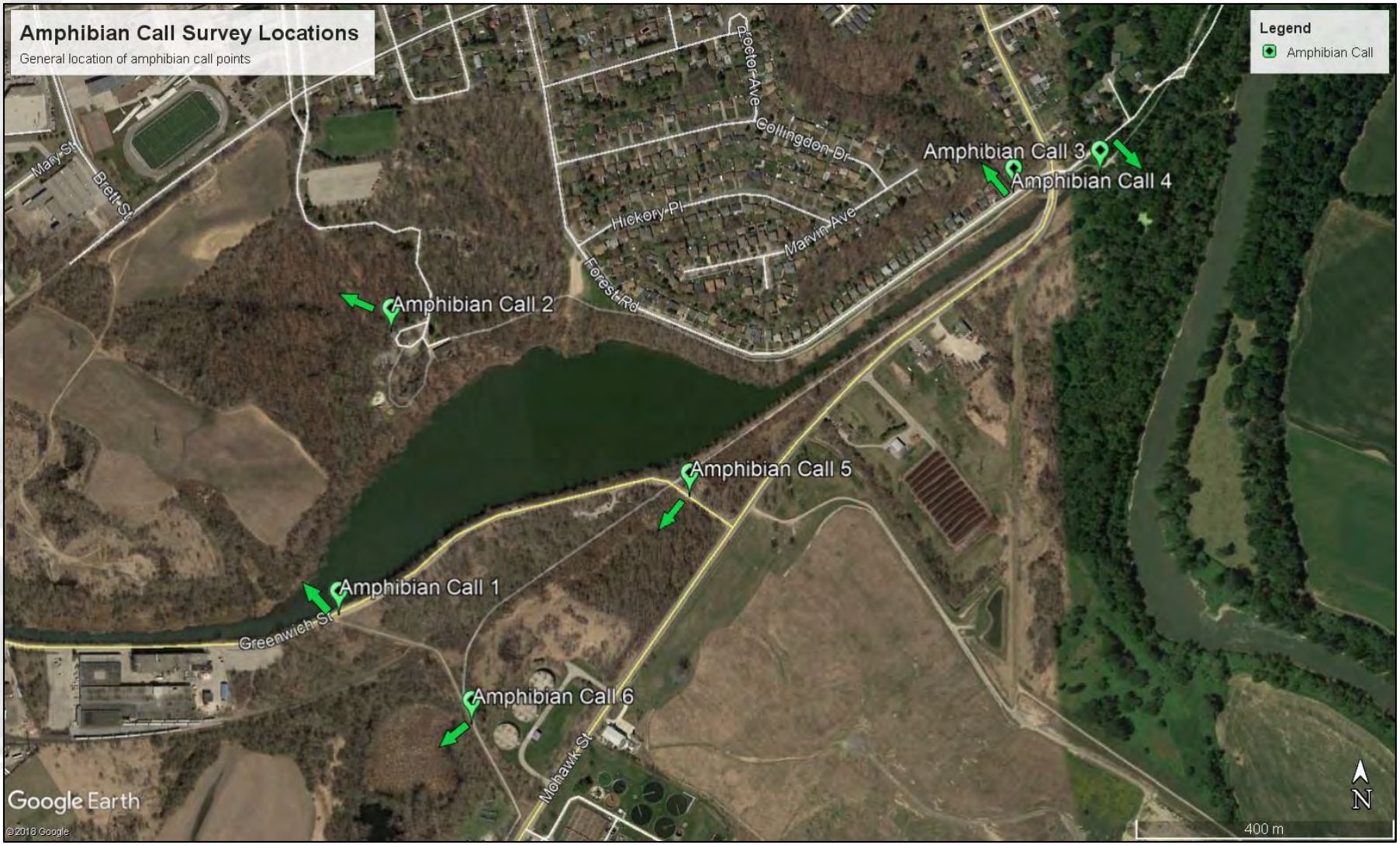


Figure 5.112: Amphibian Monitoring Station Locations Map

Table 5.33: Weather Conditions during Amphibian Call Surveys

Station #	Date/Time	Air Temp (°C)	Beaufort Wind Scale	Cloud Cover (10ths)	Precipitation
1	26-04-2018 21:55	7°C	0	0	None/Dry
	23-05-2018 22:04	21°C	0	0	None/Dry
	20-06-2018 22:16	20°C	0	3	None/Dry
2	26-04-2018 21:00	9°C	0	0	None/Dry
	23-05-2018 21:23	21°C	0	0	None/Dry
	20-06-2018 21:35	20°C	0	1	None/Dry
3	26-04-2018 21:15	8°C	0	0	None/Dry
	23-05-2018 21:32	21°C	0	0	None/Dry
	20-06-2018 21:43	20°C	0	1	None/Dry
4	26-04-2018 21:20	8°C	0	0	None/Dry
	23-05-2018 21:38	20°C	0	0	None/Dry
	20-06-2018 21:50	20°C	0	1	None/Dry
5	26-04-2018 21:31	7°C	0	0	None/Dry
	23-05-2018 21:55	21°C	0	0	None/Dry
	20-06-2018 21:58	20°C	0	3	None/Dry
6	26-04-2018 21:40	7°C	0	0	None/Dry
	23-05-2018 21:46	21°C	0	0	None/Dry
	20-06-2018 22:07	20°C	0	3	None/Dry

Aquafor Beech Limited staff completed three (3) surveys at each of the six (6) survey stations. In total, five (5) species were detected during surveys. Amphibian species recorded during surveys are summarized in **Table 5.34.**

Table 5.34: Summary of Anuran Species Recorded within the Study Area

Species		Ranking			
Scientific Name	Common Name	COSEWIC	COSSARO	G-Rank	S-Rank
Anaxyrus americanus	American Toad			G5	S5
Dryophytes versicolor	Gray Treefrog			G5	S5
Lithobates catesbeianus	American Bullfrog			G5	S4
Lithobates clamitans	Green Frog			G5	S5
Pseudacris crucifer	Spring Peeper			G5	S5

All species recorded are considered secure in Ontario. The highest call level recorded was 2; no full chorus was recorded. Detailed results of the surveys are contained in **Table 5.35**.

Table 5.35: Amphibian Call Survey Results

Survey	Station	Species Detected	Call Level Code	Count
1	1	No calls		
	2	No calls		
	3	No calls		
	4	Spring Peeper	1	2
	5	American Toad	2	4

Survey	Station	Species Detected	Call Level Code	Count
	6	No calls		
2	1	American Toad	1	3
	2	No calls		
	3	No calls		
	4	No calls		
	5	American Toad*	1	1
	6	Gray Treefrog*	1	2
		Spring Peeper	1	2
3	1	Green Frog	1	3
		American Bullfrog	1	1
	2	No calls		
	3	No calls		
	4	No calls		
	5	No calls		
	6	Green Frog	1	1

*Species recorded within wetlands outside of the 100 m survey station.

Outside of the breeding surveys, Aquafor Beech Limited biologists incidentally encountered anurans at several locations during other surveys in 2018. Large numbers of anurans were identified using habitat in Communities 21 and 24 (northeastern pond of the two in this community). These included large numbers of both American Toad and Green Frogs at each location.

5.10.8 Species at Risk and other Species of Conservation Concern

For the purpose of this study, Species at Risk (SAR) are defined as those designated Endangered, Threatened, or of Special Concern under either the SARA or ESA. Species of Conservation Concern (SOCC) are defined as species with Global Ranks of G1-G3; and species with Sub-national/Provincial ranks of S1-S3.

Species listed provincially as Endangered and Threatened receive “general habitat” protection under the ESA (2007). Important habitats of Special Concern and provincially significant species (i.e. S1-S3) are considered Significant Wildlife Habitat (SWH) and are thus protected under the City of Brantford’s OP.

Aquafor Beech Limited consulted a number of primary and secondary information sources to assess the presence of SAR and SOCC within the study area, including:

- species observed during field surveys;
- correspondence with MNRF staff regarding recent SAR records in the project area;
- MNRF list of SAR known to occur within Brantford (2018);
- occurrence records available from the Natural Heritage Information Centre (NHIC) Make-a-Map query database (1 km squares covering the study area and immediately adjacent lands);
- occurrence records available from public databases including the Ontario Nature Reptile and Amphibian Atlas (ONRAA) and eBird; and
- other background information sources including reports and policy planning documents.

Using all available sources, an aggregated list of SAR and SOCC was compiled. Using this list, Aquafor Beech Ltd. cross-referenced the habitat needs of each species with the habitat conditions present within the study area and adjacent lands. In total, 57 SAR and SOCC are included in the aggregated list. These include:

- 19 birds;
- 3 insects;
- 5 mammals;
- 12 plants;
- 6 reptiles;
- 8 mussels; and
- 4 fish

A detailed assessment of each species' potential to occur within the study area is contained in the SAR and SOCC Screening Table provided in **Appendix E-7**.

Confirmed within the Study Area

A total of seven (7) SAR and three (3) SOCC have been confirmed to be present within the study area. Each of these species is described below.

- **Barn Swallow (THR)** – Two (2) active Barn Swallow nests were documented beneath Mohawk Street bridge where it spans the Mohawk Lake outlet channel (BI-26). Several apparently inactive nests were also documented beneath the bridge. This species was also recorded foraging over Mohawk Lake (BI-4) and downstream of the bridge (BI-27), which may represent individuals from the colony breeding beneath the bridge (Terrastory 2018).

- **Chimney Swift (THR)** – Documented as "observed" during breeding bird surveys (Terrastory 2018) at four (4) stations (BI-1, BI-9, BI-18, BI-19). No artificial structures suitable for nesting and roosting were documented within the portions of the study area surveyed; it is possible that nesting could occur in chimneys of industrial buildings located within portions of the study area south of Mohawk Lake for which site access was not granted.

- **Eastern Wood-pewee (SC)** – Eastern Wood-pewee occurs at a relatively high level of abundance in the study area and was documented at seventeen (17) stations during breeding bird surveys (Terrastory 2018) in Communities 1, 2, 8, 9, 11, 15, 16, 18, and 20. At five (5) stations this species was recorded as a "possible" breeder based on one (1) record (visual or auditory) and no further evidence of breeding. At twelve (12) stations this species was recorded as a "probable" breeder largely based on records (visual or auditory) on two (2) separate occasions (i.e., the first and second round of breeding bird surveys) in approximately the same location. At station BI-9 a presumed pair was observed which strengthens the likelihood of breeding at this location.

- **Wood Thrush (SC)** – Wood Thrush was documented as a "probable" breeder at one (1) station (BI-1) (Communities 1 and 2) based on auditory records during the first and second round of breeding bird surveys (Terrastory 2018). Suitable habitat was present in forested areas throughout the study area.

- **Monarch (*Danaus plexippus*) (SC)** – Adult Monarchs were observed in Communities 17, 25, and 26 during field surveys in 2018. Common Milkweed (*Asclepias syriaca*), the obligate larval host plant of this species, was recorded in Communities 10, 11, 14, 17, 22, 25, and 26.

- **Pignut hickory (S3)** – While rare provincially, this species could be considered locally common; it was confirmed in Communities 1, 2, 4, 5, and 8 during the vegetation surveys undertaken in 2018. All of these communities are located north of Mohawk Lake, within Mohawk Park and in the valley system to the east.

- **Ohio buckeye (S1)** – This species was identified in Community 20 during the vegetation surveys undertaken in 2018. Two trees were found in a wooded area, south of the canal. One was a mature tree with a diameter at breast height (DBH) of 40 cm and the other was a young tree growing up in the understory with a DBH of 9.5 cm.

- **Tall boneset (S1)** – This species was identified in an open canopy area within the highly disturbed Community 11.

- **Blanding's Turtle (*Emydoidea blandingii*) (THR)** – Not identified during the surveys undertaken in 2018, but confirmed by MNRF to have a recent record (no date provided) within Mohawk Lake and/or the canal.

- **Snapping turtle (*Chelydra serpentina*) (SC)** – Snapping Turtle was identified using habitat in the Mohawk Canal upstream and downstream of Mohawk Lake during the surveys undertaken in 2018. Snapping Turtle was also confirmed as occurring in the Lake and canals by the MNRF. This species was also confirmed by MNRF to have a recent record (no date provided) within Mohawk Lake and/or the canal. In addition, numerous sightings have been recorded in the ONRAA public database (10 km square).

Potential to Occur within the Study Area

An additional fifteen (15) SAR, listed below, are considered to have the potential to occur within the study area based on habitat suitability and/or past occurrence records in the vicinity. None of the listed species were observed in the study area during the 2018 field investigations although this is not considered proof that the species does not or will not ever occur; lack of detection could also have occurred due to factors such as: the timing of field surveys; elusive behavior; or general difficulty in detection.

- **Bald Eagle (*Haliaeetus leucocephalus*) (SC)** – This species has been documented at Mohawk Lake and on surrounding lands via the eBird database on multiple occasions. Suitable perching and foraging habitat was present along Mohawk Lake and the canal; potential nesting habitat was present along the nearby Grand River.

- **Golden-winged Warbler (*Vermivora chrysoptera*) (SC)** – Potentially suitable early successional habitat for this species was associated with Community 11 west of Mohawk Lake and in the utility corridor and adjacent disturbed woodlands south of Mohawk Lake.

- **Northern Bobwhite (*Colinus virginianus*) (END)** - Potentially suitable habitat was present in Communities 10 and 11 west of Mohawk Lake.

- **Red-headed Woodpecker (*Melanerpes erythrocephalus*) (SC)** – This species was documented at Mohawk Lake via the eBird database as recently as 2017 (breeding status was not provided, although it was not observed during the June-July core breeding season). Potentially suitable habitat was present in natural areas throughout the study area.

- **Yellow-breasted Chat (*Icteria virens*) (END)** – There are no observation records of this species in the vicinity of the study area in the eBird database. However, potentially suitable habitat was located in Communities 10 and 11 west of Mohawk Lake, and this species could feasibly be encountered in the study area in the future.

- **Rapids Clubtail (*Gomphus quadricolor*) (END)** - Marginally suitable habitat was located along watercourses and the edges of Mohawk Lake within the study area, though this species is more likely to be associated with the nearby Grand River.

- **American Badger (*Taxidea taxis*) (END)** - No sightings or evidence (e.g., burrows) of this species were documented in the study area during the 2018 field investigations. The only potential habitat was located in Communities 10 and 11 west of Mohawk Lake. The high level of human activity in these units decreases the likelihood that American Badger will occupy the habitat; however, it is possible that this species could be present.

- **SAR bats (END)** – Summer (i.e., maternity/roosting) habitat for the four SAR bat species found in Ontario could potentially be present in the study area. Woodlands are present throughout the site, and may potentially provide the necessary habitat features (i.e., tree snags with cracks, crevices, cavities, loose bark, etc.) for bats.

- **Butternut (*Juglans cinerea*) (END)** - Not identified during the vegetation surveys undertaken in 2018; however, several young walnuts (*Juglans* sp.) were found in Communities 10 and 11 that exhibited some signs of butternut hybridity but had not yet developed enough features to be fully assessed as hybrid. No parent butternut tree was found.

- **Eastern Ribbonsnake (*Thamnophis sauritus*) (SC)** - Potentially suitable habitat for this species in the study area includes all riparian areas adjacent to wetlands.

- **Rainbow Mussel (*Villosa iris*) (SC)** - Potentially suitable habitat was present within the study area and host fish for glochida were observed during fish community surveys (largemouth bass and rock bass) though in extremely low numbers compared to other species. However, Mohawk Lake displays characteristics of a lacustrine setting with extremely low dissolved oxygen which the species requires. Suitable habitat for this species was found in the Grand River downstream of Mohawk Lake.

- **Round Pigtoe (*Pleurobema sintoxia*) (END) -** Potentially suitable habitat was present within the study area and host fish for glochida were observed during fish community surveys (bluntnose minnow and bluegill). However, Mohawk Lake displayed characteristics of a lacustrine setting with decreased water quality from siltation and pollution which threatens this species. Suitable habitat for this species was found in the Grand River downstream of Mohawk Lake.

- **Wavy-rayed Lampmussel (*Lampsilis fasciola*) (THR)** - Potentially suitable habitat was present within the study area and host fish for glochida were observed during fish community surveys (largemouth bass) though in extremely low numbers compared to other species. However, Mohawk Lake displayed characteristics of a lacustrine setting with low flow and unstable substrate.

5.10.9 Significant Wildlife Habitat within the Study Area

The province has provided guidance for the identification and assessment of Significant Wildlife Habitat (SWH). In Brantford, the primary document used to identify SWH is the Technical Guide for Ecoregion 7E (MNRF, 2015). SWH is protected under the Provincial Policy Statement (2014) and the City's Official Plan (2016).

The corresponding detailed SWH screening assessment is located in **Appendix E-8**. A summary of SWH within the study area, as displayed in **Figure 5.113**, is as follows:

Confirmed SWH

Rare Vegetation Communities

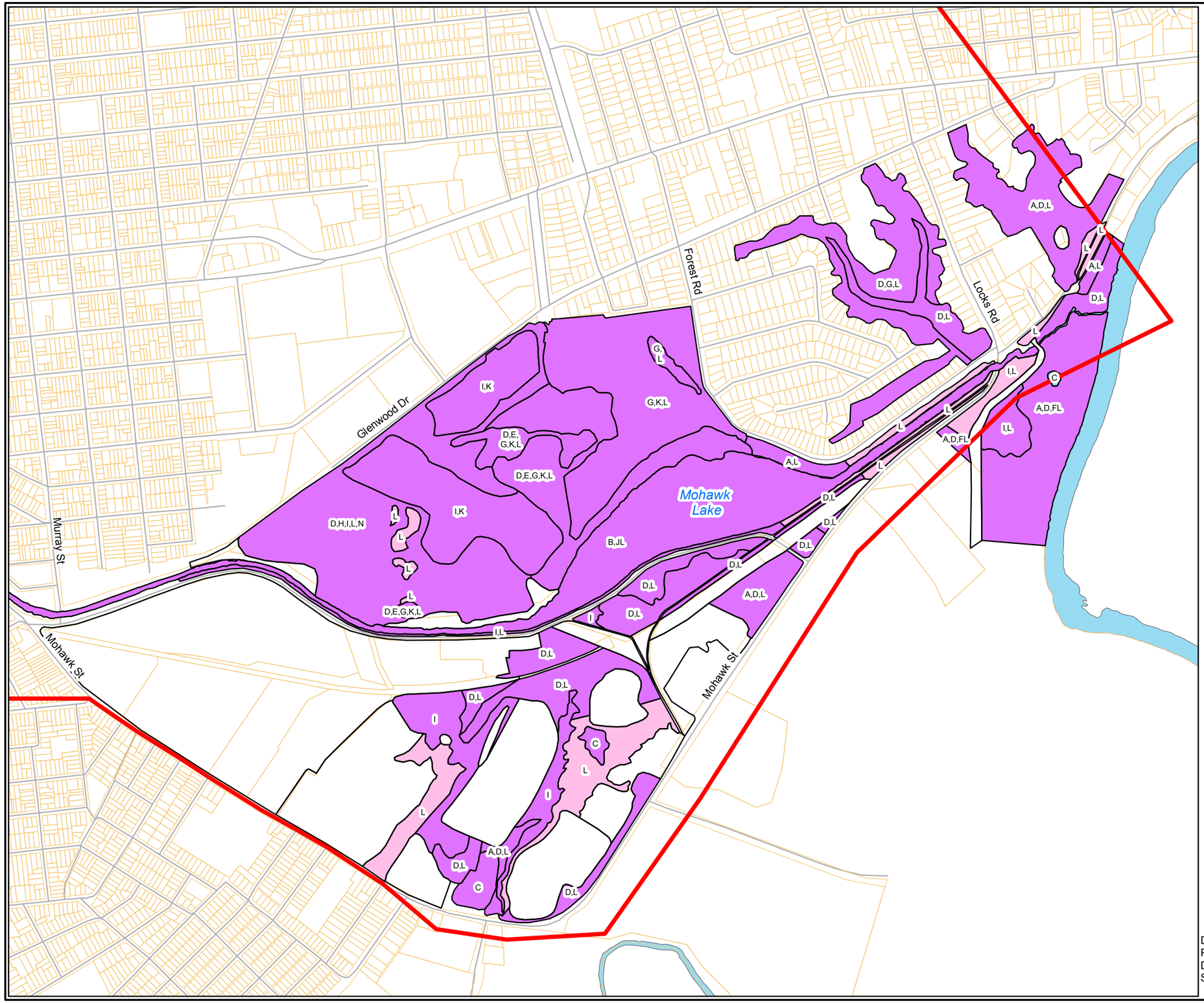
Black Walnut Lowland Deciduous Forest (FOD7-4), which is ranked S2S3 in Ontario, was documented within the study area in Vegetation Communities 6 (narrow strip along north shore of Mohawk Lake), 18 (assessed from edge – permission to enter not granted), and 20 (where it is one of two community types existing within a complex mosaic). Each of these communities was highly disturbed. It is expected that this community type may have historically been more common along the lower valley slopes and lowlands surrounding Mohawk Lake.

Bald Eagle and Osprey Nesting, Foraging and Perching Habitat

Osprey is a confirmed breeding bird in the study area, and Bald Eagle has also been documented in the area at large on multiple occasions. The Osprey nest was located on a telecommunications tower south of Mohawk Lake, and therefore does not qualify as SWH per the criteria excluding man-made structures. However, even excluding the nest itself, Mohawk Lake and associated drainage features provide suitable foraging and perching habitat for both species.

Amphibian Breeding Habitat (Wetlands)

American Bullfrog breeding habitat was documented during amphibian call surveys at station #1, located in Mohawk Canal west of Mohawk Lake. The presence of breeding American Bullfrog confirms SWH in shoreline wetlands in this area. In addition, large numbers of Green Frog and American Toad were observed incidentally by Aquafor Beech Staff during field surveys in 2018 at Communities 21 and 24 (the northwest pond of two). Therefore, both of these areas also constitute SWH.



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Road Centrelines
- Confirmed Significant Wildlife Habitat
- Candidate Significant Wildlife Habitat
- Waterbody
- Property Parcels
- Study Area

Specialized Wildlife Habitat:
A: Rare Vegetation Communities
B: Bald Eagle and osprey Nesting, Foraging, and Perching Habitat
C: Amphibian Breeding Habitat
D: Eastern Wood-pewee
E: Wood Thrush
F: Ohio Buckeye
G: Pignut Hickory
H: Tall Boneset
I: Monarch
J: Snapping Turtle
K: Raptor Wintering Area
L: Bat Maternity Colonies
M: Turtle Wintering/Nesting Areas
N: Bird Breeding Habitat

Figure: 5.113

Significant Wildlife Habitat

0 150 300 600
Meters

N

Date: September 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford, MNRF

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Specialized Habitat for Wildlife: Special Concern and Rare Wildlife Species

Special Concern and provincially rare species observed or documented in the study area include:

- Eastern Wood-pewee (SC) (Communities 1, 2, 8, 9, 11, 15, 16, 18, and 20)
- Wood Thrush (SC) (Communities 1 and 2)
- Ohio Buckeye (S1) (Community 20; south of Mohawk Canal only)
- Pignut Hickory (S3) (Communities 1, 2, 4, 5, and 8)
- Tall Boneset (S1) (Community 11)
- Monarch (SC) (Communities 10, 11, 14, 17, 22, 25, and 26)
- Snapping Turtle (SC) (Community 3)

Potential SWH within the Study Area

Raptor Wintering Area

ELC Community 10 in combination with the adjacent forest Communities 1, 2, and 4 could potentially provide suitable raptor wintering habitat. Together, this area north of Mohawk Lake includes idle field with adjacent woodlands comprising an area greater than 20 ha.

Bat Maternity Colonies

There is potential for bat species to be using treed habitats within the study area as maternity roosting habitat. This includes Communities 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 18, 20, 22, and 23. While use by bats is not known, and further studies would be required to confirm which if any of these habitats is used for bat maternity roosting.

Turtle Wintering Areas & Turtle Nesting Areas

Suitable overwintering habitat for turtles may be present in Mohawk Lake and other ponds/wetlands containing permanent standing water, and suitable nesting habitat may be present in adjacent habitats (e.g., slopes, shorelines, roadsides, and upland areas with exposed sandy soil). While neither turtle hibernation nor nesting has been confirmed within the study area, snapping turtle has been confirmed using habitat in Mohawk Canal and Mohawk Lake by Aquafor Beech Limited and MNRF staff. Northern Map Turtle has not been confirmed within Mohawk Lake / Canal; however, the Ontario Nature Reptile and Amphibian Atlas contains numerous records of this species in the 10 km square containing the study area.

Reptile Hibernaculum

No potential hibernacula were documented during field investigations. However, due to the size of the study area additional surveys would be required to confirm the absence of candidate habitat. No Talus, Rock Barren, Crevice, Cave, or Alvar community types are present within the study area; however, there is potential for hibernaculum that may occur in burrows, rock piles, old stone fences, abandoned crumbling foundations, and wetlands.

Shrub/Early Successional Bird Breeding Habitat

Target species were not observed in suitable numbers during breeding bird surveys. However, Vegetation Community 11 consists of a cultural thicket-woodland complex which meets the 10 ha size requirement for candidacy and could support suitable breeding populations of target species in future.

5.10.10 Discussion and Conclusions

The 2018 terrestrial field surveys included vegetation community classification, botanical inventory, breeding bird surveys, anuran call surveys, SAR and SOCC identification, and significant wildlife habitat identification. The following summarizes the key observations of the terrestrial field surveys:

- The field work completed within the study area in 2018 identified 26 ELC polygons comprised of 23 vegetation community types; five (5) of which represent complex communities.
    - The study area contains a wide variety of community types ranging from highly disturbed industrial lands to agricultural fields, areas used recreationally (trails, etc.), and natural forests and wetlands. One of the vegetation community type is considered to be provincially significant: Fresh – Moist Lowland Black Walnut Deciduous Forest (S2S3).
    - No prairies habitats were identified within the study area.
- A botanical inventory conducted as part of the 2018 field program indentified 260 species to species level with an additional 15 identified to genus
    - Of the 260 species, 179 (69%) are native; the other 81 (31%) are introduced. No SAR were found during the botanical inventory. Four provincially significant species (S1-S3) were identified.
- A total of sixty-two (62) bird species were recorded during the breeding bird surveys, four (4) are Species at Risk and one (1) is considered provincially rare.
- Three (3) amphibian call surveys were completed at each of the six (6) survey stations. In total, five (5) species were detected during surveys.
- A total of seven (7) SAR and three (3) SOCC have been confirmed to be present within the study area.
    - An additional fifteen (15) SAR are considered to have the potential to occur within the study area based on habitat suitability and/or past occurrence records in the vicinity.
- Significant wildlife habitat confirmed within the study area includes: Rare Vegetation Communities; Bald Eagle and Osprey Nesting, Foraging and Perching Habitat; Amphibian Breeding Habitat (Wetlands); and, Specialized Habitat for Wildlife: Special Concern and Rare Wildlife Species.

5.10.11 Recommendations

The Mohawk Lake and Oxbow Wetlands evaluation should be updated to include recent SAR records; the results of this evaluation would change the status of the wetland complex making it a Provincially Significant Wetland (PSW) pending review/confirmation by MNRF and/or GRCA.

5.11 SEDIMENT ASSESMENTS

As part of the Characterization Study, a detailed evaluation of the sediment within Mohawk Lake and canal system was undertaken which included detailed bathymetric surveys, sediment depth profiling and sediment sampling in order to determine the quantity and quality of unconsolidated sediment within the lake and canals in addition to the potential rate of accumulation over time.

5.11.1 Background

The subsections below present the findings of the background review related sediment quantity and quality completed as part of the Characterization Study.

Sediment Quantity

In 1972, Dillon and Associates completed bathymetry mapping of Mohawk Lake; the surveyed cross-sections can be seen in **Figure 5.114**. The results of the surveying determined that the sediment deposits varied in thickness with an average thickness of approximately 2.5m at the lake inlet, with an average depth of 0.9-1.2m in the lake. Sediment analysis performed indicated that material in the canal section at the mouth of the lake was classified as a dark brown organic sandy silt with obviously organic content, while the predominant sediment deposits in the Lake were organic clayey silts. The volume of lake sediments was determined to be approximately 168,000m^3.

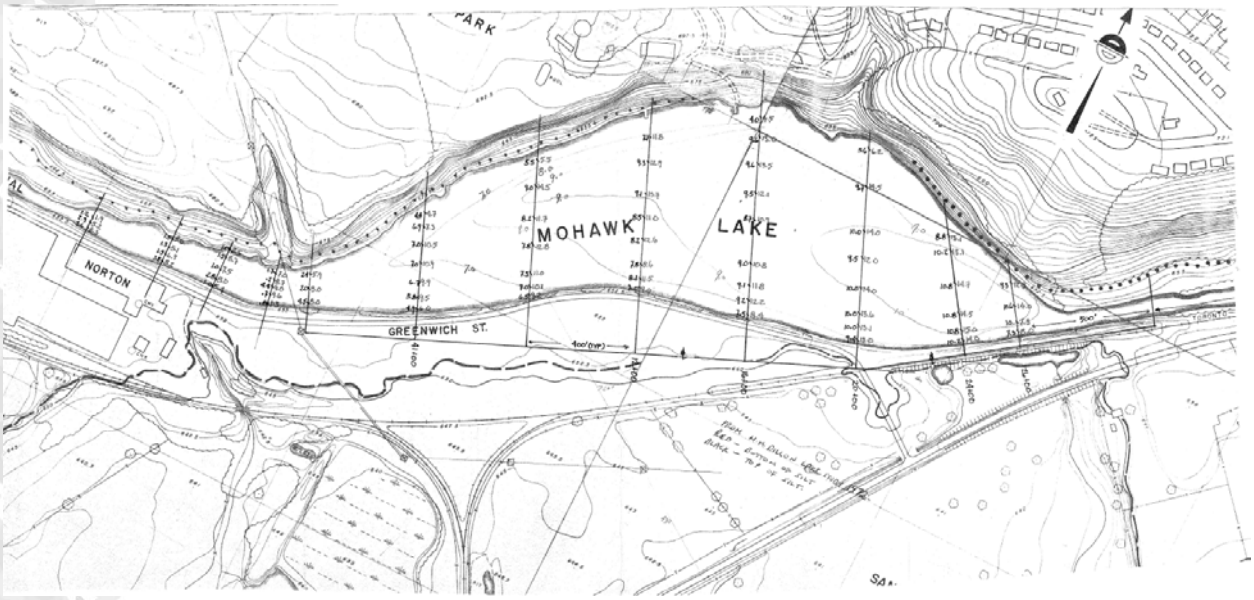

Figure 5.114: Historical Bathymetric Survey

Ecological Planning Services (1994) completed a water and sediment quality study of Mohawk Lake during the winter of 1994. Water and sediment depths were measured at 132 stations, with sediment depths varying up to 2.3m. The sediment profile revealed an upper (<20-30cm) horizon of poorly consolidated organic-rich odoriferous material underlain by a more compact horizon of dark brown, silty sand. The total volume of sediment was estimated to be 60,000 dry tonnes or 300,000m^3 in-place. The in-place sediment in the East Canal was estimated at approximately 4,300m^3.

The Gore and Storrie (1995) Report reviewed sediment sources to Mohawk Lake. It found that historically sediment accumulation in Mohawk Lake predominately resulted from the Grand River having formerly been connected to the Grand River directly upstream of the former Lorne Dam. Since the connection from

the Grand River to the West Canal was closed in 1983, stormwater discharges, surface runoff and erosion within the subwatershed were considered to continue as the primary sediment sources.

In 1981, 0.9-1.2m of sediment was dredged from the canals, and by 1995 significant volumes of sediment had re-accumulated to approximately 1.0m in thickness due to the canal's low hydraulic gradient. In 1995 the sediment in the lake was reported to have increased in depth towards the central portion of the lake, where the greatest accumulation occurred along with the western edge. Sediment depths ranged from less than 1m to over 2m in the centre of the lake. The sediment in the East Canal was approximately 0.5m deep.

According to the Ecological Planning Services (1994) and comparisons made with the 1972 Report by Dillon and Associates, the volume of sediment in the lake has continued to increase over time from an estimated volume of 168,000m^3 in 1972 to 300,000m^3 by 1994.

In 1983 another study by Roff, Emerson, Dorey and Bisset was completed for Mohawk Lake. The sediment characteristics revealed during this study indicated a small overall size of sediment particles and saltation was determined to be an insignificant portion of the total sediment loading reaching Mohawk Lake. After examining the TSS entering the Mohawk Canal from East Ward Creek and the storm sewers when compared to the outflow, it was determined that 3.07x10^5 kg/yr entered Mohawk Lake every year, which is equivalent to 116 to 192m^3/year (depending on sediment density).

Sediment Quality

In general, the sediment from the Lake and Canal has been classified as marginal (i.e. polluted for the majority of parameters). The principle source of pollutants to the lake was previously determined to be from historic sediments introduced during a century of industrial dumping of waste material in and adjacent to the canals (Conestoga Rovers, 2006). Stormwater runoff feeding Mohawk Lake was also determined to be a continual source of sediment and pollutants including heavy metals which end up in the storm sewer system through runoff from urban areas. From the review of the background information, the following key findings in regards to sediment quality were identified:

- The 1994 Ecological Services for Planning study included sediment quantity and quality analysis. The average 1.5-2.0m thick sediment profile revealed an upper (<20-30cm) horizon of poorly consolidated organic-rich odoriferous material underlain by a more compact horizon of dark brown, silty sand. Lake sediment samples showed elevated levels of metals in the uppermost layer (<65cm). The concentrations of cadmium, copper, mercury, and nickel exceeded the Provincial Sediment Quality Guidelines (PSQG) 'Lowest Effect Level' concentrations. Lead and zinc exceeded the PSQG 'Severe Effect Level' guideline; this guideline was used by the MOECC as an indicator of the need to conduct additional biological assessment to determine if the elevated concentrations were having or were likely to have a harmful effect on the aquatic environment. PCB's, PAH's and organochlorine insecticides were detected in trace amounts while phenol concentrations were all below analytical detection limits. The sediment typically contained 0.5-1% petroleum hydrocarbons. Ultimately the lake sediment was deemed 'non-hazardous' based on Ontario Reg. 347 Leachate Extraction Tests. The sediment in the upstream canal was recommended for removal as it continued to transport pollutants into the lake.
- The Mohawk Lake Sediment Dredging Pilot Test (1995) described the sediment in the lake bed as organic silt. The sediment contained heavy metals, petroleum hydrocarbons, and polyaromatic hydrocarbons in concentrations above background levels typical of lake sediments. It was determined that the contaminant concentrations were generally below the "severe effect"

classifications provided by MOEE aquatic sediment quality guidelines. Tissue analysis conducted by the MOEE in 1994 found no significant bioaccumulation of lead or other contaminants in the fish in Mohawk Lake.

- Conestoga Rovers (2006) lab testing of the sediment in the canal upstream of the lake revealed high levels of petroleum hydrocarbons, heavy metals (lead, copper, mercury, nickel, and zinc), polyaromatic hydrocarbons (PAH), and polychlorinated biphenyl (PCB's). There were exceedances of some of these parameters in the levels allowed in the *Guidelines for Use at Contaminated Sites* and in the *Provincial Sediment Quality Guidelines*. Due to the nature and concentration of contaminants in the sediment in the canal upstream of the lake, disposal in a licensed landfill were suggested. Contaminants found in canal sediment are also found in the lake sediment but at lower concentrations and could allow for disposal on land to be used for residential and park purposes per Conestoga Rovers (2006). It was determined that the contaminant concentrations, as well as the quantity of sediments accumulated in the West Canal were typical of an urban stormwater retention pond receiving run-off from areas of residential and industrial land uses.

Multiple studies have determined that the lake sediment contaminant concentrations will continue to be a source of contaminants to the overlying water column if not removed.

5.11.2 Field Study Scope and Methodology

The following sections overview the work plans and methodologies followed as part of the sediment assessment completed for the Characterization Report.

Sediment Quantity

Static water depths and the thicknesses of unconsolidated sediments throughout Mohawk have previously been measured by Ecological Service for Planning Ltd (1994), M.M. Dillon (1972) and Sandilands (1972) in earlier ecological and remedial engineering studies of the lake (Ecological Service for Planning Ltd, 1994). Methodologies for completing the works varied as did the estimations of accumulated sediment. Previous sediment accumulation estimations include:

1. Ecological Services for Planning, 1994: Estimated 300,000m^3
2. Dillon, 1972: 168,200m^3

A bathymetric survey and sediment profiling was completed as part of the Characterization Study to update the surveys completed previously and confirm existing sediment quantities and sediment distribution.

The bathymetric surveys and sediment profiling followed the "rod and measure" approach where the top of sediment and the depth of water column above it was measured as was the thickness of sediment. The thickness of the sediment was determined by pushing the rod to its termination and measuring the difference from the top of sediment measurements. The bathymetric survey efforts were limited to the permanent water areas of the lake and canals with the primary objective of characterizing the top and bottom surfaces of the sediment layers within the canals and lake. The surveys and sediment profiling was complete using GPS survey equipment. The original work plan for the bathymetric surveys included the completion of cross-sections every 20m along the canals and Lake with points collected along each cross-section every 3.0 to 5.0 m, as seen in **Figure 5.115**. However, further detail was ultimately collected. The actual survey points taken within the lake and canal system are shown on **Figure 5.116**

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Topographic & Bathymetric Survey Cross Sections
- Watercourse
- Road Centrelines
- Study Area
- Property Parcels
- Waterbody

Figure: 5.115

Topographic & Bathymetric Work Plan

0 150 300 600

Meters

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Figure 5.116: 2018 Mohawk Lake Survey Points

Sediment Quality

The sediment investigation completed as part of the Characterization Study included the goal of determining/confirming the environmental quality of the sediment within the lake and canal system. Pollutech Enviroquatic Limited was retained to complete the sediment sampling program. The following section overviews the methodology and work plan completed as part of the sediment quality sampling program. For full details of the work plan refer to **Appendix F-1**.

In general, the 2018 sediment quality investigation included the collection of surficial sediment and sediment core samples at twenty (20) locations within Mohawk Lake and canals. Site selection was based on the results of the bathymetric survey completed for the lake and canals. For the purposes of the sediment quality investigation, Mohawk Lake and canal was sub-divided into three areas as follows:

- Zone 1 = Mohawk Lake
- Zone 2 = Mohawk Canal West
- Zone 3 = Mohawk Canal East

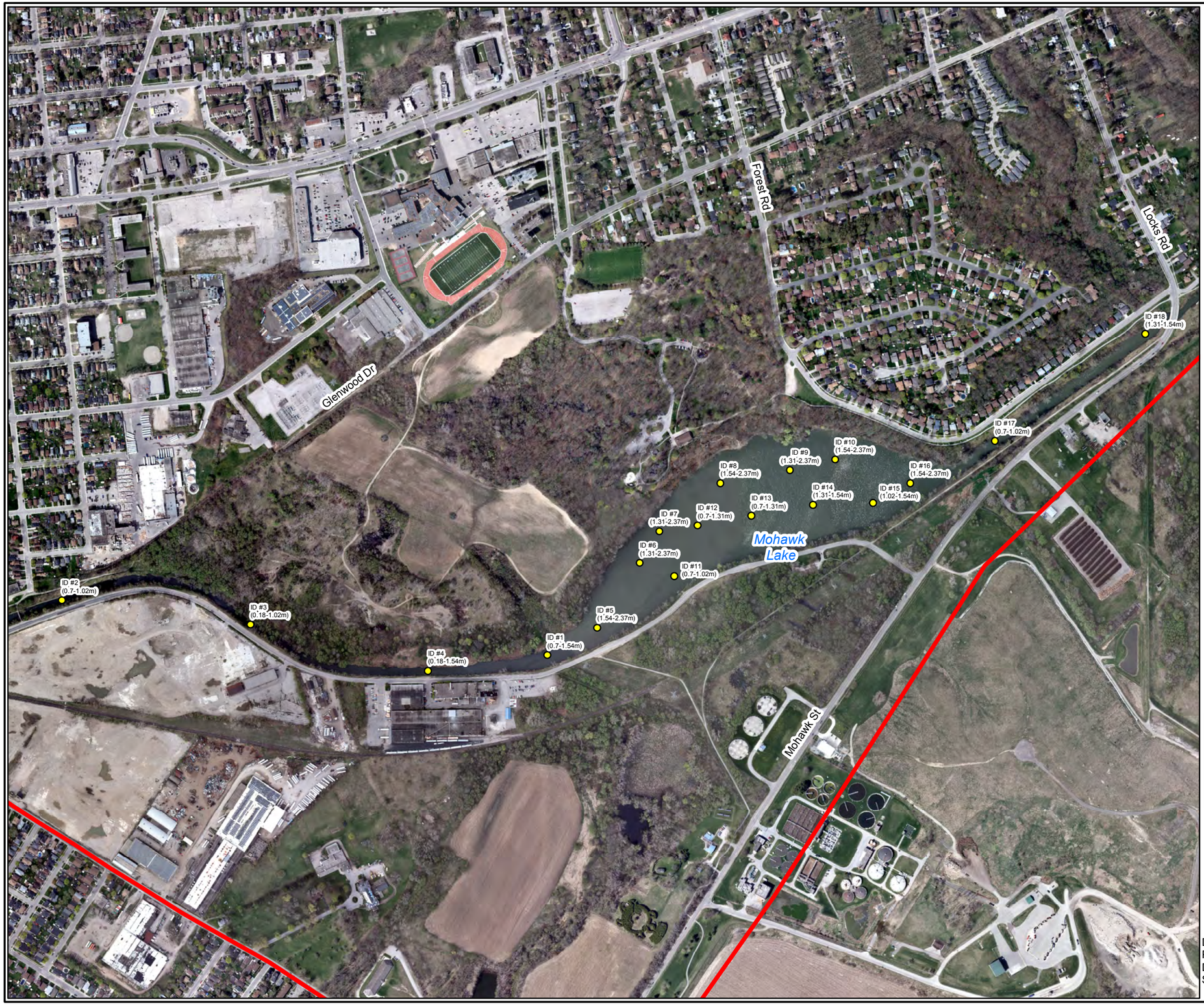
Sampling locations were distributed throughout the various zones based on the relative size of each zone and approximate position of each of the sampling locations was based on the 2018 bathymetric survey results. In summary, twelve (12) sampling locations were established within Mohawk Lake; four (4) were established within the west canal, and two (2) locations were established within the east canal. An additional two sampling locations were included for quality assurance/quality control (QA/QC) purposes from within Mohawk Lake. A total of twenty (20) sampling locations in which both surficial and sediment core sampling was completed. **Figure 5.117** demonstrates the approximate sample locations**.**

Two (2) different sample collection methods were used to collect the required sediment samples at each location. Surficial samples (0-10cm) were collected via Petite Ponar; whereas the deeper sediments 10 cm to a maximum depth of 1.5 m were collected via core sampling via Pollutech's hammer core technique. At each location, three (3) distinct samples were collected/formed (i.e., one (1) surficial sample and two (2) samples representing two (2) distinct depth intervals) for a grand total of 60 individual samples. Sediment cores were segregated to characterize two (2) depth intervals. For core samples collected to a depth of 1.0 m, the core samples were segregated into increments of 10-55 cm and 55-100 cm. Core samples collected to a depth of 1.5m were segregated into increments of 10-75 cm and 75- 150 cm. In both cases, the top 10 cm of the core samples were excluded as this increment was collected during the surficial sampling. During sampling an individual field log sheet was completed for the surficial and sediment core samples, respectively. Log sheets are provided in **Appendix F-1**.

Upon the completion of the surficial and core sample collection and processing, all samples were submitted for chemical analyses. Once daily, the core samples were shipped (in chilled coolers) under chain-of- custody to ALS Laboratories (ALS), in Waterloo for the required chemical analysis. Standard laboratory testing protocols were followed to analyze the samples for key parameters contained in the July 2011 "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Ontario Regulation 153/04, including, but not limited to:

- E. Coli, Total Coliform, Polycyclic Aromatic Hydrocarbons (16 priority PAHs); Petroleum Hydrocarbons (PHCs) F1 to F4; Metals and Inorganics; Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX); Volatile Organic Compounds (EPA 624); Conductivity, pH, Hardness (as CACO3), Sodium Adsorption Ratio (SAR); Chlorides, grain size analysis w/ %sand, %silt, %clay, % solids, Organochlorine Pesticides and PCBs, Total Phosphorus, Dissolved Phosphorus, Total Nitrogen, Nitrates, TOC and TSS.

Three (3) samples were tested using Ontario Regulation 347 Schedule 4 Leachate Quality (TCLP) to determine the waste classification (hazardous or non-hazardous) for appropriate off-site disposal. Lead 210 and radiocarbon dating was also completed as part of the coring process, as discussed in Section **5.9.2**.



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Sediment Sampling Locations
- Study Area

Figure: 5.117

Sediment Sampling Locations

0 95 190 380

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

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5.11.3 Results, Discussion & Conclusions

Sediment Quantity

The bathymetric survey results were digitized to develop a digital terrain model of the top of sediment and unconsolidated lake bottom. A cut/fill analysis was completed which evaluated the two surfaces developed in order to estimate the amount of accumulated unconsolidated sediment within Mohawk Lake and canals. The results of the analysis are as follows:

- Approximately 185,000m^3 of unconsolidated sediment has accumulated within Mohawk Lake and canals:
    - Unconsolidated sediment accumulation within the canals was estimated at 30,000m^3.
    - Unconsolidated sediment accumulation within Mohawk Lake was estimated at 155,000m^3.
- Sediment thickness within the canals ranged from 0 - 1.5m whereas sediment thickness within Mohawk Lake ranged from 0 - 2.4m.
- Water depth within the canals ranged from 0 – 1.0m whereas water depths within Mohawk Lake ranged from 0 – 2.5m.

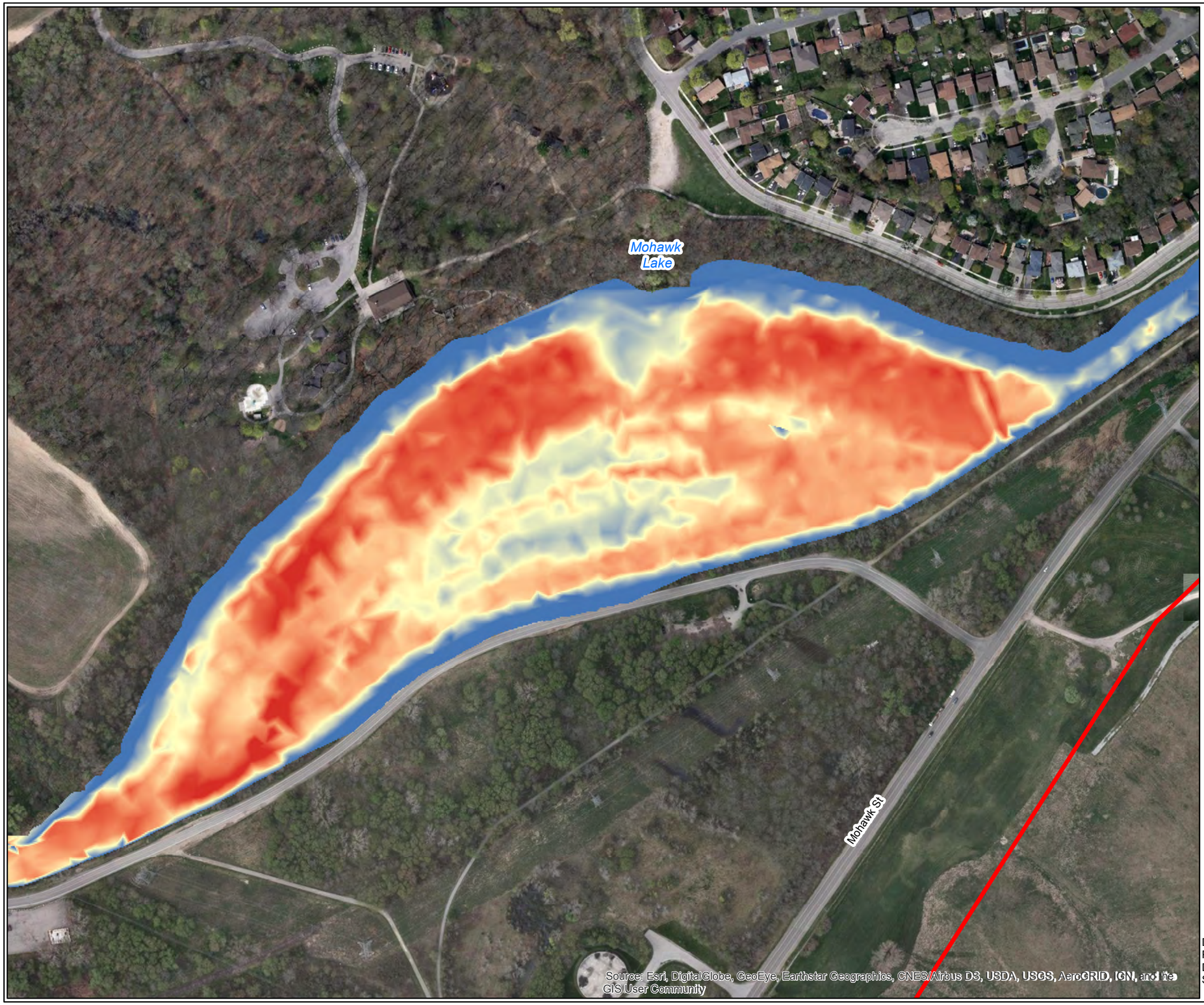
In 1972, Dillon and Associates, reported that the sediment deposits varied in thickness with an average thickness of approximately 2.5m at the lake inlet and average thickness of 0.9-1.2m in the lake. Per the Ecological Planning Services (1994) report, the greatest accumulations of sediments were previously situated in the center of the lake (2.3- 2.5 m) and in its western one-third. At the eastern end of the lake where the deepest water has been previously measured, the unconsolidated sediments average 1.6-1.8 m in thickness. Similar sediment thickness ranges were found in 2018, where the lake sediment ranged up to 2.4m with the majority of sediment accumulation occurs at the inlet/western one-third of the lake. Contrary to the 1994 observations, the 2018 sediment thickness seem to have redistributed slightly from the center of the lake toward the north half of the Lake. **Figure 5.118, Figure 5.119,** and **Figure 5.120** display the thickness and distribution of unconsolidated sediment within Mohawk Lake and canals.

Figure 5.121 demonstrates the 2018 bathymetry of Mohawk Lake. The bathymetric shows that Mohawk Lake progressively gets deeper from west to east with the deepest portion of the Lake located at the eastern limits near the east canal. **Figure 5.122** shows the water depths mapped during the completion of the Ecological Planning Services (1994) report. The 1994 water depths and general bathymetry of Mohawk Lake show similar results as compared to the 2018 bathymetric results where the deepest portion of the Lake (>2.5m) is located at the eastern limits near the east canal and gradually decrease in depth towards the west canal.

The Ecological Planning Services (1994) report evaluated the cumulative water and sediment depth data to determine the approximate profile of the original (dredged) lake bottom. It was reported that the deepest zone of the lake (>4.0 m) formed a band approximately 60-70 metres wide which extended from the middle of the lake, east - towards the east canal. **Figure 5.123** show the results of the 1994 analysis. A similar analysis was completed in 2018 for determining the bathymetry of the original (dredged) lake bottom. The 2018 results (as shown in **Figure 5.124**, **Figure 5.125**, and **Figure 5.126**) demonstrate similar results with the same general band being shown along the middle portion of the lake which reached depths of approximately 4.4m. In general, the 1994 and 2018 data show similar results for the bottom of unconsolidated sediment/original (dredged) lake bottom.

The 2018 estimate of volume of unconsolidated sediment aligns closer with the 1972 reported volume; however, the 2018 results for general Lake bathymetry, water depth, distribution of sediment, sediment

thickness and mapping of the unconsolidated sediment/original (dredged) lake bottom are comparable to the 1994 assessment. The reasons for the wide range in estimated sediment volume compared to the various sediment quantity assessment completed previously remains unclear. Without knowing the details and assumptions of the volumetric analyses completed in 1972 and 1994, a detailed evaluation to determine where discrepancies between the analyses may exist was not possible. Overall, the level of survey detail has significantly increased when compared to the historical surveys; the 2018 survey included thousands of points versus the approximately 60 and 130 points used in the 1972 and 1994 bathymetric survey, respectively.



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Sediment Depth (m)

High : 2.33

Low : -0.37

Figure: 5.118

Existing Lake & Canal Bathymetry
Mohawk Lake

0 37.5 75 150

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Sediment Depth (m)

High : 2.33

Low : -0.37

Figure: 5.119

Existing Lake & Canal Bathymetry
East Canal

0 30 60 120

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Sediment Depth (m)

High : 2.33

Low : -0.37

Figure: 5.120

Existing Lake & Canal Bathymetry
West Canal

0 75 150 300

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Elevation (m)

High : 198.341

Low : 195.386

Figure: 5.121

Existing Lake & Canal Bathymetry
Mohawk Lake

0 37.5 75 150

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

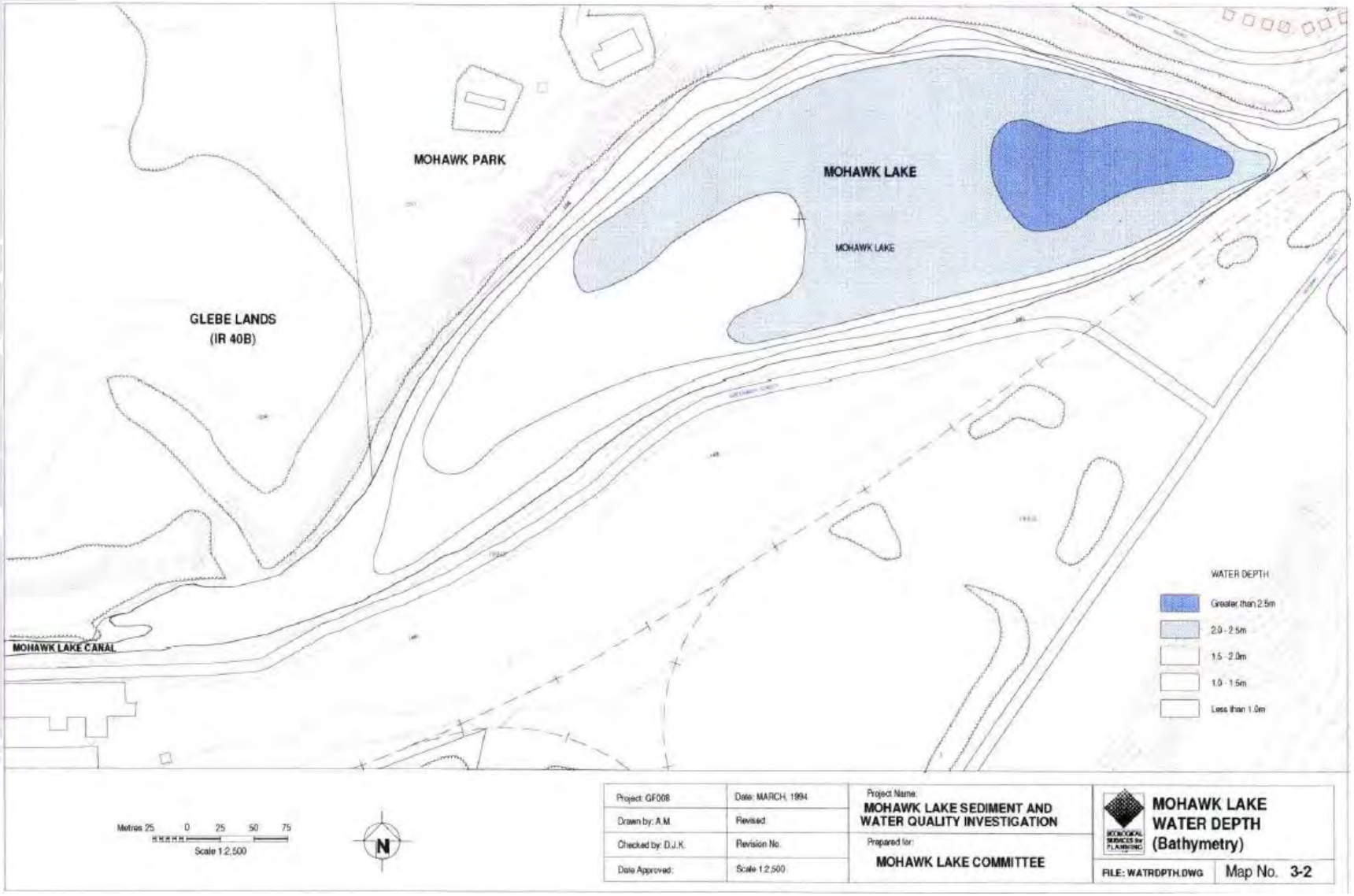

Figure 5.122: Mohawk Lake Water Depths/Bathymetry (Ecological Planning Services (1994)

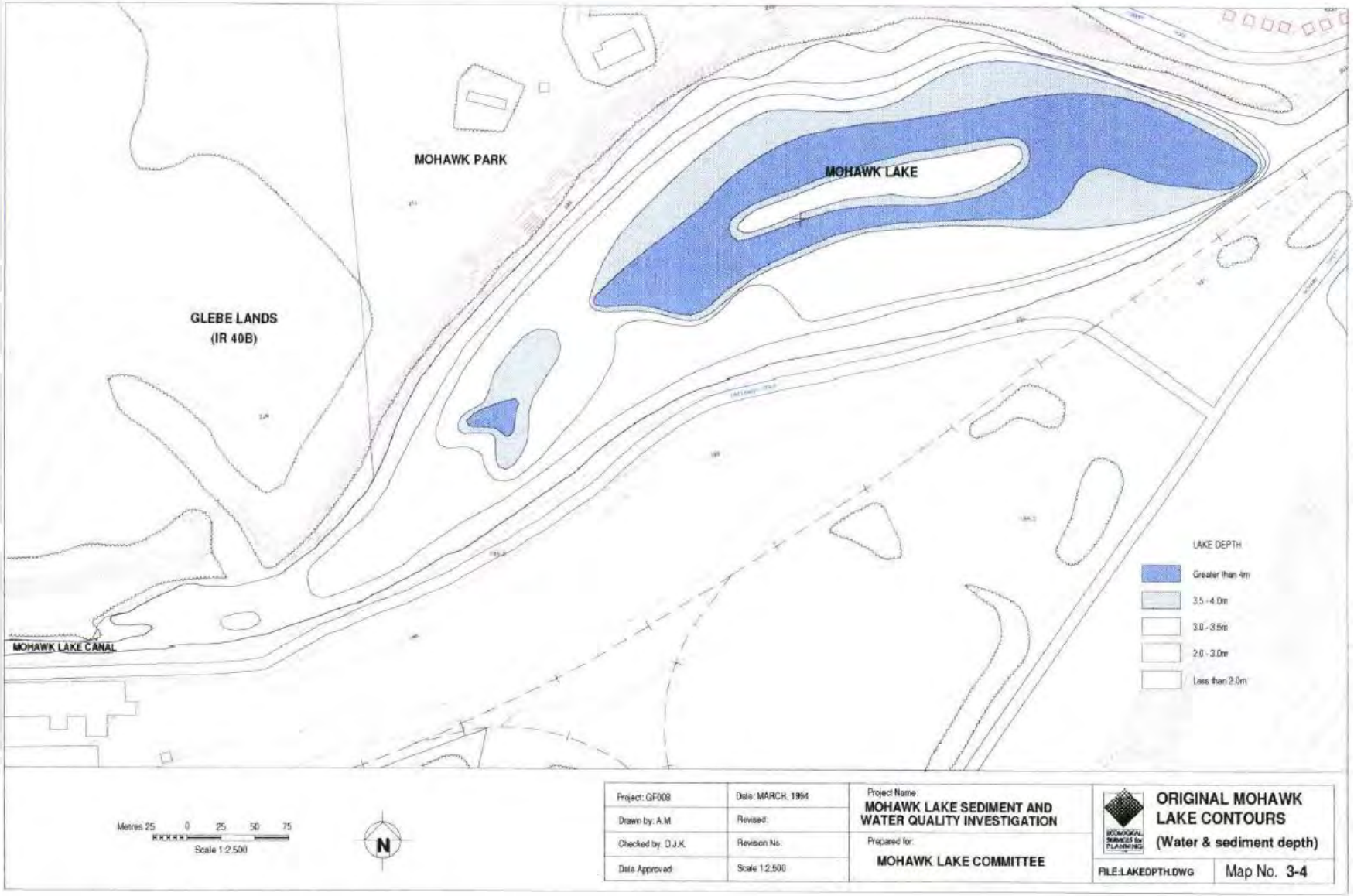

Figure 5.123: Mohawk Lake Post Dredge Bathymetry (Ecological Planning Services (1994)

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Water Depth (m)

High : 4.4

Low : -0.38

Figure: 5.124

Water Depth (Post Dredge Scenario)
West Canal

0 75 150 300

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

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Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Water Depth (m)

High : 4.4

Low : -0.38

Figure: 5.125

Water Depth (Post Dredge Scenario)
Mohawk Lake

0 37.5 75 150

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Study Area

Water Depth (m)

High : 4.4

Low : -0.38

Figure: 5.126

Water Depth (Post Dredge Scenario)
East Canal

0 30 60 120

Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Sediment Quality

Fully summarized sediment sampling results are provided in **Appendix F-2**. Two provincial regulatory guidelines apply for the assessment of lake sediment quality:

1. *Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario* (MOECC, 2008) are used to assess sediment quality. It outlines an approach to characterize and manage contaminated sediments that may pose a risk to aquatic organisms and to fish-eating birds and mammals. They specify three levels of effect for metals, nutrients, PCB's and organochlorine pesticides, and Polycyclic Aromatic Hydrocarbons (PAH's) for sediments in-situ. The levels of effect, 'No Effect', 'Lowest Effect', and 'Severe Effect' define the concentrations that classify a sediment to be considered clean, clean to marginally polluted or heavily contaminated. The guidelines only apply to the assessment of the sediment's potential to impair the aquatic environment and does not specifically apply to the disposal of sediments dredged from Mohawk Lake onto land. **Table 5.36** shows the three effects levels and the long-term effects which the contaminants may have on the sediment-dwelling organisms.

Table 5.36 PSQG Effect Levels

Effect Level	Effect
No Effect	Indicates a concentration of a chemical in the sediment that does not affect fish or sediment-dwelling organisms. At this level, **negligible** transfer of chemicals through the food chain and no effect on water quality is expected. Sediment meeting the NEL are considered clean.
Lowest	Indicates a level of contamination that can be tolerated by the majority of sediment-dwelling organisms. Sediments meeting the LEL are considered clean to marginally polluted.
Severe	Indicates a level of contamination that is expected to be detrimental to the majority of sediment-dwelling organisms. Sediments exceeding the SEL are considered heavily contaminated.

2. *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the 'Environmental Protection Act'* are used to assess the "acceptability" of the soils according to its intended final destination where these sediments can be accepted for land disposal.

Provincial Sediment Quality Guidelines

A comparison of the sediment analyses to the Provincial Sediment Quality Guidelines (PSQG) data was performed for the first interval of the sediment coring sample (0-10cm) to determine the effect level that the contaminants are having on the lake benthos and make comparisons to the 1994 study. The analytical data for the sediment samples collected is summarized and compared for the four categories of analysis (nutrients, metals, PAH's, organochlorine pesticides and PCB's) below:

Nutrients

Total Organic Carbon was found across all samples in the 'Lowest Effect' range about halfway (3.93-7.24%).

Metals

Within the lake, all metals exceeded the 'Lowest Effect' level at the majority of the sampling locations with the exception of arsenic which exceeded at only one sampling location (Location 6). Copper and Lead

exceeded the 'Severe' level at four (4) (Locations: 5, 6, 7 and 11) and eight (8) locations (5 to 7 and 11 to 15), respectively. Copper concentrations in this category that exceeded the severe effect level of 110 µg/g, ranged from 114 to 139 µg/g. For lead, they exceeded the severe level of 250 µg/g, ranging from 267-352 µg/g.

In the east and west canals, all metals exceeded the 'Lowest Effect' level at the majority of the sampling locations with the exception of nickel which was exceeded at sampling location 2, and arsenic and mercury which were never exceeded. Copper exceeded the 'Severe' level at location 2 by 4 µg/g. Sampling location 2 was located downstream of historical industrial and commercial zones, and most of the current outfalls into the west canal.

PAHs

The PSQGs include guidelines for ten (10) of the sixteen (16) individual PAHs analyzed in addition to a guideline value for the 'Total PAH'. For sediment samples collected, results show that all sampling locations exceeded the 'Lowest Effect' guideline for one (1) or more PAHs, with the majority of site exceeding for eight (8) or more. All individual samples for PAHs show concentrations several orders of magnitude less that the 'Severe Effect' guideline levels.

Organochlorine Pesticides

No organochlorine pesticides were detected above the method detection limit. However, all method detection limits were higher than the 'Lowest Effect' level. This is a general limitation of the analytical capability of the majority of laboratories.

PCBs

PCBs exceeded the 'Lowest Effect' level at all sampling locations within the lake with the exception of site 14. No PCBs were detected above the limit for locations within the east and west canals (i.e. Locations 1-4, 17, and 18).

Management of Mohawk Lake Sediment

For guidance on possible disposal of sediments dredged from Mohawk Lake, sediment analysis results at all three sampling intervals were compared to soil standards found in the April 2011 '*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*', Ontario Regulation 153/04.

The standards as listed in O. Reg. 153/04 (all Tables) apply only to sites which have or will be subject to a Record of Site Condition and are regulated by the Ministry of the Environment. However, the guidelines have been used for comparison purposes in order to guide potential re-use alternatives for the sediment sampling results received for Mohawk Lake and canals. In general, the following tables reported within O. Reg. 153/04 have been used for comparison purpose.

O. Reg. 153/04 Table 1 -Full Depth Non-Potable Ground Water Condition for fine textured soils for all land uses (Residential/Parkland/Institutional/Industrial/Commercial/Community Property). Values are considered "Background" values for uncontaminated soils (i.e. these standards are the most stringent, representing expected concentrations in pristine soils). The Table 1 standards are applicable to any land use. Because the potential disposal options would likely include other land uses and circumstances, the analytical data has to also be compared to three (3) additional standards under O. Reg. 153/04 including the following Tables:

- **O. Reg. 153/04 Table 3** - Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition) for Residential/Parkland/Institutional for fine-textured soils;
- **O. Reg. 153/04 Table 3** - Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition) for Industrial/Commercial/Community for fine-textured soils;
- **O. Reg. 153/04 Table 5** - Stratified Site Condition Standards in a Non-Potable Ground Water Condition Standards for Industrial/Commercial/Community for fine-textured soils. Note the stratified Soils conditions stipulate the that the soils in question would have to be overlain by at least 1.5 meters of acceptable soils (e.g. Table 3) following the placement of Table 5 soils. There are some restrictions regarding the land uses where the standards for stratified soils may be applied.

The analytical data was evaluated and compared to the relevant guidelines following six (6) general categories of analysis (metals, volatile organic compounds (VOC's), polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), organochlorine pesticides and PCBs):

Metals

For the majority of sampling locations, specifically within the top and middle sampling intervals, exceedance for cadmium, lead and zinc were reported. Concentrations generally exceeded the Table 3 standard for Industrial/Commercial land uses. The east canal had a single Table 1 exceedance of Antimony in the top sampling interval.

For all sampling locations and intervals within the Lake and west canal, with the exception of the bottom sampling internal, concentrations of various metals were found to exceed background Table 1 standards. Only Mercury was found to exceed background Table 1 standards in the bottom sampling interval for various site locations throughout the Lake.

VOC's

Only trace amounts of BTEX (benzene, toluene, ethylbenzene, xylene) and trichloroethylene were detected throughout the upper and middle sampling intervals with concentrations marginally exceeding background Table 1 standards. No detections of VOCs were found in the bottom sampling interval for all sampling locations with the exception of the east canal.

PAHs

In general, seven (7) PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, Dibenz(a,h)anthracene, fluoranthene and indeno(1,2,3-cd)pyrene) were found to exceed the Table 3 standards for Industrial/Commercial land use at a majority of the sampling locations and intervals.

For Sampling Locations 1, 6, 11, 12, and 13 which were generally located along the south shore and west end of Mohawk Lake, concentrations of Acenaphthylene found in the bottom and middle sampling intervals exceeded Table 5 standards. Sampling locations 1 and 4 also had Table 5 exceedances of Acenaphthene and Benzo(a)pyrene.

PHCs

Fifteen (15) of the thirty-eight (38) samples analyzed showed concentrations of F3 exceeding Table 3 standards for Industrial/Commercial (nine (9) samples) and Residential/Parkland/Institutional (six (6) samples). F3 exceedances were limited to the upper and middle sampling intervals. General sampling

locations which demonstrated exceedance for F3 were situated along the south shore and west end of Mohawk Lake.

Organochlorine Pesticides

No Organochlorine Pesticides were found above the method detection limits.

PCBs

Total PCBs exceeded Table 3 standards for Residential/Parkland/Institutional land uses for twelve (12) of the sampling locations found along the south shore and west end of Mohawk Lake. All exceedances for PCBs were found within the middle sampling interval, with sites 1 and 4 having additional exceedances in the bottom sampling interval.

Ontario Reg. 347 Schedule 4 Leachate Quality

TCLP analysis was completed for three (3) samples at locations 4, 6, and 11 (as per **Figure 5.104**) to determine if the Mohawk Lake sediment was classified as hazardous or non-hazardous. Based on the results of the Ontario Reg. 347 Leachate Extraction Tests, none of the samples exceeded the leachate quality criteria therefore the sediment was determined to be non-hazardous. These results coincide with previous sediment quality investigations which demonstrated that lake sediments are deemed 'non-hazardous'. The results of this testing are included in **Appendix F-2**.

In comparison with historical monitoring results the summarized bulk analysis results show that current sediment quality for Mohawk Lake is generally consistent with previously completed sediment quality investigations.

5.12 POLLUTION MONITORING

As part of the Characterization Study an inventory of the potential point and non-point contaminant sources was requested which was to be quantified through a series of dry and wet weather water quality sampling events at strategic locations. In addition to the development of the water quality work plan for the point and non-point contaminant monitoring, Aquafor Beech Ltd completed a background review of historic information related to the potential point and non-point sources of pollution which may contribute to the lake and canal system.

5.12.1 Background

Due to the industrial history of Mohawk Lake, as well as establishment of historical landfills, there are many properties surrounding Mohawk Lake that have the potential to act as contamination sources. Historically, wastes from many of the industrial facilities established adjacent to Mohawk Lake and canals, as well as from the local residential population, were disposed of in uncontrolled landfills. Previous factories in the immediate vicinity of Mohawk Lake have used the surrounding areas as disposal areas for waste products – many of which have been abandoned. While some of these areas have been restored, there are still impacted areas. Stormwater and surface runoff, as well as associated erosion, may also contribute contaminants from industrial properties, former landfills and residential and commercial development within the drainage areas upstream of Mohawk Lake and its canals. The locations of potential contamination sources were shown previously in **Figure 5.14** with letters correspond to historical landfill locations and the numbers correspond to past industrial properties.

Gore & Storrie assessed seven (7) abandoned landfills and the active landfill on Mohawk Street for potential impacts. Their assessment considered the location of the site in relation to Mohawk Lake and canals; the direction of groundwater flow; the historical use of the site including manufacturing processes and associated manufacturing inputs, outputs, and generated wastes; and the current use of the site. The assessment of the abandoned and existing landfills and industrial properties is summarized below:

Landfills:

Landfill A covers an area of approximately 13ha and was used by the City as a landfill from 1956 to 1965. A 1991 investigation indicated groundwater below this site has been degraded. The source of contaminants was the abandoned landfill and/or the active Mohawk Street Landfill. While the groundwater was affected, the direction of groundwater flow and the distance of the site from Mohawk Lake concluded that the site was not expected to impact Mohawk Lake.

Landfill B is approximately 1ha in size and was used for disposal of construction debris until 1976. This landfill was assumed to have a limited impact on Mohawk Lake because construction debris was not expected to represent a significant source of contamination, the small site would have a limited impact, and the direction of groundwater flow was likely to flow southeast away from the Lake.

Landfill C is approximately 21ha that was historically used by Massey Ferguson and is now owned by the City. Oils, grease, coal tars and other industrial wastes may have been disposed of at this location. Five boreholes were drilled in 1993 and groundwater monitoring wells were installed in each borehole. The impact on Mohawk Lake from this site was expected to be minimal; groundwater from this site was expected to flow towards the Grand River and only a small portion of the groundwater infiltrating the fill may migrate towards East Ward Creek and the west canal.

Landfill D is approximately 4 ha and is the site of the former canal turning basin and western reach of the canal. The canal basin and creek channel have been subject to extensive modification and landfilling after

the canal was decommissioned in 1950. A 36'' storm sewer pipe was installed in the bottom of the canal prior to filling. Multiple buildings have been constructed at this site, and as part of the process boreholes were drilled in numerous locations. A former coal gasification plant (Site 18), now Union Gas, was at this site that produced coal, coke and ash, and a liquid residue consisting of a mixture of medium and heavy oils. A subsurface soil and fill investigation determined the site was significantly contaminated with polycyclic aromatic hydrocarbons (PAH). Groundwater samples from the site were also contaminated. The groundwater flow across the site was determined to be in a southerly direction towards Shallow Creek Park. It was determined that the groundwater in the immediate vicinity of the former gasification plant was not contributing to the base flow of East Ward Creek since the elevation of the groundwater in the wells installed at the Union Gas site was below the elevation of the water within the creek. Remedial action was not considered necessary because no direct contact with the waste existed, there was an absence of any significant impact to surface water quality, and groundwater was not used as a drinking water source in the vicinity of the site. The PAH contamination of the canal/lake sediments may be contributed to by the physical transport of the contaminated soils through erosion and transportation of upstream areas. To reduce any potential for further contamination, Gore & Storrie recommended that:

- All construction work within the Mohawk Lake Watershed and in the abandoned landfill or industrial sites in particular be carefully monitored and care should be taken to avoid hydraulic transportation of the soils from the construction site;
- The existing erosion sites on East Ward Creek be corrected to minimize erosion and transportation of, or interaction with, the underlying waste;
- Continue to monitor groundwater levels in the study area to obtain information on long-term fluctuations in the groundwater system; and,
- Obtain and analyze sediment samples from upstream tributary storm sewers to East Ward Creek and the canal to try to trace the origin of the PAH contaminated sediments, and to determine the degree to which there is contribution from these upstream sources.

Landfill E is approximately 4ha in size. Part of the site now forms the base of a portion of Greenwich Street, the remainder is open space; a portion of this site was used by the City for snow disposal. This site was expected to have a limited impact as the groundwater elevation in the monitoring well installed at the site was lower than the lake surface indicating recharge conditions, the direction of groundwater flow was southerly (away from Mohawk Lake), and sodium and chloride were the only parameters of concern.

Landfill F is 0.3 ha in size and groundwater flow from this site was expected to be south into the lake. This abandoned landfill was used for tree and leaf removal with some street sweeping remnants. The type of materials disposed of at this site do not pose a significant source of contaminants into the lake and the size of the site would yield a limited impact. The results of an investigation of this site recommended preventing continued dumping and stabilizing the surface of the material to prevent additional erosion.

Landfill G is approximately 10.8ha, the former gravel pit was used by Massey Ferguson as a disposal area for foundry sand, cinders and slag until 1985. Investigations into the quality of the groundwater in the vicinity of foundry sands at other sites, such as Landfill C, indicates that the groundwater should not be significantly impacted. Groundwater discharged from the north slope of the Glebe property and Mohawk Park via surface seeps are expected to contribute a small but continuous flow to the Lake. There is no concern with the quality of these seeps. The majority of organic contaminants and all inorganic contaminants in the soil are well below residential/recreational criteria and PAH concentrations are below the commercial/industrial area. The recommendations of the previous report including site monitoring to ensure sediment contributions via erosion are minimal and encourage the First Nations to control erosion from areas containing fill materials

Mohawk Street Landfill

The current City of Brantford landfill is located in the vicinity of Mohawk Lake (Site 10). Established in 1965, the 172ha parcel of land is approved for landfilling on 72.8ha. Groundwater from the site moves in a semi-radial direction away from the landfill and Mohawk Lake in an east to southerly direction. Leachate collection systems are installed to the northeast, southeast, and southwest of the landfill. A bentonite barrier wall has also been constructed along the southwest, east, and north boundaries of the Landfill to mitigate leachate migration. 2016 groundwater elevation results indicated that the barrier wall effectively separated the licensed fill area from the buffer lands, while the perforated leachate header pipe reduced the groundwater elevations in the adjacent monitors.

Leachate produced at the Landfill mixes with the natural groundwater when it percolates down to the upper aquifer groundwater. There is potential for the contaminant plume within this aquifer to move towards the Grand River and Morrison Road, but monitoring indicates the landfill plume within the northeast, east, and south of the fill area is being controlled by the leachate controls systems. Southwest of the landfill area along Morrison Road, groundwater quality within the upper aquifer is somewhat affected by landfill leachate. The lower aquifer groundwater downgradient of the site shows no leachate impacts. The Grand River was not measurably affected by landfill leachate. Given the relative direction of the groundwater flow gradient within the areas, the Mohawk Street Landfill is not thought to have significant impacts on Mohawk Lake.

Industrial Properties:

The City of Brantford Water Pollution Control Plant (Site 1) is constructed on Landfill A. No concerns have been identified for this site.

Sonoco Products of Canada (Site 2) is an active site that has been in operation since 1915. Stormwater from this property discharges into the east canal. At the time of reporting it was noted that the water from the canal was used as non-contact cooling water and was discharged back into the lake/canal. As an active site, it was recommended that the City of Brantford conduct ongoing monitoring activities at this site to ensure stormwater and cooling water discharges are of an acceptable quality.

Robertson Restoration (Site 3) is on a site formerly used as a dry cleaning and dye operation. Stormwater from this site likely discharges to the storm sewer and/or infiltrates through the ground surface. The site is not expected to have a significant impact on Mohawk Lake or canal.

Koering Watrous (Site 6) was an engine manufacturer that operated from 1850 to 1992. The site underwent full decommissioning when a grocery store was built at this location. This site is not expected to impact Mohawk Lake.

The former P.U.C building (Site 7) had potential to impact the west canal. The historic nature of the site and the site usage has likely impacted the quality of the surface soils, however any impacts are expected to be minimal.

Current and historic uses of the Lumber Yard (Site 11) are not expected to pose an impact to Mohawk Lake.

Bixell Brewery (Site 12) was a brewery from 1850 until 1947. This site is not expected to have a signification impact on Mohawk Lake or canal system.

The Canada Glue Company (Site 13) operated at this site from the early 1900s to the mid-1970s, and the site is now owned by the Grand River Conservation Authority. The surface soils are likely impacted, however due to the southerly flow of the groundwater and the downstream location of the property in relation to Mohawk Lake and its canal, no significant impacts are expected.

Brantford Packers (Site 16) has been operating since approximately 1942. Stormwater from this site likely drains into the Mohawk Canal but it is not expected to have a significant impact on Mohawk Lake and canal.

Norton/Canadian Durex Abrasives plant (Site 17) was constructed in 1946 and operations ceased in 1985. It is not expected to have a significant impact on Mohawk Land and canal because of the historical use of the site, its location south of the canal, and the results of the groundwater quality assessment near the site.

Greenwich Mohawk Brownfield: The 21.1ha Greenwich Mohawk site consists of three properties: 22 Mohawk Street (Site 4), 66 Mohawk Street (Site 5, 8, & 15), and 347 Greenwich Street (Site 9 & 14). These sites underwent a soil remediation program to address the soil contaminants on site, including petroleum hydrocarbons, xylenes, lead, and underground storage tanks. Remediation techniques included biopiles, coarse-grain screening and washing, and offsite disposal. Three permanent underground structures were also constructed at the site to contain and prevent future re-contamination of the site from adjacent properties. In March 2017, the Greenwich Mohawk site remediation was completed. Ongoing groundwater quality monitoring were anticipated to begin in late 2018. The results from this remediation project are summarized in **Table 5.37** below:

Table 5.37 Summary of Soil Remediation Program for the Greenwich Mohawk Site

Part	Contaminant	Remediation Approach	Status
1	Soil impacted with fuel-related petroleum hydrocarbons (PHCs) and xylenes	▪ On-site treatment ▪ Soil was excavated and screened to divide fine-grained soils from coarse-grained materials ▪ A total of approximately 105,000 m^3 requires treatment ▪ Once treated, both fine-grained and coarse-grained materials were used to backfill all excavations on the site. Crushed concrete and other construction rubble meeting the remediation targets for the site will also be used to backfill the excavations.	▪ **Completed.** ▪ For all 3 properties, a total of 148,900 cubic metres of contaminated soil was remediated; ▪ 24% of the contaminated soil that was remediated was beyond original contract estimates. ▪ Of the 148,900 cubic metres of contaminated soil, 73% of the soil was addressed through onsite treatment techniques and reused at the site, and the remaining 27% of soil was addressed through offsite disposal.
2	Soil impacted with lead and heavy organic (F4) PHCs	▪ Localized impacted areas were excavated and disposed of off-site at the municipal landfill.	▪ **Completed.** ▪ Higher than expected volumes of lead-impacted soil require offsite disposal. 2,090 tonnes of soil impacted with hazardous lead was disposed offsite, which was 373% above original contract estimates. ▪ Higher than expected volumes of heavy organic PHCs required remediation (35,740 cubic metres extra)
3	Underground Storage Tanks (USTs)	▪ All USTs were pumped out and removed for off-site disposal.	▪ **Completed.** ▪ 14 USTs on the site have been uncovered at the site, including 6 unanticipated USTs. All uncovered USTs have been removed.
4	Dissolved-phase PHCs and xylenes in excavation water	▪ On-site treatment ▪ Prior to backfilling the excavation areas, the free-phase PHCs and xylenes were removed by skimming the oil sheen from the surface and pumping out for subsequent on-site water treatment and management.	▪ **Completed.** ▪ Over 120,000 litres of oil has been skimmed off the excavation water and recycled offsite. ▪ An additional volume of oil was addressed through an absorptive product called ‚Oilstic™, which was applied to oil on the excavation water, skimmed and removed and disposed offsite.
5	Residual dissolved fuel-related PHCs and xylenes in groundwater	▪ On-site treatment ▪ Tentative remediation program, pending soil treatment	▪ **Completed.** ▪ Based on discussions with MOECC and the Consultant, a groundwater remediation program is confirmed to be unnecessary to achieve the requirements for a Record of Site Condition.
6	Risk Assessment (RA)	▪ Property specific remedial targets have been established, and submitted to MOECC for review and approval	▪ **In progress.** ▪ According to regulatory requirements, the final RA submission will occur in early 2018 when post-remediation confirmatory sampling is completed. ▪ On-going dialogue continues with MOECC throughout the project to provide necessary updates.

5.12.2 Field Study Scope and Methodology: Inventory of Point and Non-Point Contamination and Nutrients

The Characterization Study included the completion of several wet and dry weather sampling event at ten (10) locations throughout the Mohawk Lake subwatershed in order to identify potential point and non-point pollution sources. Following the background review, the potential point and non-point contamination contributors which exist around Mohawk Lake and canals was well documented; however, potential contributors throughout the upstream subwatershed were generally unknown. To develop an understanding of the potential point and non-point pollution sources within the upstream subwatershed, an adaptive monitoring program was developed.

To select the initial water quality monitoring locations, a five (5) step approach was developed. The objective of the five-step approach was to assign an ‘estimate’ of the potential non-point source

contaminant loading to the lake and canal system in order to select initial water quality monitoring locations. The five (5) step approach consisted of the following:

1. Desktop assessment of contributing drainage areas and land-uses
2. Risk assessment of land-uses using a water quality database
3. Preliminary ranking of various sewershed's risks to canal and lake water quality
4. Preliminary water quality sampling to confirm risk-based sewershed ranking
5. Refined water quality sampling

Step 1 - Desktop Assessment of Contributing Drainage Areas and Land-uses

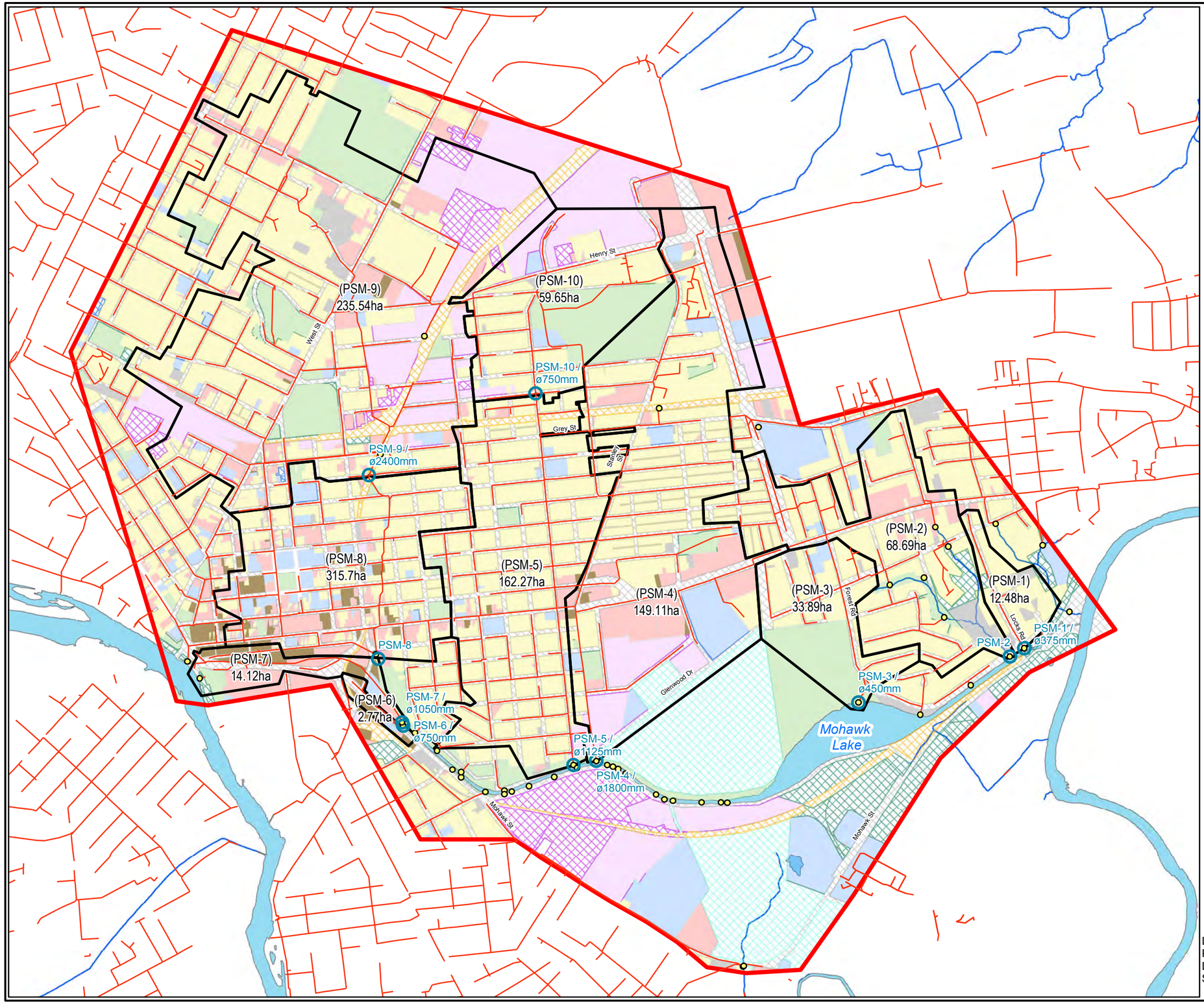
A series of ten (10) primary drainage areas and associated land-uses were identified as contributing to the Mohawk Lake and canal system. The ten (10) sewersheds were selected based on:

- The outlet location within the lake and canal system;
- Dominate land-uses within larger sewershed areas;
- Historical drainage pathways; and,
- Identification of logical drainage system junctions within the trunk sewer network which would permit future isolation of contaminant pathways.

The desktop analysis was completed to identify the potential spatial distribution of contaminant sources within the broader watershed and the smaller individual sewersheds (as defined by the sewer network). Land-uses were defined using existing land-use information as provided by the City and supplemented by Official Plan (OP) land-use designations where data gaps existed. Subsequently, land-uses were verified using aerial photography which resulted in the reclassification of ten (10) sites as Industrial. **Figure 5.127** and **Figure 5.128** illustrate the contributing sewersheds of the ten (10) initially identified drainage areas and associated outfall monitoring locations as well as the reclassification of these contributing sewersheds post desktop review.

The primary drainage areas (sewersheds) as well as existing (**Figure 5.4**) and reclassified (**Figure 5.129**) land-uses, which contribute to the canal and Mohawk Lake are summarized in **Table 5.38.**

Mohawk Lake And Mohawk Canal Characterization Study



Legend

- Polution Source Monitoring Stations
- Outfalls
- Watercourse
- Storm Gravity Mains
- Waterbody
- Study Area
- PSM Storm Sheds

Land Use

- Commercial
- Cultural / Heritage
- General / Residential
- Industrial
- Institutional
- Recreation

Inferred Land Use

- Commercial
- General / Residential
- Industrial
- Institutional
- Railway
- Recreation
- Roadway
- Six Nations of the Grand River Territory

Figure 5.127

Pollution Source Monitoring Locations
& Contributing Drainage Areas

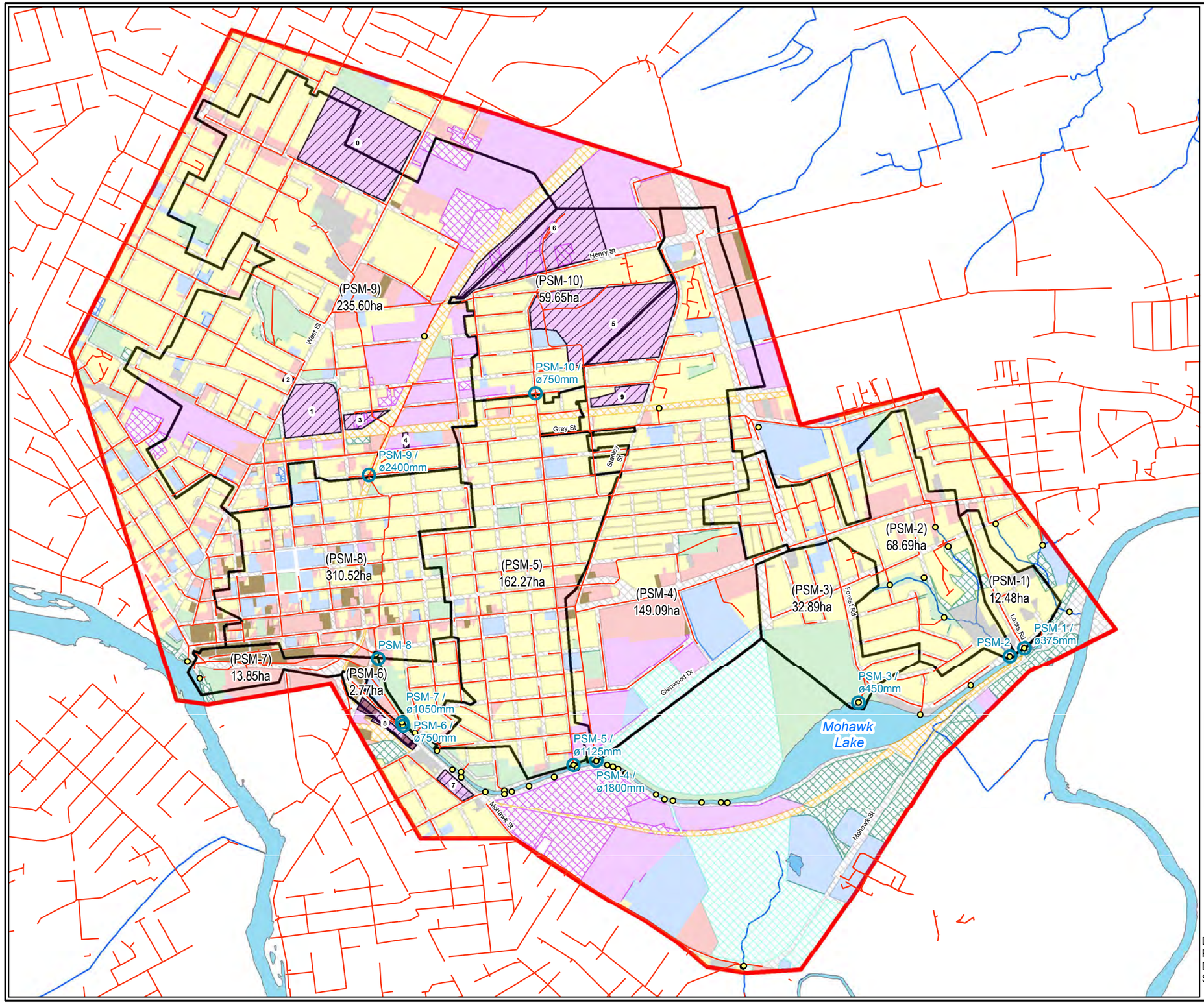
0 0.25 0.5 1

Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford
Gore & Storrie

Mohawk Lake And Mohawk Canal Characterization Study



Legend

- Polution Source Monitoring Stations
- Outfalls
- Watercourse
- Storm Gravity Mains
- Waterbody
- Study Area
- Potential High Risk Areas
- PSM Storm Sheds

Land Use

- Commercial
- General / Residential
- Industrial
- Institutional
- Recreation

Inferred Land Use

- Commercial
- General / Residential
- Industrial
- Institutional
- Railway
- Recreation
- Roadway
- Six Nations of the Grand River Territory

Figure 5.128

Pollution Source Monitoring Locations & Contributing Drainage Areas
Post Desktop Review of Existing Industry

0 0.25 0.5 1
Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford
Gore & Storrie

Aquafor Beech Limited

Table 5.38 Primary Contributing Sewersheds to the Canal and Mohawk Lake (Post Desktop Review and Adjustment)

Sewershed	DA & %	Industrial		Commercial		Institutional		General/ Residential		Recreation (incl. Open Field)		Transportation (Rail + Roads)		Total (ha)
		Existing	Re-classified	Existing	Re-classified	Existing	Re-classified	Existing	Re-classified	Existing	Re-classified	Existing	Re-classified	
1	Area (ha)	0	0	0.07	0.07	0	0	9.24	9.24	0.54	0.54	2.63	2.63	22.3
	%	0.0%	-	0.6%	0.6%	0.0%	-	74.0%	74.0%	4.3%	4.3%	21.1%	21.1%	
2	Area (ha)	0	0	4.55	4.55	0.66	0.66	42.19	42.19	5.96	5.96	15.32	15.32	122.0
	%	0.0%	-	6.6%	6.6%	1.0%	1.0%	61.4%	61.4%	8.7%	8.7%	22.3%	22.3%	
3	Area (ha)	0.92	0	0.05	0.05	0.92	0.92	14.21	14.21	14.29	10.69	7.02	7.02	63.3
	%	2.5%	-	0.1%	0.2%	2.5%	2.8%	38.0%	43.2%	38.2%	32.5%	18.8%	21.3%	
4	Area (ha)	12.47	20.60	22.01	20.37	11.12	11.12	48.71	48.64	16.02	9.60	38.78	38.78	259.4
	%	8.4%	13.8%	14.8%	13.7%	7.5%	7.5%	32.7%	32.6%	10.7%	6.4%	26.0%	26.0%	
5	Area (ha)	12.04	29.87	3.73	3.48	4.64	3.97	83.71	80.89	15.55	2.22	42.66	41.88	282.8
	%	7.4%	18.4%	2.3%	2.1%	2.9%	2.4%	51.6%	49.8%	9.6%	1.4%	26.3%	25.8%	
6	Area (ha)	0.00	0.92	1.02	0.28	0	0	0	0	0.12	0.12	1.45	1.45	4.1
	%	0.0%	33.3%	36.8%	10.3%	6.7%	0.0%	0.0%	0.0%	4.2%	4.2%	52.3%	52.3%	
7	Area (ha)	0	0	7.03	7.03	0.72	0.72	0.06	0.06	2.04	2.04	4.00	4.00	23.7
	%	0.0%	0.0%	50.8%	50.8%	5.2%	5.2%	0.4%	0.4%	14.7%	14.7%	28.9%	28.9%	
8	Area (ha)	41.26	59.28	34.31	32.69	12.68	12.68	122.93	122.32	26.64	11.05	72.70	72.50	548.5
	%	13.3%	19.1%	11.0%	10.5%	4.1%	4.1%	39.6%	39.4%	8.6%	3.6%	23.4%	23.3%	
9	Area (ha)	43.67	61.69	18.35	16.74	4.91	4.91	94.07	93.46	24.49	8.89	50.11	49.91	421.3
	%	18.5%	26.2%	7.8%	7.1%	2.1%	2.1%	39.9%	39.7%	10.4%	3.8%	21.3%	21.2%	
10	Area (ha)	10.98	28.81	0.73	0.49	1.97	1.30	22.36	19.54	13.39	0.06	10.23	9.45	109.9
	%	18.4%	48.3%	1.2%	0.8%	3.3%	2.2%	37.5%	32.8%	22.4%	0.1%	17.1%	15.8%	

Increase Decrease

Mohawk Lake And Mohawk Canal Characterization Study

Legend

Road Centerlines
Waterbody
Study Area

Land Use

Commercial
Cultural / Heritage
General / Residential
Industrial
Institutional
Recreation

Inferred Land Use

Commercial
General / Residential
Industrial
Institutional
Railway
Recreation
Roadway
Six Nations of the Grand River Territory

Figure: 5.129

Existing & Inferred Land Use

0 0.25 0.5 1
Kilometers

N

Date: June 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Step 2 - Risk Assessment of Land-uses

To gauge the risk of non-point source contamination potential for each of the preliminary sewersheds identified, a proprietary Aquafor Beech Ltd. water quality database which represents Event Mean Concentrations (EMCs) derived from more than 28 individual comprehensive monitoring studies, reports, publications and models from the 1980's to 2009 was applied to the reclassified land-uses for the ten (10) primary sewersheds. Typical event mean contaminant concentrations for TSS, TP, Copper, Zinc, E.coli, BOD and Nitrate for each land-use were included in the proprietary database. The relative contaminant risk factors for each primary land-use and the overall non-point source water quality risk and score are summarized in **Table 5.39**. The overall non-point source water quality risk and score represents the non-point source contamination potential for that specific land-use (six (6) is a high-risk factor, one (1) is a low risk factor). The land-use ranks (risk factor) were developed through relative comparisons made between the EMC data associated with the various land-uses for a particular parameter (i.e. greater the EMC, the greater the risk). Note: risk factors were only developed for parameters which were above PWQO or CCME guidelines.

Table 5.39 Typical EMC Values, Guidelines and Risk Factors per Land-use

	Industrial	Commercial	Institutional	General/ Residential	Recreation (incl. Open Field)	Transportation (Rail + Roads)	Guideline
Total Suspended Solids (TSS) (mg/L)	87	77	79	131	72	89	CCME (25)
TSS Land-use Rank (Risk Factor)	4	2	3	6	1	5	
Total Phosphorous (mg/L)	0.3	0.25	0.33	0.36	0.25	0.298	PWQO (0.05-0.15)
TP Land-use Rank (Risk Factor)	2	1	3	4	1	2	
Copper (mg/L)	0.014	0.025	0.014	0.024	0.0175	0.0189	PWQO (0.005)
Copper Land-use Rank (Risk Factor)	1	5	1	4	2	3	
Zinc (mg/L)	0.29	0.194	0.100	0.111	0.123	0.1636	PWQO (0.036-0.067)
Zinc Land-use Rank (Risk Factor)	6	5	1	2	3	4	
E. coli (#/100ml)	3000	5950	8680	20000	6775	8881	PWQO (148.9-1421.5)
E. coli Land-use Rank (Risk Factor)	1	3	4	6	2	5	
BOD	11.5	27.1	-	17.2	-	18.6	n/a
BOD Land-use Rank (Risk Factor)	1	4		2		3	
Nitrate	1.5	1.9	2.4	2.10	-	1.99	CCME (0.34 - 2.30)
Nitrate Land-use Rank (Risk Factor)	1	2	5	4		3	
Overall Non-Point Source Risk	**Mod-Low**	**Mod-High**	**Moderate**	**Very High**	**Low**	**High**	
Overall Non-Point Source Risk Score	**2.29**	**3.14**	**2.83**	**4.00**	**1.80**	**3.57**	

Step 3 - Preliminary Ranking of Sewershed Risk to Canal and Lake Water Quality

In order to identify which of the ten (10) preliminarily selected sewersheds posed the greatest overall risk to the water quality of the lake and canal system, the re-assessed sewersheds and respective land-use composition (**Table 5.38**) was combined with the overall risk factor per land-use (**Table 5.39**) to develop a preliminary sewershed water quality risk score. The preliminary sewershed water quality risk score was a weighted metric which relates the percentage of each land-use type within a sewershed to the overall

non-point source risk score associated with that land-use. **Table 5.40** provides a preliminary rank of the sewersheds from greatest to lowest overall risk to water quality within the lake and canal. Each ranked sewershed had a corresponding monitoring location identified as Non-Point Source Monitoring (PSM) one (1) to ten (10) (PSM-1 to PSM-10).

Table 5.40 Preliminary Ranking of Sewershed Risk to Water Quality within the Canal and Lake

Overall Risk to Water Quality (Rank Highest to Lowest)	Sewershed	Proposed Monitoring Locations (See Figure 5.128)
1	1	PSM-1
2	2	PSM-2
3	5	PSM-5
4	8	PSM-8
5	4	PSM-4
6	9	PSM-9
7	3	PSM-3
8	10	PSM-10
9	7	PSM-7
10	6	PSM-6

Using this methodology, non-point source monitoring efforts could be allocated to the areas of the greatest risk. However, as the preliminary sewershed water quality risks were not field verified or substantially supported by background information from past monitoring efforts, field verification was completed in order to confirm the predicted results established during Steps 1 to 3.

Step 4 - Preliminary Water Quality Sampling to Confirm Risk-Based Sewershed Ranking

In order to field verify the preliminary risk-based sewershed ranking, all ten (10) monitoring locations (PSM-1 to PSM-10) were sampled as part of the first round of 2018 non-point pollution monitoring.

The sampling program covered a minimum of 3 dry weather base flow events (no precipitation within 48 hours of the sampling event) and 3 wet-weather high flow events (rainfall events greater than 15mm) distributed throughout the approximate six (6) month project period to characterize the non-point pollution sources. Each round of the non-point source pollution monitoring program consistent of one (1) wet and one (1) dry sampling event in order to observe any differences in the sampling results during varying weather and flow conditions.

Sampling methodology, parameters and field measurements were consistent with those followed as part of the Water Quality Monitoring program (**Section 5.13.2**) in order to facilitate data analysis comparisons and recommendations and are further described in the following sections.

Step 5 - Refined Water Quality Sampling

Following the completion of sampling as detailed in Step 4, an analysis of the sampling results from the first round of sampling of the initial ten (10) sites was undertaken to confirm the preliminary risk-based sewershed ranking and ultimately refine the sampling locations to further key in on potential non-point pollution sources. Sampling locations and frequency were refined, eliminated or enhanced based on the sampling results which guide sequential rounds of water quality sampling.

A key deliverable of the sampling program included mapping of pollution 'hot-spot' sewersheds which drain to the lake and canal system. It is intended that this mapping, trends and pollutant information will provide insight into 'target areas' of the watershed where further study or remedial measures may be focused in the future.

5.12.3 Field Study Scope and Methodologies

A key objective of the field study was to identify pollution 'hot-spots' within upstream sewersheds contributing effluent to the Mohawk Lake and canal system. To perform this analysis, sampling was divided into 3 rounds. Each round consisted of sampling one (1) dry event (no rain for 48hours) and (1) wet event (rainfall >15mm) at each of the ten (10) strategically chosen sampling locations within the Mohawk Lake's stormwater sewershed.

At the end of each round, the samples were collected and sent to ALS Laboratories for physical, chemical and biological analysis. Once the lab results were returned, sampling sites showing little or no sign of contamination were relocated to upstream sites within sewersheds exhibiting high contamination. This approach allowed the project team to further hone in on pollution sources following each round of sampling. The objective of this analysis was to provide the City with target zones to focus future studies and remediation measures in order to mitigate potential sources of contamination within the Mohawk Lake stormsewer catchment.

Sampling Procedure:

Each water quality sample collected from the selected monitoring locations were analyzed for the following parameters:

- Metals & Inorganics
- E. coli & Total Coliform
- Nutrients (Total Phosphorus, Dissolved Phosphorus, Nitrogen, Nitrate)
- Total Suspended Solids
- Hardness (As CaCO3)
- Polycyclic Aromatic Hydrocarbons (16 Priority PAHs)
- Petroleum Hydrocarbons (PHCs), F1 to F4
- Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX)
- Volatile Organic Compounds (EPA 624)

Field measurements including pH and temperature were recorded during each sampling event. All sampling locations consisted of maintenance holes or stormwater outfalls to ensure accessibility. At each sampling location a collection device was lowered into the stormwater system and rinsed three (3) times with the stormwater to be collected. Once rinsed, the collection device was filled and its content was distributed into the respective sampling jars and vials. Sampling jars were then placed in a cooler packed with ice or ice packs and transported to the laboratory for analysis within a 48-hour period but typically within 12 hours.

Stormwater samples were analyzed by ALS Laboratories located in Waterloo, Ontario. Processing time at the lab was typically 5 business days, upon which results were provided within 10 to 15 business days.

Sewershed Ranking Criteria:

As mentioned, following each round of monitoring the water quality results for the ten (10) individual pollution monitoring locations were summarized and compared to provincial or federal guidelines for water quality found within natural watercourses. The application of such guidelines also allowed the results to be compared to the results of the Water Quality sampling program completed for the lake and canal system. After each round of sampling the results were analyzed and compared the guidelines and all exceedances of the specified guideline limits for a particular parameter were flagged.

In order to rank the monitoring locations included in a particular round of sampling, the exceedances were given a numerical ranking between 1-5 based on how many magnitudes greater the exceedance was than the guidelines (i.e. 0-10 times the limit = 1 point, 10-100 times the limit = 2 points, 100-1000 times the limit =3 points, etc.). The rankings for each monitoring location were then summed to give each location a total score. Locations that had more exceedances and exceedances of larger magnitudes held higher scores. The approach identified sewersheds with higher potential for contributing pollutants to the Mohawk Lake and canal system. Locations that scored relatively low were not carried forward to subsequent rounds of monitoring. The locations were reallocated to strategic nodes within the network of the more polluted sewersheds to order to further isolate pollution "hot spots". Each sampling round was independent from the next as exceedance scores for each location were limited to comparisons made directly against sites from within the same round.

Adaptive Site Selection

Following the analysis of the sampling results, sewersheds were ranked as good, fair or poor, based on their pollution scores. Sewersheds that were ranked as fair or poor were then examined using desktop analysis to determine ideal monitoring locations to further delineate the pollution source in that sewershed. This involved breaking up larger sewersheds into smaller subsewersheds to isolate potential pollution "hot spots".

5.12.4 Results, Discussion & Conclusions

The following section summarizes the results of three (3) rounds of Pollution Monitoring. The laboratory analysis of all water samples can be found in **Appendix G**.

Round 1

Sampling locations for Round 1 (**Figure 5.130**) were selected based on the above desktop analysis of the study area's contributing drainage areas and a risk assessment of land uses. Sampling for Round 1 took place on July 18th, 2018 and August 8th, 2018 and the results from both the dry and wet weather events were analyzed and an exceedance summary table was compiled (**Table 5.41**). After the exceedances were ranked and sampling locations were scored, the sewersheds for PSM-9 and PSM-10 scored significantly higher than the other sampling locations. Sewersheds represented by PSM-1, PSM-2, and PSM-3 scored lowest while PSM-4, PSM-5, PSM-6, PSM-7, and PSM-8 all received moderate scores. Based on these scores each sewershed was then classified as poor, fair or good (**Figure 5.131**). PSM-9 and PSM-10 were identified as sewersheds that required further focus during subsequent rounds of sampling. PSM-1, PSM-2, and PSM-3 all had fairly good results and were reallocated to strategic locations within the polluted sewersheds during Round 2. Furthermore, PSM-7 and PSM-8 which had moderate scores were reallocated upstream closer to PSM-9 in Round 2 in an attempt to further isolate potential pollution sources within the sewershed systems. It should be noted that although some sewersheds were ranked as "good", the

results were only “good” relative to the other monitoring location results in Round 1, and all sites in this round did exhibit exceedances of PWQO guidelines.

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Polution Source Monitoring Stations
- Storm Gravity Mains
- Watercourse
- Waterbody
- Property Parcels
- Drainage Area Boundaries
- Study Area

Drainage Area

- PSM-1
- PSM-10
- PSM-2
- PSM-3
- PSM-4
- PSM-5
- PSM-6
- PSM-7
- PSM-8
- PSM-9

Figure: 5.130

Revised Pollution Source Monitoring Locations
& Contributing Drainage Areas (Round 1)

0 0.25 0.5 1
Kilometers

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Table 5.41: Pollutant Exceedance Summary Table for Round 1

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sample Date: July 18, 2018										Sample Date: August 8, 2018									
				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10
Physical Tests (Water)																							
Total Suspended Solids	mg/L	2	25 (CCME)	<2.0	3.5	17	4.1	<2.0	48	4.5	3.9	<2.0	313	2.2	3.8	<2.0	18.1	11.2	9.5	10.9	2.1	139	1220
Anions and Nutrients (Water)																							
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	4.97	2.19	4.38	2.89	5.27	0.43	3.7	5.99	4.84	<0.020	0.555	0.479	1.09	0.69	2.25	0.531	1.19	3.6	0.422	0.147
Phosphorus, Total	mg/L	0.003	0.01 (PWQO)	0.0198	0.121	0.0946	0.0659	0.012	0.154	0.0432	0.161	0.012	8.2	0.0765	0.0782	0.0521	0.0929	0.057	0.0631	0.0501	0.125	0.233	4.6
Bacteriological Tests (Water)																							
E. Coli	CFU/100mL	10	100 (PWQO)	51	137	148	219	182	137	224	229	870	197000	1190	1280	1180	1270	860	660	1260	4800	3900	5500
Total Coliforms	CFU/100mL	10	1000 (PWQO)	12800	8700	6100	12100	970	5400	12200	11100	2800	>200000	55000	63000	9800	96000	52000	8400	9600	132000	71000	147000
Total Metals (Water)																							
Aluminum (Al)-Total	mg/L	0.01	0.015*(1) (PWQO)	<0.050	0.025	0.06	0.037	<0.010	0.458	0.046	<0.050	<0.010	0.272	0.114	0.153	0.101	0.604	0.167	0.265	0.331	<0.050	1.88	7.52
Boron (B)-Total	mg/L	0.01	0.2 (PWQO)	<0.10	0.041	0.033	0.056	0.05	0.025	0.044	<0.10	0.045	0.21	0.012	0.015	0.014	0.02	0.027	0.013	0.023	<0.10	0.012	0.03
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	<0.0010	<0.00010	0.00013	0.0002	<0.00010	0.00047	0.00015	<0.0010	<0.00010	<0.0010	<0.00010	<0.00010	<0.00010	0.00043	0.00015	0.00019	0.00019	<0.0010	0.00131	0.00516
Copper (Cu)-Total	mg/L	0.001	0.005*(4) (PWQO)	<0.010	0.0028	0.0021	0.0026	0.0016	0.0133	0.0045	<0.010	0.0014	0.152	0.004	0.0039	0.0031	0.0083	0.0048	0.0063	0.0082	<0.010	0.0224	0.0519
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	<0.10	0.073	1.01	0.359	<0.050	1.06	0.293	0.15	0.196	0.9	0.184	0.23	0.477	0.923	0.423	0.385	0.379	0.12	5.33	9.77
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.0114	0.0145	0.0341	0.129	0.0218	0.138	0.0597	0.0214	0.0529	0.0327	0.00841	0.0134	0.0195	0.0678	0.0433	0.046	0.0352	0.0243	0.293	0.251
Silver (Ag)-Total	mg/L	0.00005	0.0001 (PWQO)	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050	<0.000050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050	0.000209	0.000152
Vanadium (V)-Total	mg/L	0.0005	0.006 (PWQO)	<0.0050	0.00108	0.00091	0.00066	<0.00050	0.00346	0.00095	<0.0050	<0.00050	<0.0050	0.00161	0.00136	0.00121	0.00251	0.00137	0.00216	0.00222	<0.0050	0.00596	0.018
Zinc (Zn)-Total	mg/L	0.003	0.03* (PWQO)	<0.030	0.0082	0.0119	0.0096	0.005	0.0697	0.0195	<0.030	0.0039	0.105	0.0187	0.0099	0.0155	0.0294	0.0148	0.0224	0.0355	<0.030	0.102	0.163
Polycyclic Aromatic Hydrocarbons (Water)																							
Anthracene	ug/L	0.01	0.012 (CWQG)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.066	<0.010	0.02	<0.010
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	<0.020	<0.020	<0.020	<0.020	0.042	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.026	<0.020	0.077	<0.020	0.122	<0.020
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	<0.010	<0.010	<0.010	<0.010	<0.010	0.043	<0.010	<0.010	<0.010	0.024	0.015	0.01	<0.010	0.022	0.032	0.011	0.048	<0.010	0.168	<0.010
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	<0.020	<0.020	<0.020	0.068	0.025	<0.020	<0.020	0.031	0.038	<0.020	0.045	<0.020	0.206	0.062
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	<0.010	<0.010	<0.010	<0.010	0.016	0.01	<0.010	0.018	0.024	0.01	0.041	<0.010	0.108	<0.010
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	<0.010	<0.010	<0.010	0.017	<0.010	0.106	<0.010	<0.010	<0.010	0.011	0.053	0.022	0.01	0.048	0.068	0.028	0.174	0.012	0.256	0.026
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.048	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.036	0.032
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.015	0.018	<0.010	0.063	<0.010	0.24	0.043	0.092	<0.010	0.068	0.152	0.057	0.022	0.109	0.184	0.069	0.765	0.103	0.584	0.056
Phenanthrene	ug/L	0.02	0.4 (CWQG)	<0.020	<0.020	<0.020	0.034	<0.020	0.093	0.073	<0.020	<0.020	0.189	0.056	0.024	<0.020	0.052	0.084	0.04	0.959	0.024	0.282	0.064
Pyrene	ug/L	0.02	0.025 (CWQG)	<0.020	<0.020	<0.020	0.034	<0.020	0.176	0.026	0.107	<0.020	0.049	0.082	0.036	<0.020	0.076	0.124	0.045	0.461	0.108	0.442	0.039

Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) pH 4.5-5.5 = 0.015, pH 5.5-6.5 = n/a, pH 6.5-9.0 = 0.075
(2) Hardness<75 = 0.011, Hardness>75 = 1.1
(3) Hardness 0-100 = 0.0001, Hardness>100 = 0.0005
(4) Hardness 0-20 = 0.001, Hardness>20 = 0.005
(5) Hardness<30 = 0.001, Hardness 30-80 = 0.003, Hardness>80 = 0.005
(6) Hexavalent Cr = 1ug/L, trivalent Cr = 8.9 ug/L

PWQO: Provincial Water Quality Objectives
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter has no guideline

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Polution Source Monitoring Locations
- Storm Gravity Mains
- Watercourse
- Drainage Area Boundaries
- Study Area
- Property Parcels
- Waterbody

Conditions

- Good
- Fair
- Poor
- NULL

Figure: 5.131

Pollution Source Monitoring
Drainage Area Conditions Following Round 1 Ranking

0 250 500 1,000
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Round 2

Based on the results from Round 1, sewersheds were further divided and PSM locations were placed to attempt to isolate potential pollution "hot spots". PSM-1, PSM-2, and PSM-3 were relocated to within the sewersheds of PSM-9 and PSM-10 (Poor performers from Round 1) in order to subdivided the sewersheds into smaller areas.

Also, it was identified that PSM-4 sewershed (from Round 1) was quite large making the potential to locate potential pollution sources difficult. The sewershed was divided into three (3) sections by establishing monitoring sites at key locations within the sewer network. Revised sewershed boundaries and pollution monitoring locations were developed (**Figure 5.132**).

Sampling for Round 2 took place on September 20th, 2019 and September 25th, 2018. Results from both the dry and wet weather event were analyzed and an exceedance summary table was compiled (**Table 5.42**). After the exceedances were ranked and monitoring stations were scored, the sewersheds for PSM-1, PSM-2, and PSM-3 had the highest scores, PSM-7 and PSM-8 had the lowest scores, and the remaining stations had moderate scores. Based on these scores, each sewershed was then classified as poor, fair or good (**Figure 5.133**). As the poorest performers, PSM-1, PSM2, and PSM-3 were identified as sewersheds to be focused on for Round 3. PSM-5, PSM-7, PSM-8, PSM-10 all had moderate results and were selected to be reallocated to the more polluted sewersheds for Round 3 in order to maximize efforts to identify potential pollution hotspots during the final round of monitoring. It should be noted that although some sewersheds were ranked as "good", the results were only "good" relative to the other monitoring station results in Round 2, and all sites in this round did exhibit exceedances of PWQO guidelines.

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Polution Source Monitoring Stations
- Storm Gravity Mains
- Watercourse
- Property Parcels
- Waterbody
- Drainage Area Boundaries
- Study Area

Drainage Area

- PSM-1
- PSM-2
- PSM-3
- PSM-4
- PSM-5
- PSM-6
- PSM-7
- PSM-8
- PSM-9
- PSM-10

(PSM-8 DA) 155.32ha
(PSM-3 DA) 61.82ha
(PSM-2 DA) 49.25ha
(PSM-10 DA) 88.97ha
(PSM-9 DA) 20.72ha
(PSM-1 DA) 35.48ha
(PSM-7 DA) 44.71ha
(PSM-5 DA) 222.08ha
(PSM-4 DA) 128.85ha
(PSM-6 DA) 2.77ha

PSM-3
PSM-10
PSM-2
PSM-8
PSM-9
PSM-7
PSM-1
PSM-6
PSM-5
PSM-4

Henry St
Wayne Gretzky Pky
West St
Elgin St
Grey St
Stanley St
Rawdon St
Clarence St
Brant Ave
Colborne St
Forest Rd
Locks Rd
Glenwood Dr
Alfred St
Mohawk St
Mohawk St

Mohawk Lake

Figure: 5.132
Pollution Source Monitoring Locations
& Contributing Drainage Areas (Round 2)

0 250 500 1,000
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sample Date: September 20, 2018										Sample Date: September 25, 2018									
				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10
Physical Tests (Water)																							
Total Suspended Solids	mg/L	2	25 (CCME)	328	213	26	7.4	3.4	5.3	2.1	2.1	7.7	21.7	22	242	10.4	16.6	7.3	8.4	3.5	2.9	3	8.1
Anions and Nutrients (Water)																							
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	<0.10	<0.10	0.92	2.79	5.5	0.829	5.28	5.11	0.49	4.79	0.769	<0.10	0.65	1.02	2.16	1.08	4.47	4.42	0.336	1.65
Phosphorus, Total	mg/L	0.003	0.03 (PWQO)	5.65	5.52	0.288	0.0601	0.0129	0.0599	0.0117	0.0139	0.0224	0.0204	0.109	6.23	0.237	0.104	0.105	0.119	0.0187	0.018	0.0404	0.0688
Bacteriological Tests (Water)																							
E. Coli	CFU/100mL		100 (PWQO)	460000	440000	3200	4100	1720	660	12	840	670	5600	90000	4400000	7300	23000	10300	20900	5400	3600	3900	11900
Total Coliforms	CFU/100mL	10	1000 (PWQO)	760000	840000	47000	146000	61000	46000	2400	76000	48000	61000	470000	>20000000	91000	>200000	132000	>200000	28000	19000	27000	117000
Total Metals (Water)																							
Aluminum (Al)-Total	mg/L	0.01	0.075*(1) (PWQO)	0.437	0.227	0.378	0.183	<0.010	0.048	<0.010	<0.010	0.044	0.062	0.376	0.221	0.597	0.434	0.253	0.22	0.029	0.056	0.187	0.268
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	<0.0010	<0.0010	<0.0010	0.0003	<0.00010	<0.00010	<0.00010	<0.00010	0.00043	<0.0010	0.00029	0.00037	0.00044	0.00036	0.00017	0.00016	<0.00010	<0.00010	0.00022	0.00022
Copper (Cu)-Total	mg/L	0.001	0.005*(4) (PWQO)	0.16	0.137	<0.010	0.0023	0.0013	0.0031	<0.0010	0.0014	0.0027	<0.010	0.0115	0.128	0.0087	0.0094	0.0066	0.0107	0.002	0.0025	0.0086	0.0195
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.82	0.26	1.41	0.476	<0.050	0.219	<0.050	0.192	0.611	0.37	0.844	0.319	0.932	0.737	0.299	0.55	0.085	0.235	0.391	0.371
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.0463	0.0333	0.248	0.106	0.0187	0.0346	0.00279	0.0504	0.226	0.0103	0.0499	0.0337	0.0542	0.0513	0.0373	0.0481	0.00588	0.0468	0.0567	0.0261
Silver (Ag)-Total	mg/L	0.00005	0.0001 (PWQO)	<0.00050	<0.00050	<0.00050	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00050	<0.000050	0.000296	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.003	0.03* (PWQO)	0.138	0.125	<0.030	0.0057	0.0045	0.0201	<0.0030	0.0034	0.0184	<0.030	0.0469	0.153	0.0325	0.0362	0.0234	0.0343	0.0062	0.0084	0.0196	0.0344
Speciated Metals (Water)																							
Chromium, Hexavalent	ug/L	0.5	1.0 (PWQO)	<0.50	<0.50	1.32	<0.50	0.75	0.58	1.55	<0.50	<0.50	0.9	0.97	<0.50	1.95	1.62	0.91	0.89	1.55	0.53	<0.50	1.31
Volatile Organic Compounds (Water)																							
cis-1,2-Dichloroethylene	ug/L	0.5	200 (PWQO)	<0.50	<0.50	<0.50	0.75	3.83	<0.50	<0.50	<0.50	407	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	1.22	<0.50	<0.50	180	<0.50
Toluene	ug/L	0.5	0.8 (PWQO)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.88	<0.50	<0.50	<0.50	0.93	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	0.5	20 (PWQO)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	56.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20.8	<0.50
Polycyclic Aromatic Hydrocarbons (Water)																							
Anthracene	ug/L	0.01	0.012 (CWQG)	0.02	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.02	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	<0.040	<0.040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	<0.040	0.014	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	<0.040	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.031	<0.040	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	<0.020	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.020	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	0.052	0.036	0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.037	0.048	0.038	0.026	0.014	0.027	<0.010	<0.010	0.029	0.015
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.040	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.036	0.04	0.047	0.033	<0.010	0.016	<0.010	<0.010	0.01	<0.010	0.064	0.044	0.076	0.052	0.045	0.074	<0.010	0.027	0.184	0.028
Pyrene	ug/L	0.02	0.025 (CWQG)	0.048	<0.040	0.039	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.062	0.044	0.063	0.048	0.036	0.05	<0.020	<0.020	0.057	0.04

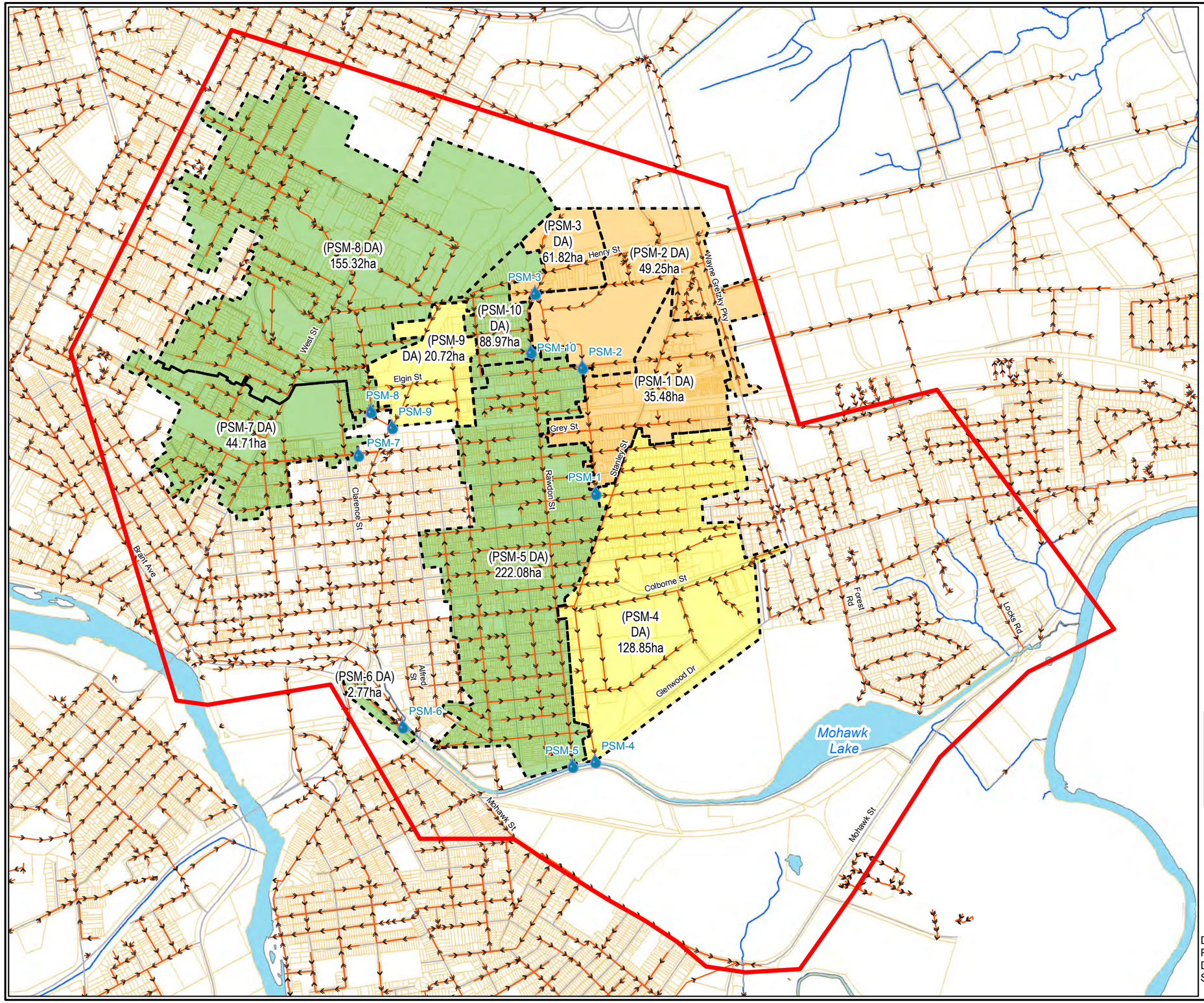
Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) pH 4.5-5.5 = 0.015, pH 5.5-6.5 = n/a, pH 6.5-9.0 = 0.075
(2) Hardness<75 = 0.011, Hardness>75 = 1.1
(3) Hardness 0-100 = 0.0001, Hardness>100 = 0.0005
(4) Hardness 0-20 = 0.001, Hardness>20 = 0.005
(5) Hardness<30 = 0.001, Hardness 30-80 = 0.003, Hardness>80 = 0.005
(6) Hexavalent Cr = 1ug/L, trivalent Cr = 8.9 ug/L

PWQO: Provincial Water Quality Objectives
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter has no guideline

Mohawk Lake And Mohawk Canal Characterization Study



Legend

- Polution Source Monitoring Stations
- Storm Gravity Mains
- Watercourse
- Property Parcels
- Waterbody
- Drainage Area Boundaries
- Study Area

Conditions

- Good
- Fair
- Poor

Figure: 5.133

Pollution Source Monitoring Locations
Drainage Area Conditions Following Round 2 Ranking

0 250 500 1,000
Meters

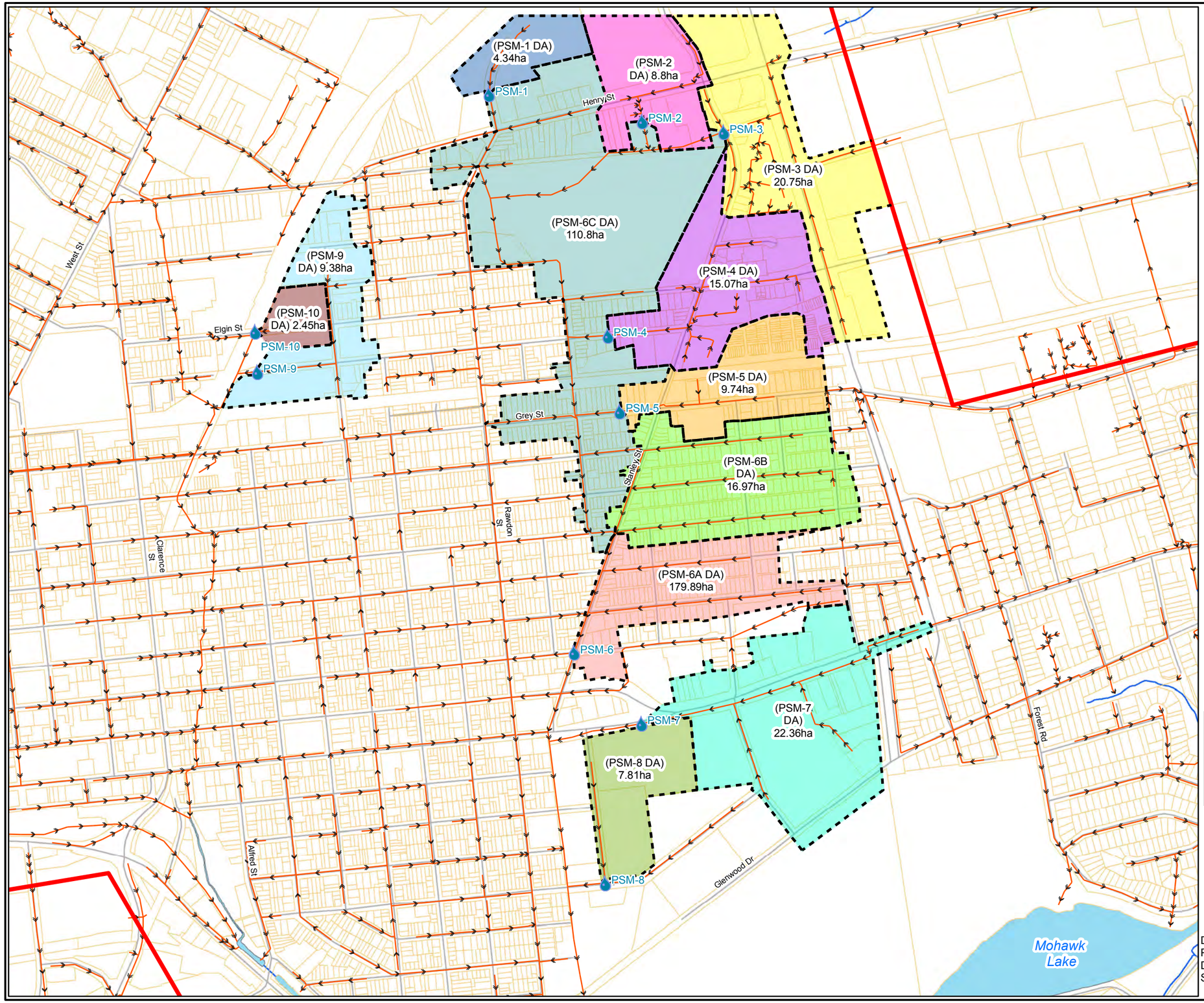
N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Round 3

Based on Round 2 results, sewershed boundaries were developed and new pollution monitoring locations were selected (**Figure 5.134)**. Round 3 sampling took place on October 12th, 2018 and October 27th, 2018 **(Table 5.43)** and results were analyzed and scored based on the ranking criteria. **Figure 5.135** demonstrates the pollution hotspots that were observed following Round 3. In this figure, the PSM-6 sewershed was broken up into sub-categories. This was done by directly comparing the pollutant concentrations from PSM-6 from Round 3 to the concentrations seen at PSM-1 in Round 2. When comparing PSM-6 (R3) to PSM-1 (R2) the only difference in inputs are stormsewer lines connecting to the Stanley Street main from the eastern side. Therefore, by comparing the concentrations from PSM-1(R2) to PSM-6(R3) it can be deduced whether those eastern stormsewer lines are adding any additional pollutants to the system. The results from PSM-6(R3) and PSM-1(R2) were very similar and therefore the conclusion was made that catchments to PSM-6A and PSM-6B (seen in **Figure 5.135**) were not significantly polluted areas. The significant pollution hotspots mapped in **Figure 5.135** are the sewershed areas for PSM-10, 6C, and 7. PSM-10 is located in a known industrial sector which could potentially be the source of pollution in these areas. The PSM-7 sewershed consists mostly of commercial, institutional, and residential sectors. This section of the Brantford is a highly trafficked area which could be the main source of the large PAHs exceedances seen at PSM-7 as PAHs are common biproducts of urban areas from vehicles and paved surfaces. Also, although many of the PAHs observed in the stormwater system are in exceedance of the PWQO, the concentrations recorded in the study are smaller than the stormwater PAH recorded and presented in the 1995 Gore and Storrie report.

It should be noted that although some watersheds were ranked as “good”, the results were only “good” relative to the other monitoring station results in Round 3, and all sites in this round did exhibit exceedances of PWQO guidelines.



Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Polution Source Monitoring Stations
- Storm Gravity Mains
- Watercourse
- Waterbody
- Property Parcels
- Drainage Area Boundaries
- Study Area

Drainage Area

- PSM-1
- PSM-2
- PSM-3
- PSM-4
- PSM-5
- PSM-6A
- PSM-6B
- PSM-6C
- PSM-7
- PSM-8
- PSM-9
- PSM-10

Figure: 5.134

Pollution Source Monitoring Locations
& Contributing Drainage Areas (Round 3)

0 150 300 600
Meters

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Table 5.43 Pollutant Exceedances Summary Table for Dry Event of Round 3

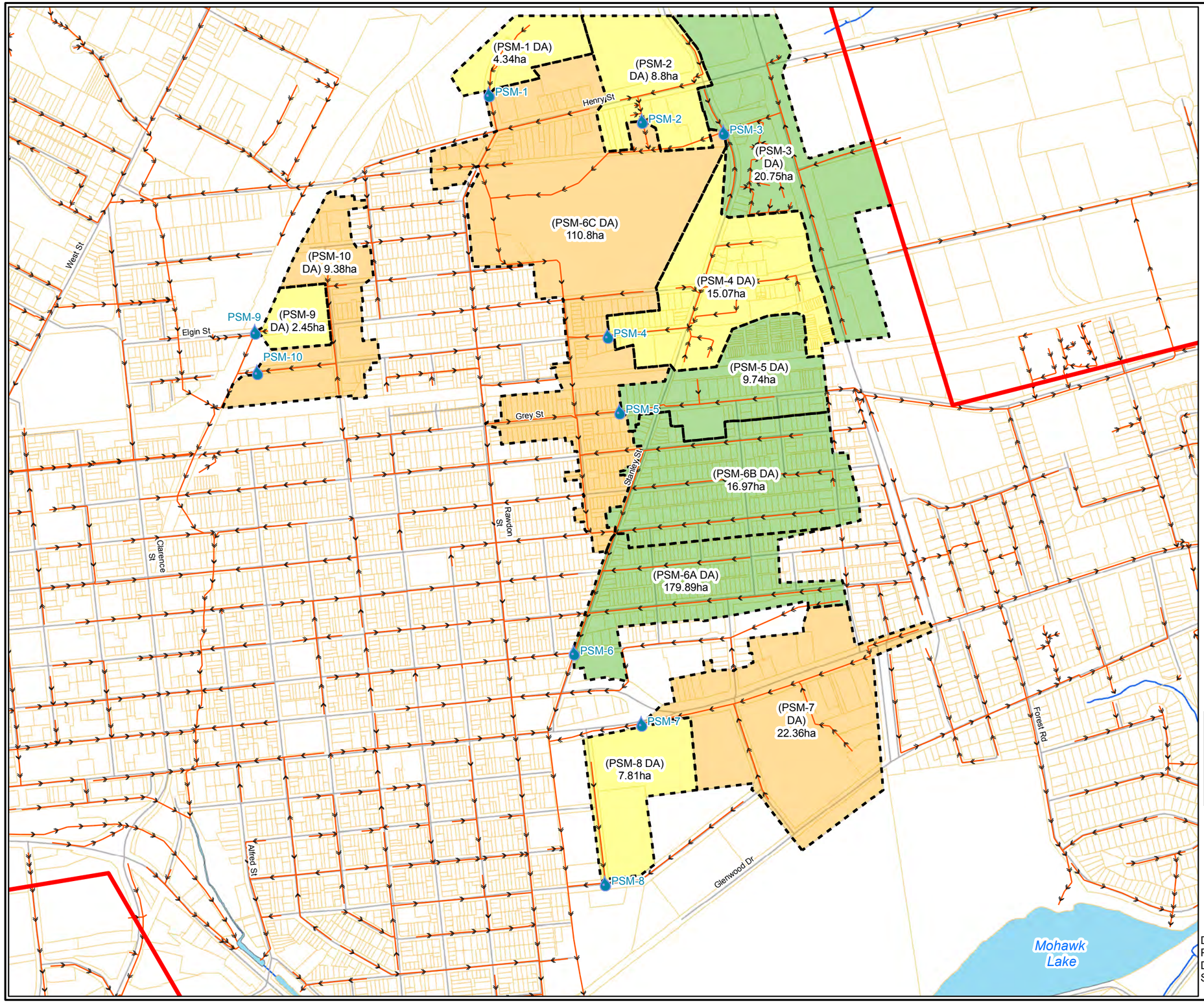
Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sample Date: October 12, 2018										Sample Date: October 27, 2018									
				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10
Physical Tests (Water)																							
Total Suspended Solids	mg/L	2	25 (CCME)	59.8	120	13	28.5	36.1	345	18.6	212	553	100	8.8	<2.0	17.2	9.7	27.9	258	18.5	4.1	16.2	14.9
Anions and Nutrients (Water)																							
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	2.06	0.75	2.75	4.41	2.99	<0.10	4.25	0.26	0.73	0.22	0.231	0.226	0.293	0.496	1.08	0.033	0.487	0.223	0.138	0.335
Phosphorus, Total	mg/L	0.003	0.03 (PWQO)	0.189	0.219	0.0545	0.0396	0.0456	7.44	0.0367	4.6	0.476	0.0758	0.074	0.0224	0.0324	0.0761	0.108	5.73	0.064	0.0262	0.0144	0.0576
Bacteriological Tests (Water)																							
E. Coli	CFU/100mL		100 (PWQO)	5500	1400	510	3500	6300	8200000	1400	2210000	23000	300	530	470	400	4400	720	6200000	5100	7900	180	540
Total Coliforms	CFU/100mL	10	1000 (PWQO)	380000	8300	5200	30000	41000	NR	6600	NR	29000	4900	9800	1600	4200	46000	5600	13200000	38000	91000	560	3600
Total Metals (Water)																							
Aluminum (Al)-Total	mg/L	0.01	0.1 (CWQG)	0.566	0.29	<0.050	0.09	0.141	0.631	1.82	1.02	5.41	0.252	0.729	0.062	0.566	0.22	0.134	0.573	0.551	0.088	0.045	0.5
Arsenic (As)-Total	mg/L	0.0001	0.005 (PWQO)	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	0.0017	<0.0010	<0.0010	0.0067	0.001	0.00078	0.00023	0.00091	0.0005	0.00088	0.00081	0.00045	0.00044	0.00021	0.00065
Boron (B)-Total	mg/L	0.01	0.2 (PWQO)	<0.10	<0.10	<0.10	<0.10	<0.10	0.2	<0.10	<0.10	0.25	0.16	0.014	<0.010	<0.010	0.011	0.022	0.3	0.011	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.00001	0.0005*(3) (PWQO)	0.000076	0.000067	<0.00005	<0.00005	<0.00005	0.000189	0.000329	0.000101	0.000616	0.000067	0.000033	0.000096	0.000053	0.000063	0.000029	0.000185	0.000044	0.000029	0.000019	0.000092
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	0.004	<0.0010	0.0063	<0.0010	0.00048	0.00015	0.00066	0.00022	0.00012	0.00085	0.00038	<0.00010	<0.00010	0.0003
Copper (Cu)-Total	mg/L	0.001	0.005*(4) (PWQO)	<0.010	<0.010	<0.010	<0.010	0.011	0.206	0.069	0.114	0.088	0.012	0.0068	0.0024	0.0233	0.0138	0.0061	0.165	0.0113	0.0022	0.0031	0.0265
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	1.75	2.71	0.85	0.53	1.19	8.83	2.5	3.74	20.6	3.94	1.06	0.07	4.25	0.881	0.336	1.8	1.11	0.128	0.084	0.831
Lead (Pb)-Total	mg/L	0.0001	0.05*(5) (PWQO)	0.00422	0.00692	<0.00050	0.00305	0.00229	0.00976	0.0409	0.0103	0.139	0.00757	0.0029	0.00027	0.00547	0.00621	0.00108	0.0062	0.00582	0.00166	0.00076	0.00905
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.276	0.1	0.26	0.0327	0.149	0.12	0.38	0.133	1.3	0.927	0.0564	0.193	0.161	0.0347	0.0324	0.0682	0.041	0.0073	0.00902	0.0427
Nickel (Ni)-Total	mg/L	0.0005	0.025 (PWQO)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0228	0.0087	0.0098	0.0251	<0.0050	0.00182	0.0012	0.00438	0.00163	0.00092	0.00571	0.00175	<0.00050	0.0006	0.00171
Silver (Ag)-Total	mg/L	0.00005	0.0001 (PWQO)	<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000232	<0.000050	<0.000050	<0.000050	<0.000050
Uranium (U)-Total	mg/L	0.00001	0.005 (PWQO)	0.00149	0.00089	0.00124	0.00111	0.00123	0.0008	0.00084	0.00082	0.00545	0.00231	0.000202	0.000073	0.000128	0.000126	0.000653	0.000699	0.000484	0.000049	0.000105	0.000153
Vanadium (V)-Total	mg/L	0.0005	0.006 (PWQO)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0172	<0.0050	0.00392	0.00067	0.00294	0.00128	0.00099	0.00146	0.00224	0.0006	<0.00050	0.00213
Zinc (Zn)-Total	mg/L	0.003	0.03* (PWQO)	0.045	0.269	<0.030	0.086	<0.030	0.176	0.369	0.235	0.346	0.082	0.0194	0.0414	0.0935	0.0859	0.0236	0.477	0.0776	0.0171	0.0157	0.0514
Speciated Metals (Water)																							
Chromium, Hexavalent	ug/L	0.5	1.0 (PWQO)	0.99	0.63	<0.50	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.05	<0.50	2.04	1.04	0.72	<0.50	1.39	0.59	<0.50	0.81
Volatile Organic Compounds (Water)																							
cis-1,2-Dichloroethylene	ug/L	0.5	200 (PWQO)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.56	328	20.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.57	<0.50
Polycyclic Aromatic Hydrocarbons (Water)																							
Anthracene	ug/L	0.01	0.012 (CWQG)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.049	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	0.084	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	0.113	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.037	<0.020	<0.020	0.058
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	<0.010	0.090	<0.010	0.014	<0.010	<0.010	0.020	<0.010	0.090	0.015	0.019	<0.010	<0.010	0.015	<0.010	<0.010	0.047	<0.010	<0.010	0.07
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO)	<0.020	0.118	<0.020	<0.020	<0.020	0.047	0.022	<0.020	0.076	<0.020	0.03	<0.020	<0.020	0.025	<0.020	<0.020	0.073	<0.020	<0.020	0.083
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO)	<0.010	0.054	<0.010	0.011	<0.010	0.013	0.013	<0.010	0.046	<0.010	0.015	<0.010	<0.010	0.012	<0.010	<0.020	0.028	<0.010	<0.010	0.05
Chrysene	ug/L	0.01	0.0001 (PWQO)	0.016	0.127	<0.010	0.022	<0.010	0.040	0.036	<0.010	0.122	0.027	0.03	<0.010	0.013	0.032	0.012	0.042	0.076	<0.010	<0.010	0.152
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO)	<0.020	0.022	<0.020	<0.020	<0.020	0.032	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.052	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.041	0.128	0.022	0.032	<0.010	0.029	0.084	0.014	0.366	0.106	0.059	<0.010	0.027	0.063	0.024	0.056	0.158	0.015	0.019	0.549
Phenanthrene	ug/L	0.02	0.4 (CWQG)	0.020	0.025	<0.020	<0.020	<0.020	0.038	0.034	<0.020	0.212	0.085	0.037	<0.020	<0.020	0.042	<0.020	0.07	0.066	<0.020	0.022	0.672
Pyrene	ug/L	0.02	0.025 (CWQG)	0.035	0.107	<0.020	0.027	<0.020	<0.035	0.065	<0.020	0.288	0.100	0.054	<0.020	0.028	0.074	0.023	0.05	0.149	<0.020	<0.020	0.28

Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) pH 4.5-5.5 = 0.015, pH 5.5-6.5 = n/a, pH 6.5-9.0 = 0.075
(2) Hardness<75 = 0.011, Hardness>75 = 1.1
(3) Hardness 0-100 = 0.0001, Hardness>100 = 0.0005
(4) Hardness 0-20 = 0.001, Hardness>20 = 0.005
(5) Hardness<30 = 0.001, Hardness 30-80 = 0.003, Hardness>80 = 0.005
(6) Hexavalent Cr = 1ug/L, trivalent Cr = 8.9 ug/L

PWQO: Provincial Water Quality Objectives
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter has no guideline



THE CORPORATION OF THE CITY OF BRANTFORD

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Polution Source Monitoring Stations
- Storm Gravity Mains
- Watercourse
- Waterbody
- Property Parcels
- Drainage Area Boundaries
- Study Area

Conditions:

- Good
- Fair
- Poor

Figure: 5.135

Pollution Source Monitoring Locations
Drainage Area Conditions Following Round 3 Ranking

0 150 300 600
Meters

N

Date: September 2019
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford

Aquafor Beech Limited

Complications and Missing Data

- In some cases, particularly for PAHs and Metals, the guidelines established by the governing agencies are below the detectable limits and analytical capabilities of typical accredited laboratories. Measurements in the tables that are highlighted in yellow fall within this range of uncertainty. To analyze theses samples at the precision established in the guidelines requires significantly higher cost, transportation distance and time. All of which were considered beyond the scope of this project. It should also be noted that PAHs very common in urban systems due to the wide range of sources such as hydrocarbon combustion by vehicles and runoff from paved surfaces.

- During the first round of sampling, speciated metals (i.e Hexavalent Chromium), VOCs and hydrocarbons were unintentionally omitted from the laboratory analysis. The implications of this omission were relatively insignificant as these compounds were analyzed during the second and third round on monitoring and the majority of the parameter concentrations fell below the guideline thresholds.

- During Round 1 and 2 sampling, the laboratory report indicated that there were small air gaps in the top sections of the VOC sampling vails. As VOCs exist in a gaseous phase at ambient temperature, it is probable that the reported concentrations of VOCs for these rounds are lower than in reality. The sampling technique was improved for the third round and reported findings in this round were more representative.

5.12.5 Recommendations

- During Round 1, field observations of fecal matter and sanitary paper in the stormwater stream indicated a potential cross-contamination within the network near the intersection of Rawdon and Bruce Street. Further investigation into possible stormsewer and sanitary sewer cross connections in this area is recommended.

- Continued pollution monitoring is recommended to further isolate the pollution hotspots in the study area and poor performing sewersheds.

- As part of the completed Geomorphological investigation (see **Section 5.11**) an erosion site in Shallow Creek Park (Reach SC-1) was identified. This area has been previously identified in the Shallow Creek Park Groundwater Investigation by Gore & Storrie in 1995 as a potential source of contaminants from the underlying waste at this location (historical landfill) as well as sediment loading. This area of erosion and restoration should be prioritized in future studies to minimize further impacts.

5.13 WATER QUALITY

The following sections describe the historical water quality conditions of Mohawk Lake and canals according to background information reviewed and the methodology and results of the water quality monitoring completed as part of the Characterization Study.

5.13.1 Background

From the review of the background information outlined above, the following key findings in regards to water quality were identified:

- As part of the 1983 study by Roff, Emerson, Dorey and Bisset, water quality sampling was conducted to expose any changes in the water quality of the Canal system incurred since 1972 when industrial discharge to the canal was stopped. In this study, multiple water quality parameters were examined, including: temperature, dissolved oxygen, nutrients, metal, phenols, bacteriological, and biological oxygen demand (BOD). The water was determined to be fairly hard (hardness of 250mg/L) and slightly alkaline. Temperature distribution was found to be fairly uniform, decreasing approximately 3˚C every meter below the surface. Values of phosphorus, nitrogen, and suspended solids were deemed fairly high. Testing also revealed extremely high levels of aluminum in East Ward Creek, as well as high copper, cadmium, and nickel levels in Mohawk Lake. Magnesium levels in the Mohawk Canal were extremely high.

- The Ecological Services for Planning (1994) study determined the lake water contained elevated concentrations of phenols, copper, and zinc. High nutrient concentrations (nitrogen, phosphorus) and high BOD loadings were also noted. No bacteriological analysis was performed. **Figure 5.136** contains the water quality results from this study. Concentrations of nutrients (phosphorus and ammonia), phenols, and heavy metals (copper and zinc) exceeded the Provincial Water Quality Objectives (PWQO).

- The City of Brantford's annual testing of storm outfalls shows that current bacteria levels are high for Mohawk Lake and canal but not unusually high (City of Brantford, 2014).

- The presence of some chemicals that exceed the Provincial Sediment Quality Guidelines (PSQG's) for the protection of freshwater biota likely affect aquatic biota and continue to negatively impact the water quality of Mohawk Lake (Ecological Services for Planning, 1994).

ECOLOGICAL SERVICES FOR PLANNING LTD.

Table 4-2. Mohawk Lake Water Quality Analyses

Analytical Parameter	Units	Detection Limit	Water Sampling Station		
			1: Lake Inlet	2: NW Springs	3: Lake Outflow
pH	None	---	7.7	7.6	7.6
Dissolved Oxygen	mg/L	---	9.57	8.78	9.83
Conductivity	µS/c	1.03	1,780	1,630	1,880
Carbonaceous BOD	m	<10	18	19	16
Ammonia	mg/L	<0.5	0.60	0.50	0.56
Total Kjeldahl Nitrogen	mg/L	<0.5	2.0	2.0	2.2
Phenols	mg/L	<0.001	0.032	0.41	0.021
Arsenic	mg/L	<0.005	<0.005	<0.005	<0.005
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.005	<0.005	<0.005	<0.005
Chromium (total)	mg/L	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	<0.006	0.006	0.006	0.010
Iron	mg/L	<0.1	0.3	<0.1	0.1
Lead	mg/L	<0.03	<0.03	<0.03	<0.03
Manganese	mg/L	<0.003	0.13	0.070	0.11
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	mg/L	<0.01	0.01	0.01	<0.01
Nickel	mg/L	<0.005	0.010	0.005	0.005
Phosphorous	mg/L	<0.05	0.05	0.10	0.05
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001
Silver	mg/L	<0.012	<0.012	<0.012	<0.012

Figure 5.136: Ecological Services for Planning (1994) Mohawk Lake Water Quality Analyses

5.13.2 Field Scope and Methodology

Water Quality Monitoring Stations

Four (4) water quality monitoring stations were established along the canal and lake and downstream of major stormwater inputs to the canal and lake. The water quality monitoring stations are shown on **Figure 5.137** and the general descriptions of the monitoring locations are as follows:

I. WQ-1- Located within the east canal approximately 100m upstream of the Locks Road Bridge. This location intended to provide an indication of the outflow water quality of Mohawk Lake and contributing outfalls. This location represents the final water quality measurement before flows reach the outlet weir and overflow into a naturalized channel to eventually join the Grand River;
II. WQ-2 – Located at the south side of Mohawk Lake near its mid-point. This location intended to provide an indication of the water quality of Mohawk Lake itself;
III. WQ-3 – Located at the mouth of the west canal with Mohawk Lake. This location intended to provide an indication of the inflow water quality to Mohawk Lake and contributing storm sewer outfalls located upstream of the lake;
IV. WQ-4 – Located directly downstream of the Murray Bridge Crossing. This location intended to provide an indication of the water quality for the portion of the west canal which is fed primarily by East Ward Creek. This station acted as a benchmark for water quality variations contributed by the outfalls located in the west canal located between Murray St. and the mouth of Lake Mohawk.

Mohawk Lake And Mohawk Canal Characterization Study

Legend

- Water Quality Monitoring Station
- Outfalls
- Storm Gravity Mains
- Study Area
- Waterbodies
- Property Parcels

Figure: 5.137

Water Quality Monitoring Locations

0 0.1 0.2 0.4

Kilometers

N

Date: October 2018
Projection: UTM_Zone_17N
Datum: NAD_1983_CSRS
Source: City of Brantford
Gore & Storrie

Aquafor Beech Limited

Methodology

The following items were used during grab sampling and field measurements:

1. Equipment/Materials: ALS sampling bottles, ice, coolers, sampling device, and sample bottles, thermometer, pH sample kit
2. Reagents and Chemicals: Preservatives (several collection bottles require an additive such as nitric acid (HNO_3) to preserve the samples until they are analyzed)

Sampling Methodology

The initial sampling program covered 2 dry weather base flow events (no precipitation within 48 hours of the sampling event) and 4 wet-weather high flow events (rainfall events greater than 15mm) distributed throughout the approximate six (6) month project period between May and October 2018. This program was repeated throughout the spring and summer of 2019 as part of the provisional water quality monitoring program.

As per standard protocols, field staff attempted to collect samples on the rising limb of the hydrograph when pollutant concentrations were greatest following the commencement of a significant storm event (typically cumulative precipitation depths greater than 15 mm). During each sample event one (1) individual grab sample was collected at each monitoring location.

Wet weather samples can be highly variable based on the magnitude and distribution of the rainfall event, number of dry days preceding the events, and the timing of the sample collection in comparison to the rising limb of the hydrograph. Due to the number of sites located at various locations around the lake and the required sampling procedure it is impossible for all sites to be sampled at the same location on the hydrograph and therefore, discretion is required in comparing results.

Grab Sample Collection

Individual grab samples were collected by filling a typical sampling device and distributing sample to each of the sampling bottles to be submitted for analysis. The sampling device was filled facing an upstream directly with canal/lake water. Prior to sample collection, the use of the “triple rinse” technique, a standard procedure, was used to neutralize the sampling device from one monitoring station to the next.

Sampling bottles were filled with sufficient volume to eliminate air bubbles or as directed by the laboratory.

Field Measurements

pH and temperature field measurements were collected at each sampling date. The “triple rinse” technique (using distilled water) was used on the measurement apparatuses between sampling at each monitoring station to ensure that water from previously sampled sites did not cross-contaminate samples from subsequent sites.

Water Quality Monitoring Parameters

Table 5.44 lists the parameters that were analyzed and sampling procedures utilized at the time of sampling.

Table 5.44 Water Quality Parameters & Sampling Procedure

Parameters	Sampling Procedure/Type	Details
Physical Tests	Grab	Conductivity, Hardness, pH, Total Suspended Solids
Bacterial	Grab	Incl. Total Coliforms and *E. coli*
Nutrients	Grab	Chloride, Nitrate, Nitrite, Total Kjeldahl Nitrogen, Total Nitrogen, Phosphorus
Metals	Grab	Incl. Salts and Metals (Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Fe, Cu, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, SAR, Sb, Se, Sn, Sr, Ti, U, V and Zn)
Polycyclic Aromatic Hydrocarbons	Grab	16 priority PAHs
Petroleum Hydrocarbons	Grab	F1 to F4
BTEX	Grab	Benzene, Toluene, Ethyl Benzene, and Xylenes
Organochlorine Pesticides and PCBs	Grab	Organochlorines (DDT & metabolites), Carbamates (Aldicarb &Carbaryl), and organophosphates (Dichlorvos & Malathion)
Volatile Organic Carbons (VOC's)	Grab	-
Temperature, pH	Field Measurement	Thermometer, pH Test Kit

5.13.3 Results, Discussion & Conclusions

The following section summarizes the water quality monitoring results. The exceedances found at each monitoring station are summarized in **Table 5.45** to **Table 5.48**. Full results for each monitoring station including parameters not in exceedance can be found in **Appendix G**.

Water quality results were compared to the following agency where applicable:

- PWQO: Provincial Water Quality Objectives
- CCME: Canadian Council of Ministers of the Environment
- CWQG: Canadian Water Quality Guidelines
- PWQMN: The Provincial (Stream) Water Quality Monitoring Network

The Provincial Water Quality Objectives are numerical and narrative criteria which serve as chemical and physical indications representing a satisfactory level for surface waters of the Province. The PWQO are set at a level of water quality which is protective to all forms of aquatic life and all aspects of aquatic life cycles during indefinite exposure to the water. These objectives cover a large range of parameters including physical parameters, nutrients, metals, PAHs, and other chemicals.

Both the CCME and CWQG provide science-based goals for the quality of aquatic and terrestrial ecosystems. Standards and guidelines from these sources were used on a select few parameters where there no PWQO was available.

The Provincial (Stream) Water Quality Monitoring Network measures water quality in rivers and streams across Ontario monitoring a number of parameters including nutrients and metals. Datasets are available online for monitoring stations all over Ontario. The closest Provincial Water Quality Monitoring Network (PWQMN) station to Mohawk Lake lies approximately 6km upstream of the Mohawk Canal outlet (see **Figure 5.138**). Some of the exceedances observed at monitoring stations WQ-1 to WQ-4 were of parameters that are also monitored by the PWQMN. In these instances, the parameter concentrations were compared to those recorded at the upstream PWQMN station.

Table 5.45 Exceedances at WQ-1

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sampling Date											
				25-Jun-18	18-Jul-18	8-Aug-18	18-Aug-18	25-Sep-18	1-Oct-18	16-Apr-19	1-May-19	22-May-19	5-Jun-19	10-Jun-19	18-Jun-19
Physical Tests															
Total Suspended Solids	mg/L	2	25 (CCME)	13.8	27.2	23.4	19.7	41.9	16.6	98.4	12.6	38.8	21.7	24.5	14.7
Anions and Nutrients															
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	0.472	<0.10	0.139	0.204	0.291	0.505	1.36	4.77	1.21	1.42	0.43	0.810
Phosphorus, Total	mg/L	0.003	0.02 (PWQO)	0.0477	0.0835	0.0658	0.0607	0.109	0.0965	0.171	0.0532	0.0325	0.0903	0.223	0.0591
Bacteriological Tests															
E. Coli	CFU/100mL	100	100 (PWQO)	250	117	410	1300	4600	1600	710	150	52	9800	4600	100
Total Coliforms	CFU/100mL	100	1000 (PWQO)	960	1500	3100	53000	4800	20000	12000	500	600	73000	410000	90000
Total Metals															
Aluminum (Al)-Total	mg/L	0.01	0.100 (CWQG)	0.159	0.142	0.154	0.111	0.367	0.148	0.853	0.122	0.208	0.227	0.429	0.105
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	0.00016	0.00013	0.00013	0.00012	0.0003	0.00012	<0.0010	0.00011	0.00016	0.00017	0.00028	0.00011
Copper (Cu)-Total	mg/L	0.001	0.005 (PWQO) (4)	0.0019	0.0019	0.0019	0.0015	0.0043	0.0021	<0.010	0.0019	0.0016	0.0037	0.0047	0.0013
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.36	0.463	0.422	0.363	0.746	0.417	1.50	0.252	0.453	0.417	0.683	0.280
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.066	0.0916	0.0761	0.0806	0.0912	0.0478	0.132	0.0515	0.0722	0.0416	0.0556	0.0439
Silver (Ag)-Total	mg/L	0.00005	0.0001 (PWQO)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Zinc (Zn)-Total	mg/L	0.003	0.03 (PWQO)	0.0048	0.0044	0.0055	0.0047	0.0117	0.0125	0.039	0.0166	0.0048	0.0150	0.0225	<0.0030
Polycyclic Aromatic Hydrocarbons															
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	<0.010	<0.010	<0.010	0.015	<0.010	0.013	0.018	<0.010	<0.010	<0.010	0.011	<0.010
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	<0.020	<0.020	<0.020	0.023	<0.020	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	<0.010	<0.010	<0.010	0.014	<0.010	0.01	0.016	<0.010	<0.010	<0.010	0.013	<0.010
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	<0.010	<0.010	0.014	0.022	0.012	0.02	0.042	<0.010	<0.010	<0.010	0.029	<0.010
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.028	0.029	0.033	0.049	0.028	0.044	0.175	0.023	0.043	0.035	0.075	0.027
Pyrene	ug/L	0.02	0.025 (CWQG)	<0.020	<0.020	0.023	0.033	0.024	0.036	0.112	<0.020	0.029	0.020	0.046	<0.020

Notes:

Exceedance

Possible Exceedance

Dry Weather Event

Wet Weather Event

(1) Interim PWQO at pH>6.5 to 9.0

(2) Interim PWQO at Hardness (as $CaCO_3$) > 75mg/L

(3) Interim PWQO at Hardness (as $CaCO_3$) > 100mg/L

(4) Interim PWQO at Hardness (as $CaCO_3$) > 20mg/L

(5) Interim PWQO at Alkalinity (as $CaCO_3$) > 80mg/L

(6) Interim PWQO set for emergency purposes

PWQO: Provincial Water Quality Guidelines

CCME: Canadian Council of Ministers of the Environment

CWQG: Canadian Water Quality Guidelines

N/V: Parameter not included in PWQOs

N/R: Data not received due to laboratory error

WQ-1 Results and Exceedances

The following sampling parameters were found to be in exceedance of their respective PWQO guidelines during sampling at WQ-1:

- Total Suspended Solids
- Nitrate
- Total Phosphorus
- E. coli
- Total Coliforms
- Aluminum
- Iron
- Manganese
- Zinc
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Fluoranthene
- Pyrene

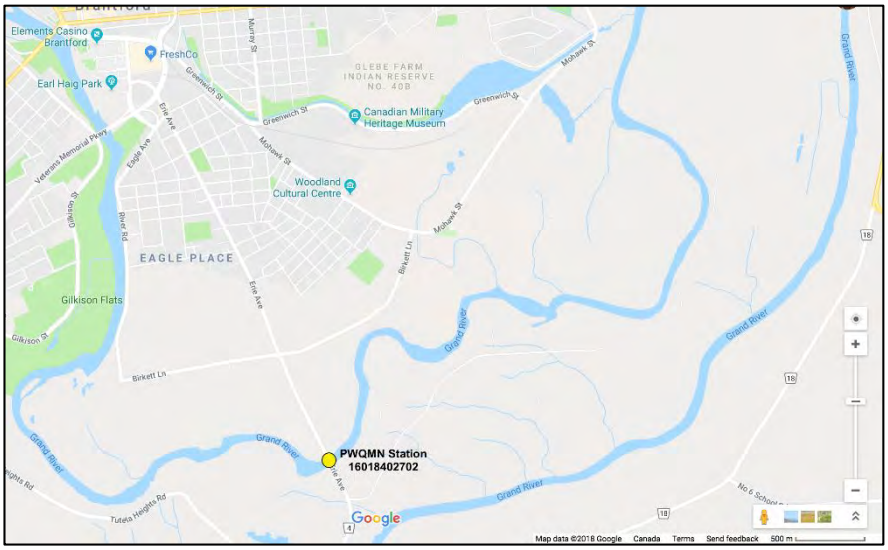


Figure 5.138: PWQMN Station upstream of Mohawk Lake

All other parameters tested at this location were either below the PWQO guidelines or had no guideline or standard to compare the results to.

Total Suspended Solids

TSS exceedances only occurred in 3 of the 12 samples (two during dry events, one during a rain event). In each case the exceedance was minimal - less than 2 times the CCME guideline.

Nitrate

Nitrate was only found in exceedance during one rain event which occurred during the provisional monitoring period in April 2019. The exceedance at this event was relatively minimal, approximately 1.5 times the CCME limit.

Total Phosphorus

Exceedances of the PWQO guideline for Total Phosphorus occurred for all 12 sampling events. The lowest exceedance was observed during one of the dry events sampled while the highest exceedance was observed during a rain event. All the exceedances were approximately two to five times greater than the PWQO guideline.

E. coli

Exceedances of the PWQO guideline occurred for 10 of the 12 sampling events. The lowest exceedances were observed during the dry events while much higher exceedances, some over 10 times the PWQO guideline, were observed during the rain events.

Total Coliforms

Exceedances of the PWQO guideline occurred for 9 of the 12 sampling events. The lowest exceedance was only 1.5 times greater than the PWQO guideline and was observed during one of the dry events. The

highest exceedances were observed during the rain events with the largest exceedance being over 400 times greater than PWQO guideline.

Aluminum

Exceedances of the CWQG guideline occurred for all 12 sampling events. Aluminum exceedances were relatively low and were fairly consistent for most of the events with the highest concentration occurring during a rain event (more than 8 times greater than the CWQG guideline).

Iron

Exceedances of the PWQO guideline occurred for 10 of 12 sampling events. Iron exceedances were relatively low and levels were fairly consistent for most of the events.

Manganese

Exceedances of the CWQG guideline occurred for 8 of 12 sampling events (one rain event was below CWQG). Manganese exceedances were relatively low and levels were fairly consistent across most of the events.

Zinc

Zinc was only found in exceedance during one rain event which occurred during the provisional monitoring period in April 2019. The exceedance was relatively minimal being less than 1.5 times greater than the PWQO guideline.

PAHs

The PWQO for PAHs are interim values set for emergency purposes. However, the laboratory detection limit for these chemicals is not low enough to be able to detect concentrations as low as the PWQO guidelines. Therefore, some of the results received for Benzo(a)anthracene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, and Dibenzo(a,h)anthracene are listed as possible exceedances because the results could potentially be greater than the PWQO guideline.

In several instances across the sample program detectable exceedances in these parameters were observed at WQ-1:

- One (1) Benzo(a)pyrene exceedance was observed during a rain event which occurred during the provisional monitoring period which was relatively minimal;
- Two (2) Benzo(g,h,i)perylene exceedances occurred during rain events which were over 1000 times greater than the PWQO guideline;
- Four (4) Benzo(k)fluoranthene exceedances occurred during rain events which were over 50 times greater than the PWQO guideline;
- Five (5) Chrysene exceedances occurred during rain events which were over 100 times greater than the PWQO guideline;
- Five (5) Fluoranthene exceedances occurred during both dry and rain events that were relatively minimal, the greatest exceedance being over 4 times greater than the CWQG guideline; and,
- Five (5) Pyrene exceedances occurred during both dry and rain events that were relatively minimal, the greatest exceedance being over 4 times greater than the CWQG guideline

Table 5.46 Exceedances at WQ-2

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sampling Date											
				25-Jun-18	18-Jul-18	8-Aug-18	18-Aug-18	25-Sep-18	1-Oct-18	16-Apr-19	1-May-19	22-May-19	5-Jun-19	10-Jun-19	18-Jun-19
Anions and Nutrients															
Phosphorus, Total	mg/L	0.003	0.02 (PWQO)	0.0419	0.0701	0.0556	0.066	0.0723	0.0501	0.0513	0.0317	0.0251	0.0298	0.0713	0.0320
Bacteriological Tests															
E. Coli	CFU/100mL	100	100 (PWQO)	560	7	87	970	100	520	100	350	38	330	140	40
Total Coliforms	CFU/100mL	100	1000 (PWQO)	3200	130	3600	48000	5500	19000	2200	3800	3000	18000	12000	110000
Total Metals															
Aluminum (Al)-Total	mg/L	0.01	0.100 (CWQG)	0.112	0.098	0.052	0.09	0.102	0.134	0.175	0.067	0.103	0.084	0.079	0.073
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.368	0.42	0.243	0.363	0.353	0.444	0.34	0.220	0.325	0.214	0.192	0.232
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.0703	0.122	0.0593	0.0784	0.0486	0.0466	0.0726	0.0585	0.0592	0.0448	0.0329	0.0457
Polycyclic Aromatic Hydrocarbons															
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	0.01	<0.010	<0.010	<0.010	0.011	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	<0.010	<0.010	<0.010	<0.010	0.01	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	0.014	0.013	<0.010	0.013	0.018	0.024	<0.025	0.013	0.011	<0.010	0.010	<0.010
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.051	0.031	0.022	0.041	0.055	0.059	0.076	0.047	0.055	0.036	0.042	0.032
Pyrene	ug/L	0.02	0.025 (CWQG)	0.028	0.02	<0.020	0.024	0.044	0.049	0.047	0.030	0.034	0.021	<0.020	<0.020

Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) Interim PWQO at pH>6.5 to 9.0
(2) Interim PWQO at Hardness (as $CaCO_3$) > 75mg/L
(3) Interim PWQO at Hardness (as $CaCO_3$) > 100mg/L
(4) Interim PWQO at Hardness (as $CaCO_3$) > 20mg/L
(5) Interim PWQO at Alkalinity (as $CaCO_3$) > 80mg/L
(6) Interim PWQO set for emergency purposes

PWQO: Provincial Water Quality Guidelines
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter not included in PWQOs
N/R: Data not received due to laboratory error

WQ-2 Results and Exceedances

The following sampling parameters were found to be in exceedance of their respective PWQO guidelines during sampling at WQ-2:

- Total Phosphorus
- E. coli
- Total Coliforms
- Aluminum
- Iron
- Manganese
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Fluoranthene
- Pyrene

All other parameters that were tested at this location were either below the PWQO guidelines or had no guideline or standard to compare the results to.

Total Phosphorus

Exceedances of the PWQO guideline in this parameter occurred for all 12 sampling events. The lowest exceedance was observed during a dry event while the highest exceedance was observed during a rain event. The exceedances seen across all events were approximately 1.5 to 4 times greater than the PWQO guideline.

E. coli

Exceedances of the PWQO guideline occurred for 6 of the 12 sampling events (one dry event and two rain events). The exceedances were approximately 1.5 to 10 times greater than the PWQO guideline.

Total Coliforms

Exceedances of the PWQO guideline occurred for 11 of the 12 sampling events (one dry event result was below PWQO). The lowest exceedance was approximately 2 times greater than the PWQO guideline and was observed during one of the rain events. The highest exceedances were seen during the rain events with the largest exceedance being more than 100 times greater than PWQO guideline.

Aluminum

Exceedances of the CWQG guideline occurred for 5 of 12 sampling events. Aluminum exceedances were relatively low and were fairly consistent across most of the events (less than 2 times greater than the CWQG guideline).

Iron

Exceedances of the PWQO guideline occurred for 7 of the 12 sampling events. Iron exceedances were relatively low (less than 1.5 times greater than the PWQO guideline) and levels were fairly consistent across the events.

Manganese

Exceedances of the CWQG guideline occurred for 7 of 12 sampling events. Manganese exceedances were relatively low and levels were fairly consistent across most of the events.

PAHs

The PWQO for PAHs are interim values set for emergency purposes. However, the laboratory detection limit for these chemicals is not low enough to be able to detect concentrations as low as the PWQO guidelines. Therefore, some of the results received for Benzo(a)anthracene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, and Dibenzo(a,h)anthracene are listed as possible exceedances because the results could potentially be greater than the PWQO guideline.

In several instances across the sample program detectable exceedances in these parameters were observed at WQ-2:

- Benzo(a)pyrene exceedance occurred during one of the rain events which was very minimal;
- Benzo(g,h,i)perylene exceedance occurred during one of the rain events which was over 1000 times greater than the PWQO guideline;
- Two (2) Benzo(k)fluoranthene exceedances occurred during rain events which were over 50 times greater than the PWQO guideline;
- Eight (8) Chrysene exceedances occurred during dry and rain events which were over 100 times greater than the PWQO guideline;
- Eight (8) Fluoranthene exceedances occurred during both dry and rain events, most of which were relatively minimal (less than 1.5 times the guideline); and,
- Six (6) Pyrene exceedances occurred during both dry and rain events, most of which were relativity minimal (less than 1.5 times the guideline).

Table 5.47 Exceedances at WQ-3

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sampling Date											
				25-Jun-18	18-Jul-18	8-Aug-18	18-Aug-18	25-Sep-18	1-Oct-18	16-Apr-19	1-May-19	22-May-19	5-Jun-19	10-Jun-19	18-Jun-19
Physical Tests (Water)															
Total Suspended Solids	mg/L	2	25 (CCME)	14.7	24.3	16.2	15.5	26.6	13.9	16.0	50.8	13.3	19.3	18.1	85.0
Anions and Nutrients (Water)															
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	0.707	0.98	1.09	0.448	1.79	1.2	1.06	0.471	3.34	3.26	3.01	3.19
Phosphorus, Total	mg/L	0.003	0.02 (PWQO)	0.0814	0.0859	0.0765	0.0772	0.135	0.0704	0.0718	0.0695	0.0449	0.0641	0.0589	0.164
Bacteriological Tests (Water)															
E. Coli	CFU/100mL	100	100 (PWQO)	970	96	1090	44000	43000	13000	570	750	1600	11100	6900	700
Total Coliforms	CFU/100mL	100	1000 (PWQO)	10300	1030	96000	119000	>200000	160000	5400	18000	21000	102000	90000	40000
Total Metals (Water)															
Aluminum (Al)-Total	mg/L	0.01	0.100 (CWQG)	0.192	0.162	0.301	0.239	0.676	0.499	0.275	0.709	0.145	0.160	0.219	0.310
Copper (Cu)-Total	mg/L	0.001	0.005 (PWQO) (4)	0.0051	0.0033	0.0045	0.0046	0.0067	0.0054	0.0041	0.0060	0.0025	0.0036	0.0044	0.0051
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.717	0.799	0.654	0.533	1.4	0.816	0.535	1.05	0.734	0.632	0.754	1.38
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.0879	0.0975	0.102	0.0605	0.0889	0.0476	0.0577	0.0603	0.0956	0.0968	0.116	0.181
Zinc (Zn)-Total	mg/L	0.003	0.03 (PWQO)	0.0097	0.0119	0.0165	0.0144	0.025	0.0224	0.0199	0.0317	0.0087	0.0127	0.0119	0.0237
Hydrocarbons															
F3 (C16-C34)	ug/L	250	N/V	<250	<250	N/R	N/R	<250	<250	<250	<250	<250	<250	<250	310
F3-PAH	ug/L	250	N/V	N/R	N/R	N/R	N/R	<250	<250	<250	<250	<250	<250	<250	310
Total Hydrocarbons (C6-C50)	ug/L	370	N/V	<370	<370	N/R	N/R	<370	<370	<370	<370	<370	<250	<250	310
Polycyclic Aromatic Hydrocarbons															
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	0.021	<0.020	0.025	<0.020	0.023	0.024	<0.030	<0.020	<0.020	<0.020	0.024
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	0.01	0.02	0.016	0.031	<0.010	0.022	0.024	0.028	0.013	<0.010	0.011	0.015
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	<0.020	0.024	0.023	0.042	<0.020	0.028	0.029	0.035	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	<0.010	0.015	0.015	0.025	<0.010	0.018	0.019	0.026	0.011	<0.010	0.010	0.016
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	0.024	0.047	0.05	0.057	0.034	0.053	0.047	0.056	0.026	0.026	0.030	0.068
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.088	0.14	0.142	0.17	0.1	0.108	0.158	0.183	0.113	0.119	0.115	0.213
Pyrene	ug/L	0.02	0.025 (CWQG)	0.045	0.088	0.091	0.11	0.07	0.084	0.104	0.131	0.081	0.076	0.069	0.148

Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) Interim PWQO at pH>6.5 to 9.0
(2) Interim PWQO at Hardness (as $CaCO_3$) > 75mg/L
(3) Interim PWQO at Hardness (as $CaCO_3$) > 100mg/L
(4) Interim PWQO at Hardness (as $CaCO_3$) > 20mg/L
(5) Interim PWQO at Alkalinity (as $CaCO_3$) > 80mg/L
(6) Interim PWQO set for emergency purposes

PWQO: Provincial Water Quality Guidelines
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter not included in PWQOs
N/R: Data not received due to laboratory error

WQ-3 Results and Exceedances

The following sampling parameters were found to be in exceedance of their respective PWQO guidelines during sampling at WQ-3:

- Total Suspended Solids
- Nitrate
- Total Phosphorus
- E. coli
- Total Coliforms
- Aluminum
- Copper
- Iron
- Manganese
- Zinc
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Fluoranthene
- Pyrene

All other parameters that were tested at this location were either below the PWQO guidelines or had no guideline or standard to compare the results to.

Total Suspended Solids

Exceedances in this parameter occurred during 3 of 12 sampling events (all during rain events). The lowest exceedance was relatively minimal, being only slightly higher than the guideline, while the highest exceedance was more than 3 times greater than the guideline.

Nitrate

Exceedances of the CCME guideline occurred during 4 of the 12 samplings events (2 rain, 2 dry), all of which occurred during the provisional monitoring period. The Nitrate exceedances were all relatively low and consistent across the 4 events.

Total Phosphorus

Exceedances of the CWQG guideline in this parameter occurred for all 12 sampling events. The exceedances were fairly consistent across the events (approximately 4 to 8 times greater than the CWQG guideline).

E. coli

Exceedances of the PWQO guideline occurred for 11 of the 12 sampling events (one dry event was below PWQO). The lowest exceedances were observed during the dry events while much higher exceedances, some over 400 times the PWQO guideline, were observed during the rain events.

Total Coliforms
Exceedances of the PWQO guideline occurred for all 12 sampling events. The lowest exceedance was very minimal and was observed during one of the dry events. The highest exceedances were seen during the rain events with the largest exceedance being over 200 times greater than PWQO guideline.

Aluminum
Exceedances of the PWQO guideline occurred for all 12 sampling events. Aluminum exceedances were more variable ranging from 1.5 to 7 times greater than the PWQO guideline.

Copper
Exceedances of the PWQO guideline occurred for 5 of the 12 sampling events (one dry event, two rain events). All the exceedances were relatively minimal, less than 1.5 times greater than the PWQO guideline.

Iron
Exceedances of the PWQO guideline occurred for all 12 sampling events. Iron exceedances were fairly consistent across most of the events (approximately 2 to 4 times greater than PWQO guidelines).

Manganese
Exceedances of the CWQG guideline occurred for 11 of 12 sampling events (1 rain event was below CWQG). Manganese exceedances were relatively consistent across most of the events, approximately 2-5 times greater than the guideline.

Zinc
One zinc exceedance occurred during a rain event carried out during the provisional monitoring period. The exceedance was relatively minor, being only 0.0017 mg/L greater than the PWQO guideline.

Hydrocarbons
WQ-3 was the only sampling site to have observable values of select hydrocarbons. Although there is no guideline for this parameter, it should be noted that all other observations for hydrocarbons across all sampling sites were below the detection limits.

PAHs
The PWQO for PAHs are interim values set for emergency purposes. However, the laboratory detection limit for these chemicals is not low enough to be able to detect concentrations as low as the PWQO guidelines. Therefore, some of the results received for Benzo(a)anthracene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, and Dibenzo(a,h)anthracene are listed as possible exceedances because the results could potentially be greater than the PWQO guideline.

In several instances across the sample program detectable exceedances in these parameters were observed at WQ-3:

- Five (5) Benzo(a)anthracene exceedances occurred during both dry and rain events which were all relatively minimal;
- Six (6) Benzo(a)pyrene exceedances occurred during both dry and rain events which were all relatively minimal;
- Six (6) Benzo(g,h,i)perylene exceedances occurred during both dry and rain events which were over 1000 times greater than the PWQO guideline;

- Nine (9) Benzo(k)fluoranthene exceedances occurred during both dry and rain events which were over 75 times greater than the PWQO guideline;
- Chrysene exceedances occurred across all twelve (12) events and ranged from 200-680 times greater than the PWQO guideline;
- Fluoranthene exceedances occurred across all twelve (12) events which were all over 100 times greater than the PWQO guidelines; and,
- Pyrene exceedances occurred across all twelve (12) events and ranged from 2 to 6 times greater than the CWQG guideline

Table 5.48 Exceedances at WQ-4

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sampling Date											
				25-Jun-18	18-Jul-18	8-Aug-18	18-Aug-18	25-Sep-18	1-Oct-18	16-Apr-19	1-May-19	22-May-19	5-Jun-19	10-Jun-19	18-Jun-19
Physical Tests (Water)															
Total Suspended Solids	mg/L	2	25 (CCME)	23.4	23.8	14.6	22.1	24.8	48.1	24.8	28.3	349	54.0	56.4	420
Anions and Nutrients (Water)															
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	3.23	3.29	0.829	1.07	0.591	0.585	1.75	0.665	3.28	0.81	2.24	2.60
Phosphorus, Total	mg/L	0.003	0.02 (PWQO)	0.0659	0.0295	0.079	0.0882	0.133	0.101	0.0592	0.0785	0.0527	0.168	0.171	0.376
Cyanides (Water)															
Cyanide, Free	mg/L	0.002	0.005 (PWQO)	<0.0020	<0.0020	0.0037	<0.0020	<0.0020	<0.0020	0.0059	0.0029	0.0042	<0.0020	<0.0020	<0.0020
Bacteriological Tests (Water)															
E. Coli	CFU/100mL	100	100 (PWQO)	1060	141	1170	12700	19000	16000	60	300	70	17300	44000	130
Total Coliforms	CFU/100mL	100	1000 (PWQO)	12100	5400	56000	86000	>200000	150000	2100	17000	6000	>200000	3900000	40000
Total Metals (Water)															
Aluminum (Al)-Total	mg/L	0.01	0.100 (CWQG)	0.11	0.046	0.245	0.249	0.367	0.588	0.275	0.414	1.90	0.696	0.732	0.517
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	0.00022	0.00013	0.0002	0.00023	0.00029	0.0004	0.00024	0.00026	0.00124	0.00050	0.00056	0.00049
Copper (Cu)-Total	mg/L	0.001	0.005 (PWQO) (4)	0.0038	0.0024	0.0065	0.0067	0.0104	0.0108	0.0055	0.0068	0.0356	0.0128	0.0123	0.0109
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.764	0.275	0.712	0.782	1.23	1.2	0.688	0.870	5.27	1.51	1.70	1.90
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.116	0.0369	0.067	0.095	0.0803	0.0567	0.0486	0.0505	0.174	0.0933	0.132	0.122
Zinc (Zn)-Total	mg/L	0.003	0.03 (PWQO)	0.011	0.0062	0.0201	0.0227	0.0362	0.047	0.0269	0.0344	0.181	0.0588	0.0574	0.0551
Polycyclic Aromatic Hydrocarbons															
Anthracene	ug/L	0.01	0.012 (CWQG)	<0.010	<0.010	0.015	0.011	0.014	0.017	<0.010	0.013	<0.010	0.019	0.029	0.013
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	<0.020	<0.020	0.032	0.053	0.042	0.124	<0.020	<0.070	<0.020	0.063	0.063	0.029
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	0.023	<0.010	0.038	0.06	0.039	0.134	0.016	0.066	0.015	0.069	0.060	0.018
Benzo(b)fluoranthene	ug/L	0.02	N/V	0.058	0.022	0.097	0.136	0.12	0.243	0.038	0.175	0.035	0.175	0.177	0.051
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO) (6)	0.028	<0.020	0.049	0.071	0.05	0.145	<0.020	0.099	<0.020	0.104	0.070	<0.020
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO) (6)	0.019	<0.010	0.032	0.039	0.036	0.104	0.013	0.054	0.013	0.059	0.050	0.017
Chrysene	ug/L	0.01	0.0001 (PWQO) (a)	0.043	0.019	0.084	0.106	0.094	0.273	0.041	0.154	0.035	0.148	0.150	0.071
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO) (6)	<0.020	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.182	0.074	0.251	0.301	0.264	0.496	0.200	0.399	0.138	0.473	0.503	0.352
Phenanthrene	ug/L	0.02	0.4 (CWQG)	0.112	0.04	0.156	0.174	0.133	0.197	0.098	0.159	0.050	0.251	0.221	0.188
Pyrene	ug/L	0.02	0.025 (CWQG)	0.101	0.042	0.164	0.206	0.176	0.383	0.122	0.267	0.092	0.312	0.341	0.223

Notes:

Exceedance
Possible Exceedance
Dry Weather Event
Wet Weather Event

(1) Interim PWQO at pH>6.5 to 9.0
(2) Interim PWQO at Hardness (as $CaCO_3$) > 75mg/L
(3) Interim PWQO at Hardness (as $CaCO_3$) > 100mg/L
(4) Interim PWQO at Hardness (as $CaCO_3$) > 20mg/L
(5) Interim PWQO at Alkalinity (as $CaCO_3$) > 80mg/L
(6) Interim PWQO set for emergency purposes

PWQO: Provincial Water Quality Guidelines
CCME: Canadian Council of Ministers of the Environment
CWQG: Canadian Water Quality Guidelines
N/V: Parameter not included in PWQOs
N/R: Data not received due to laboratory error

WQ-4 Results and Exceedances

The following sampling parameters were found to be in exceedance of their respective PWQO guidelines during sampling at WQ-4:

- Total Suspended Solids
- Nitrate
- Total Phosphorus
- E. coli
- Total Coliforms
- Cyanide
- Aluminum
- Cobalt
- Copper
- Iron
- Manganese
- Zinc
- Anthracene
- Benzo(a)anthracene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Fluoranthene
- Phenanthrene

All other parameters that were tested at this location were either below the PWQO guidelines or had no guideline or standard to compare the results to.

Total Suspended Solids

Exceedances in this parameter occurred during 6 of the 12 sampling events (during both dry and rain events). The lowest exceedance was very minimal while the highest exceedance was more than 16 times greater than the CCME guideline.

Nitrate

Exceedances in this parameter only occurred during 3 of the 12 sampling events (during both dry events). The exceedances were relatively minimal, less than 0.5 mg/L greater than the CCME guideline.

Total Phosphorus

Exceedances of the PWQO guideline in this parameter occurred for all 12 sampling events. The exceedances were fairly consistent across the events (approximately 4 to 8 times greater than the PWQO guideline).

Cyanide

Only one exceedance occurred for this parameter during one of the rain events which occurred during the provisional monitoring period. The exceedance was very minimal being on 0.009 mg/L greater than the PWQO guideline.

E. coli

Exceedances of the PWQO guideline occurred for all 10 of 12 sampling events. The lowest exceedances were observed during the dry events while much higher exceedances, some over 150 times the PWQO guideline, were observed during the rain events.

Total Coliforms

Exceedances of the PWQO guideline occurred for all 12 sampling events. The lowest exceedance was observed during one of the dry events. The highest exceedances were seen during the rain events with the largest exceedance being over 3000 times greater than PWQO guideline.

Aluminum

Exceedances of the PWQO guideline occurred for 11 of 12 sampling events. Aluminum exceedances were more variable ranging which the smallest being very minimal (less the 1.5 times greater) and the largest being 19 times greater than the PWQO guideline.

Cobalt

Only one exceedance occurred for this parameter during one of the dry events of the provisional monitoring period. The exceedance was very minimal being less than 1.5 times greater than the PWQO guideline.

Copper

Exceedances of the PWQO guideline occurred for 10 of the 12 sampling events (four rain events) and were fairly consistent across all of the rain events.

Iron

Exceedances of the PWQO guideline occurred for all 11 of the 12 sampling events (one dry event was below PWQO). Iron exceedances were fairly consistent across most of the events (approximately 2 to 6 times greater than PWQO guidelines), but the highest exceedance was more than 17 times greater than the guideline.

Manganese

Exceedances of the CWQG guideline occurred for 10 of 12 sampling events (1 rain event and 1 dry event were below CWQG). Manganese exceedances were relatively consistent across most of the events, approximately 2-4 times greater than the guideline.

Zinc

Exceedances of the PWQO guideline occurred for 7 of 12 sampling events (during 2 rain events). Zinc exceedances were relatively low and concentrations were fairly consistent, with the exception of the greatest exceedance which was 6 times greater than the guideline.

PAHs

The PWQO for PAHs are interim values set for emergency purposes. However, the laboratory detection limit for these chemicals is not low enough to be able to detect concentrations as low as the PWQO guidelines. Therefore, some of the results received for Benzo(a)anthracene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, and Dibenzo(a,h)anthracene are listed as possible exceedances because the results could potentially be greater than the PWQO guideline.

In several instances across the sample program detectable exceedances in these parameters was observed at WQ-4:

- Seven (7) Anthracene exceedances occurred during rain events, mostly of which were relatively minimal;
- Seven (7) Benzo(a)anthracene exceedances occurred during both dry and rain events which were 2-6 times greater than the CWQG guideline;
- Eleven (11) Benzo(a)pyrene exceedances occurred during both dry and rain events which were 1.5-9 times greater than the CWQG guideline;
- Eight (8) Benzo(g,h,i)perylene exceedances occurred during both dry and rain events which were over 1000 times greater than the PWQO guideline;
- Nine (9) Benzo(k)fluoranthene exceedances occurred during both dry and rain events which were over 100 times greater than the PWQO guideline;
- Chrysene exceedances occurred across all twelve (12) events and ranged from 190 to over 2000 times greater than the PWQO guideline;
- One (1) Dibenzo(a,h)anthracene exceedance occurred during a rain event that was over 10 times greater than the PWQO guideline;
- Fluoranthene exceedances occurred across all twelve (12) events which were 2-12 times greater than the CWQG guideline; and,
- Pyrene exceedances occurred across all twelve (12) events which were 4-15 times greater than the CWQG guideline

Pesticide and PCB Results

Water quality samples for WQ-1 to WQ-4 were tested for pesticides on September 25th, 2018. The following sampling parameters were found to be in possible exceedance of their respective PWQO guidelines for WQ-1 to WQ-4:

- Total PCBs
- Aldrin
- Gamme-hexachlorocyclohexane
- Chlordane
- Total DDD
- Total DDT
- Dieldrin
- Endosulfan
- Endrin
- Heptachlor
- Heptachlor Epoxide
- Hexachlorobenzene
- Hexachlorobutadiene
- Methoxychlor

For the parameters above, the detection limit is not low enough to be able to detect concentrations as low as the PWQO guidelines for each respective chemical. Therefore, some of the results were flagged as possible exceedances if the concentration could have potentially exceeded the guidelines. However, for all pesticides and PCB sampled none exceeded the laboratory detection limits.

Table 5.49 Pesticide and PCB Results

Parameter	Units	Detection Limits	Standard/ Guideline (Type)	Sample Date: September 25, 2018			
				WQ-1	WQ-2	WQ-3	WQ-4
Polychlorinated Biphenyls (Water)							
Aroclor 1242	ug/L	0.02	N/V	<0.020	<0.020	<0.020	<0.020
Aroclor 1248	ug/L	0.02	N/V	<0.020	<0.020	<0.020	<0.020
Aroclor 1254	ug/L	0.02	N/V	<0.020	<0.020	<0.020	<0.020
Aroclor 1260	ug/L	0.02	N/V	<0.020	<0.020	<0.020	<0.020
Total PCBs	ug/L	0.04	0.001 (PWQO)	<0.040	<0.040	<0.040	<0.040
2-fluorobiphenyl	%	-	N/V	83.4	77.6	76.4	90.1
Organochlorine Pesticides (Water)							
Aldrin	ug/L	0.01	0.001 (PWQO)	<0.010	<0.010	<0.010	<0.010
gamma-hexachlorocyclohexane	ug/L	0.01	0.01 (PWQO)	<0.010	<0.010	<0.010	<0.010
a-chlordane	ug/L	0.04	N/V	<0.040	<0.040	<0.040	<0.040
Chlordane (Total)	ug/L	0.057	0.006 (PWQO)	<0.057	<0.057	<0.057	<0.057
g-chlordane	ug/L	0.04	N/V	<0.040	<0.040	<0.040	<0.040
o,p-DDD	ug/L	0.03	N/V	<0.030	<0.030	<0.060	<0.075
pp-DDD	ug/L	0.03	N/V	<0.030	<0.030	<0.060	<0.075
Total DDD	ug/L	0.042	0.003 (PWQO)	<0.042	<0.042	<0.085	<0.11
o,p-DDE	ug/L	0.008	N/V	<0.016	<0.016	<0.0080	<0.0080
pp-DDE	ug/L	0.008	N/V	<0.016	<0.016	<0.0080	<0.0080
Total DDE	ug/L	0.011	0.003 (PWQO)	<0.023	<0.023	<0.011	<0.011
op-DDT	ug/L	0.03	N/V	<0.030	<0.030	<0.060	<0.075
pp-DDT	ug/L	0.03	N/V	<0.030	<0.030	<0.060	<0.075
Total DDT	ug/L	0.042	0.003 (PWQO)	<0.042	<0.042	<0.085	<0.11
Dieldrin	ug/L	0.05	0.001 (PWQO)	<0.050	<0.050	<0.10	<0.13
Endosulfan I	ug/L	0.03	N/V	<0.030	<0.030	<0.030	<0.030
Endosulfan II	ug/L	0.03	N/V	<0.030	<0.030	<0.060	<0.075
Endosulfan (Total)	ug/L	0.042	0.003 (PWQO)	<0.042	<0.042	<0.067	<0.081
Endrin	ug/L	0.04	0.002 (PWQO)	<0.040	<0.040	<0.080	<0.10
Heptachlor	ug/L	0.01	0.001 (PWQO)	<0.010	<0.010	<0.010	<0.010
Heptachlor Epoxide	ug/L	0.01	0.001 (PWQO)	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene	ug/L	0.01	0.0065 (PWQO)	<0.010	<0.010	<0.010	<0.010
Hexachlorobutadiene	ug/L	0.01	0.009 (PWQO)	<0.010	<0.010	<0.010	<0.010
Hexachloroethane	ug/L	0.01	1.0 (PWQO	<0.010	<0.010	<0.010	<0.010
Methoxychlor	ug/L	0.05	0.04 (PWQO)	<0.050	<0.050	<0.10	<0.13
2-Fluorobiphenyl	%	-	N/V	65.2	64.8	57.5	56.1
d14-Terphenyl	%	-	N/V	73.9	61.1	44	42.7

Notes:

Exceedance

Possible Exceedance

PWQO: Provincial Water Quality Guidelines

N/V: Parameter not included in PWQOs

Discussion

While the concentrations varied, parameter exceedances were common at all four (4) monitoring stations. WQ-1, which was located in the East Canal, and WQ-2, which was located in the lake, generally had lower concentrations of the exceeded parameters which may likely be attributed to the dilution effect of Mohawk Lake. In contrast, WQ-3 and WQ-4, located in the West Canal, had higher concentrations of the exceedance parameters compared to WQ-1 and WQ-2. This is not surprising as 92% of the inflow from the storm sewer outlets located throughout the Mohawk Lake watershed enters the Mohawk Lake and Canal system via the West Canal. During the pollution monitoring program, select outfalls that emptied directly into the Lake and Canals were sampled during rounds 1 and 2 (see **Figure 5.130**, **Figure 5.132**). **Table 5.50** provides the average concentrations from specific outfalls (Round 1: PSM1-7, Round 2: PSM4-6) sampled during pollution monitoring program for select parameters that were commonly exceeded during at the water quality stations. The samples from the outfalls in the West Canal typically displayed higher concentrations that those in the Lake and East Canal, which is likely why WQ-3 and WQ-4 also experience higher concentrations.

Table 5.50: Average Concentrations from Pollution Monitoring Outfalls

Parameters	Units	Detection Limits	Standard/ Guideline (Type)	West Canal	Lake	East Canal
Physical Tests (Water)						
Total Suspended Solids	mg/L	2	25 (CCME)	11.90	9.5	3.167
Anions and Nutrients (Water)						
Nitrate (as N)	mg/L	0.02	2.9 (CCME)	2.17	2.735	2.0485
Phosphorus, Total	mg/L	0.003	0.03 (PWQO)	0.07	0.07335	0.0739
Bacteriological Tests (Water)						
E. Coli	CFU/100mL	10	100 (PWQO)	4678	664	664.5
Total Coliforms	CFU/100mL	10	1000 (PWQO)	48473	7950	34875
Total Metals (Water)						
Aluminum (Al)-Total	mg/L	0.01	0.100 (CWQG)	0.25	0.0805	0.0973
Cobalt (Co)-Total	mg/L	0.0001	0.0009 (PWQO)	0.00025	0.00013	<0.00010
Copper (Cu)-Total	mg/L	0.001	0.005 (PWQO)	0.01	0.0026	0.0036
Iron (Fe)-Total	mg/L	0.05	0.3 (PWQO)	0.51	0.7435	0.1623
Manganese (Mn)-Total	mg/L	0.0005	0.05 (CWQG)	0.06	0.0268	0.0119
Zinc (Zn)-Total	mg/L	0.003	0.03 (PWQO)	0.02	0.0137	0.0123
Polycyclic Aromatic Hydrocarbons (Water)						
Anthracene	ug/L	0.01	0.012 (CWQG)	0.07	<0.01	<0.01
Benzo(a)anthracene	ug/L	0.02	0.018 (CWQG)	0.05	<0.02	<0.020
Benzo(a)pyrene	ug/L	0.01	0.015 (CWQG)	0.03	<0.01	0.0125
Benzo(g,h,i)perylene	ug/L	0.02	0.00002 (PWQO)	0.04	<0.02	0.025
Benzo(k)fluoranthene	ug/L	0.01	0.0002 (PWQO)	0.02	<0.01	0.013
Chrysene	ug/L	0.01	0.0001 (PWQO)	0.06	<0.01	0.0375
Dibenzo(ah)anthracene	ug/L	0.02	0.002 (PWQO)	<0.020	<0.02	<0.020
Fluoranthene	ug/L	0.01	0.04 (CWQG)	0.14	0.022	0.0605
Phenanthrene	ug/L	0.02	0.4 (CWQG)	0.13	<0.02	0.04
Pyrene	ug/L	0.02	0.025 (CWQG)	0.10	<0.02	0.059

During the completion of the water quality monitoring program, observable indications of poor water quality, especially from an aesthetic perspective, was the great deal of trash and debris observed in the West Canal. Items such as grocery carts, metal garbage bins and barrels, computer monitors (See **Figure 5.139**) were seen through the Canal and the deterioration of these materials could also be a contributing factor to the poorer water quality observed in the West Canal.

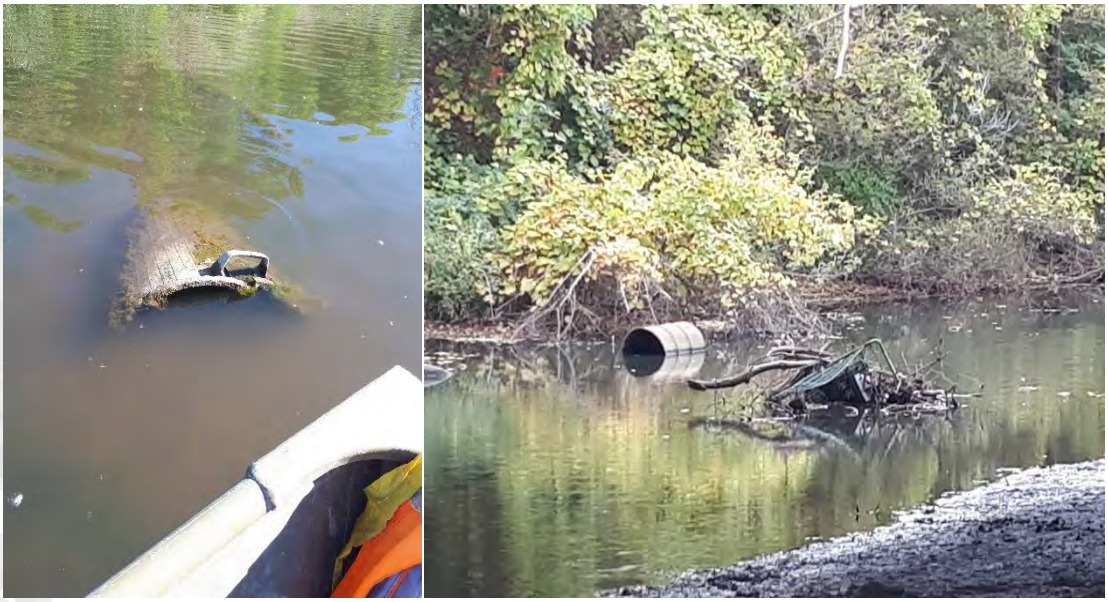


Figure 5.139: Garbage observed within the West Canal

The water quality of Mohawk Lake was also compared to that of the Grand River. Select parameters that are monitored in the Grand River by the PWQMN station upstream of Mohawk Lake (see **Figure 5.138**) were evaluated against the concentrations observed in Mohawk Lake during the water quality monitoring program **(Table 5.51**).

Table 5.51: Comparison of Select Parameters in Mohawk Lake and the Grand River

Parameter	Guideline (mg/L)	PWQMN (2016) (mg/L)	WQ-1 (mg/L)	WQ-2 (mg/L)	WQ-3 (mg/L)	WQ-4 (mg/L)
Phosphorus	0.3 (PWQO)	0.022	0.0477 - 0.171	0.0251 - 0.0723	0.0589 - 0.164	0.0295 - 0.376
Nitrate	2.9 (CCME)	2.961	<0.10 - 4.77	0.196 - 1.63	0.471 - 3.34	0.585 - 3.29
Aluminum	0.100 (CWQG)	0.059	0.111 - 0.853	0.052 - 0.175	0.145 - 0.709	0.046 - 1.9
Copper	0.005 (PWQO)	0.002	0.00011 - 0.0003	0.0014 - 0.0026	0.0025 - 0.0067	0.0024 - 0.0356
Iron	0.3 (PWQO)	0.103	0.252 - 1.50	0.192 - 0.444	0.533 - 1.4	0.275 - 5.27
Manganese	0.05 (CWQG)	0.015	0.0439 - 0.132	0.0329 - 0.122	0.0476 - 0.181	0.0369 - 0.174
Zinc	0.03 (PWQO)	0.017	<0.003 - 0.039	0.0035 - 0.0067	0.0087 - 0.0317	0.0062 - 0.181

The concentration of parameters observed at the PWQMN station upstream of Mohawk Lake either met or slightly exceeded the respective guidelines whereas Mohawk Lake results for similar parameters mostly exceeded the guideline. These results are expected as the water quality at Mohawk Lake closer resembles that of a Stormwater Pond, rather than a large, quickly moving natural system such as the Grand River, due to the fact that the majority of inputs come from urban runoff. While the water quality at Mohawk Lake exceeded numerous PWQO/CCME/CWQG guidelines, the results that were observed throughout the monitoring period are similar to those seen in other urban systems. It should also be noted that although PAHs exceed PWQO guidelines, the PWQO guidelines for PAHs were developed and set in 1994 for emergency purposes so discretion is advised when applying them. PAHs are almost always detectable in urban watercourses due to the wide range of sources, such as hydrocarbon combustion by vehicles and runoff from paved surfaces. Other environmental agencies, such as the United States Environmental Protection Agency (USEPA), no longer have recommended freshwater guidelines for PAHs (other than for drinking water) since the primary pathway for aquatic effects attributable to PAHs is via sediment, and the principal human health related exposure pathway in urban environments tends to be through the air.

As outlined in **Section 5.11.3**, based on the sediment samples collected, the sediment in the Mohawk Lake and Canal system exceeded the 'Lowest Effect' guideline for multiple PAHs, but all individual samples for PAHs show concentrations several orders of magnitude less that the 'Severe Effect' guideline levels. Although water is not considered a key pathway for aquatic impacts attributable to PAHs, PAHs contained in the water column can become incorporated into the bottom sediments and impact organisms in contact with the bed sediments.

The large exceedances in E. Coli and Total Coliforms should be monitored closely, especially since there have been observations of people swimming in Mohawk Lake throughout the summer. In the past, there have been public warnings issued due to increased concentrations of blue-green algae in the lake and increased bacterial and nutrient levels (i.e. Phosphorus and Nitrogen) levels could lead to increased occurrences of blue-green algae spikes. During the pollution monitoring program, there were field observations of fecal matter and sanitary paper in the stormwater stream near the intersection of Rawdon and Bruce Street, indicating a potential cross-contamination with the sanitary network. It is likely that undocumented cross-connections between the sanitary and stormsewer network may be contributing the high bacterial levels and further investigation into repairing possible stormsewer and sanitary sewer cross connections may help lower concentrations of E. Coli and Total Coliforms.

When examining the water quality of Mohawk Lake and its Canals over the past 25 years, there does not appear to be a significant change. The 1994 study by the Ecological Services for Planning Ltd only tested for a select number of parameters in their water quality program, but there was an overlap of 18 parameters (metals, nutrients, physical parameters), that were tested in both the 1994 study and this study. When comparing the results from the 1994 study (**Figure 5.136**) to the 2018/2019 results, most of the parameters observed had similar concentrations with the exception of Phosphorus, Iron, Manganese and Zinc. Current concentrations for these parameters were observed to be slightly greater within the lake and canals compared to those recorded in the 1994 report.

Overall, the water quality observations at the Mohawk Lake and Canal system are typical of an urban environment. Although Mohawk Lake may be categorized as a natural system, it may not be practical to expect this system to meet the PWQOs (or other respective guidelines for natural waters) while the main input to the system is untreated urban runoff. As mentioned above, repairing any sanitary and stormsewer cross connections may help improve bacterial levels but if the inputs to the system stay the same, the water quality is likely to stay the same as well. Utilizing different stormwater management

controls including source control (e.g. rain gardens, oil grit separators, etc.), end-of-pipe treatment (e.g. stormwater ponds), and conveyance measures (e.g. swales, perforated pipe, etc.) could improve stormwater runoff quality, and ultimately improve the water quality of the Mohawk Lake and Canal system.

5.14 GIS DATA

Table 5.52 summarizes the City of Brantford's GIS layers, associated metadata, and any related information received for the completion of this study.

Table 5.52: List of Available and Required GIS Data for the Mohawk Lake Canal Characterization Study.

Mapping and GIS Data (Georeferenced)	Received to Date
Aerial Photography of Study Area (multiple dates if available)	Received Feb 15/18
Topography of Study Area (including digital terrain model extending beyond study limits): a) Digital Elevation Model (DEM)/ Digital Terrain Model (DTM) b) Breaklines c) Contours	 Received June 14/18 Received June 14/18 Received Feb 20/18
Official Plan Land Use	Received Feb 15/18 (Data Gaps - augmented by Official Plan)
Existing Landuse with land-owner identified	Received (Data Gaps)
Capital Improvement Planning (points, lines, polygons)	Received Feb 15/18
Parcel Layer (including street numbers)	Received Feb 15/18
Zoning District	Received Feb 15/18
Significant Groundwater Features • Intake Protection Zone (IPZ) • Wellhead Protection Areas (WPHA) • Source Protection Plan (SPP)	 Received Feb 15/18 Received Feb 20/18 Received
Sanitary Sewer Networks • Sanitary Pipes – plans, elevations, size, slope • Sanitary Manholes – plans, elevations, size, City ID#'s • Sanitary Subwatersheds	 Received Feb 12/18 Received Feb 12/18 Received Feb 15/18
Stormwater Sewer Networks • Storm Pipes – plans elevations, size, City ID#'s • Storm Manholes – plans elevations, size, City ID#'s • Storm Outfalls-plans, elevations, size, City ID#'s • SWM Ponds and SWM pond catchments • Stormwater Sewer subcatchments	 Received Feb 15/18 Received Feb 12/18 Received Feb 12/18 Received Feb 12/18 Received Feb 12/18
Watermain Network • Water Pipes – Diameter, Length • Water Valves	 Received Feb 15/18 Received Feb 15/18
Road Networks • Single line	 Received Feb 15/18
New Development Areas, Infill and Redevelopment Areas	Received
Subwatershed boundaries	Received Feb 20/18
Existing Hydrologic and Hydraulic Models	Received 2016
Existing Condition Catchment Areas	Sewershed Catchment Areas Received Jan 2018
Mapping and metadata for identified recharge/discharge areas, geology, bedrock geology, soils, hydrologic soil groups, surficial geology.	Received

Watercourse and Waterbody Layers: • Previously identified erosion sites • Floodlines	Received Feb 20/18 Not Available Received
Impervious/Pervious Layer	Received Feb 20/18
Mapping of lands regulated under Ontario Regulation 150/06	Received
Regulatory Floodplain Mapping, including model sections, labels, elevations, etc., in digital format.	Received Feb 20/18
Buildings/Structures	Received
Other infrastructure mapping, (i.e., gas pipelines, hydro-lines, etc.)	Watermains Received Gas, hydro etc. Not Required at Phase
Natural Heritage System mapping, including and not limited to wetlands and woodlands, Cores, linkages, etc. for study area and adjacent lands up to 120 m from the study area: a. ELC mapping b. SOLRIS (MNR woodlands) GIS data for the study area c. MNR evaluated wetland mapping and metadata d. Other wetland (non-PSWs, unevaluated wetlands) mapping e. Most current MNR/ CA Fish Habitat Classifications	 Received July 12/18 Received Received Received Feb 20/18 Not Available
Areas of Natural and Scientific Interest (ANSI) mapping and metadata	Received
Significant Woodland mapping and metadata	Not Available
Significant Valleylands mapping and metadata	Received Feb 20/18
Any other available base mapping information (e.g. vegetation communities, significant wildlife habitat, rare species, land use, geology, soils, etc.)	Significant Wildlife Habitat & Rare Species Not Available
Study Area (incl. detailed & general study areas)	Received Feb 15/18

6 Additional Monitoring Technical Memo

This task consisted of a simple technical memo summarizing the results of the additional monitoring data collected and discussed in the context of the previously identified trends and conclusions of the Interim and Characterization Reports. This memo included the results of 8 months of continued rainfall, groundwater, and flow monitoring, and additional water quality sampling. These results have been detailed within this report, and the memo is included in **Appendix H**.

7 Challenges

For context purposes, the challenges encountered during the course of the study are discussed below. During the development of the work plans and completion of the Environmental Assessments several challenges were encountered which impacted the Study results in terms of the overall schedule and data quality/availability. The challenges encountered during the completion of the Characterization Study are described in detail below as are recommendations for mitigation:

- Property Access – Due to site access issues, the monitoring program was postponed as a result of necessary consultation and coordination efforts required with various stakeholders. The monitoring program started in June 2018 which shortened many of the data collection intervals.

- Weather – Flow monitoring and water quality and pollution monitoring required wet and dry events to obtain the information necessary for analysis. Due to the delay of the monitoring program and dry weather conditions, the collected water quality samples, flow measurements, groundwater levels and meteorological data are not representative/consider seasonal fluctuations. The provisional 8-month water quality and flow monitoring which is schedule to be completed should fulfill such data gaps.

- Catchment Hydrologic Response and Canal/Lake Flow Regime – The low gradient and attenuating nature of the Canal and Lake system created challenges when attempting to measure flow rates at various flow monitoring locations through the Canal and Lake system. Within more defined channel sections, the “flashiness” of the upstream catchment area, especially downstream of East Ward Creek made the development of spot-flow measurement equally as difficult. This result in poor correlations being made between logger depth and discharge which impacted the accuracy of the rating curves. The provisional 8-month flow monitoring which is schedule to be completed should fulfill such data gaps and refine rating curves. Also, alternative methods of determine inflow volumes and peak flows to the Canal and Lake system shall be evaluated and any results shall be incorporated into future updates to the Characterization Report.

- Vandalism/Theft – Significant data was losses were experienced during the course of the monitoring program due to theft and vandalism. Overall, two (2) data loggers and one (1) computer were stolen during the monitoring program and one (1) borehole location was destroyed in a car accident. To prevent future data losses due to vandalism and theft, locks were installed on all flow monitoring stations.

- Utility Locates – Clearance from public and private utilities delayed several work programs including the those related to hydrogeological and sediment sampling. Such delays shortened many of the data collection intervals. The provisional 8-month groundwater level monitoring which is schedule to be completed should fulfill such data gaps pertaining to the hydrogeological assessments. Sediment sampling was ultimately completed on-time.

8 Conclusions

The primary purpose of the Phase 1 Characterization Study was to develop an understanding of the form, function, and current conditions within the Mohawk Lake subwatershed based on available background information collected and supporting environmental assessments completed. The following section discusses the characterization of the Mohawk Lake subwatershed following the background review and environmental assessment completed under this phase.

The water quality in the system was found to be poorest in the West Canal and improved towards the outlet to the Grand River. As 92% of the storm sewer outlets contributing to the system outfall within the west canal, poorer water quality was expected. While there are exceedances when compared to PWQOs and other guidelines utilized in this study, the tested parameter concentrations all fall within typical EMCs for the land uses present in the Mohawk Lake subwatershed. Although Mohawk Lake may be categorized as a natural system, it may not be practical to expect this system to meet the PWQOs (or other respective guidelines for natural waters) while the main input to the system is untreated urban stormwater runoff. The water quality observations within the Mohawk Lake and Canal system are typical of a waterbody within the urban environment. When examining the water quality of Mohawk Lake and its canals over the past 25 years, there does not appear to be a significant change. A primary observation of the study was fecal matter and sanitary paper in the stormwater network and west canal indicating potential cross-contaminations between the stormwater and sanitary network, which may be impacting bacteriological concentrations within the lake and canal system. Similarly, in comparison with historical monitoring results the 2019 bulk analysis results showed that current sediment quality for Mohawk Lake was generally consistent with previously completed sediment quality investigations. In general, the majority of tested sediment contaminants were within the lowest effect level on aquatic life, with the exception of lead and copper within the lake itself, which may effect benthic invertebrates within the deeper portions of the lake. However, the low DO within the deep portion of the lake may also be a primary factor in limiting sensitive aquatic fauna within this lake strata.

The most consistent contaminant found throughout the entire Mohawk Lake system was PAHs. PAHs are almost always detectable in urban watercourses due to the wide range of sources, such as hydrocarbon combustion by vehicles and runoff from paved surfaces. PAH exceedances were found in water quality, groundwater quality, pollution monitoring, and sediment quality monitoring. While the primary pathway for aquatic effects attributable to PAHs is via sediment, PAHs contained in the water column can become incorporated into the bottom sediments and impact organisms in contact with the bed sediments. Furthermore, based on the results of the hydrogeological investigation, the aquifer in the area is relatively vulnerable to potential contaminants and other anthropogenic activities. Potential contaminants located in the recharge areas of the system could lead to further contamination of the lake and the deeper aquifer system in the study area. The PAH results presented for Mohawk Lake, while elevated above ideal concentrations, do not present any reason for undue concern with respect to aquatic life. Previous studies have also demonstrated that contaminates within Mohawk Lake do not seem to be bioaccumulated within the aquatic foodweb.

The benthic invertebrate and fish community assessments indicated that the water body is doing quite well. Based on a comparison between the 2018 field survey and historical surveys, bluegill (*Lepomis macrochirus*) and creek chub (*Semotilus atromaculatus*) were newly identified species within Mohawk Lake. The study provided evidence of a diverse cool to warmwater fishery, and although the benthic

invertebrate community was dominated by pollution tolerant chironomids (midge larvae) and oligochaetes (worms) which are typical of urbanized receiving water bodies that are organically enriched with periodic episodes of low oxygen. A main consideration of previous studies was the quantity of Common Carp within Mohawk Lake and canals. Carp often create very turbid conditions, due to their foraging activities, which can elevate nutrient concentrations and uproot macrophytes. The high turbidity within the lake causes a disadvantage to native game fish present since many of them feed by sight. Under turbid conditions, fish must rely on movement and sound to detect prey. Unfortunately, these conditions are advantageous for the invasive Common Carp.

Groundwater monitoring of Mohawk Lake and surrounding areas show evidence of significant recharge to the lake and canal system. Such observations were supported by the results of the hydrological monitoring which estimated groundwater inputs to the system may be upwards of approximately 30% which is supported by previous study results. Evidence of cool to warmwater fisheries species and a trend of dilution though Mohawk Lake during water quality result comparisons also support such conclusions.

The 2018 estimate of volume (185,000m^3) of unconsolidated sediment aligns closer with the 1972 reported volume; however, the 2018 results for general Lake bathymetry, water depth, distribution of sediment, sediment thickness and mapping of the unconsolidated sediment/original (dredged) lake bottom are comparable to the 1994 assessment. In general, the results do not show significant sediment accumulation within the lake and canals throughout this time period. This was supported by the results of the Lead 210 analysis and radiocarbon dating which indicated that the top 30 centimetres of sediment (~20 cm core depth) was deposited in the last 55 years. While the inlet connection to the Grand River was closed in 1983, the sediment accumulation continued on a linear trend indicating that the main source of sediment to the system consists of that produced by erosion and stormwater runoff.

The decision to dredge Mohawk Lake and Canals has been considered as part of previous studies. It is anticipated that such efforts may improve the Mohawk Lake and Canal system by removing historical contamination, improving sediment retention capacities, altering the thermal regime to a coolwater dominant system, and improving connectivity with groundwater inputs which are likely to diversify the aquatic ecosystem. However, the overall benefits of undertaking such a dramatic change are difficult to quantify. The study, at this point, suggests that there is no evidence of the need for environmental dredging to alleviate toxic conditions. Additionally, it is expected that the cost associated with undertaking such a large scope of dredging works would be very significant. Dredging as a means of improving Mohawk Lake may be completed in strategic locations in association with other measures (i.e. end-of-pipe controls, OGS units, LIDs, etc.) implemented to control the suspected sediment inputs originating from erosion sites and stormwater runoff.

While the results of the field investigations demonstrate that the waterbody contaminant concentrations are typical for urban environments, measures should be implemented to ensure no further degradation occurs within the system. The following recommendations are to be considered by the City and future project phases to improve the overall condition of Mohawk Lake and its Canals.

- Implementing various stormwater management controls including source control (e.g. rain gardens, oil grit separators, etc.), end-of-pipe treatment (e.g. stormwater ponds), and conveyance measures (e.g. swales, perforated pipe, etc.) would improve stormwater runoff quality, and ultimately improve the conditions of the Mohawk Lake and canal system.

- Targeting areas identified in the pollution monitoring, including the industrial area that outlets directly to the west canal, should be prioritized.
- Field observations of fecal matter and sanitary paper in the stormwater network indicates a potential cross-contamination between the stormwater and sanitary network near the intersection of Rawdon and Bruce Street. Further investigation into possible stormsewer and sanitary sewer cross connections in this area is recommended.
- Overall observations of the lake and canals included garbage and debris, such as computer monitors, shopping carts, garbage cans, etc. A general clean-up of the area, in particular the west canal, is recommended.
- Identifying and mitigating other sediment sources from the urban drainage network is also a critical issue to reduce future sediment supply. Existing erosion sites, including Erosion Sites #1 and #3, may be considered for future works associated the overall Mohawk Lake revitalization project to reduce inputs/contaminates into the system.
- Erosion Site #2 is recommended for immediate attention by City staff to mitigate the documented erosion risks.
- Further monitoring of existing landfill sites for potential non-source pollution, as well and improvements to the City's storm sewer network maintenance programs (i.e. flushing and catch basins clean-outs) will assist with the overall conditions of Mohawk Lake.
- Future model scenarios which are developed for evaluating potential remedial alternatives should consider that stormwater to Mohawk Lake is a significant component of the system's water balance. Measures which may be considered as part of future phases for improving water quality to the lake and canals may need to considered the preservation of inflow to the system to avoid potential degradation (i.e. source and conveyance controls which focus on filtration versus infiltration as flow from the storm sewer network is the primary input to the system. A major reduction in storm sewer flow as a result of source and conveyance controls may lead to stagnant lake conditions).
- A Common Carp management plan may also be valuable to promoting a more diversified aquatic ecosystem and reduce the resuspension of sediment bound contaminants.
- Any opportunities to further define the percentage of evapotranspiration and groundwater recharge to and from the system is encouraged to further understand the systems overall water balance.

Redevelopment plans around Mohawk Lake and throughout the subwatershed are ongoing and constantly evolving as planning phases progress. Future phases of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project will have to consider the most recent Official Plan, Master Plans and individual planning studies in order to guide potential remediation alternatives. Results from this Characterization Report should be incorporated into subsequent stages to inform on the existing conditions of Mohawk Lake and Canals and provide insight of the additional studies which should be completed to further characterize Mohawk Lake and support future project phases.

Through the characterization of Mohawk Lake and canals, future required studies have been identified. These include:

- **Stage 1 Archaeological Assessment** will be required as part of the future EA and subwatershed process completed as part of the Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project. The Stage 1 Assessment shall include a full review of registered archaeological sites within the Mohawk Lake Study Area.

- The **Mohawk Lake and Oxbow Wetlands evaluation** should be updated to include recent SAR records; the results of this evaluation would change the status of the wetland complex making it a Provincially Significant Wetland (PSW) pending review/confirmation by MNRF and/or GRCA.
- Continued **pollution monitoring** is recommended to further isolate the pollution hotspots in the study area and poor performing sewersheds in addition to potential cross-connections.
- A **suspended sediment monitoring program** is an essential undertaking to understand the sources and timing of current sediment loading to the lake.
- To augment and support the recommended erosion mitigation works and erosion hazard assessments a number of **detailed geotechnical investigations** should be considered:
    - For detailed engineering design to mitigate risk at Erosion Site #2, Reach T1d.
    - For risk assessment of local geotechnical hillslope hazards in Reach T1c.
    - For stability of embankments along the canal, especially where local slope erosion and undercut banks have been identified.
- Finalization of the Hydrogeological study completed as part of the Characterization Study which shall be provided under a separate cover.

The modelling component of future studies should consider the following:

- A major system model should be incorporated to route flows according to the urban sewershed rather than based on topology; this will require re-delineation of the storm sewer subcatchment areas to reflect urban drainage patterns (i.e. curb and gutter). Catch basin type should be confirmed for each street and incorporated into the model accounting for slope, grate type and lead size; and,
- LiDAR data is recommended to refine the ground model and to generate the overland flow paths. This can be done in the 1D InfoWorks model with the surface elevations at each node inferred directly from the LiDAR ground model.

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Appendix A-1 – Preliminary Hydrological Assessment

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A DRAFT REPORT TO
AQUAFOR BEECH LTD.
HYDROGEOLOGICAL ASSESSMENT
MOHAWK LAKE CHARACTERIZATION STUDY

CITY OF BRANTFORD

REFERENCE NO. 1806-W012

OCTOBER 2019

DISTRIBUTION

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APPENDICES

1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. conducted a hydrogeological assessment for the characterization of Mohawk Lake and surrounding local vicinity, in the City of Brantford

The subject site lies within the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The surface geological map of Ontario shows that the area has a complex mixture of glaciofluvial and glaciolacustrine native soil deposits, reworked by the present-day Grand River.

The subject site is located within Southern Grand River subwatershed of the Grand River Watershed.

A review of the local topography shows that the subject site has undulating relief, exhibiting a gentle decline in elevation relief towards Mohawk Lake.

The study has disclosed that beneath the existing layer of topsoil, or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits.

The findings of this study indicate that the groundwater level elevations range from 193.67 masl at the southern limits of the study area to 214.13 masl within the areas located north of Mohawk Lake. Review of the average groundwater elevations suggest that it flows in southerly and south-easterly directions, towards the Mohawk Lake and the adjacent canal.

The single well response tests (SWRT) provided estimated hydraulic conductivity (K) values for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s,

the K estimate for the sand and silty clay unit is 1.5 x 10^{-5} m/s, the K estimate for the silty clay unit is 5.4 x 10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5 x 10^{-7} m/s, and the K estimate for the earth fill is 1.4 x 10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The above results suggest that the hydraulic conductivity for the groundwater-bearing soils at the depths of the well screens is low to high, with corresponding low to high groundwater seepage rates into open excavations, below the water table.

The Hazen Equation calculated permeability results derived from the soil grain size analysis indicates that the hydraulic conductivity (K) estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a depth of 4.57 mbgs at BH/MW 5 is 1.6 x 10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is 1.0 x 10^{-6} m/sec. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.

The Hazen Estimated hydraulic conductivity (K) results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. Given these, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.

The pressure transducer data loggers, which were installed within the groundwater monitoring wells in the vicinity of the Mohawk Lake indicates that groundwater temperatures vary from 6.82º C to 13.86º C. The warming and cooling trend reflects the annual seasonal cycle, with a cooling trend observed from August 2018, to late

April 2019; after which a gradual warming trend was observed to August 2019 in the summer months.

The logger data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations across the project areas.

Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

The areas south of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area. Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.

In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons compounds, which are associated with coal tar materials and waste.

2.0 INTRODUCTION

2.1 Project Description

In accordance with the authorization, dated May 24, 2018, from Mr. William Cowlin of Aquafor Beech Ltd., Soil Engineers Ltd. (SEL) conducted a hydrogeological assessment to characterize Mohawk Lake and local vicinity in support of the proposed Mohawk Lake Rehabilitation Program. The location of the subject site, the lake and study area are shown on Drawing No. 1.

2.2 Site History

The City of Brantford is located in southwestern Ontario, approximately 35 km from Hamilton, and 90 km from Toronto, both of which are located to the east and it is about 90 km from London to the west.

Brantford's economic development was spurned by the opening of the Grand River Navigation Company's canal that linked Brantford by water to the Welland Canal and to important cities like Buffalo, New York. In 1832 the Grand River Navigation Company began work on a system of canals, dams and locks along the Grand River in order to make the river navigable from Brantford down to Dunnville. The "Brantford Cut" or "Brantford Canal" was the final part of the system to be built and was opened to great fanfare in 1848. This canal brought freight and passengers right into Brantford's downtown and increased trade and attracted new businesses to the area. Beginning in the 1850s, Brantford was also quickly incorporated into the maze of rail-lines that soon linked it to places like Hamilton, Toronto, Port Dover, London, Buffalo, and Detroit.

Brantford's industrial development began in earnest in the 1850s with a host of new industries, including, foundries, stone ware factories, stove factories and various mills. From the 1870s to the 1890s Brantford became home to several significant agricultural equipment manufacturers. Starting in the early 1900s several of Brantford's industries built larger new factories on what became the Greenwich-Mohawk site.

The Greenwich-Mohawk site was a bustling industrial hub in what was a booming industrial city. But this all changed in the 1980s. Besides the social and economic problems of de-industrialization in Brantford, there was also an environmental legacy: brownfield sites. Brownfields are defined as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination."

Over 36 hectares within the city were now abandoned and are considered contaminated post-industrial sites, or brownfields.

The Study Area, approximately 324 hectares in size, is located in the southeast corner of Brantford, adjacent to the north shore of the Grand River.

2.3 **Previous Investigations**

2.3.1 *Union Gas Property*

In 1990, Terraqua Investigation Limited conducted detailed investigations on an abandoned coal gasification plant (Union Gas property), adjoining the Shallow Creek Park. This site was previously used as a waste disposal site for the former plant. Relatively thin discontinuous zone of coal tar was observed in their monitoring wells,

along with ashes, cinders coal, bricks and spent oxides. The underlying silty clay deposits encountered were thought to restrict the mobility of coal tar materials.

2.3.2 *Former Police Building*

In 1992, Waterloo Geoscience Consultants Ltd. conducted an environmental audit of the former police station lands, west of Shallow Creek Park. This included the drilling, monitoring well and installation, and monitoring of the groundwater monitoring wells. The investigations indicated that silty clay soil was encountered and coal tar and related contaminants were present throughout the site. It was indicated the granular soil deposits underlying the silty soil deposit beneath the fill are likely to be hydraulically connected with the Grand River and contaminant migration form the area may likely impact the surface water quality.

2.3.3 *Shallow Creek Park Groundwater Investigation*

In 1992, Gore and Storrie Ltd., undertook an investigation which was aimed at characterizing the contaminants contained within the Shallow Creek Park, and to evaluate their potential impacts to the canal/lake system. The investigation included drilling, monitoring well installation, monitoring, testing and sampling of groundwater monitoring wells, along with geophysical investigations. The investigation indicated that general groundwater flow direction is towards the southwest and that surface water elevations in the Eastward Creek were higher than the Lake water levels, indicating that the Eastward Creek is recharging of surface water to the subsurface (as a losing watercourse). In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons) compounds, which are characteristic of coal tar waste.

2.3.4 *Mohawk Street Landfill Site*

The Town of Brantford initiated an annual groundwater and surface water monitoring program for the site. In 2016, WSP undertook the monitoring program, which included the installation of groundwater monitoring wells and establishment of surface water monitoring stations. The program has been expanded to include groundwater level monitoring, and sampling, and also sampling from pumping stations and selected groundwater monitors in the spring and fall of every year. The investigation indicated a groundwater interceptor trench has influenced the shallow groundwater table in the vicinity of Morrison Road where it flows, northerly towards the interceptor trench. It was indicated that leachate from the Landfill Site percolated down to the upper groundwater aquifer, where there is the potential for the contaminant plume within the upper aquifer to move laterally below the landfill toward the Grand River and Morrison Road.

2.4 **Remediation and Redevelopment**

The City of Brantford has been working on a plan to revitalize the Mohawk Lake and Canal area for the last thirty years. Multiple plans have been created to reflect the communities' ideas in regard to land use in this area. The enhancement of the natural attributes and recreational usage of the Mohawk Lake area have consistently been a primary focus of both the community and the proposed plans. The Mohawk Lake Revitalization Plan developed in 1999 which aimed to restore the natural system and improve the recreational usage while respecting the cultural heritage of this site; this same goal is reflected in the Waterfront Master Plan.

Mohawk Lake and the surrounding parkland has been used for recreation for a few hundreds years. After the construction of the canal, the water levels in the original wetland rose to form a pond, now Mohawk Lake. Recreational facilities include Mohawk Lake, Mohawk Park, and extensive pedestrian trails and circulation routes. The area has been used for both water-based and open space recreation. Past uses of Mohawk Park, include; the Brantford Street Electric Railway Station, an amusement park, as well as cycling competitions hosted on the first cinder bicycle track in Ontario. In the 1950s the canal ditch, west of Greenwich Street was backfilled creating Shallow Creek Park.

This report summarizes the initial findings of the field study and associated groundwater monitoring, providing a description and characterization of the hydrogeostratigraphy for the site and local surrounding area.

2.5 **Project Objectives**

The major objectives of this Hydrogeological Study Report are as follows:

1. Establish the local hydrogeological setting for Mohawk Lake and the surrounding areas;
2. Interpretation of shallow groundwater flow and runoff patterns;
3. Identify zones of higher groundwater yield as potential sources for ongoing shallow groundwater seepage;
4. Characterizing the hydraulic conductivity (K) for groundwater-bearing sub-soil strata;
5. Prepare an interpreted hydrostratigraphic cross-section across the subject site;
6. Evaluate the groundwater contribution to the Mohawk Lake and its environs.

7. Evaluate local groundwater quality for comparison evaluation against applicable provincial standards
8. Assess the fluctuation of shallow groundwater levels in response to local precipitation records.

2.6 **Scope of Work**

The scope of work for the Hydrogeological Study is summarized below:

1. Installation of ten (10) monitoring wells within the study area footprint;
2. Monitoring well development and groundwater level measurements at the ten (10) installed monitoring wells;
3. Performance of Single Well Response Tests (SWRTs) at the monitoring wells to estimate the hydraulic conductivity (K) for the groundwater-bearing subsoils at the depths of the well screens;
4. Describing the geological and hydrogeological setting for the site and surrounding local area;
5. Estimating the hydraulic conductivity (K) for the groundwater bearing subsoil strata, based on the SWRT results and from the soil grain size analyses.
6. Instrumentation of all monitoring wells with data loggers to monitor the shallow water table and any responses to precipitation received at the site
7. Characterizing the quality of shallow groundwater in the study area.
8. Evaluating the horizontal and vertical gradients for local groundwater to assess any losing or gaining status for local shallow groundwater relative to Mohawk Lake.

3.0 METHODOLOGY

3.1 Borehole Advancement and Monitoring Well Installation

The hydrogeological characterization study for Mohawk Lake included the drilling and installation of ten (10), 50- mm diameter PVC groundwater monitoring wells at seven (7) selected locations within the vicinity of Mohawk Lake and the associated study area. There are three (3) locations, where there is a shallow groundwater monitoring well installed adjacent to a deeper monitoring well, making them three (3) nested sets of groundwater monitoring wells. These proposed sets of nested wells were installed to assist with the determination of any vertical groundwater gradient in the vicinity of the lake, to determine if there is groundwater discharge towards the Mohawk Lake, from the shallow aquifer, or if the lake loses water to recharge the shallow aquifer system.

These proposed wells were strategically placed to enable interpretation of a hydrogeostratigraphic profile across the lake area, and to determine background groundwater elevations, groundwater flow patterns, and to characterize the background shallow groundwater quality in the vicinity of the lake.

Borehole drilling and monitoring well construction were conducted on August 7, 8 and on September 4, 2018. The program comprised of the drilling of ten (10) boreholes (BH) and the installation of ten (10) monitoring wells, one in each of the (10) boreholes advanced beneath the site. The locations of the boreholes/monitoring wells are shown on Drawing No. 2. The groundwater monitoring well at BH/MW 5, was inadvertently knocked over by a vehicle between September 24, and October 25, 2018. A replacement well was installed on January 8, 2019. This replacement well is designated as BH/MW 5R.

The borehole drilling and monitoring well construction were completed by a licensed water well contractor, DBW Drilling Ltd., under the full-time supervision of a geotechnical technician from SEL, who also logged the soil sub-strata encountered during borehole advancement, and collected representative soil samples for textural classification. The boreholes were drilled using continuous flight power augers. Detailed descriptions of the encountered subsurface soil and groundwater conditions are presented on the borehole and monitoring well logs, on the enclosed Figures 1 to 10 inclusive.

The monitoring wells were constructed using 50-mm diameter PVC riser pipes and screens, which were and installed in each of the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were provided with monument-type protective steel casings and above the ground surface. The details of the monitoring well construction are provided on the enclosed Borehole Logs (Figures 1 to 10).

The UTM coordinates at the borehole/monitoring well locations, together with the monitoring well construction details, are provided on Table 3-1.

Table 3-1 - Monitoring Well Installation Details

Well ID	Installation Date	UTM Coordinates		Monitoring Well Depth (mbgs)	Screen Interval (mbgs)	Casing Dia. (mm)
		East (m)	North (m)			
BH/MW 1S	August 7, 2018	562310	4776028	4.6	1.52-4.6	50
BH/MW 1D	August 7, 2018	562311	4776029	6.1	3.1-6.1	50
BH/MW 2	September 4, 2018	562333	4776272	6.1	3.1-6.1	50
BH/MW 3	August 7, 2018	562576	4776215	6.1	3.1-6.1	50
BH/MW 4S	August 7, 2018	563089	4776239	4.6	1.52-4.6	50
BH/MW 4D	August 7, 2018	563091	4776240	6.1	3.1-6.1	50
BH/MW 5/5R	August 8,2018* January 8,2019	562740	4775937	6.1	3.1-6.1	50
BH/MW 6	September 4,2018	562498	4775883	6.1	3.1-6.1	50
BH/MW 7S	August 8, 2018	562237	4775723	4.6	1.52-4.6	50
BH/MW 7D	August 8, 2018	562239	4775723	6.1	3.1-6.1	50

Notes:
mbgs -- metres below ground surface
* BH/MW 5 well destroyed and replaced on January 8, 2019

3.2 Groundwater Monitoring

The groundwater levels in the monitoring wells were measured, manually on September 24, October 25, November 22, December 21, 2018, and again on January 18, February 15, March 22, April 15, May 24, June 19, July 26, and August 22, 2019, to record the static and the seasonal groundwater table fluctuations.

A cluster of two mini-piezometers, consisting of a deep (D) and a shallow pipe installations unit (S), were installed at the BH/MWs 1, 4, and 7 locations, to monitor groundwater elevations and to determine the vertical hydraulic gradients relative to Mohawk Lake, and to assess groundwater contribution, if any, to Mohawk Lake.

Aquafor Beech installed one (1) automated data logger within each of the BH/MWs. These data loggers record the fluctuating groundwater levels and temperatures in the groundwater. The data loggers were used to record groundwater elevations and temperatures at fifteen (15) minutes intervals.

3.3 Monitoring Well Development and Single Well Response Tests

All of the deeper monitoring wells, except BH/MW 3, underwent development in preparation for single well response testing (SWRT) to estimate the hydraulic conductivity (K) for saturated subsoil strata at the depths of the monitoring well screens. Well development involved the purging and removal of several well casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the well screens, thereby improving the transmissivity of the saturated subsoil strata formation at the well screen depths.

The K values derived from the SWRT's provide an indication of the yield capacity for the groundwater-bearing soil strata, at the well screen depths, and can be used to estimate the flow of groundwater through the water-bearing subsoil strata.

The SWRT involves the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The rate at which the water level recovers to static conditions (falling head) is tracked using a pressure transducer data logger/, and/or manually using a water level tape. The rate at which the water table recovers to static conditions is used to estimate the K value for the groundwater-bearing strata formation at the well screen depth interval.

The SWRT could not be performed at BH/MW 3, due to the insufficient volume of groundwater within the well throughout the monitoring period.

The SWRT's were completed on October 25, 2019, and on June 19, 2019, with the results being provided in Table 6-2 and Appendix 'A'.

4.0 REGIONAL AND LOCAL SETTING

4.1 Regional Geology

The subject site lies within the Physiographic Region of Southern Ontario known as the Norfolk Sand Plain. The Norfolk sand plain is wedge shaped with a broad, curved base along the north shore of Lake Erie where it tapers northward to a point at Brantford on the Grand River. It includes the western half of the Regional Municipality of Haldimand-Norfolk (previously Norfolk County), the eastern end of Elgin County, southern Brant, and a small corner of Oxford, having a total an area of 3,136 square kilometres. The plain declines southward from about elevation 259 masl to the level of Lake Erie (174 masl) or from the west to the top of the shore cliff about 30.48 m or more above the lake.

The sands and silts of this region were deposited as a delta in the former glacial Lakes Whittlesey and Warren. A great discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta within the former lake, from west to east as the glacier withdrew. Thus, it covered most of the area west of the Galt Moraine. This and other moraines to the west are partly buried by sand; with some sections being entirely covered whereas other moraines still stand up about 15.24 to 22.86 m above the general ground level.

The drainage is through small rivers flowing directly into Lake Erie, except in a small area in the north which is tributary to the Grand River. These streams, the largest of which are; Otter Creek and Big Creek, have cut deep incised valleys across the sand plain, often about 22.86 to 30.48 m deep.

The surface geological map of Ontario shows that the area is a complex mixture of glaciofluvial and glaciolacustrine soil deposits, reworked by the present-day Grand River. Areas south of, and including Mohawk Lake and the canal are underlain by modern day alluvial sediments of the Grand River comprised of un-subdivided sand, silt, gravel clay and muck. Mohawk Lake and the canal almost form a boundary between the glaciolacustrine and older alluvial deposits to the north. Older alluvial terrace remnants, consisting of gravel and sand make up the southwest portion of the drainage area within the Brantford City core, within a pocket on the north side of the canal, in the Glebe lands where it empties into Mohawk Lake. The latter location has had some aggregate extraction in the past, followed by landfilling activities.

The central and north areas of the drainage area located in the Brantford City core and areas on the north side of Mohawk Lake and the canal downstream of the lake are underlain by glacial-age Lake Warren and younger glaciolacustrine deep water deposits comprised of stratified to varved silt and clay with minor sand which are locally overlain by a veneer of sand, which is a pocked in the south central and peripheral areas in the northwest, north, northeast and east drainage areas are underlain by Lake Warren and younger glaciolacustrine sands with some silt of a shallow water and deltaic origin. Drawing No. 3, reproduced from Ontario Geological Survey (OGS) mapping, illustrates the Quaternary surface soil geology for the site and surrounding area.

The bedrock underlying the site is comprised, mainly of shale and dolomite belonging to the Salina Formation which is of Upper Silurian Age, which is underlain by dolostone of Guelph Formation. The bedrock surface elevation is at approximately 183.00 masl. (Bedrock Geology of Ontario, 1993).

4.2 **Physical Topography**

A review of the local topography shows that the subject site is undulating, exhibiting a gentle decline in elevation relief towards the Mohawk Lake. The ground elevations generally vary from about 199 to 212 masl. Drawing No. 4 shows the mapped topographical contours for the site and surrounding area.

4.3 **Watershed Setting**

The study area is located within the Southern Grand River subwatershed of the Grande River Watershed. The Grand River has its headwaters near the town of Dundalk (Grey County) within one of the highest topographic elevations in Southern Ontario at 526 masl. It flows south for about 280 km to its mouth on Lake Erie at Port Maitland. The Grande River Watershed is the largest watershed in southern Ontario, and occupies an area of about 6,800 square kilometers. The Grand River has a dendritic drainage system with some major rivers such as the Conestoga, Nith, Speed and Eramosa. The Grand River is the predominant feature within Brantford, flowing from the northwest portion of the City in a southeasterly direction.

The central region of the watershed is the most populated, with large cities that include; Kitchener, Waterloo, Guelph, Cambridge and Brantford. A major challenge for the future is coping with significant population growth. Maintaining or even improving the quality of our waterways while conserving the natural heritage of wetlands, woodlands and wildlife habitat, will be a major challenge in light of these growth pressures.

Drawing No. 5 shows the location of the subject site within the Grand River Watershed and Southern Grande River Sub-watershed.

4.4 Local Surface Water and Natural Features

Mohawk Lake was constructed in the 1840s as part of the Mohawk Canal, located in the City of Brantford. The Mohawk Canal starts at Shallow Creek Park and continues to the Alfred Watts Hydro Generating Station Ruins at the Grand River, a federally recognized National Heritage River. The 4.8 km length canal is narrow and shallow with reinforced banks. Mohawk Lake is surrounded by trees with several small open areas that can be accessed for recreational purposes. The Mohawk Lake is shallow and has a surface area of approximately 13 hectares, with depths ranging from 1 to 3 m. Multiple stormwater management outlets are found along the canal, making stormwater runoff the primary water contribution source. Mohawk Lake's 839 ha drainage area is comprised of mainly of urbanized sub-catchments, including the Brantford neighbourhoods/districts of Lower Downtown, Colborne, and Mohawk Greenwich. The Six Nations owns 37 hectares of land directly on the north side of the lake, known as Glebe Farm No. 40B. The land directly adjacent to the south side of Mohawk Lake, and north of Six Nations Indian Reserve No. 40 are privately owned. The Grand River Conservation Authority (GRCA) owns the land abutting the Grand River. The City of Brantford owns the majority of the remaining adjacent lands.

The locations of the site and the noted natural features are shown on Drawing No. 6. The nearby wetlands shown on Drawing No.6, identified as other, have not been evaluated asbeing Provincially Significant.

5.0 SOIL LITHOLOGY

The study has disclosed that beneath the existing layer of topsoil, and earth fill materials, the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and assorted organics. The lithology for the previous BH/MW 5 were used to describe the lithology for the location of the replacement well BH/MW 5R. A Key Plan, and the interpreted geological cross-sections are presented on Drawing Nos. 7-1, 7-2A and 7-2B.

5.1 **Topsoil** (BH/MWs 1S, 1D, 2, 4S, 4D, 7S and 7D)

Topsoil, approximately 80 to 100 mm thick, was observed at the ground surface at the BH/MWs 1S, 1D, 2, 4S, 4D, 7S and 7D locations.

5.2 **Earth Fill** (All BH/MWs)

Earth fill, was encountered beneath the topsoil layer, or at the ground surface at all of the BH/MW locations. The fill is generally brown in colour and consists of fine to medium grained sand, or silty sand having traces of gravel. At the BH/MWs 6, 7S and D locations, the earth fill encountered was brown to black in colour, consisting of organics, sand and glass fragments which emitted a strong odour. The thickness of this fill unit generally ranges from 0.6 to 3.0 m. At BH/MW 7D, the earth fill was encountered at a depth of 0.1 mbgs where it extends to the maximum investigated depth of 6.5 m. A lower unit of earth fill was encountered at BH/MW 3, at a depth of 4.6m. The fill unit is grey in colour, consisting of silty clay with some organics, and having a strong odour. This unit extends to the maximum investigation depth of 5.0 m at the BH/MW 3 location.

5.3 Silty Clay (BH/MWs 1S, 1D, 2, 4S, 4D, 5 and 6)

Silty clay, was encountered at depths ranging from, 2.3 to 4.6 mbgs at BH/MWs 1S, 1D, 2, 4S, 4D, 5 and 6 locations. It is brown to grey in colour, is soft to stiff in consistency, having traces of sand and gravel, with traces of organic material and gravel. A lower unit of silty clay was encountered at a depth of 6.1 mbgs at the BH/MW 1D location. The thickness of the silty clay layer ranges from 0.1 to 2.3 m at BH/MWs 1S, 1D, 5 and 6 locations, where it extends to the maximum investigated depth of 6.5 m at the BH/MW 2, and 4D locations. The lower unit encountered in BH/MW 1D extends to the maximum investigated depth of 6.5 m. The moisture content for this silty clay unit ranges from 6% to 33%, indicating damp to very moist conditions.

5.4 **Silt** (BH/MWs 1S and 1D)

Silt, was encountered at a depth of 2.5 mbgs beneath the silty clay unit at the BH/MWs 1 S and 1D locations. It is brown in colour and compact to dense in consistency. The unit is 2.1 m thick at BH/MW 1D, and at BH/MW 1S, it extends to the maximum borehole depth of 5.0 m. The moisture content for the sandy silt unit ranges from 17% to 19%, indicating moist conditions.

5.5 **Sandy Gravel (**BH/MW 5)

Sandy gravel, was encountered at a depth of 4.6 mbgs, beneath the silty clay unit at the BH/MW 5 location. It is brown in colour and is compact in consistency, having some silt with traces of clay. This unit extends to the maximum investigated depth of 6.5 m. The moisture content for the sandy gravel unit ranges from 20% to 23%, indicating moist conditions.

The estimated permeability for the sandy gravel unit encountered at BH/MW 5, at a depth of 4.57 mbgs is about 10^{-5} m/sec. Grain size analysis was performed on one (1) sample, and the gradation is plotted on Figure 11.

5.6 **Silty Sand** (BH/MWs 1D and 6)

Silty sand was encountered at depth of 4.6 mbgs, at BH/MWs 1D and 6 locations. It is brown to grey in colour, is loose to very loose in consistency, having a trace of clay. The unit is 1.5 m thick at BH/MW 1D where it extends to the maximum investigated depth of 6.5 m at the BH/MW 6 location. The moisture content for the silty sand unit ranges from 17% to 31%, indicating moist to very moist conditions.

The estimated permeability for the silty sand unit at BH/MW 6, at a depth of 6.1 mbgs is about 10^{-6} m/sec. Grain size analysis was performed on one (1) sample, and the gradation is plotted on Figure 12.

5.7 **Organics** (BH/MW 3)

A layer of organic material was encountered at a depth of 3.0 mbgs at the BH/MW 3 location. It is black in colour, and contains wood debris. It is approximately 1.6 m thick. The moisture content for the retrieved soil sample is 50%, indicating saturated conditions.

The sub- soils encountered indicate that the subsurface conditions in the area are complex due to the Quaternary glacial and post glacial processes and the depositional environments that were created by the Grand River in the vicinity.

6.0 GROUNDWATER STUDY

6.1 Groundwater Monitoring (Manual Readings)

The groundwater levels in the monitoring wells were measured manually on twelve (12) occasions over the study period, on the following dates; September 18, October 25, November 22, December 21, 2018, and again on January 18, February 15, March 22, April 15, May 24, June 19, July 26, and August 22, 2019, to record the static and the seasonal groundwater table fluctuations. The water levels and corresponding elevations are given in Table 6-1.

Table 6-1 - Groundwater Level Measurements

Well ID		24-Sep-18	25-Oct-18	22-Nov-18	21-Dec-18	18-Jan-19	15-Feb-19	22-Mar-19	15-Apr-19	24-May-19	19-Jun-19	26-Jul-19	22-Aug-2019	Average	Fluctuation (m)
BH/MW 1S	mbgs	3.48	3.47	3.37	3.14	2.75	2.63	2.72	2.52	2.44	2.58	3.22	3.36	2.97	1.04
	masl	207.32	207.33	207.43	207.66	208.05	208.17	208.08	208.28	208.36	208.22	207.58	207.44	207.82	
BH/MW 1D	mbgs	3.70	3.64	3.51	3.27	3.00	2.69	2.90	2.61	2.52	2.64	3.40	2.94	3.07	1.18
	masl	207.05	207.11	207.24	207.48	207.75	208.06	207.85	208.14	208.23	208.11	207.35	207.81	207.68	
BH/MW 2	mbgs	4.72	5.25	4.00	3.65	3.31	4.12	2.72	2.36	2.65	2.94	2.81	4.55	3.59	2.89
	masl	211.77	211.24	212.49	212.84	213.18	212.37	213.77	214.13	213.84	213.55	213.68	211.94	212.90	
BH/MW 3	mbgs	>4.50	>4.50	>4.50	4.48	4.46	>4.50	>4.50	3.74	3.81	4.12	4.36	4.36	4.19	0.76
	masl	<207.07	<207.07	<207.07	207.09	207.11	<207.07	<207.07	207.83	207.76	207.45	207.21	207.21	207.31	
BH/MW 4S	mbgs	3.05	2.98	2.89	2.82	2.80	2.73	2.57	2.46	2.80	2.78	3.03	2.98	2.82	0.59
	masl	198.20	198.27	198.36	198.43	198.45	198.52	198.68	198.79	198.45	198.47	198.22	198.27	198.42	
BH/MW 4D	mbgs	3.07	3.03	2.94	2.86	2.84	2.75	2.71	2.49	2.83	2.82	3.05	3.02	2.87	0.58
	masl	198.25	198.29	198.38	198.46	198.48	198.57	198.61	198.83	198.49	198.50	198.27	198.30	198.45	
BH/MW 5/5R	mbgs	5.23	*	*	*	3.71	3.54	3.27	3.28	3.53	3.53	4.00	4.14	3.80	1.96
	masl	193.35	*	*	*	194.87	195.04	195.31	195.30	195.05	195.05	194.58	194.44	194.78	
BH/MW 6	mbgs	4.03	5.09	3.72	2.98	3.35	3.38	3.13	2.58	3.04	3.23	3.79	4.02	3.53	2.51
	masl	194.73	193.67	195.04	195.78	195.41	195.38	195.63	196.18	195.72	195.53	194.97	194.74	195.23	
BH/MW 7S	mbgs	3.57	3.58	3.57	3.52	3.51	3.51	3.49	3.46	3.45	3.47	3.56	3.58	3.52	0.13
	masl	195.72	195.71	195.72	195.77	195.78	195.78	195.80	195.83	195.84	195.82	195.73	195.71	195.77	
BH/MW 7D	mbgs	3.58	3.61	3.60	3.56	2.78	3.54	3.50	3.47	3.46	3.48	3.57	3.60	3.48	0.15
	masl	195.78	195.75	195.76	195.80	196.58	195.82	195.86	195.89	195.90	195.88	195.79	195.76	195.88	

Notes:
mbgs -- metres below ground surface
masl -- metres above sea level
* -- BH/MW 5 well destroyed between September 24, and October 25, 2018, and reinstalled on January 8, 2019

Table 6.2 - Summary of Manual Groundwater Elevations
(October 2018 to October 2019)

Well ID	Minimum Groundwater Elevation (masl)	Maximum Groundwater Elevation (masl)	Average Groundwater Elevation (masl)
BH/MW 1S	207.32	208.36	207.82
BH/MW 1D	207.05	208.23	207.68
BH/MW 2	211.24	214.13	212.90
BH/MW 3	<207.07	207.83	207.31
BH/MW 4S	198.20	198.79	198.42
BH/MW 4D	198.25	198.83	198.45
BH/MW 5/5R	193.35	195.31	194.78
BH/MW 6	193.67	196.18	195.23
BH/MW 7S	195.71	195.84	195.77
BH/MW 7D	195.75	195.90	195.88

The general trend of the manual groundwater levels obtained during the monitoring period from September 24, 2018 to August 22, 2019, indicate the typical seasonal trend, whereby the groundwater levels are at their lowest during the late summer months of September and October 2018; the levels consistently increase after, to where they reach their highest levels during the spring months of April and May 2019.

6.1.1 Vertical Groundwater Gradient in the Vicinity of Mohawk Lake

BH/MWs 1S and 1D, 4S and 4D, and 7S and 7D, represent three (3) pairs of nested monitoring wells. BH/MWs 1S and D, are located north, and upgradient of Mohawk Lake, BH/MWs 4S and 4D, are located northeast of Mohawk Lake, and BH/MWs 7D and 7S, are located south and downgradient of Mohawk Lake. These nested wells were installed in the vicinity of Mohawk Lake, to assist in determining the vertical hydraulic gradients relative to Mohawk Lake, and to assess any groundwater contribution to the Lake. The potential recharge discharge areas can be delineated

based on vertical differences in hydraulic head measurements as discussed below. Although surface water features are typically associated with discharge features, surface water features such as the Mohawk Lake, sometimes recharge the underlying groundwater flow systems.

The groundwater levels recorded during the monitoring period indicated that the water table elevations in BH/MW 1S were higher than those recorded in the deeper nested monitoring well pair at BH/MW 1 D, on eleven (11) of the twelve (12) groundwater level monitoring events, throughout the monitoring period. This suggest that the local vertical gradient for groundwater is most often downward such that the shallower groundwater aquifer is recharging the deeper aquifer system. The groundwater levels measured in the deeper nested well, BH/MW 1D was higher than that of the groundwater elevation in BH/MW 1S, on only occasion on August 22, 2019. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system, within the area north portion of the Mohawk Lake area, and that there is likely some groundwater contribution to the Mohawk Lake.

The groundwater levels recorded during the monitoring period indicated that the water table elevations in the deeper monitoring well BH/MW 4D were higher than those recorded in the shallower nested monitoring well pair at BH/MW 4S, on eleven (11) of the twelve (12) groundwater monitoring events, throughout the monitoring period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system. In March 22, 2019, a reversal in the groundwater gradient occurred whereby the shallow groundwater in BH/MW 4S was higher than levels observed in BH/MW 4D, and that the local vertical groundwater gradient for groundwater was interpreted as being downward such that the shallower groundwater aquifer is recharging the deeper aquifer system.

The groundwater elevation for the deeper monitoring well BH/MW 7D was consistently higher than that of the groundwater elevation in MP 7DS, on all of the monitoring events during the study period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system within the areas east and west of Mohawk Lake, and that there is likely groundwater recharge to Mohawk Lake from the deeper aquifer system.

It is likely that the vertical groundwater gradient will vary, where the deeper groundwater aquifer will receive groundwater contribution from the shallow aquifer system during low groundwater level period (summer and fall seasons), and where the shallow groundwater will receive recharge from the deeper groundwater during high groundwater periods (i.e. spring and winter)

6.1.2 **Shallow Groundwater Flow Pattern**

The shallow groundwater flow pattern was interpreted from the average of groundwater level measurements recorded in the BH/MWs. The measured levels indicate that shallow groundwater flows in southerly directions from an interpreted high groundwater area located north of the Mohawk Lake. Groundwater flow south of the lake, is in a southerly direction. The interpreted shallow groundwater flow pattern for the site area is illustrated on Drawing No. 8.

6.2 **Groundwater Monitoring-Logger Data- August 2018 to August 2019.**

Automated data loggers were installed in each of the ten (10) BH/MWs. The loggers were programmed to record the groundwater level elevation, and temperatures at fifteen (15) minutes intervals from August 2018, to August 2019. Daily

precipitation data was obtained from observations reported at the Brantford Airport Climate Station (Station ID 6140942), which is the nearest climate station without significant interruptions for precipitation records. The station is operated by Environment Canada and is located approximately 7.7 km west of the site, within the Southern Grand River Mohawk sub- watershed. The local precipitation data was plotted against the groundwater level elevations, to determine the response time of the shallow aquifer to precipitation events. The monthly groundwater elevations and temperature variations are summarized on Tables 6-3 to 6-22 below, and the data is presented on Charts B-1 to B-10 in Appendix "B".

6.2.1 Groundwater Monitoring-Logger Data- BH/MW 1S

The logger data indicates that the monthly groundwater level elevations for BH/MW 1S, fluctuations range from a low of 207.11 masl to a high of 208.75 masl. The raw data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations. The monthly groundwater temperature data is summarized in Table 6-3 below, and is plotted on Chart B-1.

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation and is graphed on Chart B-1. The data indicates that shallow groundwater showed a moderate response, and during larger rainfall event, an increase of about 0.8 m was observed in the groundwater levels.

Table 6-3 – BH/MW 1S Monthly Groundwater Level Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	208.26	208.27	208.26
September 2018	208.26	208.59	208.50
October 2018	208.39	208.74	208.51
November 2018	207.99	208.39	208.14
December 2018	207.16	207.99	207.47
January 2019	207.11	208.30	207.66
February 2019	207.77	208.75	208.22
March 2019	207.74	208.46	208.09
April 2019	208.06	208.26	208.19
May 2019	208.45	208.74	208.56
June 2019	208.10	208.52	208.31
July 2019	208.06	208.26	208.19
August 2019	207.11	207.64	207.32

Notes:
masl -- metres above sea level

6.2.2 Groundwater Temperature -Logger Data- BH/W1 S

The data logger records indicate that the average groundwater temperature for BH/MW 1S, range from 6.57 to 13.46° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from early November 2018, to late April 2019; after which a gradual warming trend was observed until August 2019 in the summer months.

The monthly groundwater temperature data is summarized in Table 6-4 and is plotted on Chart B-1.

Table 6-4 – BH/MW 1S Monthly Temperature Data Variation (monthly) – Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.30	12.50	12.31
September 2018	12.30	12.98	12.70
October 2018	12.98	13.37	13.12
November 2018	12.50	13.46	12.97
December 2018	10.94	12.50	11.65
January 2019	9.28	10.94	10.02
February 2019	7.88	9.57	8.43
March 2019	6.98	8.38	7.47
April 2019	6.57	7.08	6.82
May 2019	6.98	7.88	7.43
June 2019	7.88	9.67	8.75
July 2019	9.67	10.85	10.33
August 2019	10.85	11.82	11.36

6.2.3. **Groundwater Monitoring-Logger Data- BH/MW 1D**

The data from the data logger installed in BH/MW 1D, indicates that the monthly groundwater level elevation fluctuations, range from a low of 205.12 masl in November 2018, to a high of 208.68 masl in May 2019. The raw data indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, then a gradual decrease in groundwater elevation to late August 2019.
The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-2. The monitoring data indicates that shallow groundwater showed a moderate response to rainfall events, with the levels increasing by about 0.7 m as recorded in direct response to larger rainfall events.

The monthly groundwater level elevations and temperature variations are summarized on Table 6.5 below.

Table 6.5 – BH/MW 1D Monthly Groundwater Level Elevations – (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	207.43	207.47	207.45
September 2018	205.54	207.47	207.27
October 2018	205.13	207.45	207.24
November 2018	205.12	207.95	206.79
December 2018	205.13	207.82	207.64
January 2019	207.65	208.28	207.88
February 2019	207.68	208.61	208.16
March 2019	207.64	208.41	207.98
April 2019	207.89	208.25	208.11
May 2019	208.41	208.68	208.50
June 2019	208.21	208.48	208.34
July 2019	205.15	208.25	208.10
August 2019	207.11	207.53	207.32

Notes:
masl -- metres above sea level

6.2.4 **Groundwater Temperature -Logger Data- BH/W1D**

The groundwater temperatures in the vicinity of BH/MW 1D were monitored from August 2018, to August 2019. The data logger records indicate that the average groundwater temperature range from 7.38 to 12.01° C. The warming and cooling trend that was observed in the raw data, which reflects the annual seasonal cycle, with a cooling trend observed from early November 2018, to late April 2019; after which a gradual warming trend was observed until August 2019 in the summer

months. The monthly groundwater temperature data is summarized in Table 6-6 and is plotted on Chart B-2.

Table 6-6 – BH/MW 1D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	10.55	10.85	10.56
September 2018	10.55	11.24	10.88
October 2018	11.24	12.01	11.47
November 2018	10.16	11.92	11.36
December 2018	11.24	11.82	11.63
January 2019	10.06	11.33	10.69
February 2019	8.58	10.46	9.34
March 2019	7.78	9.28	8.58
April 2019	7.38	8.48	7.79
May 2019	7.58	8.38	7.99
June 2019	8.28	8.98	8.63
July 2019	8.98	9.57	9.26
August 2019	9.57	10.26	9.89

6.2.5 **Groundwater Monitoring-Logger Data- BH/MW 2**

The data indicates that the monthly groundwater elevation for BH/MW 2, fluctuations range from a low of 210.73 masl to a high of 214.19 masl. The raw data, the logger data indicates that the monthly groundwater level elevations for BH/MW 2, fluctuations range from a low of 207.11 masl to a high of 208.75 masl. The raw data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The groundwater level data was

plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-3. The data indicates that shallow groundwater showed a moderate response to rainfall events, and during larger rainfall events, an increase of about 0.3 m was observed. The monthly groundwater elevations and temperature variations are summarized on Tables, 6-7 and 6-8, and the data is presented on Chart B-3 in Appendix "B".

Table 6-7 – BH/MW 2 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	211.30	211.62	211.48
September 2018	210.89	211.79	211.65
October 2018	210.73	211.88	211.54
November 2018	211.87	212.70	212.37
December 2018	212.69	213.09	212.82
January 2019	212.86	213.19	212.97
February 2019	213.13	213.32	213.24
March 2019	213.10	213.98	213.57
April 2019	213.77	214.19	213.98
May 2019	211.30	211.62	211.48
June 2019	210.89	211.79	211.65
July 2019	210.73	211.88	211.54
August 2019	211.87	212.70	212.37

Notes:
masl -- metres above sea level

6.2.6 **Groundwater Temperature -Logger Data- BH/W2**

The groundwater temperatures in the vicinity of BH/MW 2 were monitored from August 2018, to August 2019. The data logger records indicate that the average groundwater temperature range from 7.28 to 12.21° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a

cooling trend observed from August 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. Some fluctuations in temperatures were observed between late February 2019, and early May 2019.

Table 6-8 – BH/MW 2 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	10.94	11.24	10.95
September 2018	10.94	11.82	11.31
October 2018	11.14	12.21	11.87
November 2018	11.92	12.21	12.06
December 2018	10.94	12.01	11.56
January 2019	9.77	10.94	10.43
February 2019	9.08	9.77	9.42
March 2019	7.28	9.67	8.78
April 2019	7.28	8.68	7.72
May 2019	10.94	11.24	10.95
June 2019	10.94	11.82	11.31
July 2019	11.14	12.21	11.87
August 2019	11.92	12.21	12.06

6.2.7 **Groundwater Monitoring-Logger Data- BH/MW 3**

The groundwater levels in the BH/MW 3, often decreased to levels below the depth of the well, and were recorded as being dry during the summer months until March 2019. The logger data indicates that the monthly groundwater level elevations for BH/MW 3 fluctuations, range from a low of 207.58 masl to a high of 208.09 masl. The raw data, indicates that the groundwater level elevation trends shows a consistent

increase in groundwater elevation from March to May 2019, after which, there was a gradual decline in groundwater elevation, to where it decreased to below the bottom of the well for the remainder of the monitoring period. The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-4. The data indicates that shallow groundwater showed a moderate response to precipitation, and during larger rainfall events, an increase of about 0.2 m was observed. The monthly groundwater elevations and temperature variations are summarized on Tables 6-9, and 6-10, and the data is presented on Chart B-4 in Appendix "B".

Table 6-9 – BH/MW 3 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	Groundwater Elevation Below the Bottom of the Monitoring Well		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019			
March 2019	207.58	207.69	207.58
April 2019	207.69	208.01	207.90
May 2019	207.81	208.09	207.98
June 2019	207.58	207.89	207.65
July 2019	Groundwater Elevation Below the Bottom of the Monitoring Well		
August 2019			

Notes:
masl -- metres above sea level

6.2.8 **Groundwater Temperature -Logger Data- BH/W3**

The data logger records indicate that the average groundwater temperature for BH/MW 3, range from 7.58 to 11.72° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from August 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-10, and is plotted on Chart B-3.

Table 6-10 – BH/MW 3 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	Groundwater Elevation Below the Bottom of the Monitoring Well		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019			
March 2019			
April 2019	6.98	9.47	7.97
May 2019	6.67	7.58	7.03
June 2019	7.58	9.18	8.41
July 2019	9.18	10.46	9.85
August 2019	10.36	11.72	11.02

6.2.9 **Groundwater Monitoring-Logger Data- BH/MW 4S**

The monthly groundwater elevations and temperature variations for BH/MW 4S, are summarized on Tables 6-11, and 6-12, below, and the data is presented on Chart B-5 in Appendix "B". The data indicates that the monthly groundwater elevation for BH/MW 4S, fluctuations range from a low of 198.10 masl to a high of 198.77 masl. The raw data, indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, then a gradual decrease in groundwater elevation to late August 2019.

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Table 6-11 – BH/MW 4S Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	198.27	198.29	198.28
September 2018	198.17	198.30	198.24
October 2018	198.21	198.38	198.27
November 2018	198.32	198.65	198.40
December 2018	198.33	198.49	198.39
January 2019	198.30	198.50	198.38
February 2019	198.10	198.43	198.29
March 2019	198.17	198.55	198.31
April 2019	198.33	198.54	198.41
May 2019	198.32	198.77	198.52
June 2019	198.25	198.43	198.33
July 2019	198.33	198.54	198.41
August 2019	198.10	198.23	198.17

Notes:
masl -- metres above sea level

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-5. The data indicates that shallow

groundwater showed a moderate response to rainfall events, increases of about 0.3m was observed in the groundwater elevation, in response to larger rainfall events.

6.2.10 **Groundwater Temperature -Logger Data- BH/W4S**

The data logger records indicate that the average groundwater temperature for BH/MW 4S, range from 9.18 to 19.85° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from September 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-12, and is plotted on Chart B-5.

Table 6-12 – BH/MW 4S Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	18.52	19.00	18.60
September 2018	18.62	19.85	19.35
October 2018	19.00	19.85	19.68
November 2018	17.00	19.19	18.13
December 2018	14.52	17.09	15.88
January 2019	12.79	14.71	13.78
February 2019	10.65	12.79	11.55
March 2019	9.28	10.85	10.09
April 2019	9.18	9.77	9.44
May 2019	9.57	11.33	10.32
June 2019	11.24	13.85	12.52
July 2019	13.75	16.52	15.20
August 2019	16.52	18.24	17.44

6.2.11 **Groundwater Monitoring-Logger Data- BH/MW 4D**

The monthly groundwater elevations and temperature variations for BH/MW 4D are summarized on Table 6-13, and 6-14, and the data is presented on Chart B-5 in Appendix "B". The data indicates that the monthly groundwater elevation for BH/MW 4D, fluctuations range from a low of 198.18 masl in September 2018, to a high of 198.88 masl in May2019. The raw data, indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, and afterwards there was a gradual decrease in groundwater elevations to late August 2019.

Table 6-13 – BH/MW 4D Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	198.25	198.28	198.26
September 2018	198.19	198.29	198.24
October 2018	198.24	198.39	198.28
November 2018	198.34	198.66	198.41
December 2018	198.35	198.51	198.41
January 2019	198.32	198.52	198.40
February 2019	198.31	198.65	198.50
March 2019	198.39	198.77	198.53
April 2019	198.55	198.76	198.63
May 2019	198.44	198.88	198.63
June 2019	198.32	198.55	198.43
July 2019	198.55	198.76	198.63
August 2019	198.18	198.30	198.24

Notes:
masl -- metres above sea level

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-6. The data indicates that shallow groundwater showed a moderate response to rainfall events, and increases of about

0.3m was observed in the groundwater elevations, in response to larger rainfall events.

6.2.12 **Groundwater Temperature -Logger Data- BH/W4D**

The data logger records indicate that the average groundwater temperature for BH/MW D, range from 9.77 to 20.42° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from September 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-14, and is plotted on Chart B-6.

Table 6-14 – BH/MW 4D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	18.52	18.90	18.63
September 2018	18.62	20.42	19.27
October 2018	19.09	19.76	19.56
November 2018	17.19	19.19	18.28
December 2018	14.90	17.28	16.07
January 2019	12.98	14.90	13.97
February 2019	11.24	13.08	12.10
March 2019	9.97	11.33	10.65
April 2019	9.77	10.16	9.93
May 2019	9.97	11.63	10.65
June 2019	11.43	13.85	12.60
July 2019	13.65	16.33	14.99
August 2019	16.14	18.05	17.18

6.2.13 **Groundwater Monitoring-Logger Data- BH/MW 5R**

An automated data logger was installed in BH/MW 5. The logger was programmed to record the groundwater temperature and elevations at fifteen (15) minutes intervals. The groundwater monitoring well at BH/MW 5, was inadvertently knocked over by a vehicle between September 24, and October 25, 2018. A replacement well, BH/MW 5R, was installed on January 8,2019, and a data logger was installed in the replacement well on February 2, 2019.

The monthly groundwater elevations and temperature variations are summarized on Tables 6-15, and 6-16, and the data is presented on Chart B-7 in Appendix "B". The data indicates that the monthly groundwater elevation for BH/MW 4S, fluctuations range from a low of 194.18 masl in June 2019, and a high of 194.91 masl in May 2019; after which there was a gradual decrease in groundwater elevations.

Table 6-15 BH/MW 5R Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	Monitoring Well Destroyed, Replacement Well Installed on February 2, 2019		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019	194.35	194.54	194.42
March 2019	194.30	194.69	194.48
April 2019	194.56	194.69	194.63
May 2019	194.52	194.91	194.75
June 2019	194.18	194.65	194.41
July 2019	194.56	194.69	194.63
August 2019	193.68	193.85	193.75

Notes:
masl -- metres above sea level

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-7. The data indicates that shallow groundwater showed a moderate response, and during larger rainfall events, an increase of about 0.3 m was observed.

6.2.14 **Groundwater Temperature -Logger Data- BH/W5R**

The data logger records indicate that the average groundwater temperature for BH/MW 5R, range from 9.18 to 19.85° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from February 2019, to between late May, and early June 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-16, and is plotted on Chart B-7.

Table 6-16 – BH/MW 5R Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	Monitoring Well Destroyed, Replacement Well Installed on February 2, 2019		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019	12.11	12.21	12.14
March 2019	11.63	12.11	11.88
April 2019	11.04	11.63	11.36
May 2019	10.75	11.04	10.85
June 2019	10.75	11.24	10.85
July 2019	11.04	11.33	11.17
August 2019	11.33	11.72	11.53

6.2.15 **Groundwater Monitoring-Logger Data- BH/MW 6**

The monthly groundwater elevations and temperature variations for BH/MW 6, are summarized on Tables 6-17, and 6-18, and the data is presented on Chart B-6 in Appendix “B”.

Table 6-17 – BH/MW 6 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
September 2018	194.72	195.52	194.81
October 2018	194.55	195.74	194.93
November 2018	195.01	195.94	195.27
December 2018	195.13	195.89	195.31
January 2019	195.13	195.89	195.28
February 2019	195.12	195.42	195.31
March 2019	195.29	196.05	195.53
April 2019	195.92	196.13	196.02
May 2019	195.73	196.23	196.03
June 2019	195.28	195.93	195.57
July 2019	195.92	196.13	196.02
August 2019	194.73	194.94	194.82

Notes:
masl -- metres above sea level

The data indicates that the monthly groundwater elevations for BH/MW 6, fluctuations, range from a low of 194.55 masl in October 2018, to a high of 196.23 masl in May 2019, there was a gradual decrease in groundwater elevation to late August 2019. The raw data indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-8. The data indicates that shallow groundwater showed minor responses to rainfall events, with an approximate increase of about 0.1 m for the groundwater levels in response.

6.2.16 **Groundwater Temperature -Logger Data- BH/W 6**

The groundwater temperatures in the vicinity of BH/MW 6 were monitored from September 2018, to August 2019.

Table 6-18 – BH/MW 6 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
September 2018	12.59	17.19	13.22
October 2018	11.72	16.43	13.86
November 2018	9.87	13.37	12.84
December 2018	9.97	13.08	12.33
January 2019	9.57	12.88	12.23
February 2019	12.30	12.79	12.43
March 2019	7.28	12.50	11.82
April 2019	7.48	11.24	9.52
May 2019	9.87	11.33	10.36
June 2019	10.46	11.53	10.84
July 2019	11.04	11.72	11.33
August 2019	11.53	11.92	11.77

The data logger records indicate that the groundwater temperature range from 7.28 to 17.19° C. The groundwater temperatures in BH/MW 6 fluctuated in the summer and winter months of 2018; it stabilized mid January 2019, to mid March 2019, and after declined to its lowest temperature of 7.28 ° C, in late March 2019. It afterwards, showed a gradual warming trend throughout the rest of the monitoring period. Fluctuation in temperature of up to 4 ^{0}C was observed over the monitoring period. It is not clear as to the cause of these observed fluctuations, as in some instances, an increase in temperature appears to coincide with rainfall events, whereas in other cases it does not.

6.2.17 **Groundwater Monitoring-Logger Data- BH/MW 7S**

The logger data indicates that the monthly groundwater elevation for BH/MW 7S, fluctuations, range from a low of 195.66 masl in October 2018, to a high of 195.91 masl, in May 2019. The raw data, indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The monthly groundwater elevations and temperature variations are summarized on Tables 6-19, and 6-20, and the data is presented on Chart B-9 in Appendix "B".

Table 6-19 – BH/MW 7S Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	195.76	195.77	195.77
September 2018	195.71	195.78	195.76
October 2018	195.66	195.77	195.75
November 2018	195.72	195.78	195.75
December 2018	195.73	195.78	195.75
January 2019	195.70	195.79	195.75
February 2019	195.69	195.79	195.75
March 2019	195.73	195.82	195.77
April 2019	195.78	195.83	195.81
May 2019	195.84	195.91	195.88
June 2019	195.78	195.87	195.82
July 2019	195.78	195.83	195.81
August 2019	195.68	195.72	195.71

Notes:
masl -- metres above sea level

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-9. The data indicates that shallow groundwater showed minor response, and during larger rainfall event, an increase of

less than 0.1 m, was observed in response to rainfall events.

6.2.18 **Groundwater Temperature -Logger Data- BH/W 7S**

The data logger records indicate that the groundwater temperature for BH/MW 7S, range from 11.14 to 14.42° C. A gradual warming trend observed from August 2018, to December 2019; a gradual cooling trend was observed to late May to early June 2019, after which a gradual warming trend was observed to the end of the monitoring period. The monthly groundwater temperature data is summarized in Table 6-20, and is plotted on Chart B-9.

Table 6-20 – BH/MW 7S Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.69	12.98	12.70
September 2018	12.69	13.46	13.05
October 2018	13.46	14.04	13.72
November 2018	13.94	14.23	14.09
December 2018	13.85	14.42	14.04
January 2019	13.37	13.94	13.65
February 2019	12.69	13.37	12.96
March 2019	11.72	12.69	12.12
April 2019	11.33	11.82	11.54
May 2019	11.14	11.33	11.21
June 2019	11.24	11.24	11.16
July 2019	11.24	11.72	11.43
August 2019	11.72	12.30	12.00

6.2.19 **Groundwater Monitoring-Logger Data- BH/MW 7D**

The monthly groundwater elevations and temperature variations for BH/MW 7D, are summarized on Tables 6-21, and 6-22, and the data is presented on Chart B-10 in Appendix "B".

Table 6-21 – BH/MW 7D Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2019	195.75	195.76	195.75
September 2018	195.73	195.77	195.75
October 2018	195.71	195.76	195.74
November 2018	195.73	195.79	195.76
December 2018	195.73	195.78	195.75
January 2019	195.72	195.79	195.76
February 2019	195.70	195.79	195.76
March 2019	195.75	195.83	195.79
April 2019	195.81	195.91	195.85
May 2019	195.85	195.93	195.89
June 2019	195.80	195.88	195.84
July 2019	195.81	195.85	195.83
August 2019	195.71	195.74	195.73

Notes:
masl -- metres above sea level

The data indicates that the monthly groundwater elevation for BH/MW 7D, fluctuations, range from a low of 195.70 masl to a high of 195.91 masl. The raw data, indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The groundwater level data was plotted against the Brantford Airport Climate Station precipitation, and is graphed on Chart B-10. The data indicates that shallow

groundwater showed minor response, and during larger rainfall event, an increase of less than 0.1 m, was observed in response to rainfall events.

6.2.20 **Groundwater Temperature -Logger Data- BH/W 7D**

The data logger records indicate that the groundwater temperature for BH/MW 7D, range from 11.63 to 13.37° C. A gradual warming trend observed from August 2018, to December 2019; a gradual cooling trend was observed to late May to early June 2019, after which a gradual warming trend was observed to the end of the monitoring period. The monthly groundwater temperature data is summarized in Table 6-22, and is plotted on Chart B-10.

Table 6-22 – BH/MW 7D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.21	12.40	12.21
September 2018	12.21	12.79	12.37
October 2018	12.50	13.08	12.77
November 2018	12.98	13.27	13.08
December 2018	13.17	13.37	13.28
January 2019	13.27	13.37	13.31
February 2019	12.88	13.37	13.11
March 2019	12.40	12.88	12.64
April 2019	12.01	12.40	12.31
May 2019	11.72	12.01	11.86
June 2019	12.21	12.21	11.71
July 2019	11.63	11.92	11.77
August 2019	11.82	12.01	11.95

6.3 Vertical Groundwater Gradient in the Vicinity of Mohawk Lake – Comparison of Groundwater Logger Data (August 2018 to August 2019)

A comparison of the logger data for BH/MWs 1S, and 1D, indicated that the groundwater table elevations in BH/MW 1S, were higher than those recorded in the deeper nested monitoring well pair at BH/MW 1-D, for much of the monitoring period. This suggest that the local vertical gradient for groundwater is most often downward, such that the shallower groundwater aquifer is recharging the deeper aquifer system. The groundwater levels measured in the deeper nested well, BH/MW 1D, were higher than the groundwater elevations in BH/MW 1S, during late October through to early November 23018, and again in late June through to early January 2019. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system. This observation agrees with those observed in the manual groundwater level elevations, suggesting that the groundwater north of Mohawk Lake is has a downward vertical gradient. A comparison in groundwater level elevations, between the logger data for BH/MW 1S and 1D is provided on Chart B-11.

The groundwater levels recorded during the monitoring period indicated that the groundwater level elevation in both the deep and shallow monitoring wells for BH/MW 4S and 4D, were similar, where the differences in elevations varying from 0.03 to 0.05 m. The groundwater elevations in the deeper monitoring well, BH/MW 1D, were consistently slightly higher than those in the shallower monitoring wells BH/MW 4S between late January through to early February 2019. There was a noted difference in groundwater level elevation, where the deeper groundwater levels were consistently higher than those of the shallower aquifer. This trend continued to the end of the monitoring period. The manual groundwater measurements also agree with the logger data, which indicates that the groundwater from the deeper aquifer is

recharging the shallower aquifer system. A chart showing the comparison in groundwater elevations, between the logger data for BH/MW 4S and 4D is provided on Chart B-12.

The groundwater elevations for both deep and shallow monitoring wells, BH/MWs 7S and D, were similar for both wells. The elevations in the deeper monitoring well BH/MW 7D were however consistently slightly higher than the groundwater level elevations in MP 7DS, during the study period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system within the areas east and west of Mohawk Lake, and that there is likely groundwater recharge to Mohawk Lake from the deeper aquifer system.

The vertical groundwater gradient migration is important where the dominant groundwater migration pattern is downward which can provide a pathway for contaminants that originate at the ground surface into the underlying aquifer. The areas south of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area.

Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.

Whereas there was evidence of groundwater flow contribution to Mohawk Lake, during the monitoring period, the areas of discharge to the Lake, and the quantification of these flows, could not be conclusively determined from this study.

6.3.1. **Groundwater Temperature**

Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

Large fluctuations in groundwater temperatures of up to 6^0C, were noted in BH/MW 6, during summer, winter, and spring. There is the possibility that these increases could be associated with rainfalls events. This however could not be conclusively determined, as there were periods where the increase in rainfall events were accompanied by either an increase or a decrease in groundwater temperature.

6.3.2 **Single Well Response Test Analysis**

All of the deeper BH/MWs except BH/MW3, underwent single well response tests (SWRTs) to assess the hydraulic conductivity (K) for saturated shallow aquifer sub-soils at the depths of the well screens. The SWRT could not be performed at BH/MW 3, due to the insufficient volumes of groundwater within the wells throughout the monitoring period.

The results of the SWRTs are presented in Appendix 'B', with a summary of the findings shown in Table 6-23.

Table 6-23 - Summary of SWRT Results

Well ID	Ground El. (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Screened Sub-Soil Strata	Hydraulic Conductivity (K) (m/sec)
BH/MW 1D	210.75	6.1	6.5	3.1-6.1	Silt, Silty Sand/Silty Clay	4.4×10^{-8}
BH/MW 2	216.49	6.1	6.5	3.1-6.1	Sand/ Silty Clay	1.5×10^{-5}
BH/MW 4D	201.32	6.1	6.5	3.1-6.1	Silty Clay	5.4×10^{-6}
BH/MW 5R	198.58	6.1	6.5	3.1-6.1	Silty Clay/Sandy Gravel	2.5×10^{-7}
BH/MW 6	198.76	6.1	6.5	3.1-6.1	Silty Clay/Silty Sand	4.1×10^{-5}
BH/MW 7D	199.36	6.1	6.5	3.1-6.1	Earth Fill	1.4×10^{-6}

Notes
mbgs -- metres below ground surface
masl -- metres above sea level
- -- Test not done due on BH/MW 3, due to insufficient volume of water within the well.

As shown above, the K estimates for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s, the K estimate for the sand and silty clay unit is 1.5×10^{-5} m/s, the K estimate for the silty clay unit is 5.4×10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5×10^{-7} m/s, and the K estimate for the earth fill is 1.4×10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The

above results suggest that the hydraulic conductivity for the groundwater-bearing sub-soils at the depths of the well screens is low to high, with corresponding low to high groundwater seepage rates being anticipated into open excavations, below the water table.

6.3.3 **Assessment of Hydraulic Conductivity Based on the Hazen Equation**

The Hazen Equation method was also adopted to estimate the hydraulic conductivity (K) for different subsoil layers which may contain high groundwater levels during the seasonal (spring) period, or if encountered within the deeper excavations. These layers are primarily above the well screen depths.

The Hazen Equation method relies on the interrelationship between hydraulic conductivity and effective soil particle grain size, d_{10}, (mm) for the sub-soil media. This empirical relation predicts a power-law relation with K, as follow:

$$K = Ad_{10}^2$$

where;

d_{10}: Value of the soil grain size gradation curve (mm) as determined by sieve analysis, whereby 10% by weight of the soil particles are finer and 90% by weight of the soil particles are coarser.

A: Coefficient; it is equal to 1 when K is in m/sec and d_{10} is in mm

The Hazen Equation K estimation provides an indication for the yield capacity for groundwater-bearing subsoil strata at the depths where the soil samples that underwent grain size analyses were collected. The calculated results indicate that the K estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a

depth of 4.57 mbgs at BH/MW 5 is 1.6 x 10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is 1.0 x 10^{-6} m/sec.

The results of the Hazen method determined K estimates are provided in Table 6-24 below. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.

Table 6-24 - Summary of Hazen Equation Estimated K Results

Well ID	Sample Depth (mbgs)	Sample El. (masl)	Description of Soil Strata	D_{10} (mm)	Hydraulic Conductivity (K) (m/sec)
BH/MW 5	6	194.01	Sandy Gravel, some silt, and a trace of clay	0.04	1.60 x 10^{-5}
BH/MW 6	6.1	192.66	Silty sand, a trace of clay	0.01	1.0 x 10^{-6}

Notes
mbgs -- metres below ground surface
masl -- metres above sea level

The Hazen Estimated K Results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. Given these, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.

7.0 Groundwater Quality Monitoring

One (1) groundwater sample was collected for analysis from each of the following monitoring wells; the BH/MWs 1S, 1D, 2, 4S, 4D, 6, 7S, and 7, by Aquafor Beech Ltd., on October 23, 2018. Groundwater samples were not collected from BH/MW 3, due to the insufficient volume of groundwater within the well throughout the monitoring period. Groundwater samples were also not collected from BH/MW 5 well, as this well was destroyed during the groundwater sampling programme. Some of the samples underwent field filtration during collection, prior to analyses for Metals.

The laboratory reported results from monitoring well samples which were compared to both the Ontario Drinking Water Quality Standards and the Provincial Water Quality Objectives that relate to surface water. Surface water criteria was considered since shallow groundwater discharges to watercourses and waterbodies, and thus contributes to the surface water quality. Detailed laboratory reports are provided in the Appendix C and a summary of the exceedances are provided in Tables 7-1 and 7-2 below.

The following table summarizes exceedances of the ODWQS.

Table 7-1 Exceedances of the Ontario Drinking Water Quality Standards

Parameter	Standard & Type	Reported Results (ug/L)		
		BH/MW 6	BH/MW 7S	BH/MW 7D
Barium	1,000 - MAC			1,160
Sodium	200,000- AO	525,000	310,000	289,000
Benzo (a) pyrene	0.01- MAC			0.048

Notes:
MAC- Maximum Acceptable Concentration
AO - Aesthetic Objective

Table 7-2 Exceedances of the Provincial Water Quality Objectives

Parameter	**Standard & Type**	**Reported Results (ug/L)**				
		BH/MW 1S	BH/MW 2	BH/MW 6	BH/MW 7S	BH/MW 7D
Anthracene	0.0008 – Interim PWQO		0.041	0.062	0.029	0.147
Benzo(a)anthracene	0.0004- Interim PWQO		-	-	-	0.182
Boron	200- Interim PWQO				200	240
Chromium	1	1.39				
Benzo(g,h,i)perylene	0.00002-Interim PWQO		-	-	-	0.034
Benzo(k)fluoranthene	0.0002- Interim PWQO		-	-	-	0.041
Chrysene	0.0001- Interim PWQO		-	-	-	0.241
Fluoranthene	0.0008- Interim PWQO		-	0.027	0.053	0.475
Fluorene	0.2- Interim PWQO		1.43	0.319	0.207	0.336
1-Methylnaphthalene	2- Interim PWQO		6.55	-	-	-
2-Methylnaphthalene	2- Interim PWQO		2.54	-	-	-
Phenanthrene	0.03 – Interim PWQO		0.655	0.536	0.304	1.05

Groundwater quality at 3 of the BH/MWs locations, exceeded the Ontario Drinking Water Quality Objectives for 3 parameters, as shown in the above summary Table 7-1. Groundwater quality at 5 of the BH/MWs locations, exceeded the Provincial Water Quality Objectives for 12 parameters, as shown in the above summary table provided

in Table 7-2. These wells are located south and north of the Mohawk Lake. The parameters exceeding the PWQO, mainly included; Polycyclic Aromatic Hydrocarbons (PAH's), which are associated with the coal tar materials and associated waste.

Previous studies by Terraqua Investigation Limited, in 1990, identified an abandoned coal gasification plant, as the source of coal tar materials (PAHs) in the underlying aquifer. It is therefore possible that the PAHs exceedances observed at these locations could occur as a result of these, and from other contaminant sources.

8.0 CONCLUSIONS

1. The subject site lies within the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The surface geological map of Ontario shows that the area has a complex mixture of glaciofluvial and glaciolacustrine native soil deposits, reworked by the present-day Grand River.
2. The subject site is located within Southern Grand River subwatershed of the Grand River Watershed.
3. A review of the local topography shows that the subject site has undulating relief, exhibiting a gentle decline in elevation relief towards Mohawk Lake.
4. The study has disclosed that beneath the existing layer of topsoil, or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits.
5. The findings of this study indicate that the groundwater level elevations range from 193.67 masl at the southern limits of the study area to 214.13 masl within the areas located north of Mohawk Lake. Review of the average groundwater elevations suggest that it flows in southerly and south-easterly directions, towards the Mohawk Lake and the adjacent canal.
6. The single well response tests (SWRT) provided estimated hydraulic conductivity (K) values for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s, the K estimate for the sand and silty clay unit is 1.5×10^{-5} m/s, the K estimate for the silty clay unit is 5.4×10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5×10^{-7} m/s, and the K estimate for the earth fill is 1.4×10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The above results suggest that the hydraulic conductivity for the groundwater-bearing soils at the depths of the well screens is low to high, with corresponding low to

high groundwater seepage rates into open excavations, below the water table.

7. The Hazen Equation calculated permeability results derived from the soil grain size analysis indicates that the hydraulic conductivity (K) estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a depth of 4.57 mbgs at BH/MW 5 is 1.6×10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is 1.0×10^{-6} m/sec. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.
8. The Hazen Estimated hydraulic conductivity (K) results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. Given these, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.
9. The pressure transducer data loggers, which were installed within the groundwater monitoring wells in the vicinity of the Mohawk Lake indicates that groundwater temperatures vary from 6.82º C to 13.86º C. The warming and cooling trend reflects the annual seasonal cycle, with a cooling trend observed from August 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months.
10. The logger data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations across the project areas.
11. Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result

from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

12. The areas south of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area. Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.
13. In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons compounds, which are associated with coal tar materials and waste.
14. The results of this preliminary draft report, will be further updated to include a comparative assessment of other studies previously conducted in the area.

9.0 REFERENCES

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FIGURES 1 to 12

BOREHOLE LOGS AND GRAIN SIZE DISTRIBUTION GRAPHS

REFERENCE NO. 1806-W012

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

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Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
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4 to 10	loose
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over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 1S

FIGURE NO.: 1

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
210.8	Ground Surface							
0.0	100 mm TOPSOIL							
0.1	Brown **EARTH Fill** sand, fine to medium grained, a trace to some gravel	1	DO		0		11	
		2	DO		1		2	
		3	DO		2		3	
208.4								
2.4	Brown, stiff	4A	DO				6	
2.5	**SILTY CLAY**	4B	DO				20	
	Brown, compact **SILT**	5	DO		3		19	
		6	DO		4		17	
205.8					5			
5.0	END OF BOREHOLE				6			
					7			
					8			
					9			
					10			

Installed 50 mm dia. monitoring well to 4.6 m
Slotted screen from 1.52 to 4.6 m
Sand backfill from 0.9 to 4.6 m
Bentonite seal from 0.0 to 0.9 m
Provided with a steel monument casing

Groundwater Readings:
W.L @ 207.32 masl on September 24, 2018
W.L @ 207.33 masl on October 25, 2018
W.L @ 207.43 masl on November 22, 2018
W.L @ 207.66 masl on December 21, 2018
W.L @ 208.05 masl on January 18, 2019
W.L @ 208.17 masl on February 15, 2019
W.L @ 208.08 masl on March 22, 2019
W.L @ 208.28 masl on April 15, 2019
W.L @ 208.36 masl on May 24, 2019
W.L @ 208.22 masl on June 19, 1019
W.L @ 207.58 masl on July 26, 2019
W.L @ 207.44 masl on August 23, 2019

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 1D

FIGURE NO.: 2

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
210.8	Ground Surface				
0.0	100 mm TOPSOIL				0
0.1	Brown **EARTH Fill** sand, fine to medium grained, a trace to some gravel	1	DO		
		2	DO		1
		3	DO		2
208.4					
2.4	Brown, stiff	4A	DO		
2.5	**SILTY CLAY**	4B	DO		
	Brown, compact **SILT**	5	DO		3
206.2					4
4.6	Brown, loose **SITY SAND**	6	DO		5
204.7					6
6.1	Grey, soft **SILTY CLAY** sand layers	7	DO		
204.2					7
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing				8
	Groundwater Readings: W.L @ 207.05 masl on September 24, 2018 W.L @ 207.11 masl on October 25, 2018 W.L @ 207.24 masl on November 22, 2018 W.L @ 207.48 masl on December 21, 2018 W.L @ 207.75 masl on January 18, 2019 W.L @ 208.06 masl on February 15, 2019 W.L @ 207.85 masl on March 22, 2019 W.L @ 208.14 masl on April 15, 2019 W.L @ 208.23 masl on May 24, 2019 W.L @ 208.11 masl on June 19, 1019 W.L @ 207.35 masl on July 26, 2019 W.L @ 207.81 masl on August 23, 2019				9
					10

Dynamic Cone (blows/30 cm) 10 30 50 70 90

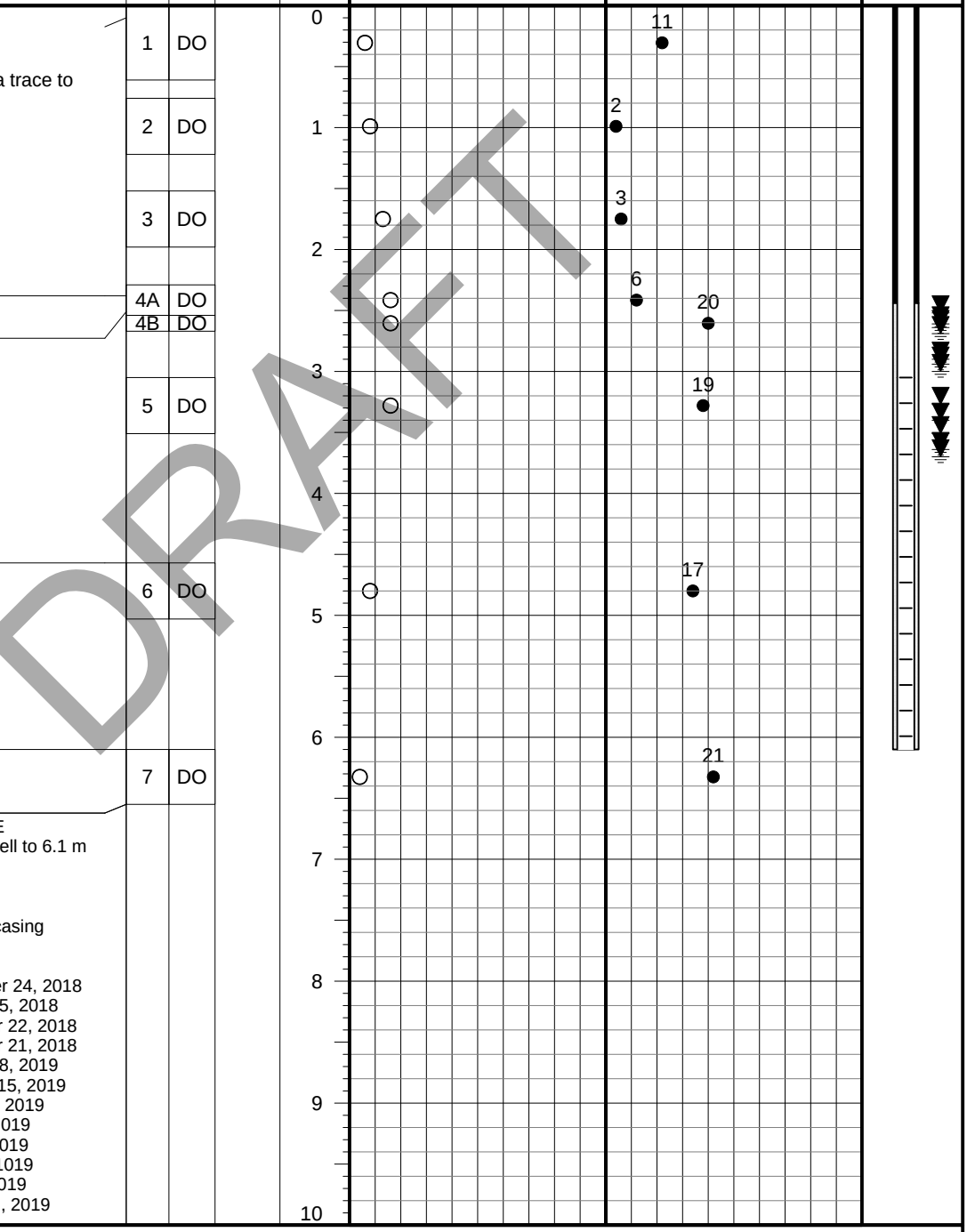
Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

WATER LEVEL



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JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 2

FIGURE NO.: 3

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: September 4, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
216.5	Ground Surface							
0.0	170 mm TOPSOIL				0			
0.2	Brown **EARTH Fill** silty sand	1	DO				11	
215.7								
0.8	Brown, loose to compact **SAND** fine to medium grained	2	DO		1		3	
		3	DO		2		4	
		4	DO				7	
		5	DO		3		8	
211.9					4			
4.6	Grey, stiff **SILTY CLAY**	6	DO		5		20	
		7	DO		6		23	
209.9								
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 211.77 masl on September 24, 2018 W.L @ 211.24 masl on October 25, 2018 W.L @ 212.49 masl on November 22, 2018 W.L @ 212.84 masl on December 21, 2018 W.L @ 213.18 masl on January 18, 2019 W.L @ 212.37 masl on February 15, 2019 W.L @ 213.77 masl on March 22, 2019 W.L @ 214.13 masl on April 15, 2019 W.L @ 213.84 masl on May 24, 2019 W.L @ 213.55 masl on June 19, 1019 W.L @ 213.68 masl on July 26, 2019 W.L @ 211.94 masl on August 23, 2019				7 8 9 10			

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 3

FIGURE NO.: 4

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

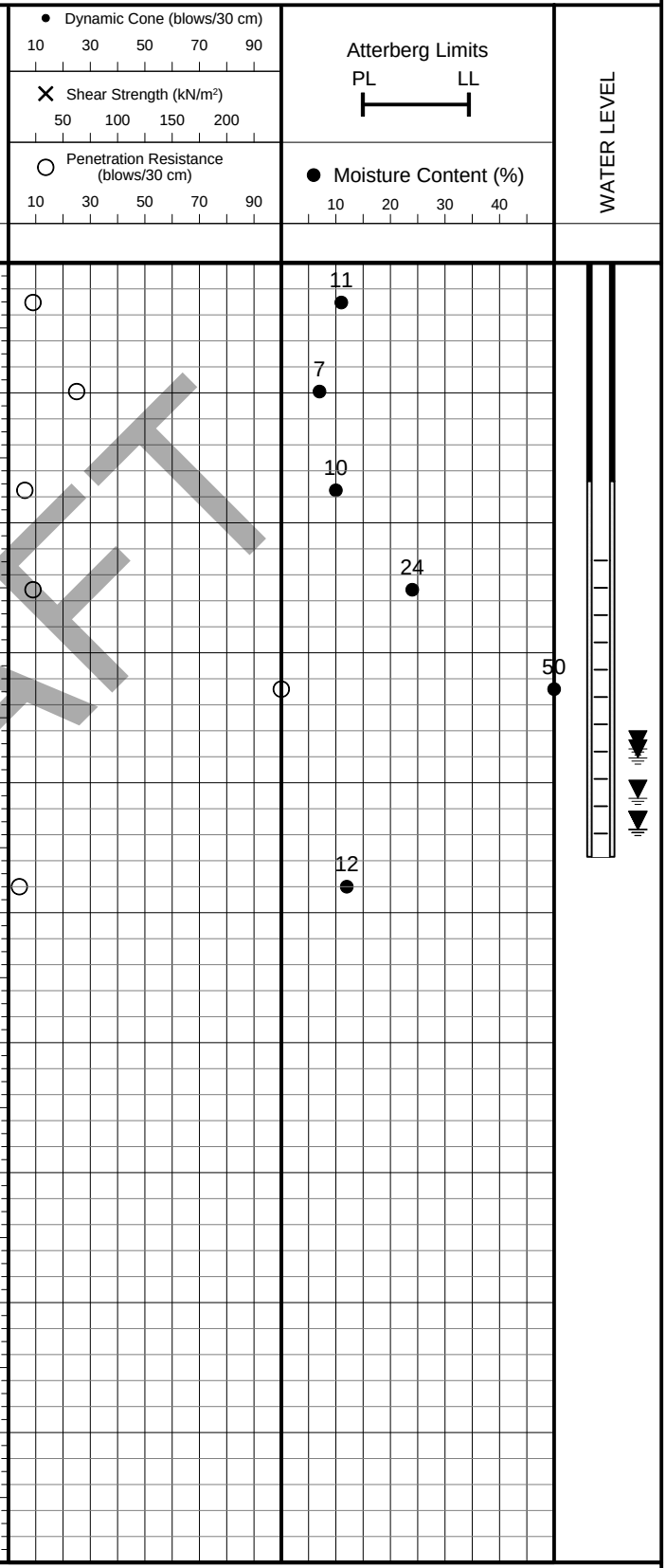
PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
211.6 / 0.0	Ground Surface			
	Brown **EARTH Fill** sand root inclusions	1	DO	
	gravel and cobble	2	DO	
		3	DO	
	black	4	DO	
208.5 / 3.0	Black **ORGANICS** wood debris	5	DO	
207.0 / 4.6	Grey **EARTH Fill**	6	DO	
206.5 / 5.0	silty clay, strong odour, some organics END OF BOREHOLE			

Installed 50 mm dia. monitoring well to 4.6 m
Slotted screen from 1.5 to 4.6 m
Sand backfill from 0.9 to 4.6 m
Bentonite seal from 0.0 to 0.9 m
Provided with a steel monument casing

Groundwater Readings:
DRY on September 24, 2018
DRY on October 25, 2018
N/A (lock jammed) on November 22, 2018
W.L @ 207.09 masl on December 21, 2018
W.L @ 207.11 masl on January 18, 2019
DRY on February 15, 2019
DRY on March 22, 2019
DRY on April 15, 2019
W.L @ 207.76 masl on May 24, 2019
W.L @ 207.45 masl on June 19, 1019
W.L @ 207.21 masl on July 26, 2019
W.L @ 207.21 masl on August 23, 2019



Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 4S

FIGURE NO.: 5

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
201.3	Ground Surface							
0.0 / 0.1	80 mm TOPSOIL							
	Brown **EARTH Fill** silty sand — trace of organics	1	DO		0		8	
	trace of gravel	2	DO		1		9	
		3	DO		2		12	
199.0 / 2.3	Grey, soft to stiff **SILTY CLAY**	4	DO				21	
		5	DO		3		24	
	trace of gravel	6	DO		4		23	
196.2 / 5.0	END OF BOREHOLE				5			
	Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.52 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing				6			
	Groundwater Readings: W.L @ 198.20 masl on September 24, 2018 W.L @ 198.27 masl on October 25, 2018 W.L @ 198.36 masl on November 22, 2018 W.L @ 198.43 masl on December 21, 2018 W.L @ 198.45 masl on January 18, 2019 W.L @ 198.52 masl on February 15, 2019 W.L @ 198.68 masl on March 22, 2019 W.L @ 198.79 masl on April 15, 2019 W.L @ 198.45 masl on May 24, 2019 W.L @ 198.47 masl on June 19, 1019 W.L @ 198.22 masl on July 26, 2019 W.L @ 198.27 masl on August 23, 2019				7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 4D

FIGURE NO.: 6

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
201.3	Ground Surface							
0.0 / 0.1	80 mm TOPSOIL				0			
	Brown **EARTH Fill** silty sand — trace of organics	1	DO				8	
	trace of gravel	2	DO		1		9	
		3	DO		2		12	
199.0 / 2.3	Grey, soft to stiff **SILTY CLAY**	4	DO				21	
		5	DO		3		24	
	trace of gravel	6	DO		4		23	
		7	DO		5		27	
194.8 / 6.5	END OF BOREHOLE				6			
	Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing				7			
	Groundwater Readings: W.L @ 198.25 masl on September 24, 2018 W.L @ 198.29 masl on October 25, 2018 W.L @ 198.38 masl on November 22, 2018 W.L @ 198.46 masl on December 21, 2018 W.L @ 198.48 masl on January 18, 2019 W.L @ 198.57 masl on February 15, 2019 W.L @ 198.61 masl on March 22, 2019 W.L @ 198.83 masl on April 15, 2019 W.L @ 198.49 masl on May 24, 2019 W.L @ 198.50 masl on June 19, 1019 W.L @ 198.27 masl on July 26, 2019 W.L @ 198.30 masl on August 23, 2019				8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 5R

FIGURE NO.: 7

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: January 8, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
198.6	Ground Surface							
0.0	Brown **EARTH Fill** silty sand gravel	1	DO		0		7	
		2	DO		1		8	
		3	DO		2		12	
196.3								
2.3	Grey, firm **SILTY CLAY** trace of organics	4	DO		3		23	
		5	DO				31	
194.0					4			
4.6	Brown, compact **SANDY GRAVEL** some silt a trace of clay	6	DO		5		23	
		7	DO		6		20	
192.0								
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 193.35 masl on September 24, 2018 W.L N/A on October 25, 2018 W.L N/A on November 22, 2018 W.L N/A on December 21, 2018 W.L @ 194.87 masl on January 18, 2019 W.L @ 195.04 masl on February 15, 2019 W.L @ 195.31 masl on March 22, 2019 W.L @ 195.30 masl on April 15, 2019 W.L @ 195.05 masl on May 24, 2019 W.L @ 195.05 masl on June 19, 1019 W.L @ 194.58 masl on July 26, 2019 W.L @ 194.44 masl on August 23, 2019				7 8 9 10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 6

FIGURE NO.: 8

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: September 4, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
198.8	Ground Surface							
0.0	Brown **EARTH Fill** silty clay, some sand, organics	1	DO		0		22	
198.0								
0.8	Brown **EARTH Fill** silty sand, a trace of gravel	2	DO		1		16	
197.2							50	
1.5	Black **EARTH Fill** organics, sandy, a trace of gravel, odour	3	DO		2		50	
196.5								
2.3	Black **EARTH Fill** sand, some organics, gravelly	4	DO				30	
195.7					3			
3.0	Grey, soft **SILTY CLAY**	5	DO				33	
194.2					4			
4.6	Grey, very loose **SILTY SAND** a trace of clay	6	DO				31	
					5			
					6			
192.2		7	DO				13	
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 194.73 masl on September 24, 2018 W.L @ 193.67 masl on October 25, 2018 W.L @ 195.04 masl on November 22, 2018 W.L @ 195.78 masl on December 21, 2018 W.L @ 195.41 masl on January 18, 2019 W.L @ 195.38 masl on February 15, 2019 W.L @ 195.63 masl on March 22, 2019 W.L @ 196.18 masl on April 15, 2019 W.L @ 195.72 masl on May 24, 2019 W.L @ 195.53 masl on June 19, 1019 W.L @ 194.97 masl on July 26, 2019 W.L @ 194.74 masl on August 23, 2019				7 8 9 10			

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 7S

FIGURE NO.: 9

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 8, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m^2) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
199.3	Ground Surface							
0.0	80 mm TOPSOIL				0			
0.1 / 198.5	Brown **EARTH Fill** silty sand, a trace of gravel	1	DO				6	
0.8 / 197.8	Brown **EARTH Fill** sand, fine to medium grained, a trace of gravel	2	DO		1		6	
1.5 / 197.0	Brown **EARTH Fill** silty sand, a trace of gravel, strong odour	3	DO		2		50	
2.3	Black **EARTH Fill** sand	4	DO				50	
	organics	5	DO		3		43	
					4		50	
194.3		6	DO					
5.0	END OF BOREHOLE Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.52 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing Groundwater Readings: W.L @ 195.72 masl on September 24, 2018 W.L @ 195.71 masl on October 25, 2018 W.L @ 195.72 masl on November 22, 2018 W.L @ 195.77 masl on December 21, 2018 W.L @ 195.78 masl on January 18, 2019 W.L @ 195.78 masl on February 15, 2019 W.L @ 195.80 masl on March 22, 2019 W.L @ 195.83 masl on April 15, 2019 W.L @ 195.84 masl on May 24, 2019 W.L @ 195.82 masl on June 19, 1019 W.L @ 195.73 masl on July 26, 2019 W.L @ 195.76 masl on August 23, 2019				5 6 7 8 9 10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 7D

FIGURE NO.: 10

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 8, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
199.4	Ground Surface				
0.0	80 mm TOPSOIL				0
0.1 / 198.6	Brown **EARTH Fill** silty sand, a trace of gravel	1	DO		
0.8 / 197.8	Brown **EARTH Fill** sand, fine to medium grained, a trace of gravel	2	DO		1
1.5 / 197.1	Brown **EARTH Fill** silty sand, a trace of gravel, strong odour	3	DO		2
2.3 / 194.8	Black **EARTH Fill** sand organics	4	DO		3
		5	DO		4
4.6 / 192.8	Brown **EARTH Fill** sand, glass fragments	6	DO		5
		7	DO		6
6.5	END OF BOREHOLE				7

Dynamic Cone (blows/30 cm): 10 30 50 70 90

Shear Strength (kN/m²): 50 100 150 200

Penetration Resistance (blows/30 cm): 10 30 50 70 90

Atterberg Limits: PL — LL

Moisture Content (%): 10 20 30 40

Moisture Content values: 6, 6, 50, 50, 43, 50, 50, 42

WATER LEVEL

Installed 50 mm dia. monitoring well to 6.1 m
Slotted screen from 3.1 to 6.1 m
Sand backfill from 2.4 to 6.1 m
Bentonite seal from 0.0 to 2.4 m
Provided with a steel monument casing

Groundwater Readings:
W.L @ 195.78 masl on September 24, 2018
W.L @ 195.75 masl on October 25, 2018
W.L @ 195.76 masl on November 22, 2018
W.L @ 195.80 masl on December 21, 2018
W.L @ 196.58 masl on January 18, 2019
W.L @ 195.82 masl on February 15, 2019
W.L @ 195.86 masl on March 22, 2019
W.L @ 195.89 masl on April 15, 2019
W.L @ 195.90 masl on May 24, 2019
W.L @ 195.88 masl on June 19, 1019
W.L @ 195.79 masl on July 26, 2019
W.L @ 195.76 masl on August 23, 2019

Soil Engineers Ltd.

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GRAIN SIZE DISTRIBUTION

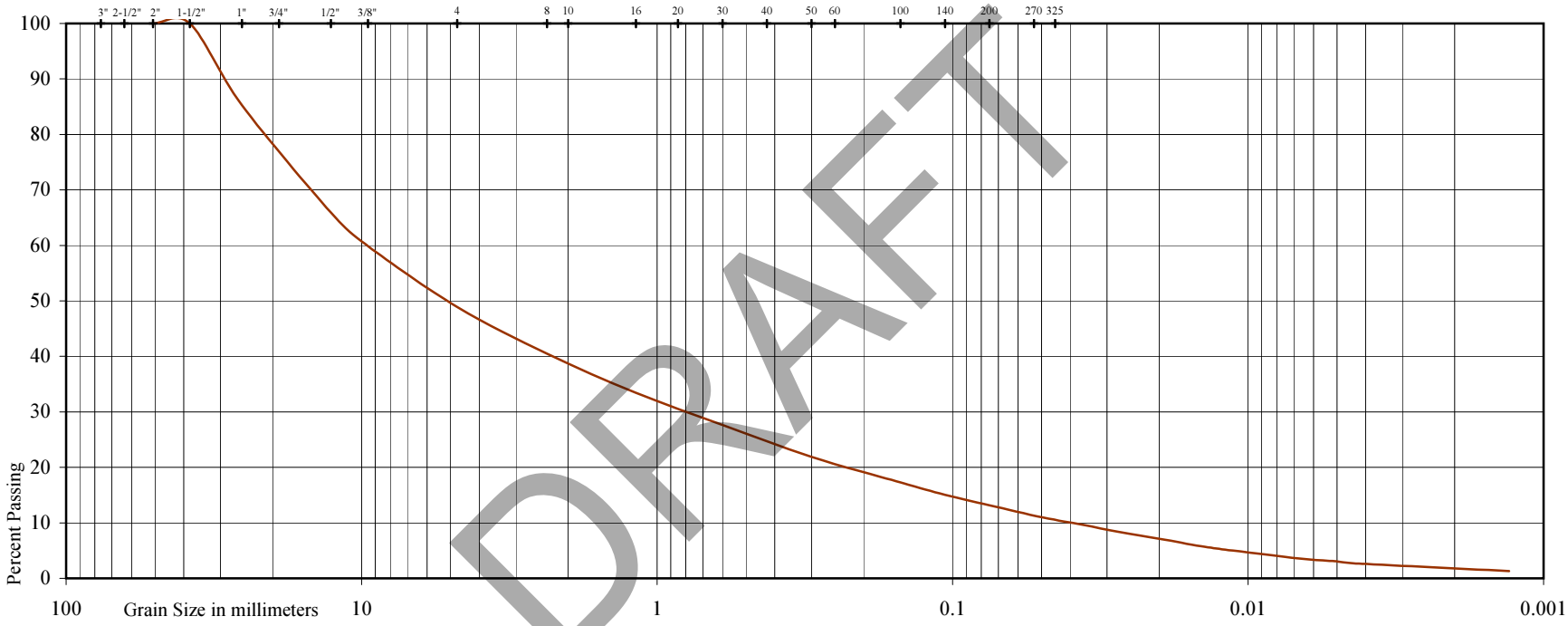
Reference No: 1806-W012

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Mohawk Lake Characterization Study

Location: North of Forest Road and South of Greenwich Street , Brantford

Borehole No: 5

Sample No: 6

Depth (m): 4.57

Elevation (m): 194.0

Estimated Permeability (m./sec.) = 10^{-5}

Classification of Sample [& Group Symbol]: SANDY GRAVEL, some silt, a trace of clay

Figure 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

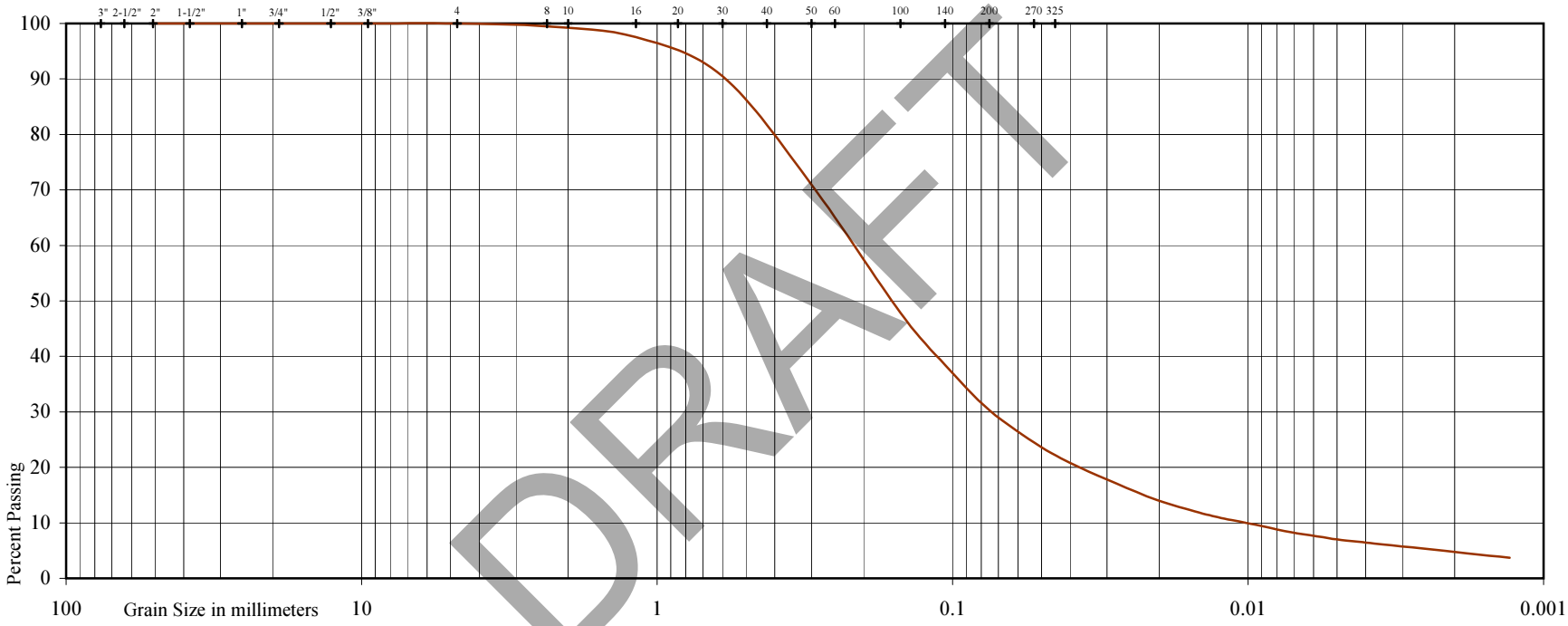
Reference No: 1806-W012

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Mohawk Lake Characterization Study

Location: North of Forest Road and South of Greenwich Street , Brantford

Borehole No: 6

Sample No: 7

Depth (m): 6.1

Elevation (m): 192.6

Estimated Permeability (m./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SILTY SAND, a trace of clay

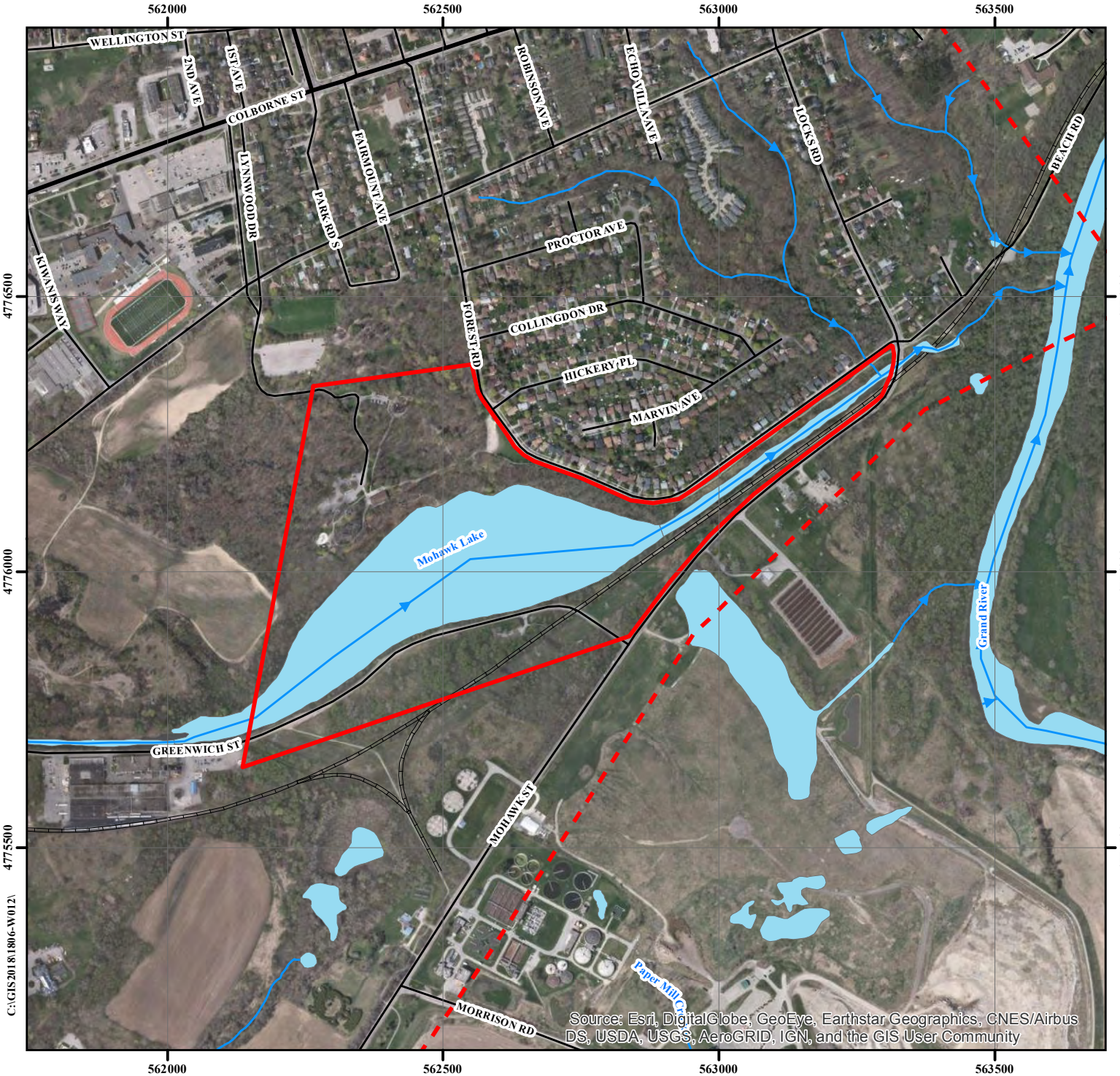
Figure 12

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

DRAWINGS 1 to 8

REFERENCE NO. 1806-W012



N

Approximate Boundary of Subject Site
Study Area
Waterbody
Watercourse
Major Road
Local Road
Railway

Soil Engineers Ltd.

Title: Site Location Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 50 100 200 300 400 500
Metres

Drawing No. 1

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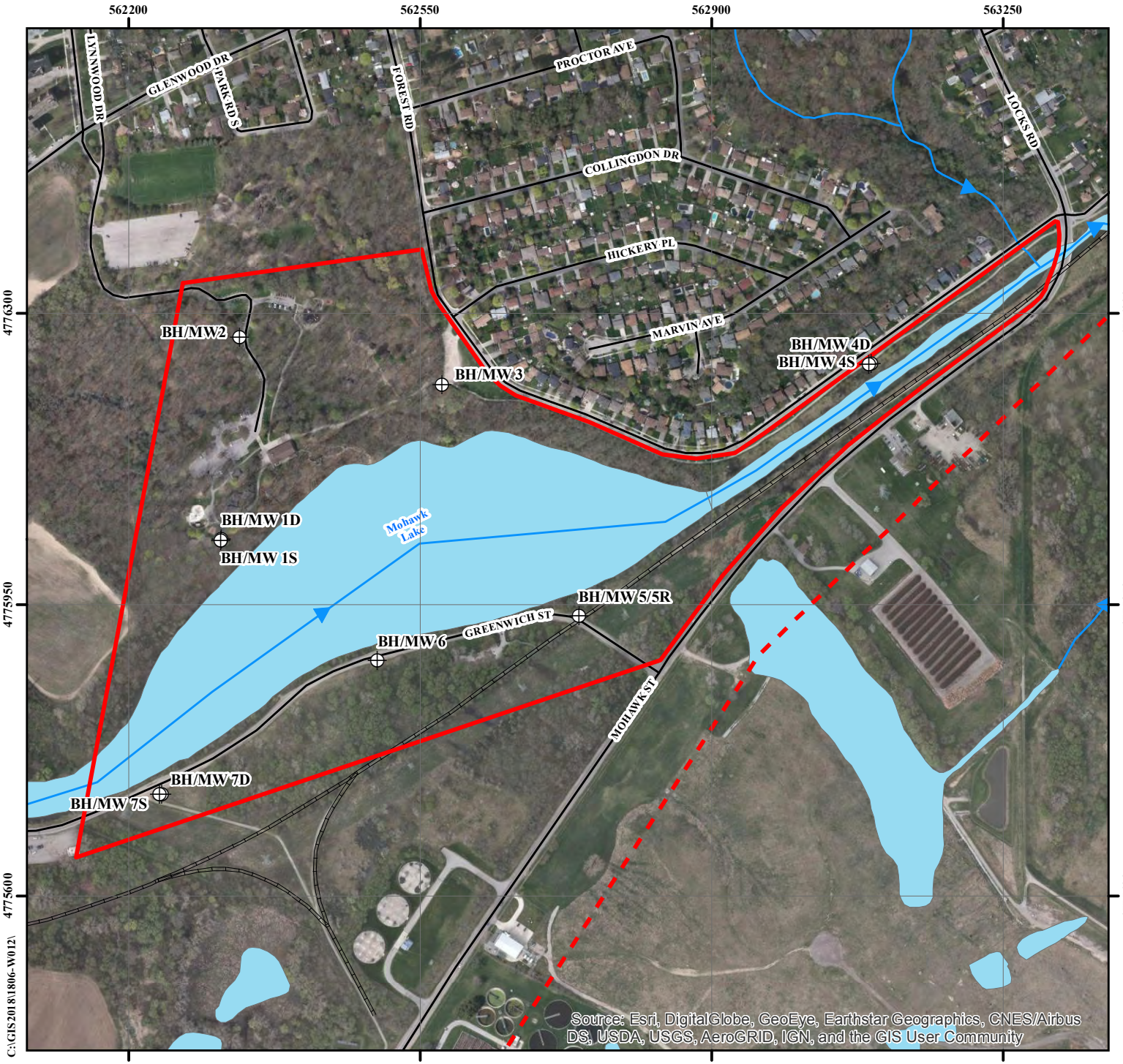

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Source: Water Course, Ontario Ministry of Natural Resources and Forestry
©Queen's Printer for Ontario
Source: Water Body, Ontario Ministry of Natural Resources and Forestry
©Queen's Printer for Ontario

N

- Approximate Boundary of Subject Site
- Study Area
- Borehole with Monitoring Well
- Waterbody
- Watercourse
- Local Road
- Railway

Soil Engineers Ltd.

Title: Borehole and Monitoring Well Location Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

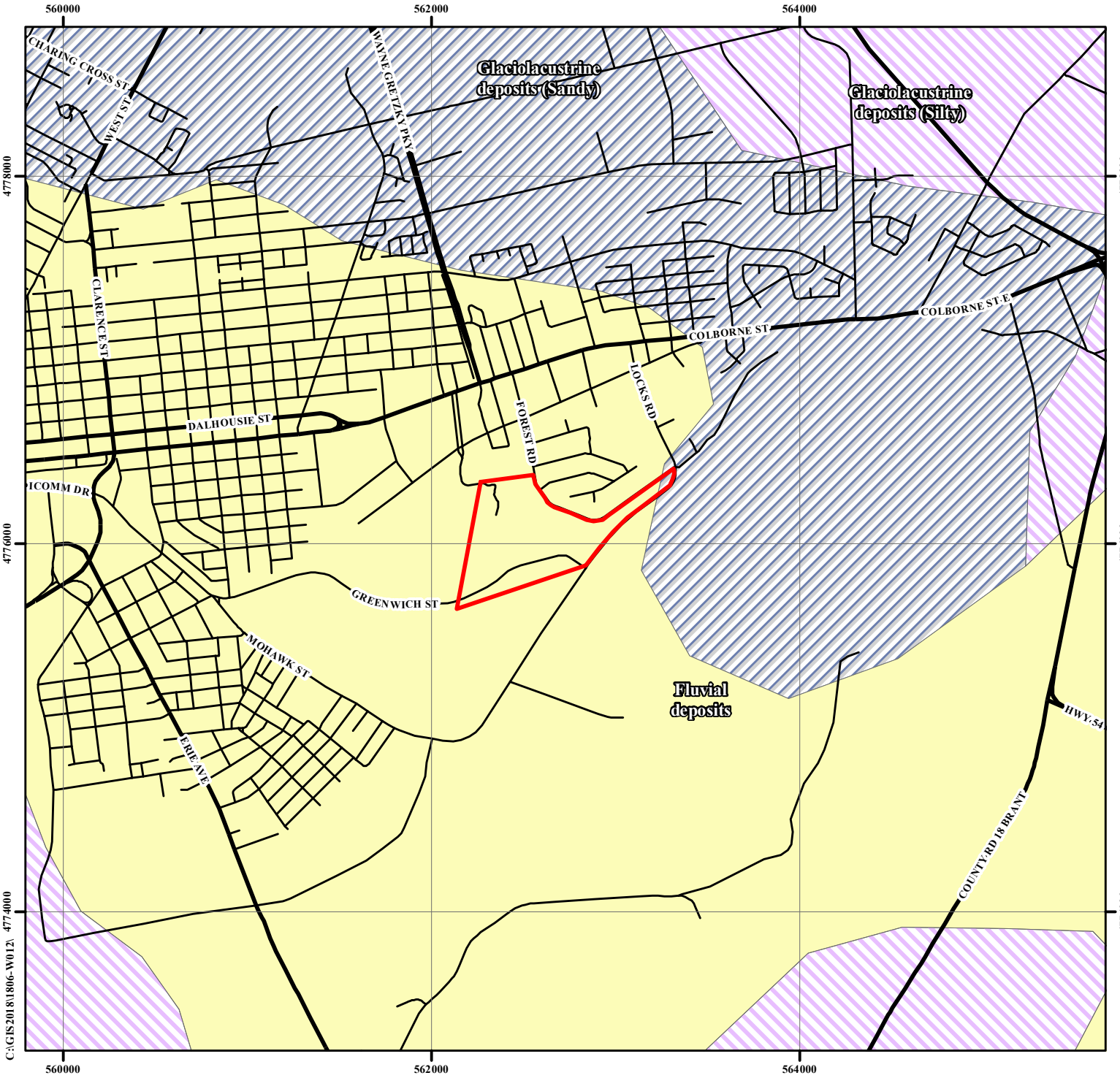
Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 2



N

- Approximate Boundary of Subject Site
- Fluvial deposits
  Material: gravel, sand, silt and clay, deposited on modern flood plains
- Glaciofluvial outwash deposits
  Material: gravel and sand, includes proglacial river and deltaic deposits
- Glaciolacustrine deposits (Sandy)
  Material: sand, gravelly sand and gravel, nearshore and beach deposits
- Glaciolacustrine deposits (Silty)
  Material: silt and clay, minor sand, basin and quiet water deposits
- Wentworth Till
  material: sandy silt to silt matrix, becoming finer grained to silty clay near Lake Erie, highly calcareous, clast content moderate to low decreasing southward
- Expressway/Freeway
- Major Road
- Local Road

Source:Ontario Geological Survey, 1997, Surface Geology of Ontario; Ontario Geological Survey, Miscellaneous Released-Data 0014

Soil Engineers Ltd.

Title: Quarternary and Surface Geology Map

Project:

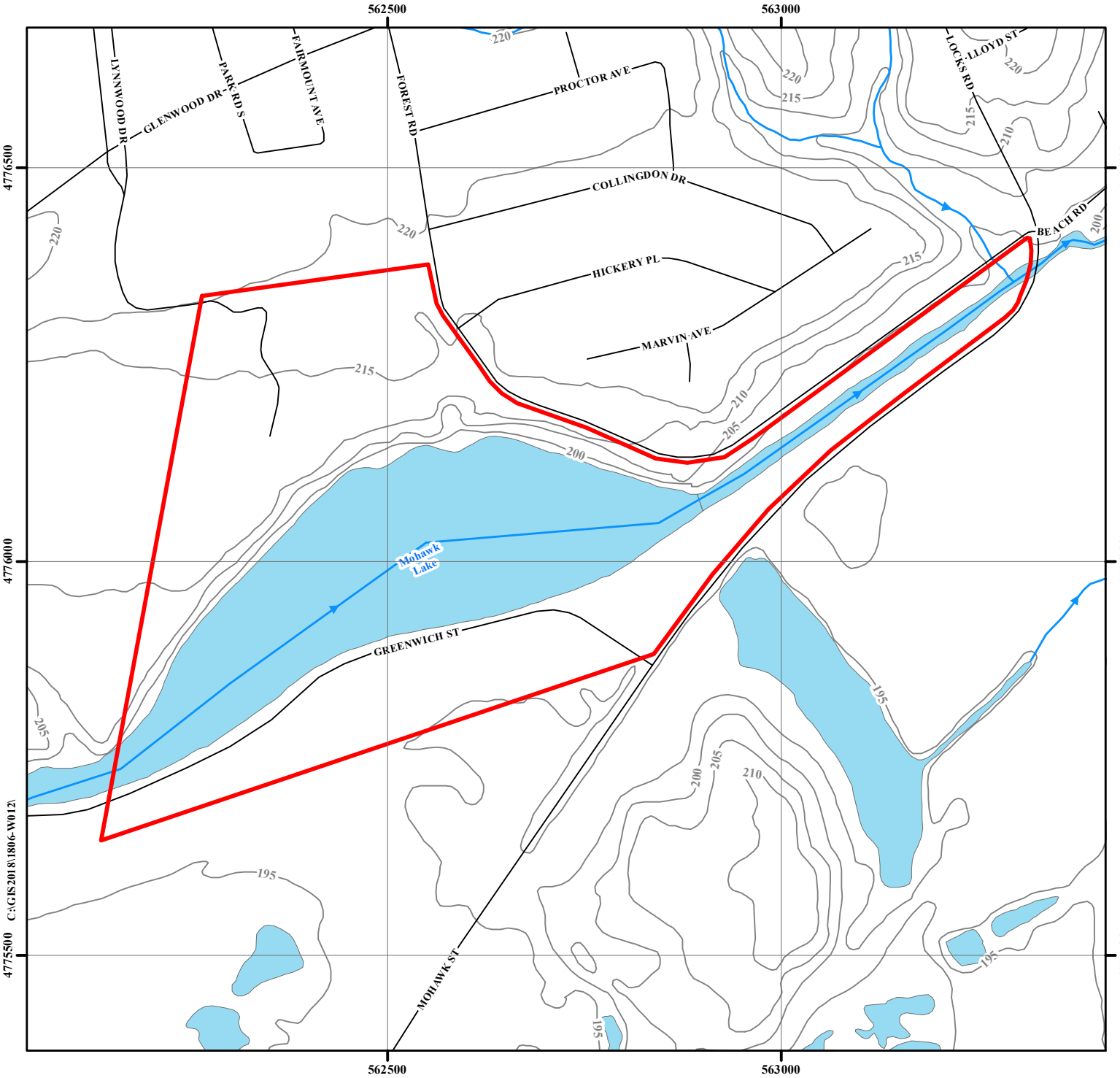
Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:
0 155 310 620 930 1,240 1,550
Metres

Drawing No. 3



N

Approximate Boundary of Subject Site

Waterbody

Watercourse

Local Road

200 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Topographic Map

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 35 70 140 210 280 350

Metres

Drawing No. 4

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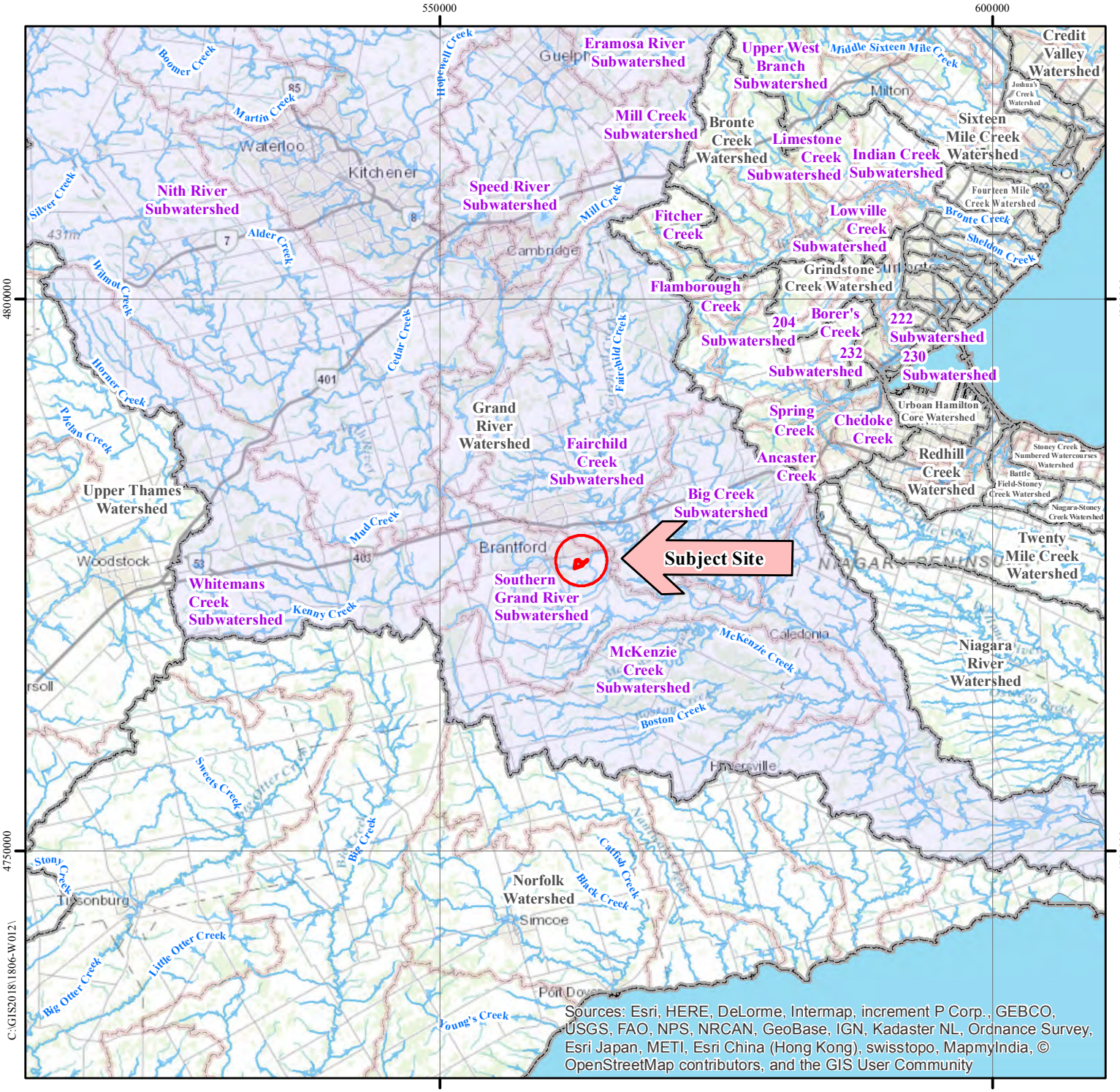
Source: Contour, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

Source: Water Body, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

Source: Water Course, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015



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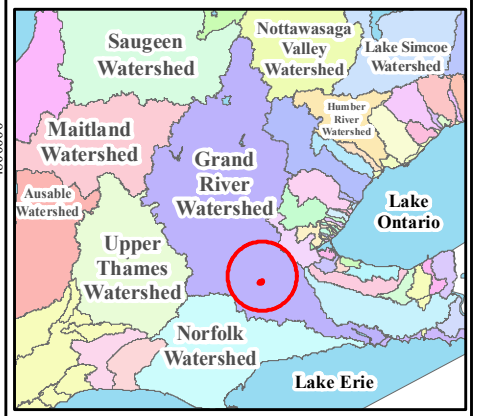
this mapping was produced by SEL and should be used for information purposes only.
Data sources used in its production are of varying quality and accuracy and all boundaries should be considered approximate.

N

Watershed:



Approximate Boundary of the Subject Site

Watershed Boundaries

Water Body

Watercourse

Expressway/Major Road

Soil Engineers Ltd.

Title: Watershed and Subwatershed Map

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

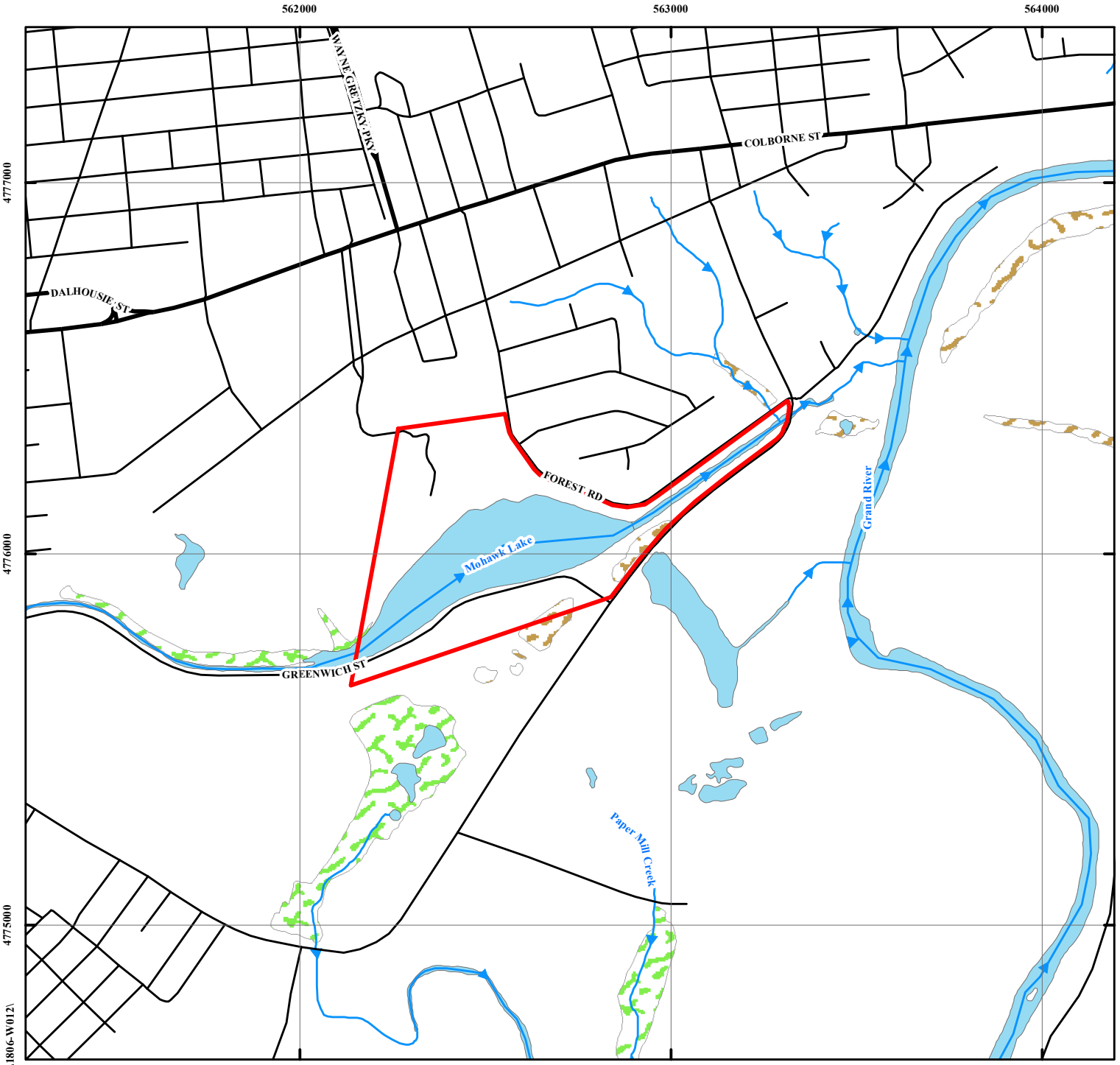
Date: October 17, 2018

Scale:

0 18,750 37,500 75,000 112,500 150,000 187,500

Metres

Drawing No. 5



N

- Approximate Boundary of Subject Site
- Wetland (classified as Other)
- Wetland (Not Evaluated per OWES)
- Water Body
- Watercourse
- Major Road
- Local Road

Soil Engineers Ltd.

Title: Natural Features and Protection Area Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

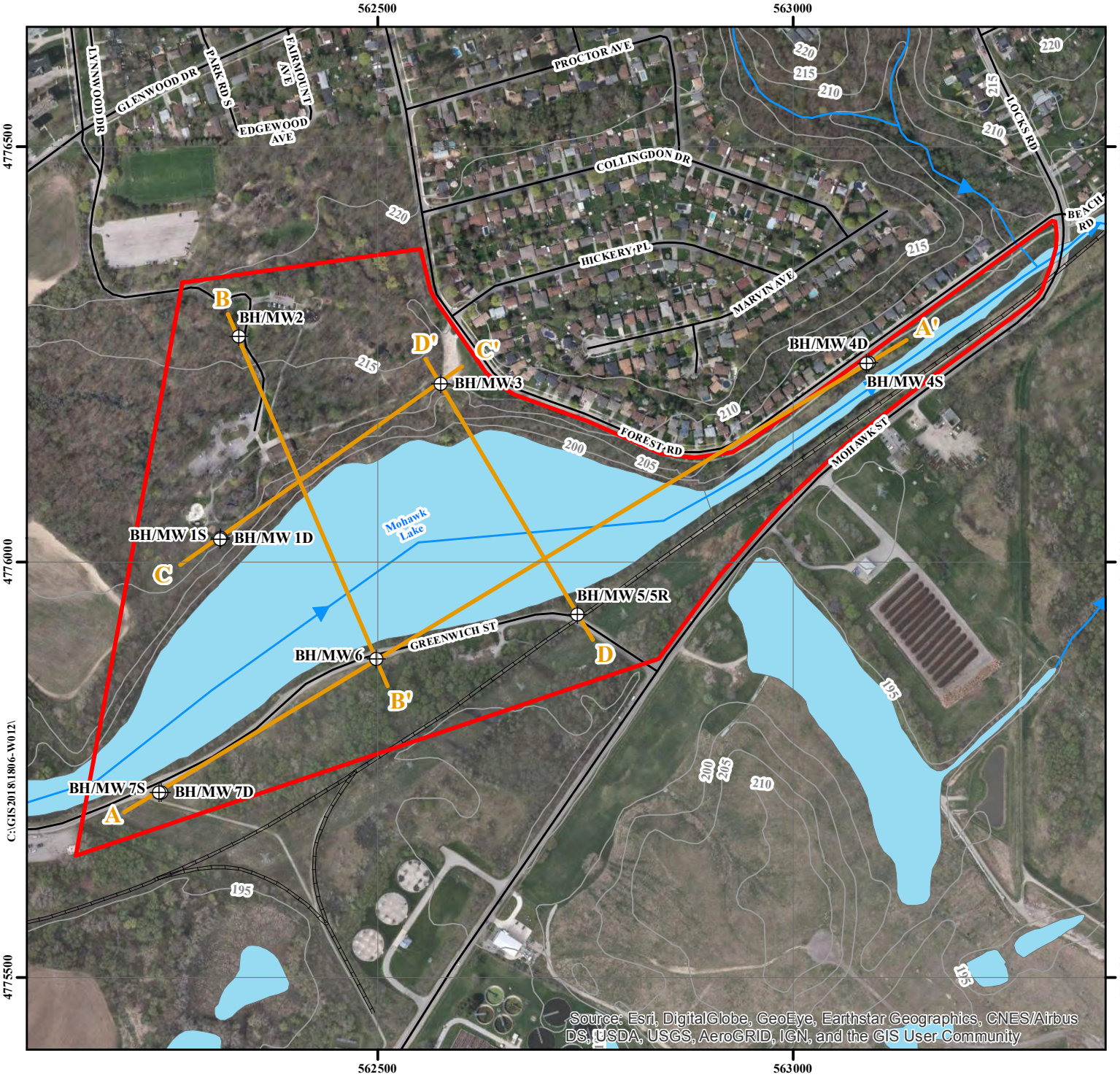
Scale:

0 75 150 300 450 600 750

Metres

Drawing No. 6

C:\GIS2018\1806-W012\



Approximate Boundary of Subject Site

Borehole with Monitoring Well

Waterbody

Watercourse

Local Road

Railway

A A' Cross-Section Direction

200 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 4, 2019

Scale:

0 30 60 120 180 240 300

Metres

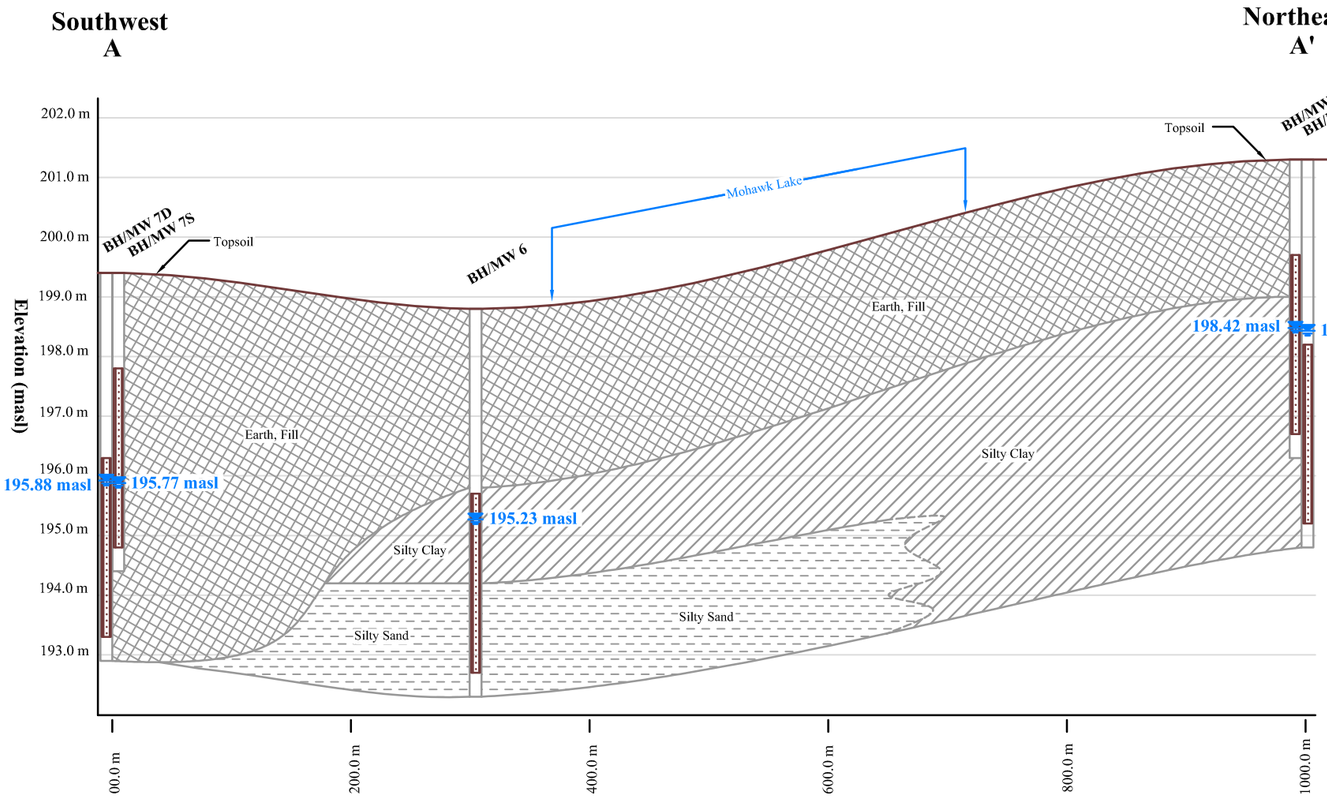
Drawing No. 7-1

Source: Contour, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

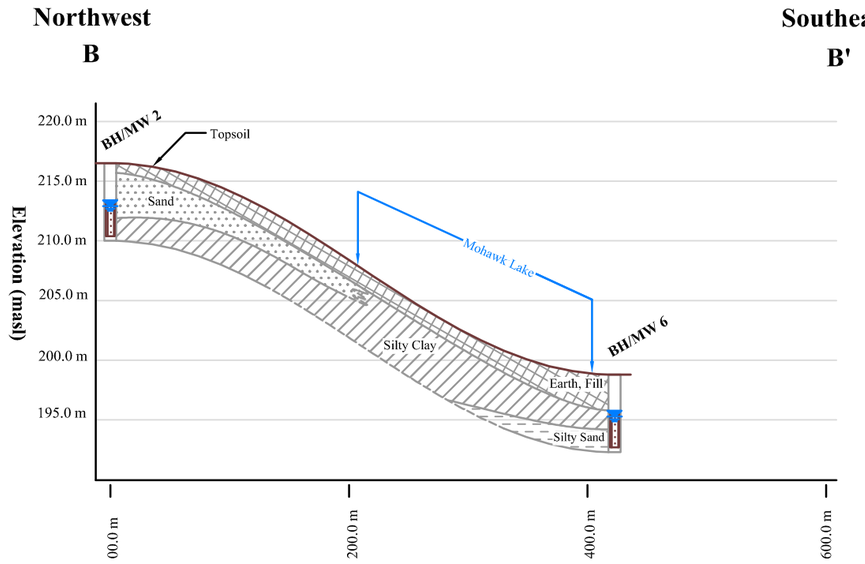
Source: Water Body, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

Source: Water Course, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

C:\GIS\2018\1806-W012\



Section A-A'
(V. Scale: 1:100)



Section B-B'
(V. Scale: 1: 500)

C:Projects/2018 Jobs/1812-W012

Earth, Fill
Silty Clay
Sand
Silty Sand
Screen
Water Table

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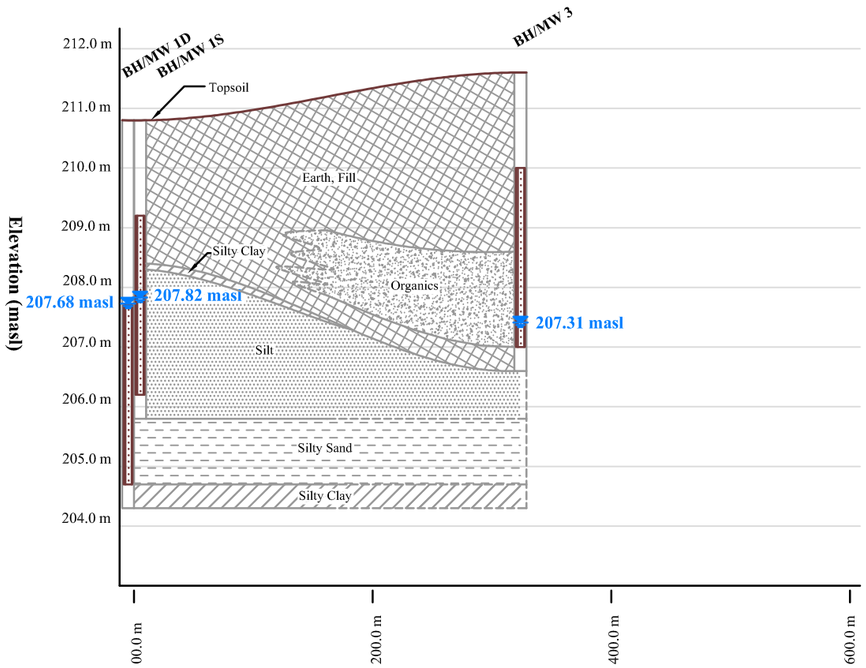
Title: Geological Cross-Section (A-A' and B-B')

Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	7-2A

Southwest
C

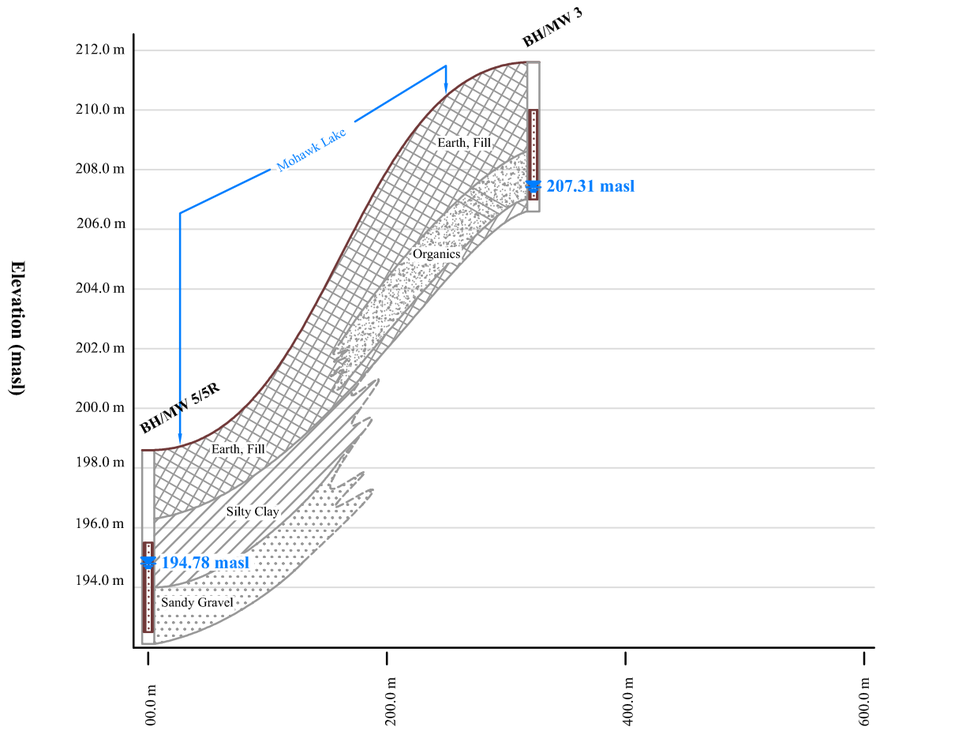
Northeast
C'



Section C-C'
(V. Scale: 1:100)

Southeast
D

Northwest
D'



Section D-D'
(V. Scale: 1: 200)

C:Projects/2018 Jobs/1812-W012

Earth, Fill
Silt
Silty Clay
Silty Sand
Organics
Sandy Gravel

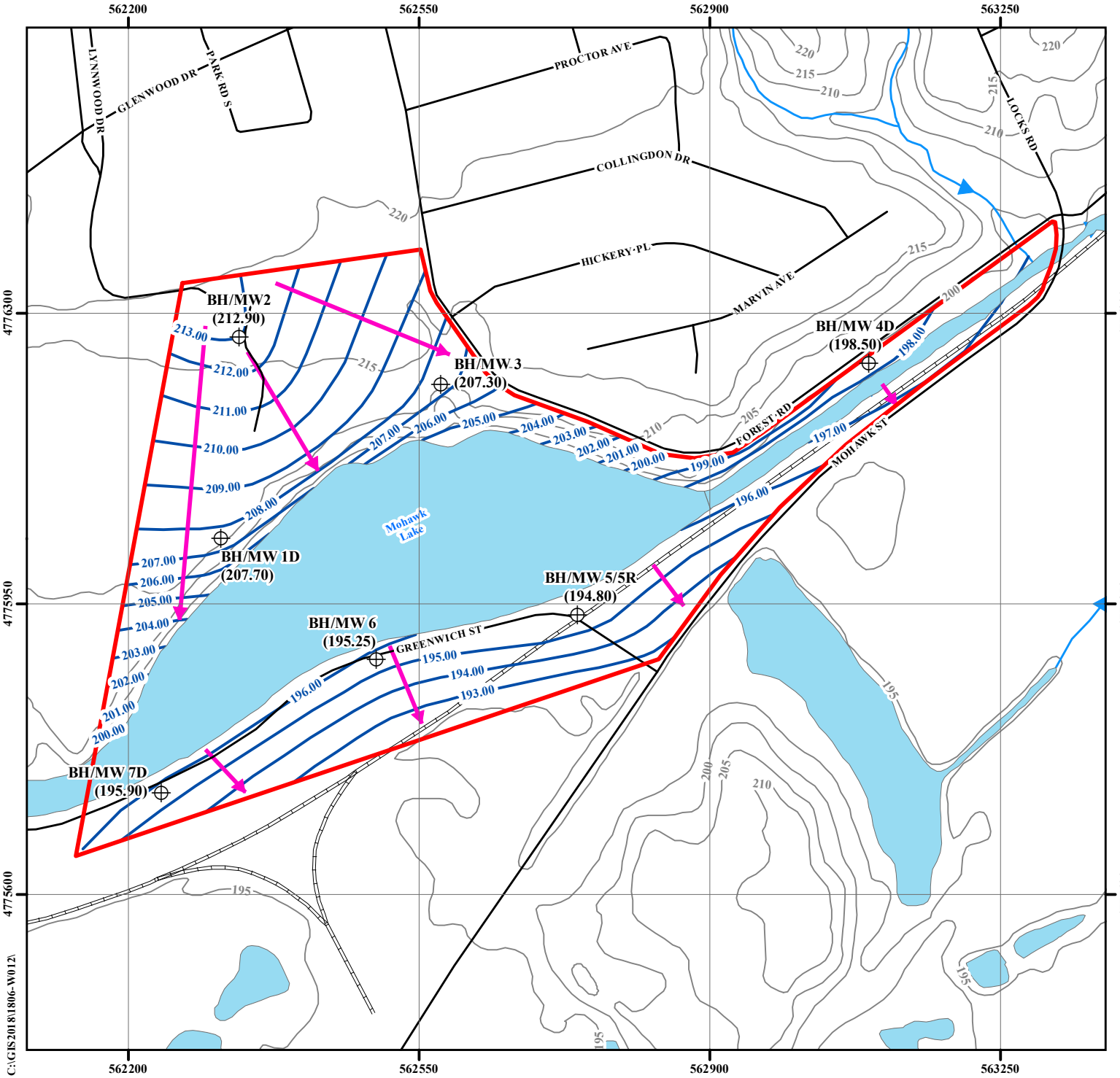
Screen
Water Table

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (C-C' and D-D')

Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	7-2B



N

Approximate Boundary of Subject Site

Borehole with Monitoring Well

Interpreted Shallow Groundwater Flow Direction

Interpreted Shallow Groundwater Level Elevation (masl)

Waterbody

Watercourse

Local Road

Railway

200 Topographic Contour (masl)

198.50 Average Shallow Groundwater Level Elevation (masl)

Soil Engineers Ltd.

Title: Shallow Groundwater Flow Pattern Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 4, 2019

Scale:

0 30 60 120 180 240 300

Metres

Drawing No. 8

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'A'

RESULT OF SINGLE WELL RESPONSE TESTS

REFERENCE NO. 1806-W012

Falling Head Test (Slug Test)

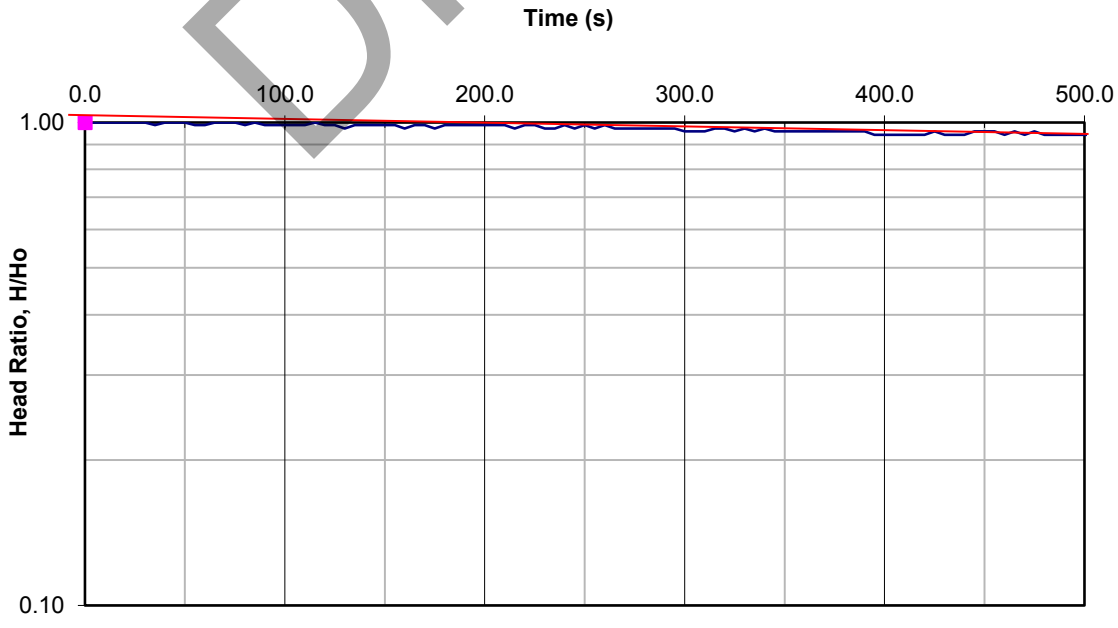
Test Date:		25-Oct-19	
Piezometer/Well No.:		BH/MW 1D	
Ground level:		210.75	m
Screen top level:		207.75	m
Screen bottom level:		204.65	m
Test El. (at midpoint of screen):		206.2	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.245	m
Initial water depth		3.64	m
Aquifer material:		**SILT/SILTY SAND/SILTY CLAY**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.0001317$

K= **4.4E-06** cm/s
4.4E-08 m/s



Falling Head Test (Slug Test)

Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 2	
Ground level:		216.49	m
Screen top level:		213.49	m
Screen bottom level:		210.39	m
Test El. (at midpoint of screen):		211.94	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.4	m
Initial water depth		2.94	m
Aquifer material:		**SAND/SILTY CLAY**	

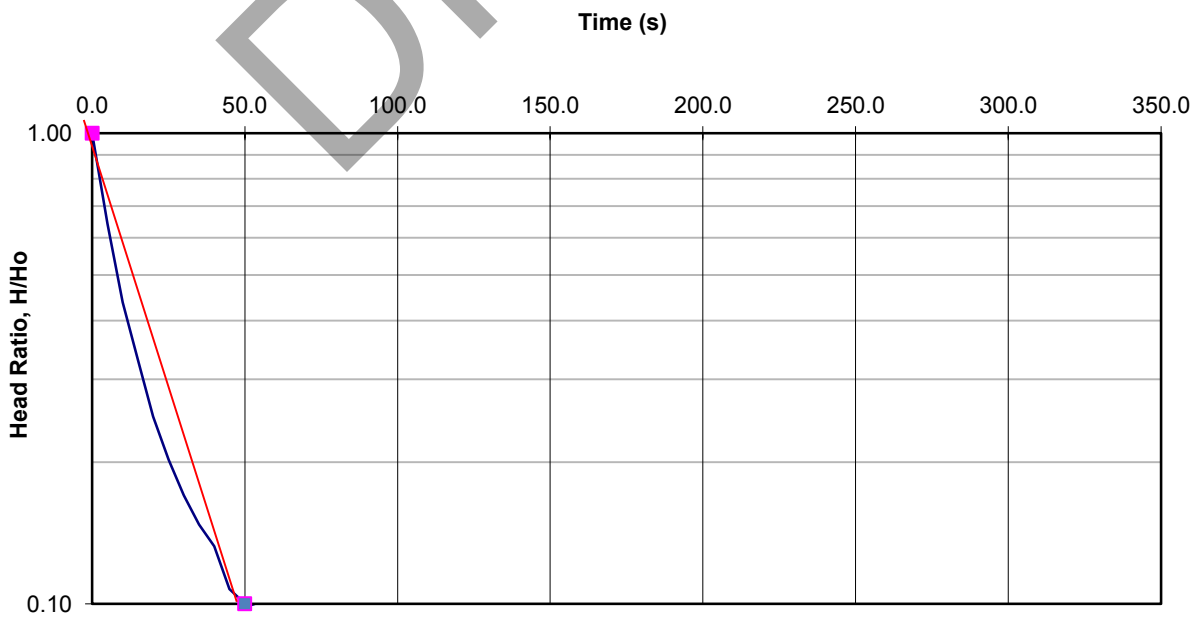
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.0460517$

K= **1.5E-03** cm/s

1.5E-05 m/s



Falling Head Test (Slug Test)

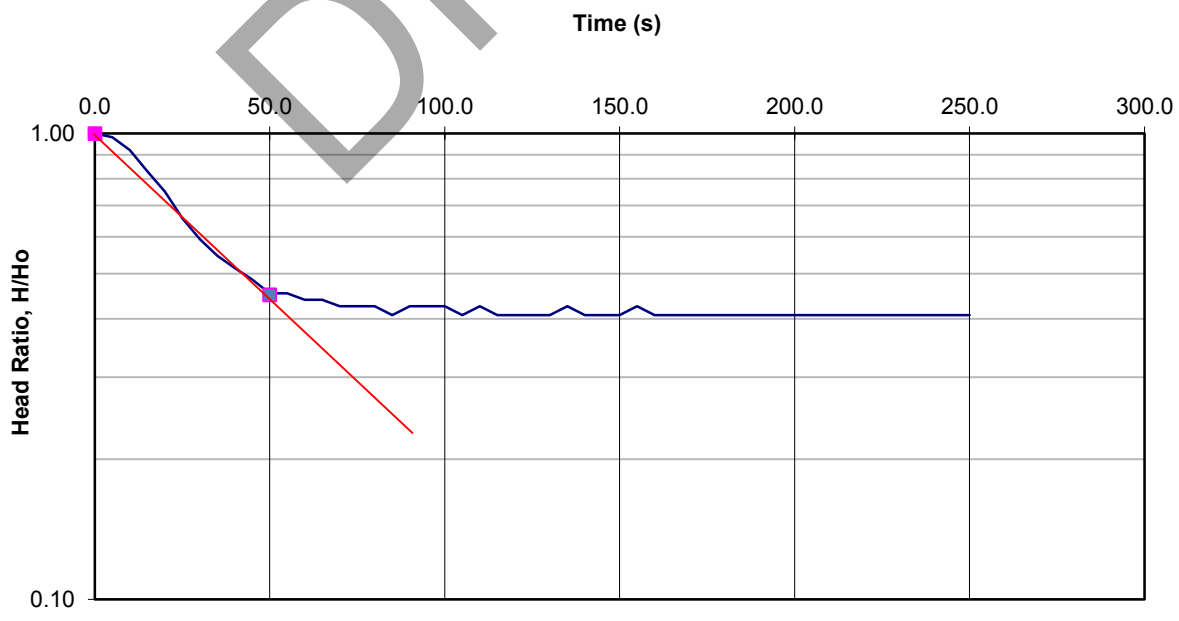
Test Date:		25-Oct-18	
Piezometer/Well No.:		BH/MW 4D	
Ground level:		201.32	m
Screen top level:		198.32	m
Screen bottom level:		195.22	m
Test El. (at midpoint of screen):		196.77	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.216	m
Initial water depth		3.03	m
Aquifer material:		**SILTY CLAY**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.01597015$

K= **5.4E-04** cm/s
5.4E-06 m/s



Falling Head Test (Slug Test)

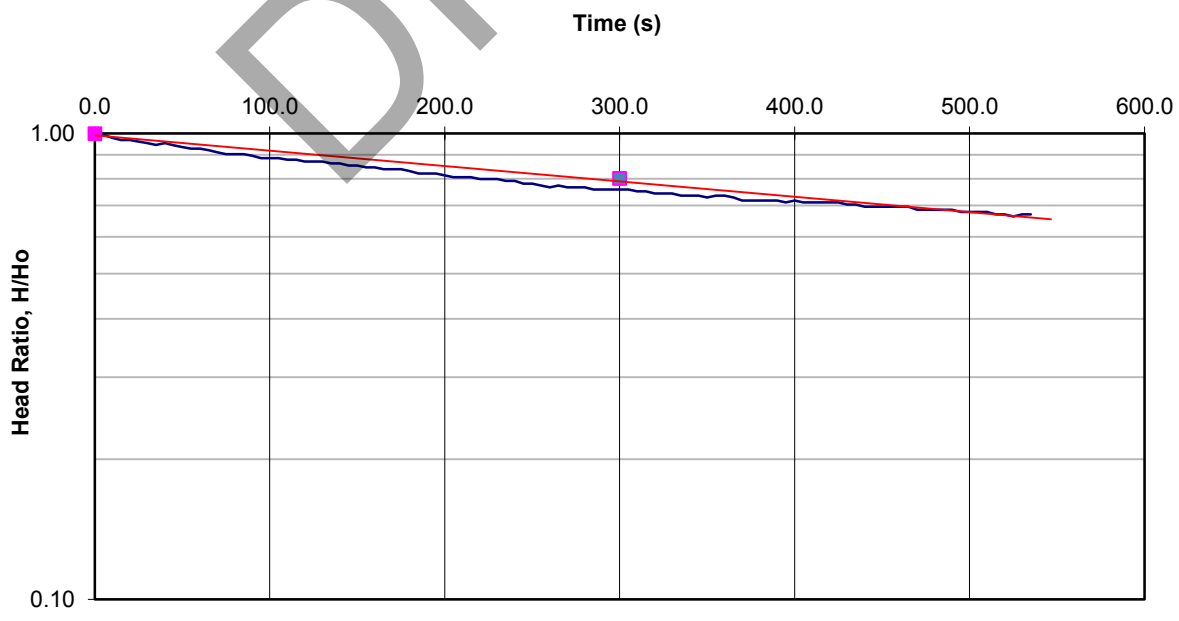
Test Date:		25-Oct-18	
Piezometer/Well No.:		BH/MW 5R	
Ground level:		198.58	m
Screen top level:		195.58	m
Screen bottom level:		192.48	m
Test El. (at midpoint of screen):		194.03	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.401	m
Initial water depth		3.53	m
Aquifer material:		**SILTY CLAY/SANDY GRAVEL**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00074381$

K= **2.5E-05** cm/s
2.5E-07 m/s



Falling Head Test (Slug Test)

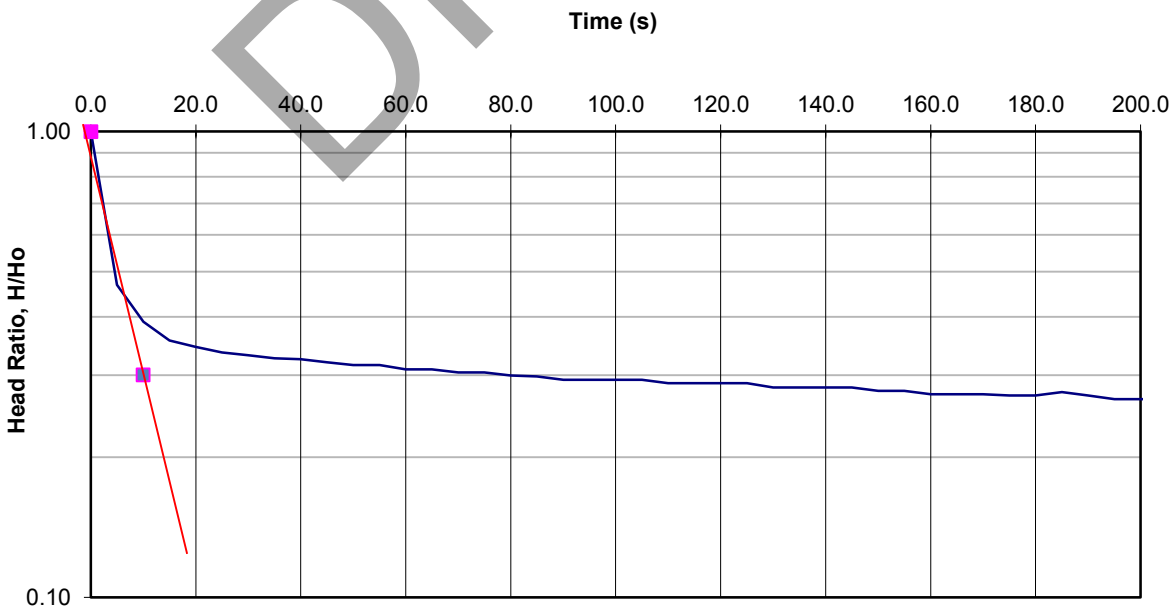
Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 6	
Ground level:		198.76	m
Screen top level:		195.76	m
Screen bottom level:		192.66	m
Test El. (at midpoint of screen):		194.21	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.638	m
Initial water depth		3.23	m
Aquifer material:		**SILTY CLAY/SILTY SAND**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.12039728$

K= **4.1E-03** cm/s
4.1E-05 m/s



Falling Head Test (Slug Test)

Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 7D	
Ground level:		199.36	m
Screen top level:		196.36	m
Screen bottom level:		193.26	m
Test El. (at midpoint of screen):		194.81	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.666	m
Initial water depth		3.48	m
Aquifer material:		**EARTH FILL**	

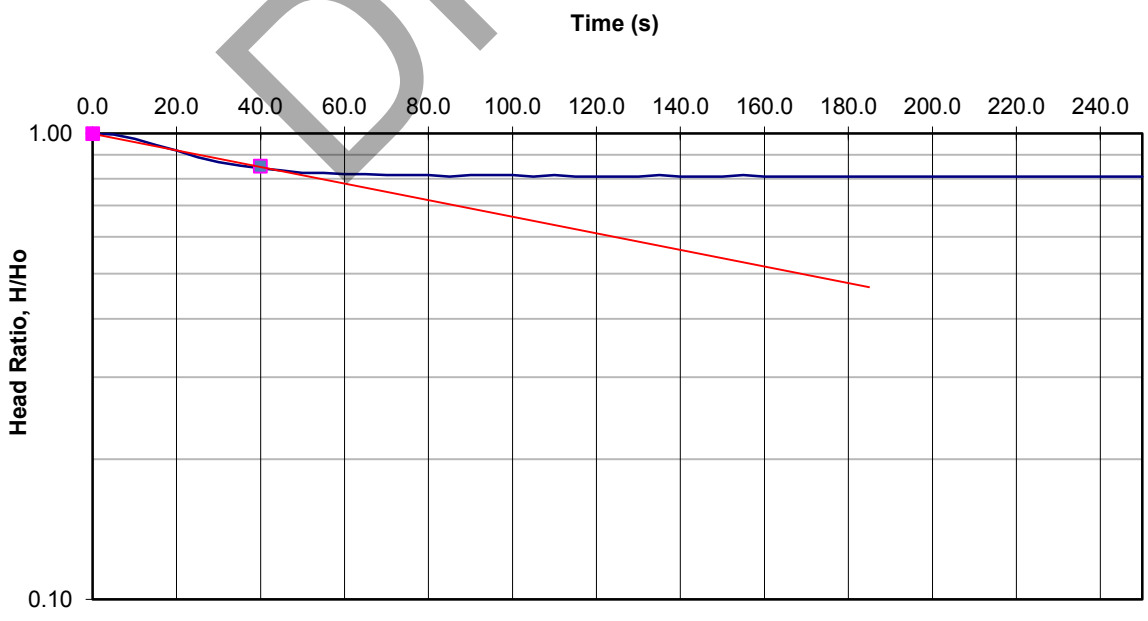
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00406297$

K= **1.4E-04** cm/s

1.4E-06 m/s



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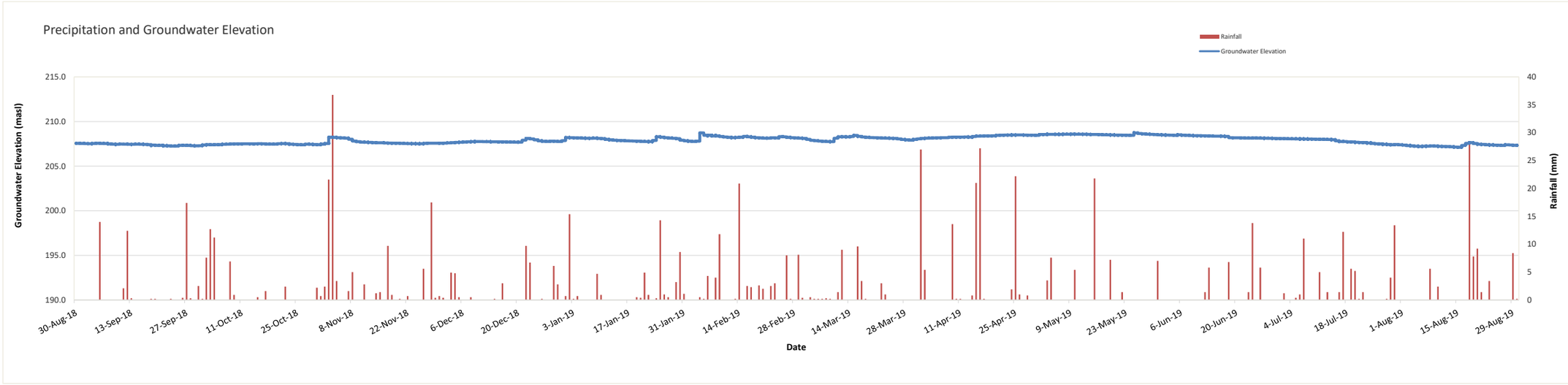
APPENDIX 'B'

GROUNDWATER LOGGER MONITORING DATA

REFERENCE NO. 1806-W012

Chart B-1
Groundwater Levels BH/MW 1S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



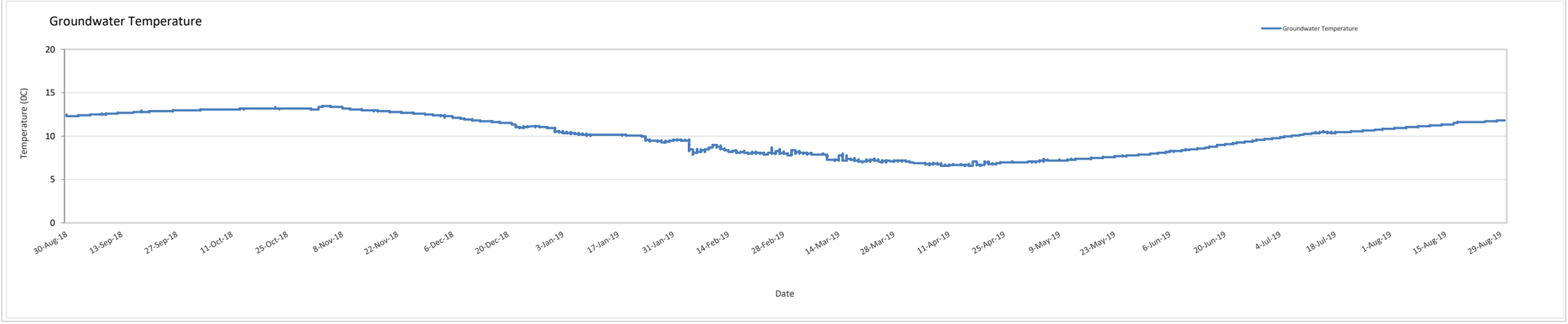
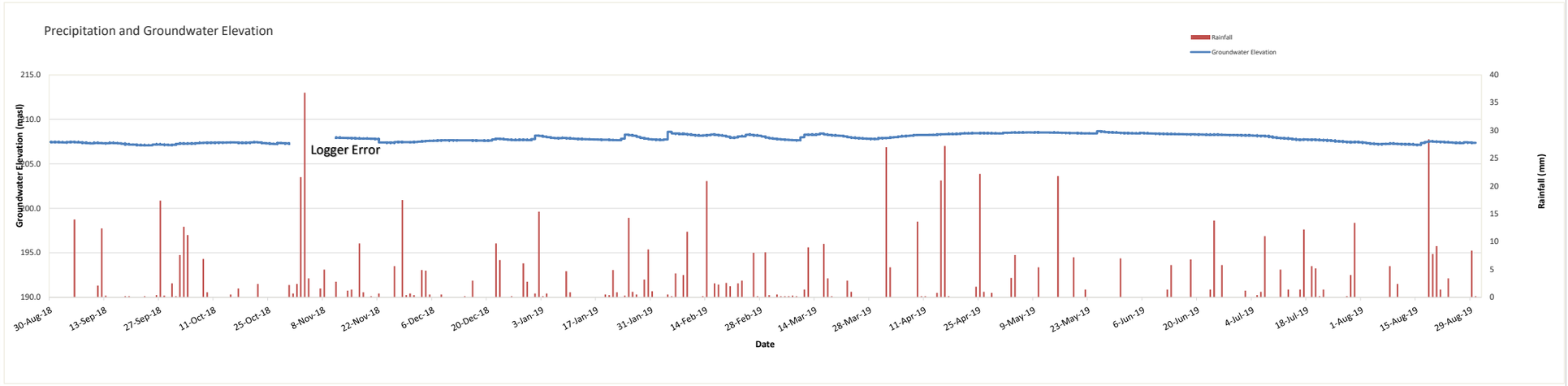


Chart B-2
Groundwater Levels BH/MW 1D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



Logger Error

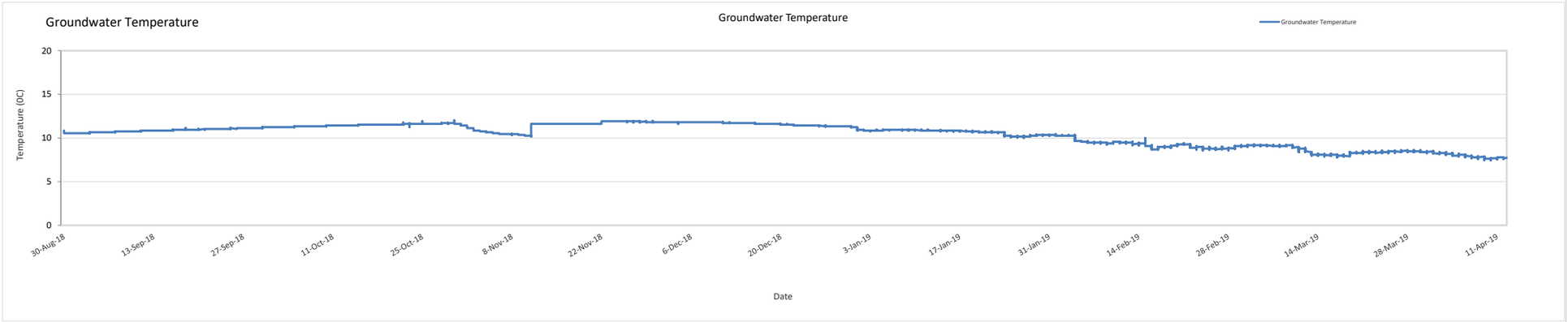
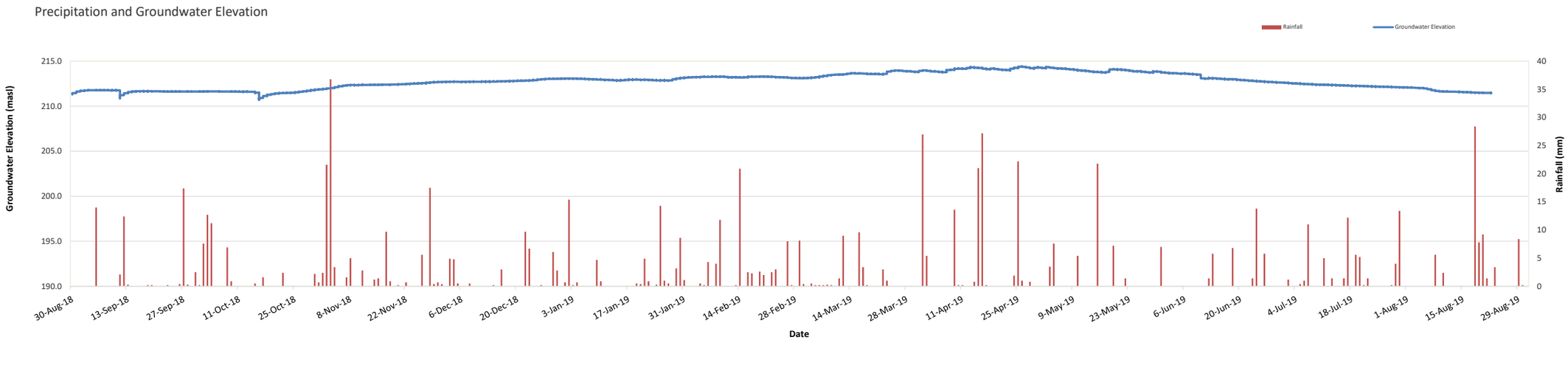


Chart B-3
Groundwater Levels BH/MW 2
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



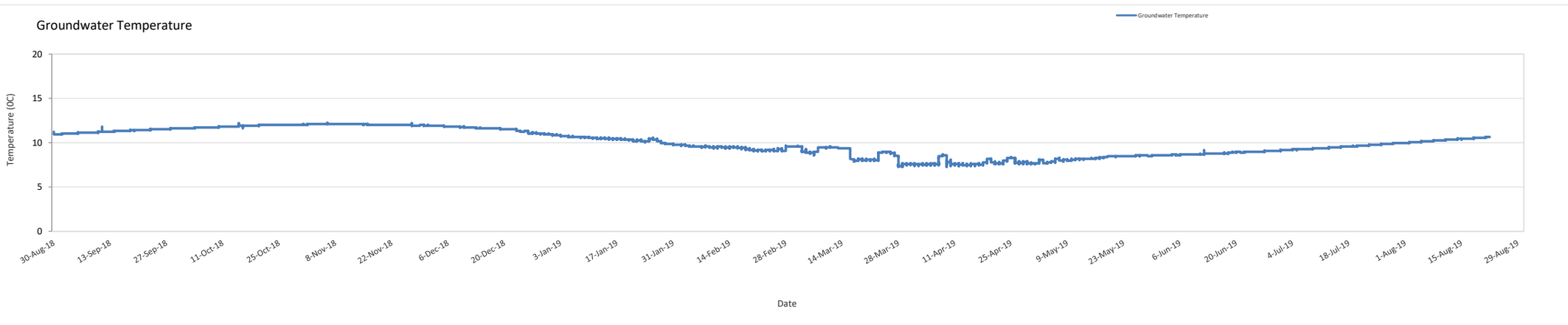
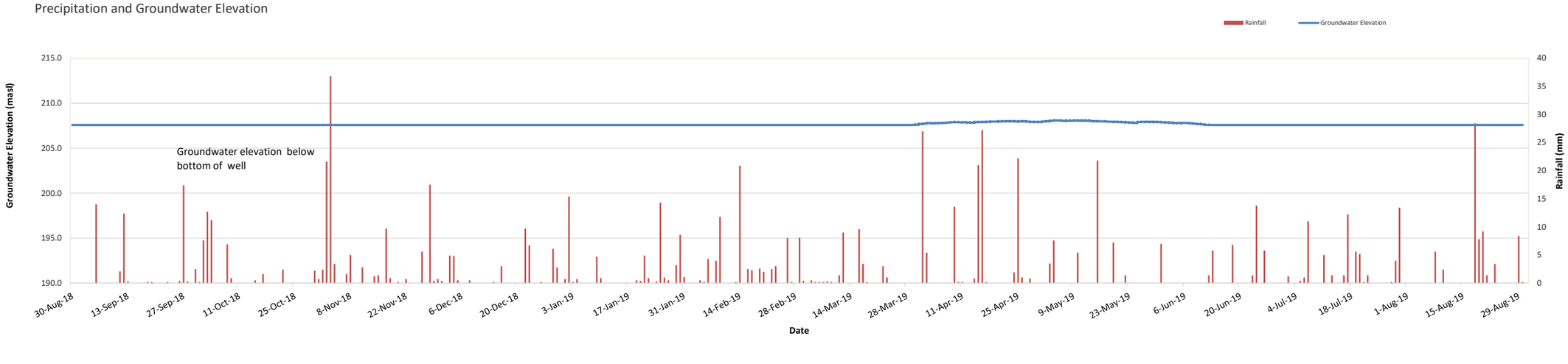


Chart B-4
Groundwater Levels BH/MW 3
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



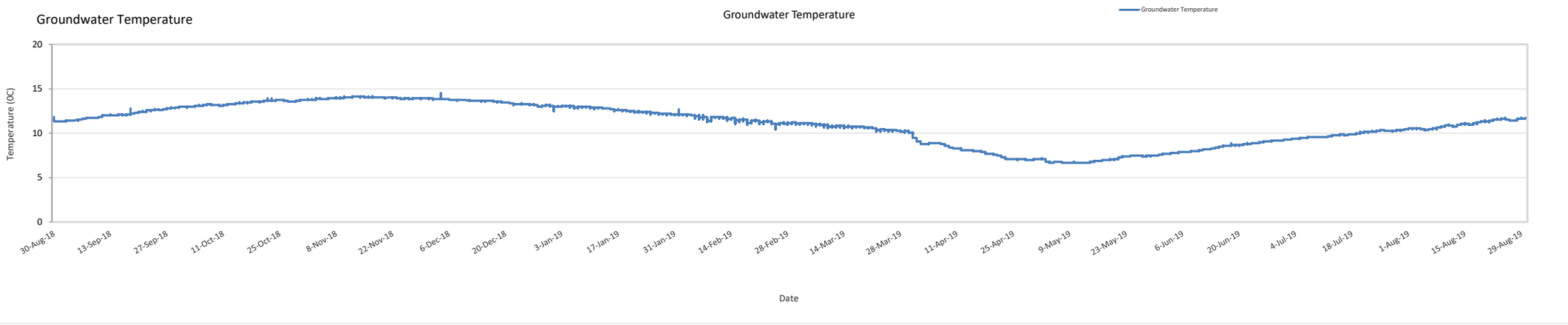
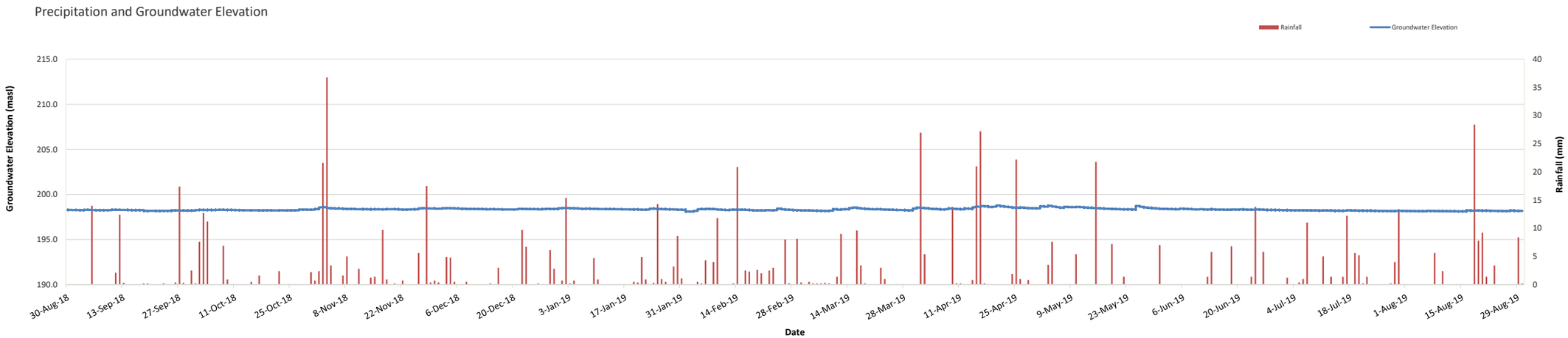


Chart B-5
Groundwater Levels BH/MW 4S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30,2019



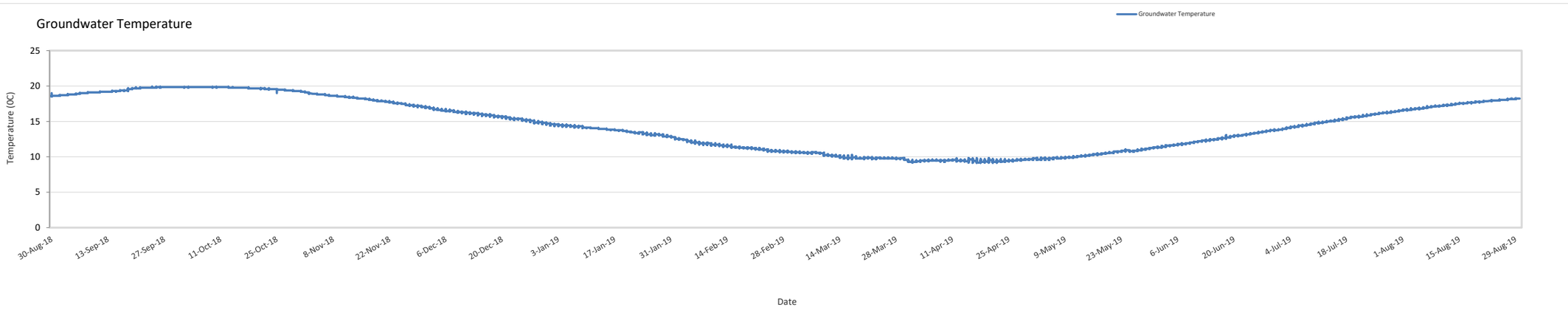
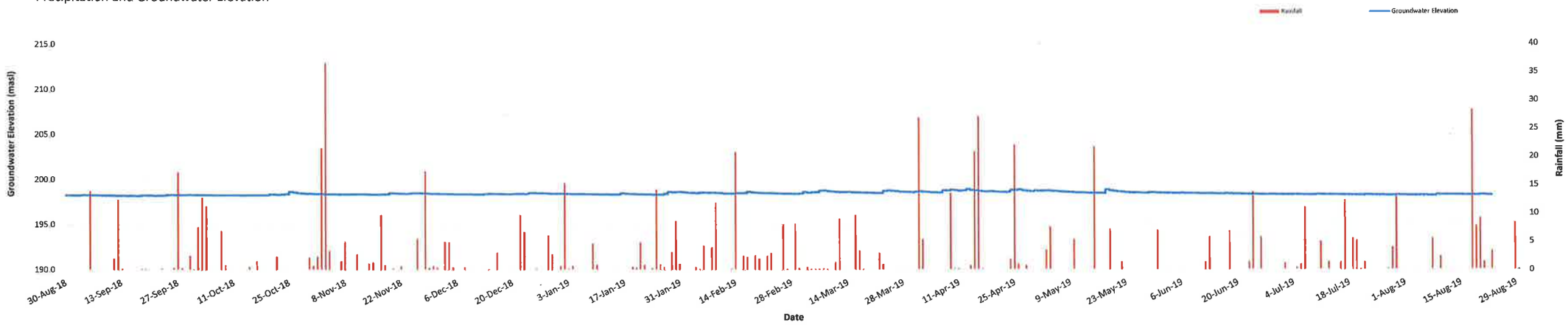


Chart B-6
Groundwater Levels BH/MW 4 D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019

Precipitation and Groundwater Elevation



Groundwater Temperature

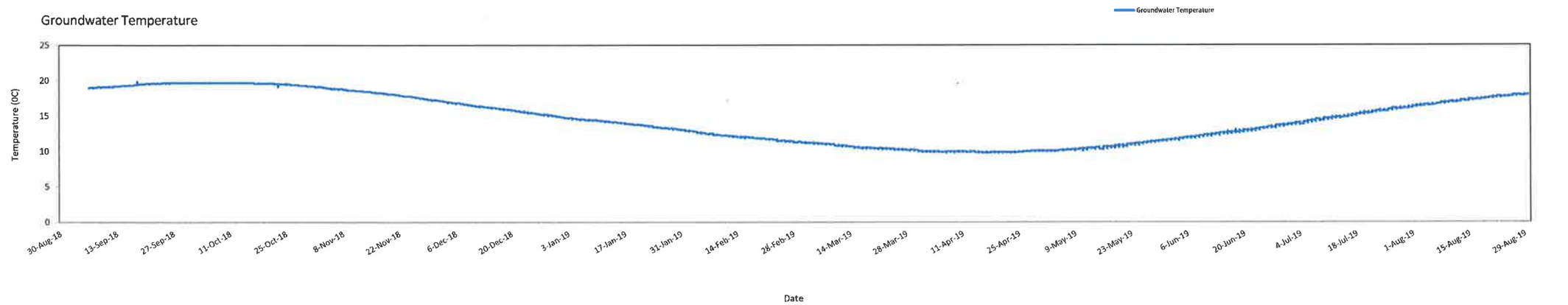
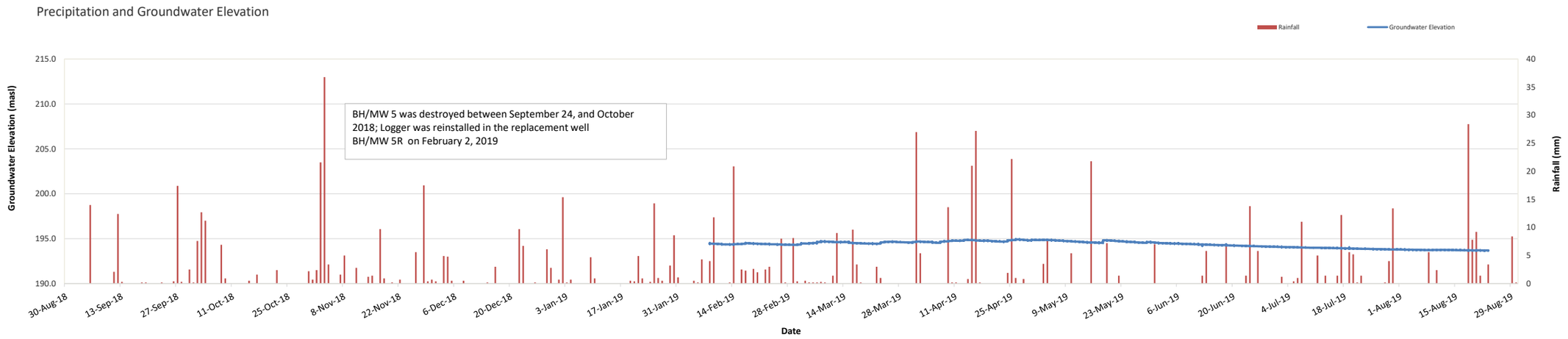


Chart B-7
Groundwater Levels BH/MW 5R
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



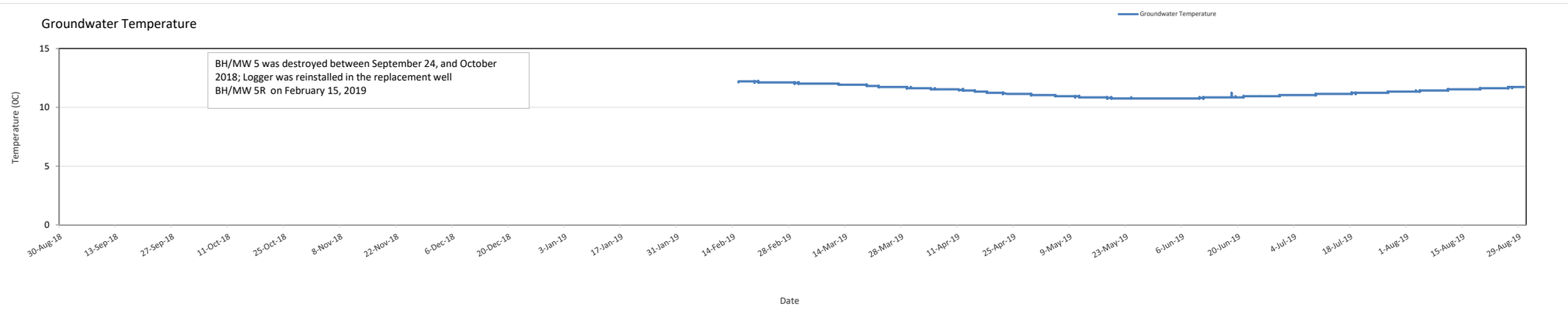
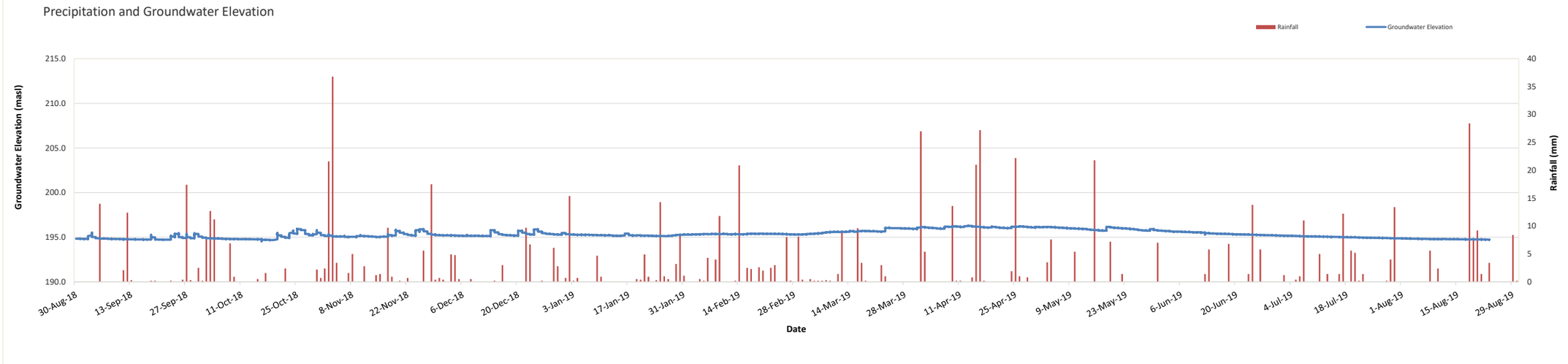


Chart B-8
Groundwater Levels BH/MW 6
Groundwater Logger Monitoring Data, September 9, 2018 to August 30, 2019



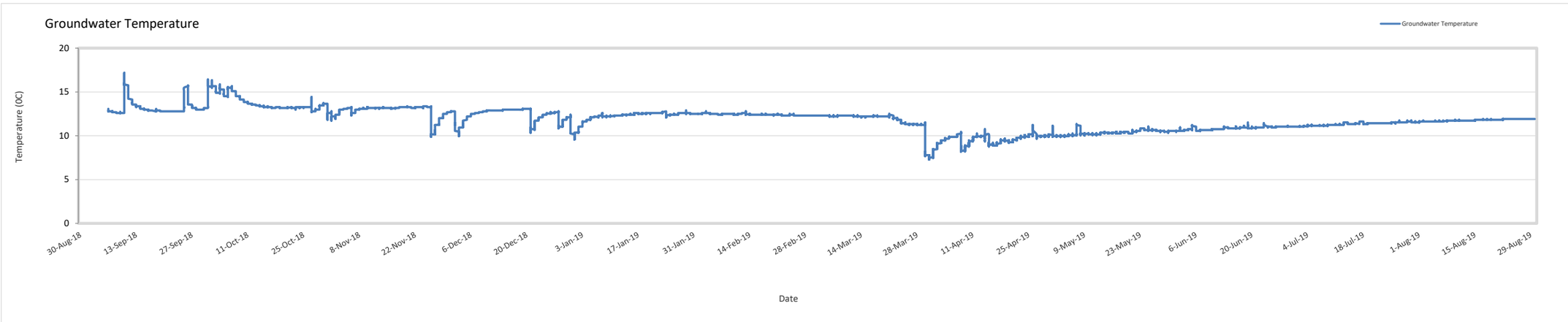
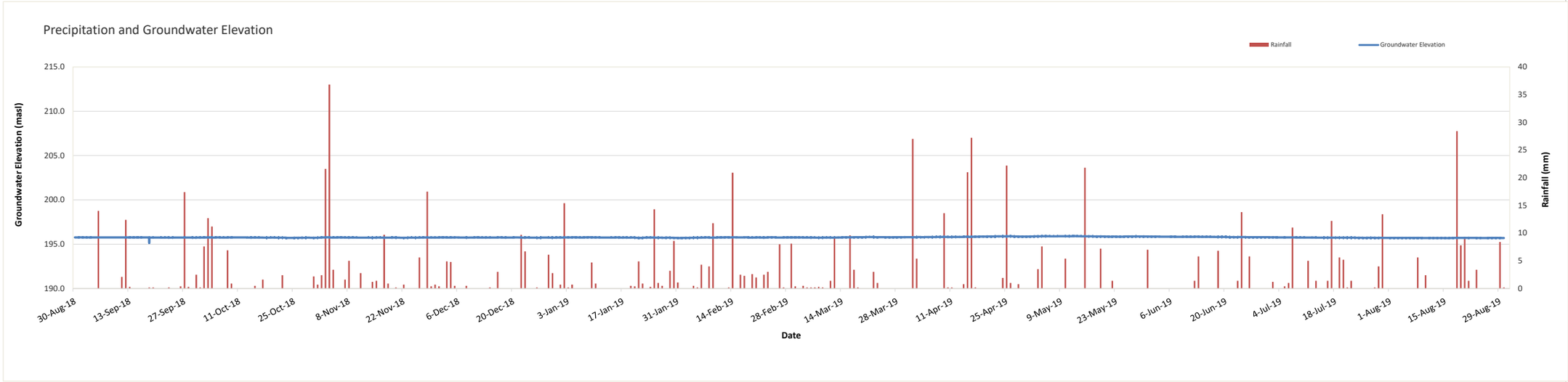


Chart B-9
Groundwater Levels BH/MW 7S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



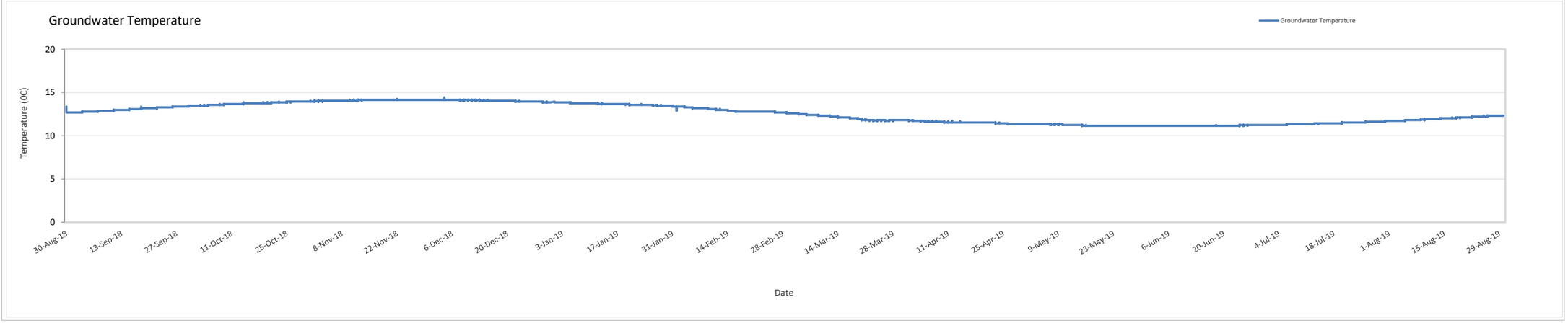
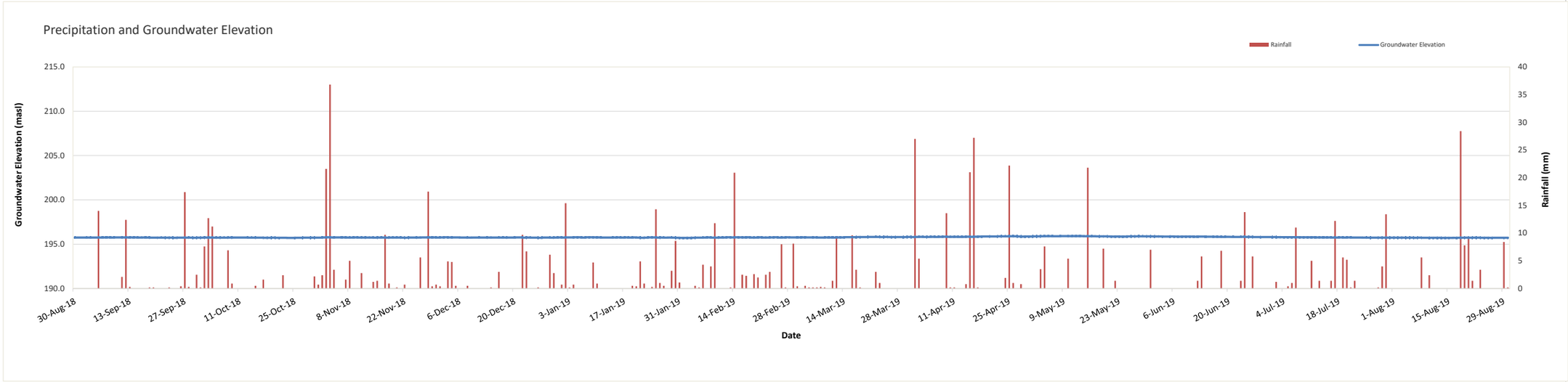


Chart B-10
Groundwater Levels BH/MW 7D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



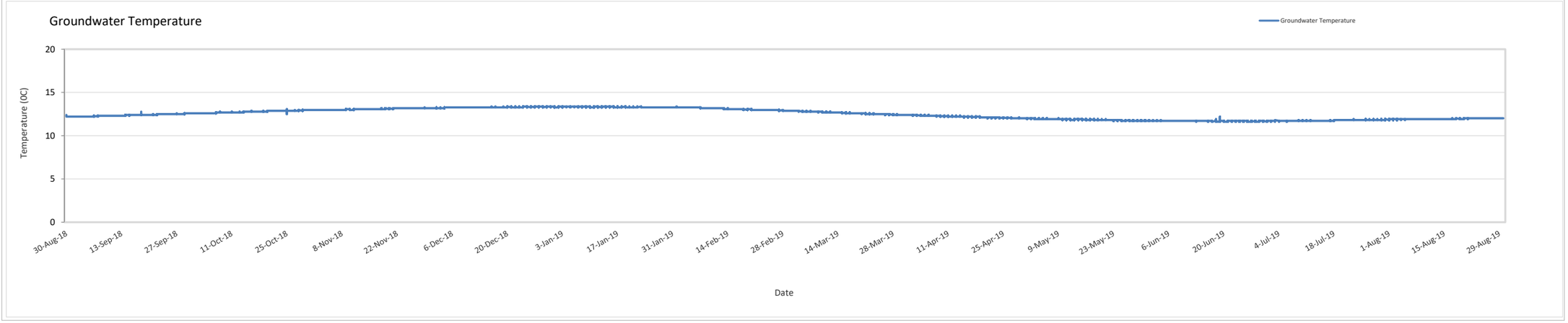


Chart B-11
Comparison ofGroundwater Levels- BH/MW 1D and 1S
Groundwater Logger Data, August 30, 2018 to August 30, 2019

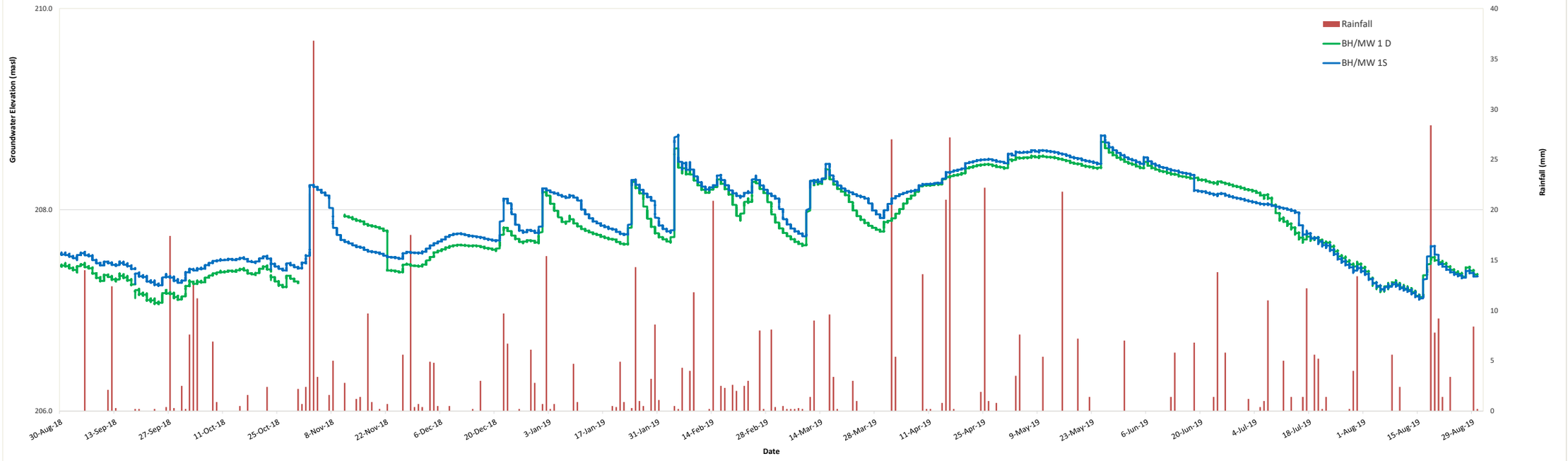


Chart B-12
Comparison of Groundwater Levels- BH-4S and 4D
Groundwater Logger Data August 30, 2018 to August 30, 2019

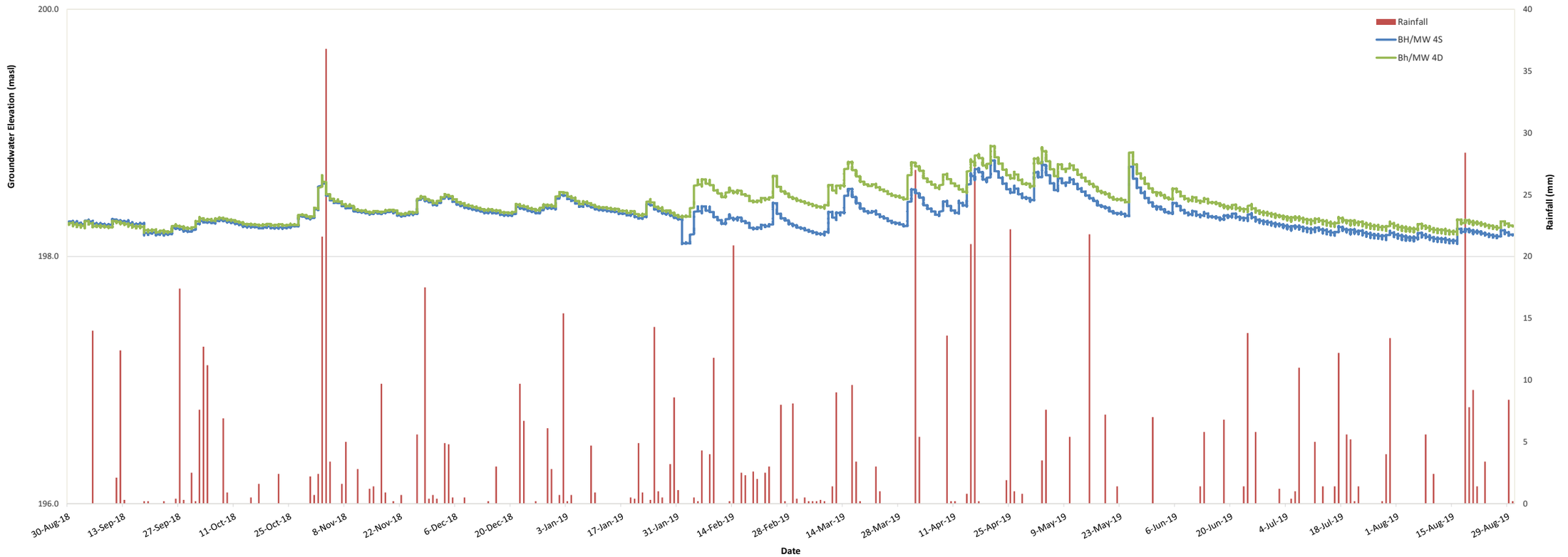
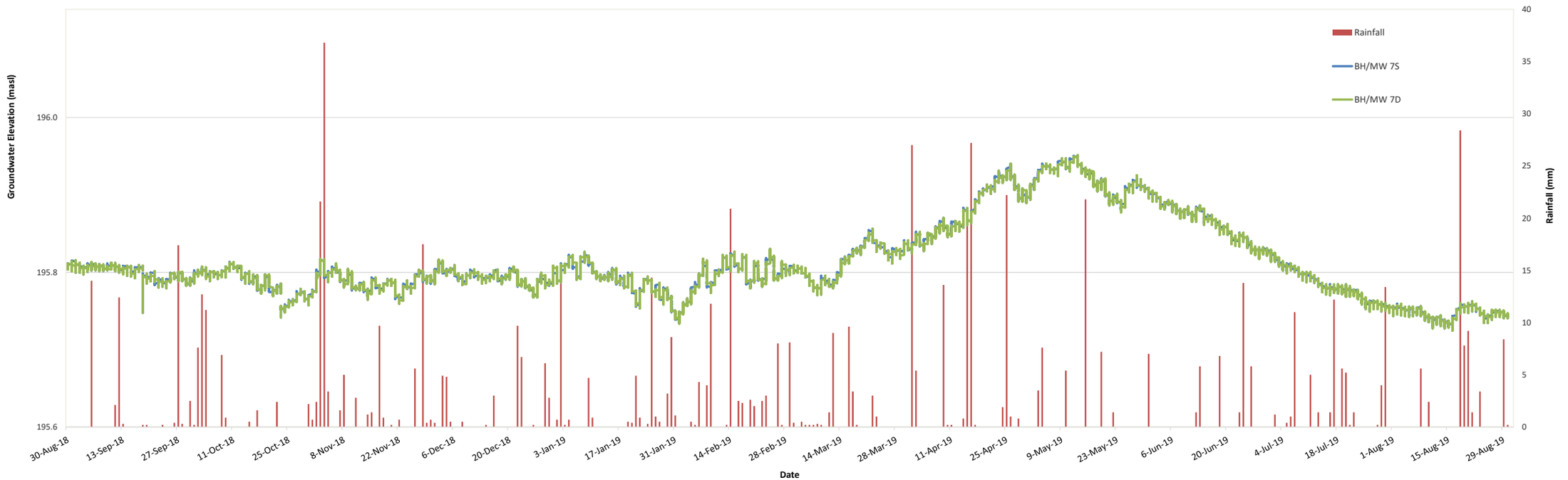


Chart B-13
Comparison of Groundwater Elevations - BH/MW 7S and 7D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30,2019



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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'C'

WATER QUALITY ANALYSIS

REFERENCE NO. 1806-W012

Table C-1 Groundwater Chemistry

Client Sample ID					MW-1S	MW-1D	MW-2	MW-4D	MW-4S	MW-6	MW-7D	MW-7S
Date Sampled					23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018
Time Sampled					0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
ALS Sample ID					L2185953-1	L2185953-2	L2185953-3	L2185953-4	L2185953-5	L2185953-6	L2185953-7	L2185953-8
Parameter	Lowest Detection Limit	Units	ODWQS (ug/l)	PWQO (ug/l)	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests (Water)												
Conductivity	0.0030	mS/cm			0.948	0.969	3.06	1.41	1.35	3.62	2.70	2.62
pH	0.10	pH units	6.5-8.5 (ii)	6.5-8-5	7.64	7.65	7.41	7.52	7.49	6.91	6.95	7.15
Turbidity	0.10	NTU			6.90	14.4	2.16	128	55.6	669	439	520
Anions and Nutrients (Water)												
Chloride (Cl)	0.50	mg/L	250,000		64.4	76.4	854	145	165	956	772	<2.5
Cyanides (Water)												
Cyanide, Weak Acid Diss	2.0	ug/L		5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dissolved Metals (Water)												
Dissolved Mercury Filtration Location		-			FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		-			FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Antimony (Sb)-Dissolved	0.10	ug/L	6	20	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Arsenic (As)-Dissolved	0.10	ug/L	25	100	0.14	0.13	<1.0	4.66	7.62	1.6	2.1	1.5
Barium (Ba)-Dissolved	0.10	ug/L	1,000		27.9	29.1	188	198	220	811	1160	818
Beryllium (Be)-Dissolved	0.10	ug/L		11-1100	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Boron (B)-Dissolved	10	ug/L	5,000	200	19	21	<100	154	100	170	240	200
Cadmium (Cd)-Dissolved	0.010	ug/L	5	0.2	0.013	0.010	0.051	<0.010	<0.010	<0.050	<0.050	<0.050
Chromium (Cr)-Dissolved	0.50	ug/L	50	1	1.39	0.97	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Cobalt (Co)-Dissolved	0.10	ug/L	1,000	0.9	<0.10	<0.10	3.0	1.27	1.78	1.1	1.4	1.3
Copper (Cu)-Dissolved	0.20	ug/L	1,000	5	2.26	1.11	<2.0	0.27	0.34	<2.0	<2.0	<2.0
Lead (Pb)-Dissolved	0.050	ug/L	10		<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	0.58	<0.50
Mercury (Hg)-Dissolved	0.010	ug/L	1	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum (Mo)-Dissolved	0.050	ug/L		40	0.483	0.389	0.90	22.9	6.05	0.95	3.08	0.70
Nickel (Ni)-Dissolved	0.50	ug/L		25	0.56	0.69	7.6	1.20	1.46	<5.0	<5.0	<5.0
Selenium (Se)-Dissolved	0.050	ug/L	10	100	0.371	0.511	<0.50	0.362	0.256	<0.50	<0.50	<0.50
Silver (Ag)-Dissolved	0.050	ug/L		0.1	<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	<0.50	<0.50
Sodium (Na)-Dissolved	500	ug/L	200,000		82,600	74,800	120,000	119,000	63,400	525,000	289,000	310,000
Thallium (Tl)-Dissolved	0.010	ug/L		0.3	<0.010	0.012	<0.10	<0.010	<0.010	<0.10	<0.10	<0.10
Uranium (U)-Dissolved	0.010	ug/L		5	0.538	0.795	4.01	3.77	0.529	0.12	<0.10	<0.10
Vanadium (V)-Dissolved	0.50	ug/L		6	<0.50	<0.50	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Zinc (Zn)-Dissolved	1.0	ug/L	5,000	30	85.9	179	107	54.2	29.9	91	69	26
Speciated Metals (Water)												
Chromium, Hexavalent	0.50	ug/L	50	1	1.43	1.09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Volatile Organic Compounds (Water)												
Acetone	30	ug/L	0		<30	<30	<30	<30	<30	<30	<30	<30
Benzene	0.50	ug/L		100 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	2.0	ug/L	100	200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	5.0	ug/L	100	60	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	0.50	ug/L		0.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	0.20	ug/L	50		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	0.50	ug/L	80 (30**)	15	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	2.0	ug/L	0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	1.0	ug/L	100		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.20	ug/L			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	0.50	ug/L	200 (3**)	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	0.50	ug/L		2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	0.50	ug/L	5 (1**)	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	2.0	ug/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	0.50	ug/L	14		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	0.50	ug/L	5*		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	0.50	ug/L	14	40 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	0.50	ug/L		200 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	0.50	ug/L		200 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	5.0	ug/L	50	100 (i)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	0.50	ug/L		0.7 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	0.30	ug/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	0.30	ug/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	0.50	ug/L	2.4**	8 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	20	ug/L		400 (i)	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	20	ug/L			<20	<20	<20	<20	<20	<20	<20	<20
MTBE	2.0	ug/L		200 (i)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	0.50	ug/L		20 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	0.50	ug/L		70 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Table C-1 Groundwater Chemistry

Client Sample ID					MW-1S	MW-1D	MW-2	MW-4D	MW-4S	MW-6	MW-7D	MW-7S
Date Sampled					23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018
Time Sampled					0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
ALS Sample ID					L2185953-1	L2185953-2	L2185953-3	L2185953-4	L2185953-5	L2185953-6	L2185953-7	L2185953-8
Parameter	Lowest Detection Limit	Units	ODWQS (ug/l)	PWQO (ug/l)	Water	Water	Water	Water	Water	Water	Water	Water
Tetrachloroethylene	0.50	ug/L	30	50 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	0.50	ug/L	24**	0.8 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	0.50	ug/L		10 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	0.50	ug/L		800 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	0.50	ug/L	5	20 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	5.0	ug/L			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	0.50	ug/L	2	600 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene	0.30	ug/L		40 (i)	<0.30	<0.30	1.20	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	0.40	ug/L	300**		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	0.50	ug/L			<0.50	<0.50	1.2	<0.50	<0.50	<0.50	<0.50	<0.50
4-Bromofluorobenzene		%			97	97.3	98.6	98.7	97.8	98.3	99.5	98.6
1,4-Difluorobenzene		%			97.6	97	97.2	96.8	96.9	97.1	97	96.1
Hydrocarbons (Water)												
F1 (C6-C10)	25	ug/L			<25	<25	28	<25	<25	<25	<25	<25
F1-BTEX	25	ug/L			<25	<25	26	<25	<25	<25	<25	<25
F2 (C10-C16)	100	ug/L			<100	<100	560	<100	<100	900	110	<100
F2-Naphth	100	ug/L			<100	<100	560	<100	<100	900	110	<100
F3 (C16-C34)	250	ug/L			<250	<250	<250	<250	<250	990	570	<250
F3-PAH	250	ug/L			<250	<250	<250	<250	<250	990	570	<250
F4 (C34-C50)	250	ug/L			<250	<250	<250	<250	<250	<250	280	<250
Total Hydrocarbons (C6-C50)	370	ug/L			<370	<370	580	<370	<370	1890	960	<370
Chrom. to baseline at nC50		-			YES	YES	YES	YES	YES	YES	YES	YES
2-Bromobenzotrifluoride		%			98.5	86.3	95.3	91.5	98.3	89.8	92.2	94.8
3,4-Dichlorotoluene		%			81.6	76.7	77.2	67.2	68	72.9	75.2	71.6
Polycyclic Aromatic Hydrocarbons (Water)												
Acenaphthene	0.020	ug/L			<0.020	<0.020	0.964	<0.020	<0.020	0.218	0.272	0.188
Acenaphthylene	0.020	ug/L			<0.020	<0.020	0.147	<0.020	<0.020	0.051	<0.020	<0.020
Anthracene	0.020	ug/L		0.0008 (i)	<0.020	<0.020	0.041	<0.020	<0.020	0.062	0.147	0.029
Benzo(a)anthracene	0.020	ug/L		0.0004 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.182	<0.020
Benzo(a)pyrene	0.010	ug/L	0.01		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.048	<0.010
Benzo(b)fluoranthene	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.172	<0.020
Benzo(g,h,i)perylene	0.020	ug/L		0.00002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.034	<0.020
Benzo(k)fluoranthene	0.020	ug/L		0.0002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.041	<0.020
Chrysene	0.020	ug/L		0.0001 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.241	<0.020
Dibenzo(ah)anthracene	0.020	ug/L		0.002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	0.020	ug/L		0.0008 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	0.027	0.475	0.053
Fluorene	0.020	ug/L		0.2 (i)	<0.020	<0.020	1.43	<0.020	<0.020	0.319	0.336	0.207
Indeno(1,2,3-cd)pyrene	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	<0.020
1+2-Methylnaphthalenes	0.028	ug/L			<0.028	<0.028	9.1	0.03	<0.028	1.68	1.32	0.831
1-Methylnaphthalene	0.020	ug/L		2 (i)	<0.020	<0.020	6.55	0.030	0.020	0.730	0.748	0.476
2-Methylnaphthalene	0.020	ug/L		2 (i)	<0.020	<0.020	2.54	<0.020	<0.020	0.950	0.576	0.355
Naphthalene	0.050	ug/L		7 (i)	<0.050	<0.050	<0.630	<0.050	<0.050	<0.350	0.196	0.084
Phenanthrene	0.020	ug/L		0.03(i)	<0.020	<0.020	0.655	<0.020	<0.020	0.536	1.05	0.304
Pyrene	0.020	ug/L			<0.020	<0.020	0.094	<0.020	<0.020	0.192	0.500	0.044
d10-Acenaphthene		%			94.4	91.6	93.9	98.4	93.6	84.9	88.4	91.5
d12-Chrysene		%			64.3	66.6	67.4	73.7	67.3	82.8	62.5	64.3
d8-Naphthalene		%			99.6	96	87.1	102.7	99.2	85.4	90.8	95.5
d10-Phenanthrene		%			101	97.3	102.5	105.3	99.9	106.3	96.2	99.9

Notes :

All concentrations are in ug/L unless indicated otherwise

ODWQS- Onatario Drinking Water Quality Standards (MOE June 2003, revised June 2006)

PWQO- Provincinal Water Quality Objective (1995, and July 1998 updates)

(1) *-Maximum Acceptable Concentration

(2) (o) - Operational Guideline

(3) **-Aesthetic Objective

(4) (i) Interim PWQO Standard

Appendix A-2 – Monitoring Well and Borehole Field Logs

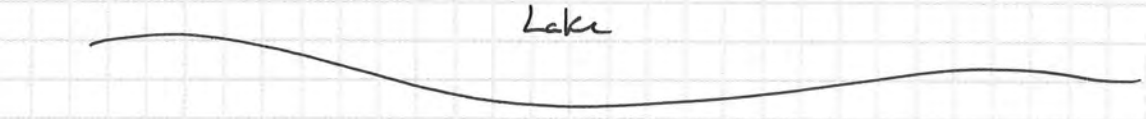
[redacted]

Aquafor
Beech
Limited

Calculation Sheet

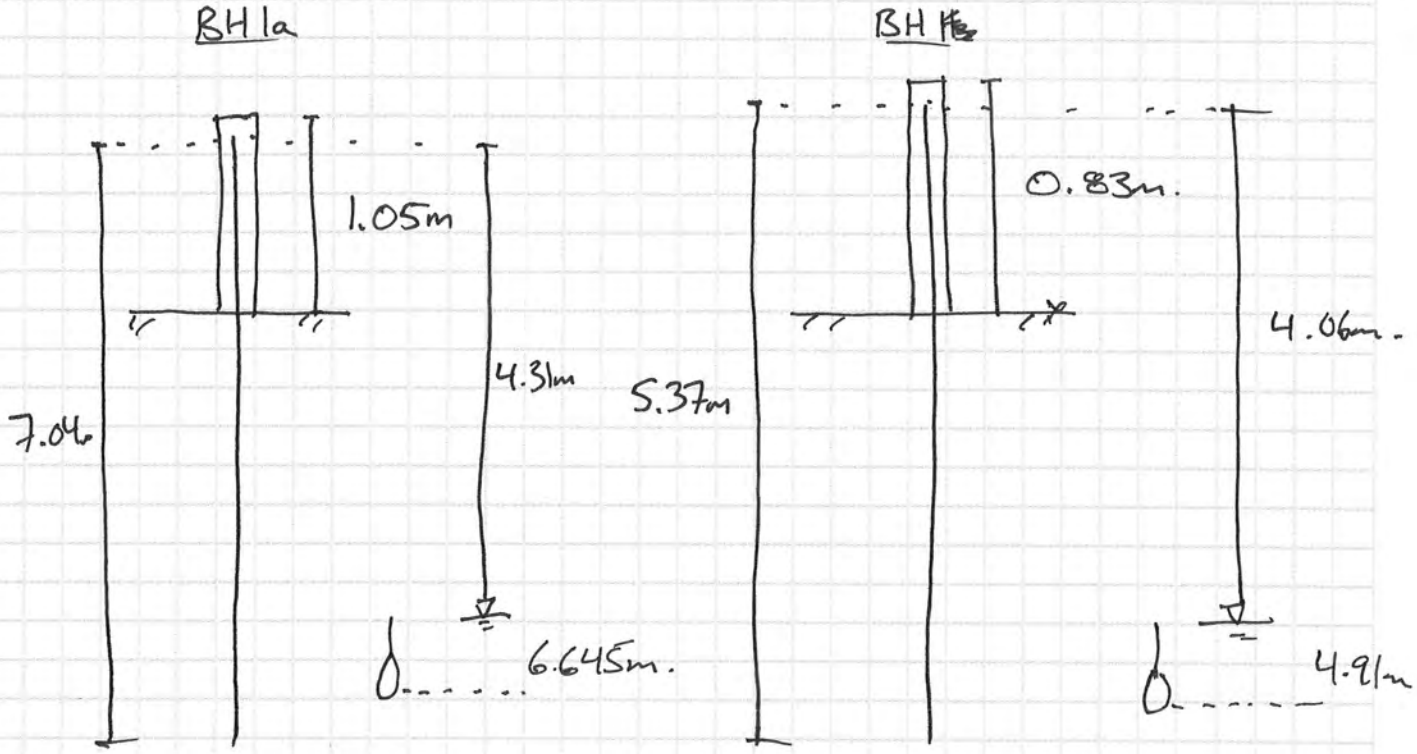
sheet no____ of____

for Mohawk Lake	by	project no.	date Aug 30, 2018
subject Borehole Loggers - BH11 - Nested		checked by	date checked 9:30am



BH11a

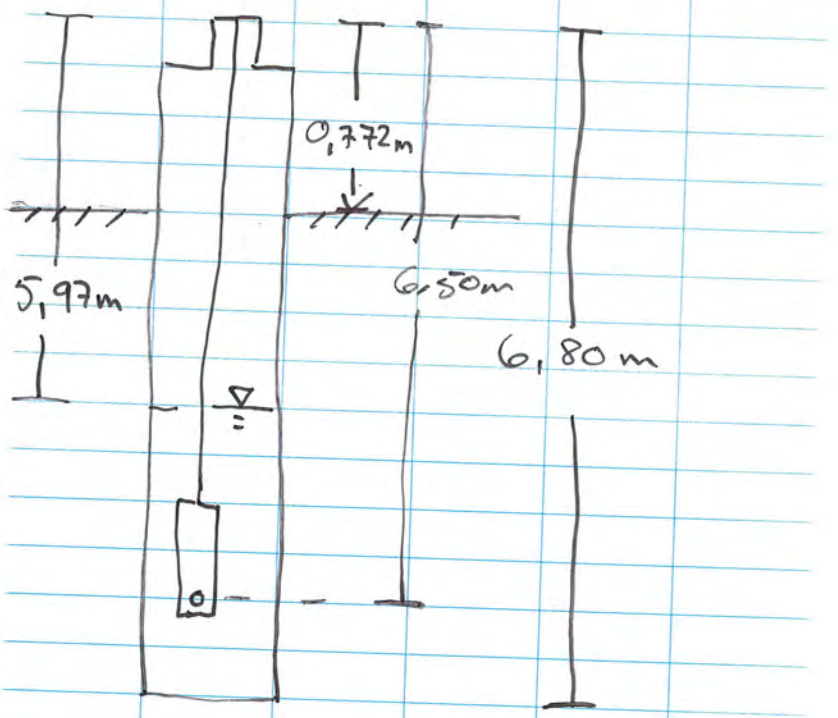
BH11[redacted]



Depth of Hole = 7.04m
Water Level = 4.31m
Logger Depth = 6.645m

Depth of Hole = 5.37m
Water Level = 4.06m
Logger Depth = 4.91m

Mohawk Lake
Date Sept 6, 2018
Time: 2:25 pm
M.D. & F.P



Rite in the Rain

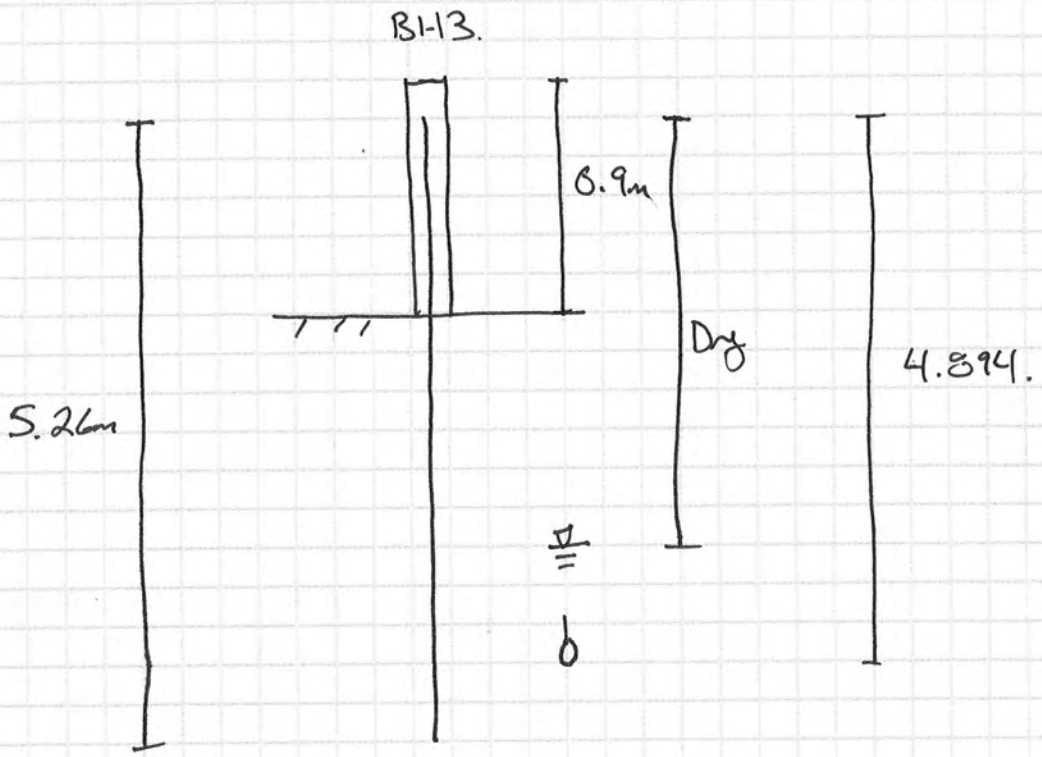
[redacted]

Aquafor
Beech
Limited

Calculation Sheet

sheet no____ of____

for Molesk Lake	by	project no.	date Aug 30, 2018
subject Borehole Monitoring - BH3.		checked by	date checked 10:30am



Depth of Hole = 5.26m
Water Level = Dry
Depth of Logger = 4.894

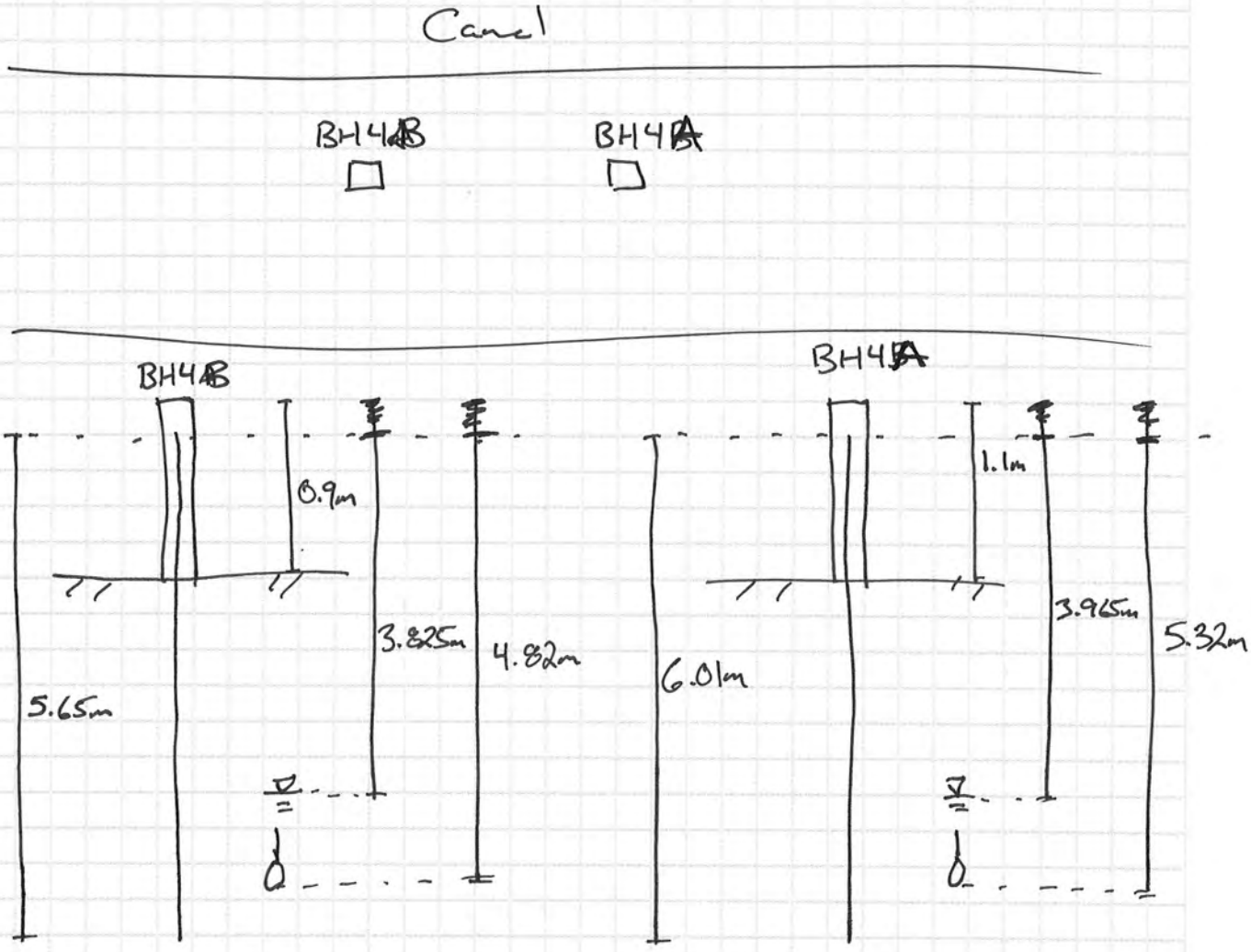
[redacted]

Aquafor
Beech
Limited

Calculation Sheet

sheet no____ of____

for Mohawk Lake	by	project no.	date Aug 30, 2018
subject Borehole Monitoring - BH4.		checked by	date checked 10:00 am



Depth of Hole = 5.65m
Water Level = 3.825m
Depth of Logger = 4.82m

Depth of Hole = 6.01m.
Water Level = 3.965m
Depth of Logger = 5.32m

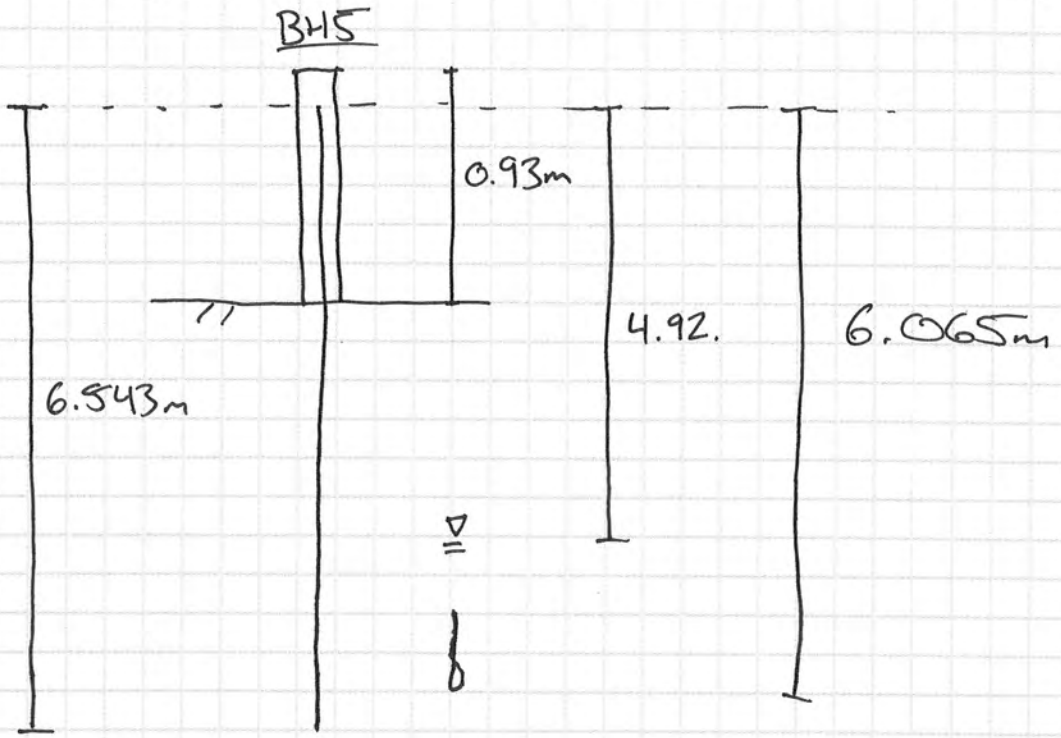
[redacted]

Aquafor
Beech
Limited

Calculation Sheet

sheet no____ of____

for Mohawk Lake	by	project no.	date Aug 30, 2018
subject Borehole Monitoring - BH5		checked by	date checked 11:00 am

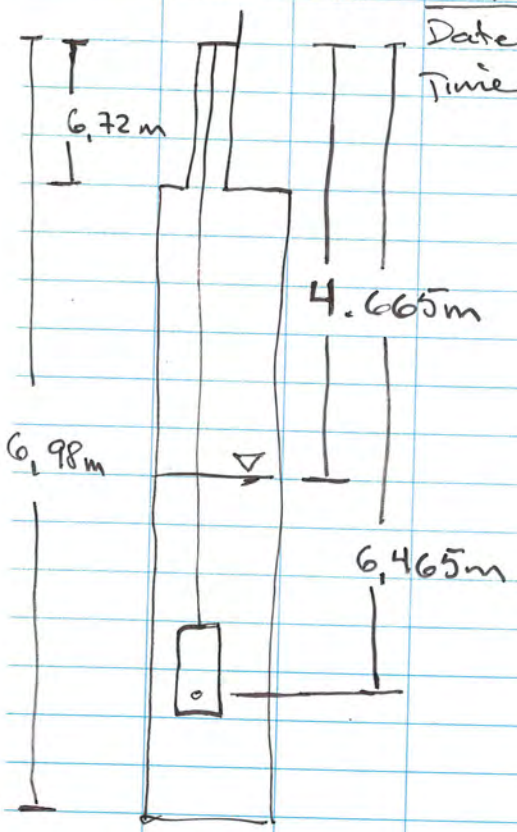


Depth of Hole = 6.543 m
Water Level = 4.92 m
Depth of Logger = 6.065m

Mohawk Lake BH-6

Date Sept 6th 2019

Time: 12:35



Rite in the Rain

[redacted]

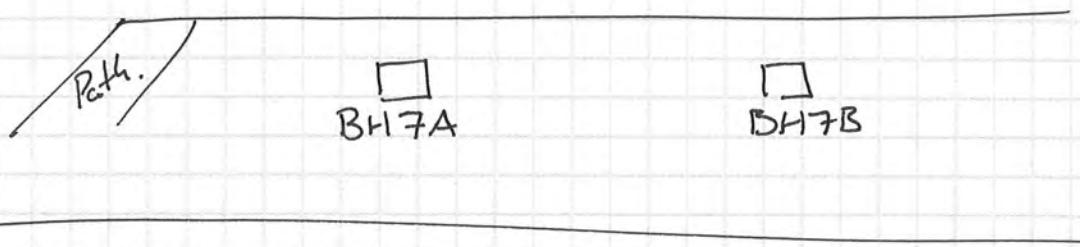
Aquafor
Beech
Limited

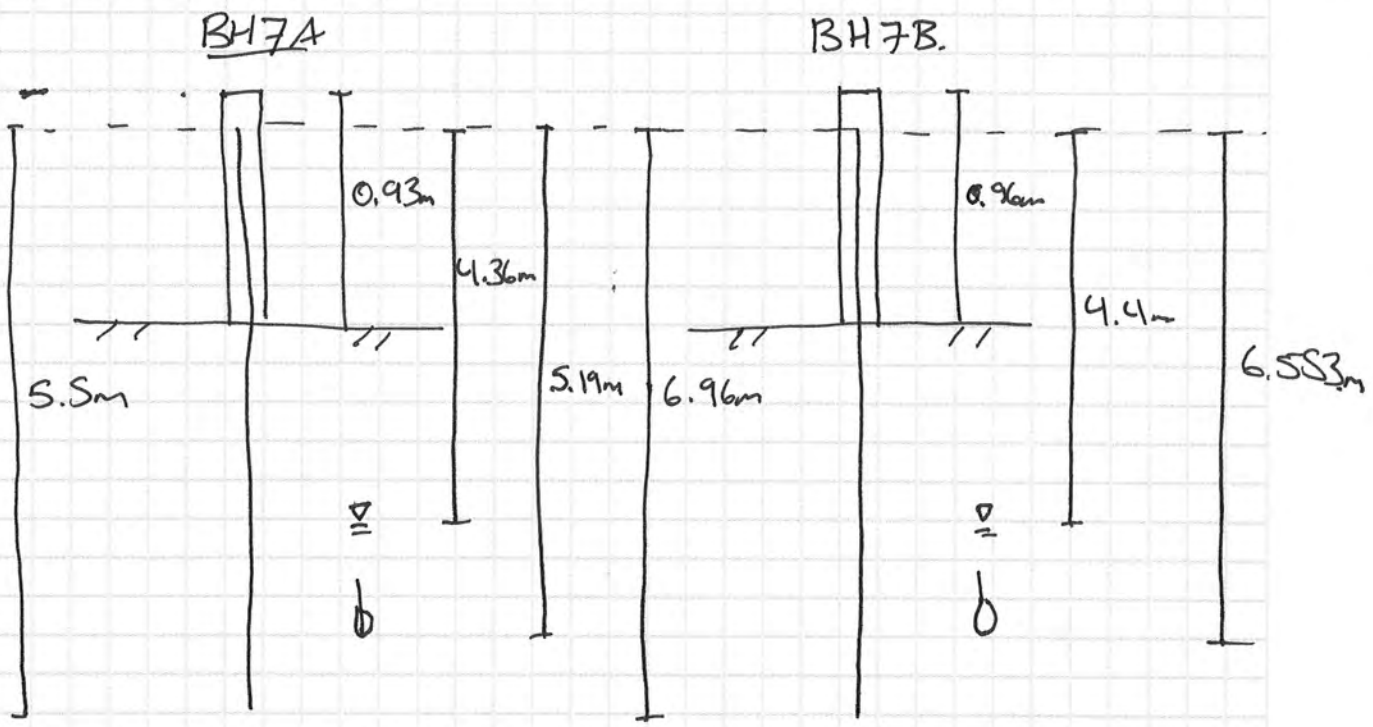
Calculation Sheet

sheet no____ of____

for Mohawk Lake	by	project no.	date Aug 30, 2018
subject Borehole Monitoring - BH7.		checked by	date checked 11:[redacted]5am

Lake.





Depth of Hole = 5.5m
Water Level = 4.36m
Depth of Logger = 5.19m

Depth of Hole = 6.96m
Water Level = 4.4m
Depth of Logger = 6.553

Appendix A-3 – Groundwater Quality Results

Groundwater Quality Results

Parameter	Detection Limits	Units	Groundwater Standards of O.Reg. 153/04 (Table 1)	Sample Date: October 23, 2018							
				Sample ID							
				MW-1	MW-1A	MW-2	MW-4A	MW-4B	MW-6	MW-7A	MW-7B
Physical Tests (Water)											
Conductivity	0.0030	mS/cm	N/V	0.948	0.969	3.06	1.41	1.35	3.62	2.70	2.62
pH	0.10	pH units	N/V	7.64	7.65	7.41	7.52	7.49	6.91	6.95	7.15
Turbidity	0.10	NTU	N/V	6.90	14.4	2.16	128	55.6	669	439	520
Anions and Nutrients (Water)											
Chloride (Cl)	0.50	mg/L	790	64.4	76.4	854	145	165	956	772	<2.5
Cyanides (Water)											
Cyanide, Weak Acid Diss	2.0	ug/L	5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dissolved Metals (Water)											
Dissolved Mercury Filtration Location	-	-	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	-	-	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Antimony (Sb)-Dissolved	0.10	ug/L	1.5	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Arsenic (As)-Dissolved	0.10	ug/L	13	0.14	0.13	<1.0	4.66	7.62	1.6	2.1	1.5
Barium (Ba)-Dissolved	0.10	ug/L	610	27.9	29.1	188	198	220	811	1160	818
Beryllium (Be)-Dissolved	0.10	ug/L	0.5	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Boron (B)-Dissolved	10	ug/L	1700	19	21	<100	154	100	170	240	200
Cadmium (Cd)-Dissolved	0.010	ug/L	0.5	0.013	0.010	0.051	<0.010	<0.010	<0.050	<0.050	<0.050
Chromium (Cr)-Dissolved	0.50	ug/L	11	1.39	0.97	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Cobalt (Co)-Dissolved	0.10	ug/L	3.8	<0.10	<0.10	3.0	1.27	1.78	1.1	1.4	1.3
Copper (Cu)-Dissolved	0.20	ug/L	5	2.26	1.11	<2.0	0.27	0.34	<2.0	<2.0	<2.0
Lead (Pb)-Dissolved	0.050	ug/L	1.9	<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	0.58	<0.50
Mercury (Hg)-Dissolved	0.010	ug/L	0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum (Mo)-Dissolved	0.050	ug/L	23	0.483	0.389	0.90	22.9	6.05	0.95	3.08	0.70
Nickel (Ni)-Dissolved	0.50	ug/L	14	0.56	0.69	7.6	1.20	1.46	<5.0	<5.0	<5.0
Selenium (Se)-Dissolved	0.050	ug/L	5	0.371	0.511	<0.50	0.362	0.256	<0.50	<0.50	<0.50
Silver (Ag)-Dissolved	0.050	ug/L	0.3	<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	<0.50	<0.50
Sodium (Na)-Dissolved	500	ug/L	790000	82600	74800	120000	119000	63400	525000	289000	310000
Thallium (Tl)-Dissolved	0.010	ug/L	0.5	<0.010	0.012	<0.10	<0.010	<0.010	<0.10	<0.10	<0.10
Uranium (U)-Dissolved	0.010	ug/L	8.9	0.538	0.795	4.01	3.77	0.529	0.12	<0.10	<0.10
Vanadium (V)-Dissolved	0.50	ug/L	3.9	<0.50	<0.50	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Zinc (Zn)-Dissolved	1.0	ug/L	160	85.9	179	107	54.2	29.9	91	69	26
Speciated Metals (Water)											
Chromium, Hexavalent	0.50	ug/L	25	1.43	1.09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Volatile Organic Compounds (Water)											
Acetone	30	ug/L	2700	<30	<30	<30	<30	<30	<30	<30	<30
Benzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	2.0	ug/L	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	5.0	ug/L	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Bromomethane	0.50	ug/L	0.89	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	0.20	ug/L	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	2.0	ug/L	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	1.0	ug/L	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.20	ug/L	N/V	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	2.0	ug/L	590	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	0.50	ug/L	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	0.50	ug/L	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	5.0	ug/L	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	0.30	ug/L	N/V	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	0.30	ug/L	N/V	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	0.50	ug/L	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	20	ug/L	400	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	20	ug/L	640	<20	<20	<20	<20	<20	<20	<20	<20
MTBE	2.0	ug/L	15	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	0.50	ug/L	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	0.50	ug/L	0.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	5.0	ug/L	150	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	0.50	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene	0.30	ug/L	N/V	<0.30	<0.30	1.20	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	0.40	ug/L	N/V	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	0.50	ug/L	72	<0.50	<0.50	1.2	<0.50	<0.50	<0.50	<0.50	<0.50
4-Bromofluorobenzene	-	%	n/v	97	97.3	98.6	98.7	97.8	98.3	99.5	98.6
1,4-Difluorobenzene	-	%	n/v	97.6	97	97.2	96.8	96.9	97.1	97	96.1
Hydrocarbons (Water)											
F1 (C6-C10)	25	ug/L	420	<25	<25	28	<25	<25	<25	<25	<25
F1-BTEX	25	ug/L	N/V	<25	<25	26	<25	<25	<25	<25	<25

F2 (C10-C16)	100	ug/L	150	<100	<100	560	<100	<100	900	110	<100
F2-Naphth	100	ug/L	n/v	<100	<100	560	<100	<100	900	110	<100
F3 (C16-C34)	250	ug/L	500	<250	<250	<250	<250	<250	990	570	<250
F3-PAH	250	ug/L	N/V	<250	<250	<250	<250	<250	990	570	<250
F4 (C34-C50)	250	ug/L	500	<250	<250	<250	<250	<250	<250	280	<250
Total Hydrocarbons (C6-C50)	370	ug/L	N/V	<370	<370	580	<370	<370	1890	960	<370
Chrom. to baseline at nC50	-	-	N/V	YES	YES	YES	YES	YES	YES	YES	YES
2-Bromobenzotrifluoride	-	%	N/V	98.5	86.3	95.3	91.5	98.3	89.8	92.2	94.8
3,4-Dichlorotoluene	-	%	N/V	81.6	76.7	77.2	67.2	68	72.9	75.2	71.6
Polycyclic Aromatic Hydrocarbons (Water)											
Acenaphthene	0.020	ug/L	4.1	<0.020	<0.020	0.964	<0.020	<0.020	0.218	0.272	0.188
Acenaphthylene	0.020	ug/L	1	<0.020	<0.020	0.147	<0.020	<0.020	0.051	<0.020	<0.020
Anthracene	0.020	ug/L	0.1	<0.020	<0.020	0.041	<0.020	<0.020	0.062	0.147	0.029
Benzo(a)anthracene	0.020	ug/L	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.182	<0.020
Benzo(a)pyrene	0.010	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.048	<0.010
Benzo(b)fluoranthene	0.020	ug/L	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.172	<0.020
Benzo(g,h,i)perylene	0.020	ug/L	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.034	<0.020
Benzo(k)fluoranthene	0.020	ug/L	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.041	<0.020
Chrysene	0.020	ug/L	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.241	<0.020
Dibenzo(ah)anthracene	0.020	ug/L	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	0.020	ug/L	0.4	<0.020	<0.020	<0.020	<0.020	<0.020	0.027	0.475	0.053
Fluorene	0.020	ug/L	120	<0.020	<0.020	1.43	<0.020	<0.020	0.319	0.336	0.207
Indeno(1,2,3-cd)pyrene	0.020	ug/L	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	<0.020
1+2-Methylnaphthalenes	0.028	ug/L	2	<0.028	<0.028	9.1	0.03	<0.028	1.68	1.32	0.831
1-Methylnaphthalene	0.020	ug/L	2	<0.020	<0.020	6.55	0.030	0.020	0.730	0.748	0.476
2-Methylnaphthalene	0.020	ug/L	2	<0.020	<0.020	2.54	<0.020	<0.020	0.950	0.576	0.355
Naphthalene	0.050	ug/L	7	<0.050	<0.050	<0.630	<0.050	<0.050	<0.350	0.196	0.084
Phenanthrene	0.020	ug/L	0.1	<0.020	<0.020	0.655	<0.020	<0.020	0.536	1.05	0.304
Pyrene	0.020	ug/L	0.2	<0.020	<0.020	0.094	<0.020	<0.020	0.192	0.500	0.044
d10-Acenaphthene	-	%	N/V	94.4	91.6	93.9	98.4	93.6	84.9	88.4	91.5
d12-Chrysene	-	%	N/V	64.3	66.6	67.4	73.7	67.3	82.8	62.5	64.3
d8-Naphthalene	-	%	N/V	99.6	96	87.1	102.7	99.2	85.4	90.8	95.5
d10-Phenanthrene	-	%	N/V	101	97.3	102.5	105.3	99.9	106.3	96.2	99.9

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 23-OCT-18
Report Date: 25-OCT-18 15:28 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2185953

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2185953-1 / 23-OCT-18 / - / **MW-1**	L2185953-2 / 23-OCT-18 / - / **MW-1A**	L2185953-3 / 23-OCT-18 / - / **MW-2**	L2185953-4 / 23-OCT-18 / - / **MW-4A**	L2185953-5 / 23-OCT-18 / - / **MW-4B**	L2185953-6 / 23-OCT-18 / - / **MW-6**
Conductivity	mS/cm	0.948	0.969	3.06	1.41	1.35	3.62
pH	pH units	7.64	7.65	7.41	7.52	7.49	6.91
Turbidity	NTU	6.90	14.4	2.16	128	55.6	669

Physical Tests (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2185953-7 / 23-OCT-18 / - / **MW-7A**	L2185953-8 / 23-OCT-18 / - / **MW-7B**
Conductivity	mS/cm	2.70	2.62
pH	pH units	6.95	7.15
Turbidity	NTU	439	520

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-1 / 23-OCT-18 / - / MW-1	L2185953-2 / 23-OCT-18 / - / MW-1A	L2185953-3 / 23-OCT-18 / - / MW-2	L2185953-4 / 23-OCT-18 / - / MW-4A	L2185953-5 / 23-OCT-18 / - / MW-4B	L2185953-6 / 23-OCT-18 / - / MW-6
Chloride (Cl)	mg/L		64.4	76.4	854 DLHC	145 DLHC	165 DLHC	956 DLHC

Anions and Nutrients (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-7 / 23-OCT-18 / - / MW-7A	L2185953-8 / 23-OCT-18 / - / MW-7B
Chloride (Cl)	mg/L		772 DLHC	<2.5 DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-1 23-OCT-18 - **MW-1**	L2185953-2 23-OCT-18 - **MW-1A**	L2185953-3 23-OCT-18 - **MW-2**	L2185953-4 23-OCT-18 - **MW-4A**	L2185953-5 23-OCT-18 - **MW-4B**	L2185953-6 23-OCT-18 - **MW-6**
Cyanide, Weak Acid Diss	ug/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Cyanides (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-7 23-OCT-18 - **MW-7A**	L2185953-8 23-OCT-18 - **MW-7B**
Cyanide, Weak Acid Diss	ug/L		<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Dissolved Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-1 23-OCT-18 - MW-1	L2185953-2 23-OCT-18 - MW-1A	L2185953-3 23-OCT-18 - MW-2	L2185953-4 23-OCT-18 - MW-4A	L2185953-5 23-OCT-18 - MW-4B	L2185953-6 23-OCT-18 - MW-6
Dissolved Mercury Filtration Location	No Unit		FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	No Unit		FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Antimony (Sb)-Dissolved	ug/L		<0.10	<0.10	<1.0 DLHC	<0.10	<0.10	<1.0 DLHC
Arsenic (As)-Dissolved	ug/L		0.14	0.13	<1.0 DLHC	4.66	7.62	1.6 DLHC
Barium (Ba)-Dissolved	ug/L		27.9	29.1	188 DLHC	198	220	811 DLHC
Beryllium (Be)-Dissolved	ug/L		<0.10	<0.10	<1.0 DLHC	<0.10	<0.10	<1.0 DLHC
Boron (B)-Dissolved	ug/L		19	21	<100 DLHC	154	100	170 DLHC
Cadmium (Cd)-Dissolved	ug/L		0.013	0.010	0.051 DLHC	<0.010	<0.010	<0.050 DLHC
Chromium (Cr)-Dissolved	ug/L		1.39	0.97	<5.0 DLHC	<0.50	<0.50	<5.0 DLHC
Cobalt (Co)-Dissolved	ug/L		<0.10	<0.10	3.0 DLHC	1.27	1.78	1.1 DLHC
Copper (Cu)-Dissolved	ug/L		2.26	1.11	<2.0 DLHC	0.27	0.34	<2.0 DLHC
Lead (Pb)-Dissolved	ug/L		<0.050	<0.050	<0.50 DLHC	<0.050	<0.050	<0.50 DLHC
Mercury (Hg)-Dissolved	ug/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum (Mo)-Dissolved	ug/L		0.483	0.389	0.90 DLHC	22.9	6.05	0.95 DLHC
Nickel (Ni)-Dissolved	ug/L		0.56	0.69	7.6 DLHC	1.20	1.46	<5.0 DLHC
Selenium (Se)-Dissolved	ug/L		0.371	0.511	<0.50 DLHC	0.362	0.256	<0.50 DLHC
Silver (Ag)-Dissolved	ug/L		<0.050	<0.050	<0.50 DLHC	<0.050	<0.050	<0.50 DLHC
Sodium (Na)-Dissolved	ug/L		82600	74800	120000 DLHC	119000 DLHC	63400	525000 DLHC
Thallium (Tl)-Dissolved	ug/L		<0.010	0.012	<0.10 DLHC	<0.010	<0.010	<0.10 DLHC
Uranium (U)-Dissolved	ug/L		0.538	0.795	4.01 DLHC	3.77	0.529	0.12 DLHC
Vanadium (V)-Dissolved	ug/L		<0.50	<0.50	<5.0 DLHC	<0.50	<0.50	<5.0 DLHC
Zinc (Zn)-Dissolved	ug/L		85.9	179	107 DLHC	54.2	29.9	91 DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Dissolved Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-7 23-OCT-18 - MW-7A		L2185953-8 23-OCT-18 - MW-7B	
Dissolved Mercury Filtration Location	No Unit		FIELD		FIELD	
Dissolved Metals Filtration Location	No Unit		FIELD		FIELD	
Antimony (Sb)-Dissolved	ug/L		<1.0	DLHC	<1.0	DLHC
Arsenic (As)-Dissolved	ug/L		2.1	DLHC	1.5	DLHC
Barium (Ba)-Dissolved	ug/L		1160	DLHC	818	DLHC
Beryllium (Be)-Dissolved	ug/L		<1.0	DLHC	<1.0	DLHC
Boron (B)-Dissolved	ug/L		240	DLHC	200	DLHC
Cadmium (Cd)-Dissolved	ug/L		<0.050	DLHC	<0.050	DLHC
Chromium (Cr)-Dissolved	ug/L		<5.0	DLHC	<5.0	DLHC
Cobalt (Co)-Dissolved	ug/L		1.4	DLHC	1.3	DLHC
Copper (Cu)-Dissolved	ug/L		<2.0	DLHC	<2.0	DLHC
Lead (Pb)-Dissolved	ug/L		0.58	DLHC	<0.50	DLHC
Mercury (Hg)-Dissolved	ug/L		<0.010		<0.010	
Molybdenum (Mo)-Dissolved	ug/L		3.08	DLHC	0.70	DLHC
Nickel (Ni)-Dissolved	ug/L		<5.0	DLHC	<5.0	DLHC
Selenium (Se)-Dissolved	ug/L		<0.50	DLHC	<0.50	DLHC
Silver (Ag)-Dissolved	ug/L		<0.50	DLHC	<0.50	DLHC
Sodium (Na)-Dissolved	ug/L		289000	DLHC	310000	DLHC
Thallium (Tl)-Dissolved	ug/L		<0.10	DLHC	<0.10	DLHC
Uranium (U)-Dissolved	ug/L		<0.10	DLHC	<0.10	DLHC
Vanadium (V)-Dissolved	ug/L		<5.0	DLHC	<5.0	DLHC
Zinc (Zn)-Dissolved	ug/L		69	DLHC	26	DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2185953-1 / 23-OCT-18 / - / **MW-1**	L2185953-2 / 23-OCT-18 / - / **MW-1A**	L2185953-3 / 23-OCT-18 / - / **MW-2**	L2185953-4 / 23-OCT-18 / - / **MW-4A**	L2185953-5 / 23-OCT-18 / - / **MW-4B**	L2185953-6 / 23-OCT-18 / - / **MW-6**
Chromium, Hexavalent	ug/L	1.43	1.09	<0.50	<0.50	<0.50	<0.50

Speciated Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2185953-7 / 23-OCT-18 / - / **MW-7A**	L2185953-8 / 23-OCT-18 / - / **MW-7B**
Chromium, Hexavalent	ug/L	<0.50	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (WATER)

Analyte	Unit	L2185953-1 23-OCT-18 - MW-1	L2185953-2 23-OCT-18 - MW-1A	L2185953-3 23-OCT-18 - MW-2	L2185953-4 23-OCT-18 - MW-4A	L2185953-5 23-OCT-18 - MW-4B	L2185953-6 23-OCT-18 - MW-6
Acetone	ug/L	<30	<30	<30	<30	<30	<30
Benzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	<20	<20	<20	<20	<20	<20
MTBE	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (WATER)

Analyte	Unit	L2185953-7 23-OCT-18 - MW-7A	L2185953-8 23-OCT-18 - MW-7B
Acetone	ug/L	<30	<30
Benzene	ug/L	<0.50	<0.50
Bromodichloromethane	ug/L	<2.0	<2.0
Bromoform	ug/L	<5.0	<5.0
Bromomethane	ug/L	<0.50	<0.50
Carbon tetrachloride	ug/L	<0.20	<0.20
Chlorobenzene	ug/L	<0.50	<0.50
Dibromochloromethane	ug/L	<2.0	<2.0
Chloroform	ug/L	<1.0	<1.0
1,2-Dibromoethane	ug/L	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	<0.50	<0.50
Dichlorodifluoromethane	ug/L	<2.0	<2.0
1,1-Dichloroethane	ug/L	<0.50	<0.50
1,2-Dichloroethane	ug/L	<0.50	<0.50
1,1-Dichloroethylene	ug/L	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	<0.50	<0.50
trans-1,2-Dichloroethylene	ug/L	<0.50	<0.50
Methylene Chloride	ug/L	<5.0	<5.0
1,2-Dichloropropane	ug/L	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	<0.50	<0.50
Ethylbenzene	ug/L	<0.50	<0.50
n-Hexane	ug/L	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	<20	<20
Methyl Isobutyl Ketone	ug/L	<20	<20
MTBE	ug/L	<2.0	<2.0
Styrene	ug/L	<0.50	<0.50
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<0.50
Tetrachloroethylene	ug/L	<0.50	<0.50
Toluene	ug/L	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	<0.50	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2185953-1 / 23-OCT-18 / - / **MW-1**	L2185953-2 / 23-OCT-18 / - / **MW-1A**	L2185953-3 / 23-OCT-18 / - / **MW-2**	L2185953-4 / 23-OCT-18 / - / **MW-4A**	L2185953-5 / 23-OCT-18 / - / **MW-4B**	L2185953-6 / 23-OCT-18 / - / **MW-6**
1,1,2-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	<0.30	<0.30	1.20	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	<0.50	<0.50	1.20	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	97.0	97.3	98.6	98.7	97.8	98.3
Surrogate: 1,4-Difluorobenzene	%	97.6	97.0	97.2	96.8	96.9	97.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (WATER)

Analyte	Unit	ALS ID: L2185953-7 Sampled Date: 23-OCT-18 Sampled Time: - Sample ID: **MW-7A**	ALS ID: L2185953-8 Sampled Date: 23-OCT-18 Sampled Time: - Sample ID: **MW-7B**
1,1,2-Trichloroethane	ug/L	<0.50	<0.50
Trichloroethylene	ug/L	<0.50	<0.50
Trichlorofluoromethane	ug/L	<5.0	<5.0
Vinyl chloride	ug/L	<0.50	<0.50
o-Xylene	ug/L	<0.30	<0.30
m+p-Xylenes	ug/L	<0.40	<0.40
Xylenes (Total)	ug/L	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	99.5	98.6
Surrogate: 1,4-Difluorobenzene	%	97.0	96.1

ANALYTICAL REPORT

Hydrocarbons (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-1 23-OCT-18 - MW-1	L2185953-2 23-OCT-18 - MW-1A	L2185953-3 23-OCT-18 - MW-2	L2185953-4 23-OCT-18 - MW-4A	L2185953-5 23-OCT-18 - MW-4B	L2185953-6 23-OCT-18 - MW-6
F1 (C6-C10)	ug/L		<25	<25	28	<25	<25	<25
F1-BTEX	ug/L		<25	<25	26	<25	<25	<25
F2 (C10-C16)	ug/L		<100	<100	560	<100 OWP	<100	900 OWP
F2-Naphth	ug/L		<100	<100	560	<100	<100	900
F3 (C16-C34)	ug/L		<250	<250	<250	<250 OWP	<250	990 OWP
F3-PAH	ug/L		<250	<250	<250	<250	<250	990
F4 (C34-C50)	ug/L		<250	<250	<250	<250 OWP	<250	<250 OWP
Total Hydrocarbons (C6-C50)	ug/L		<370	<370	580	<370	<370	1890
Chrom. to baseline at nC50	No Unit		YES	YES	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%		98.5	86.3	95.3	91.5	98.3	89.8
Surrogate: 3,4-Dichlorotoluene	%		81.6	76.7	77.2	67.2	68.0	72.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (WATER)

	ALS ID	L2185953-7		L2185953-8	
	Sampled Date	23-OCT-18		23-OCT-18	
	Sampled Time	-		-	
	Sample ID	**MW-7A**		**MW-7B**	
Analyte	Unit				
F1 (C6-C10)	ug/L	<25		<25	
F1-BTEX	ug/L	<25		<25	
F2 (C10-C16)	ug/L	110	OWP	<100	OWP
F2-Naphth	ug/L	110		<100	
F3 (C16-C34)	ug/L	570	OWP	<250	OWP
F3-PAH	ug/L	570		<250	
F4 (C34-C50)	ug/L	280	OWP	<250	OWP
Total Hydrocarbons (C6-C50)	ug/L	960		<370	
Chrom. to baseline at nC50	No Unit	YES		YES	
Surrogate: 2-Bromobenzotrifluoride	%	92.2		94.8	
Surrogate: 3,4-Dichlorotoluene	%	75.2		71.6	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2185953-1 23-OCT-18 - MW-1	L2185953-2 23-OCT-18 - MW-1A	L2185953-3 23-OCT-18 - MW-2	L2185953-4 23-OCT-18 - MW-4A	L2185953-5 23-OCT-18 - MW-4B	L2185953-6 23-OCT-18 - MW-6
Acenaphthene	ug/L		<0.020	<0.020	0.964	<0.020	<0.020	0.218
Acenaphthylene	ug/L		<0.020	<0.020	0.147	<0.020	<0.020	0.051
Anthracene	ug/L		<0.020	<0.020	0.041 R	<0.020	<0.020	0.062 R
Benzo(a)anthracene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chrysene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Dibenzo(ah)anthracene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	0.027
Fluorene	ug/L		<0.020	<0.020	1.43	<0.020	<0.020	0.319
Indeno(1,2,3-cd)pyrene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1+2-Methylnaphthalenes	ug/L		<0.028	<0.028	9.10	0.030	<0.028	1.68
1-Methylnaphthalene	ug/L		<0.020	<0.020	6.55	0.030	0.020	0.730
2-Methylnaphthalene	ug/L		<0.020	<0.020	2.54	<0.020	<0.020	0.950
Naphthalene	ug/L		<0.050	<0.050	<0.630 DLQ	<0.050	<0.050	<0.350 DLQ
Phenanthrene	ug/L		<0.020	<0.020	0.655	<0.020	<0.020	0.536
Pyrene	ug/L		<0.020	<0.020	0.094	<0.020	<0.020	0.192
Surrogate: d10-Acenaphthene	%		94.4	91.6	93.9	98.4	93.6	84.9
Surrogate: d12-Chrysene	%		64.3	66.6	67.4	73.7	67.3	82.8
Surrogate: d8-Naphthalene	%		99.6	96.0	87.1	102.7	99.2	85.4
Surrogate: d10-Phenanthrene	%		101.0	97.3	102.5	105.3	99.9	106.3

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (WATER)

Analyte	Unit	ALS ID: L2185953-7 Sampled Date: 23-OCT-18 Sampled Time: - Sample ID: **MW-7A**	ALS ID: L2185953-8 Sampled Date: 23-OCT-18 Sampled Time: - Sample ID: **MW-7B**
Acenaphthene	ug/L	0.272	0.188
Acenaphthylene	ug/L	<0.020	<0.020
Anthracene	ug/L	0.147	0.029 R
Benzo(a)anthracene	ug/L	0.182	<0.020
Benzo(a)pyrene	ug/L	0.048	<0.010
Benzo(b)fluoranthene	ug/L	0.172	<0.020
Benzo(g,h,i)perylene	ug/L	0.034	<0.020
Benzo(k)fluoranthene	ug/L	0.041	<0.020
Chrysene	ug/L	0.241	<0.020
Dibenzo(ah)anthracene	ug/L	<0.020	<0.020
Fluoranthene	ug/L	0.475	0.053
Fluorene	ug/L	0.336	0.207
Indeno(1,2,3-cd)pyrene	ug/L	0.045	<0.020
1+2-Methylnaphthalenes	ug/L	1.32	0.831
1-Methylnaphthalene	ug/L	0.748	0.476
2-Methylnaphthalene	ug/L	0.576	0.355
Naphthalene	ug/L	0.196	0.084
Phenanthrene	ug/L	1.05	0.304
Pyrene	ug/L	0.500	0.044
Surrogate: d10-Acenaphthene	%	88.4	91.5
Surrogate: d12-Chrysene	%	62.5	64.3
Surrogate: d8-Naphthalene	%	90.8	95.5
Surrogate: d10-Phenanthrene	%	96.2	99.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
ISCR:ST	Improper Sample Container Received: Subsamples Taken - ES/WT lab preserved for cyanide.

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
OWP	Organic water sample contained visible sediment (must be included as part of analysis). Measured concentrations of organic

Reference Information

substances in water can be biased high due to presence of sediment.

DLHC Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Water	Cyanide (WAD)-O.Reg 153/04	APHA 4500CN I-Weak acid Dist Colorimet

Weak acid dissociable cyanide (WAD) is determined by undergoing a distillation procedure. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-R511-WT	Water	Hex Chrom-O.Reg 153/04 (July 2011)	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-R511-WT	Water	Conductivity-O.Reg 153/04 (July 2011)	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
HG-D-UG/L-CVAA-WT	Water	Diss. Mercury in Water by CVAAS (ug/L)	EPA 1631E (mod)
		Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).	
MET-D-UG/L-MS-WT	Water	Diss. Metals in Water by ICPMS (ug/L)	EPA 200.8
		The metal constituents of a non-acidified sample that pass through a membrane filter prior to ICP/MS analysis.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
METHYLNAPS-CALC-WT	Water	PAH-Calculated Parameters	SW846 8270
PAH-511-WT	Water	PAH-O. Reg 153/04 (July 2011)	SW846 3510/8270
		Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
TURBIDITY-WT	Water	Turbidity	APHA 2130 B
		Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

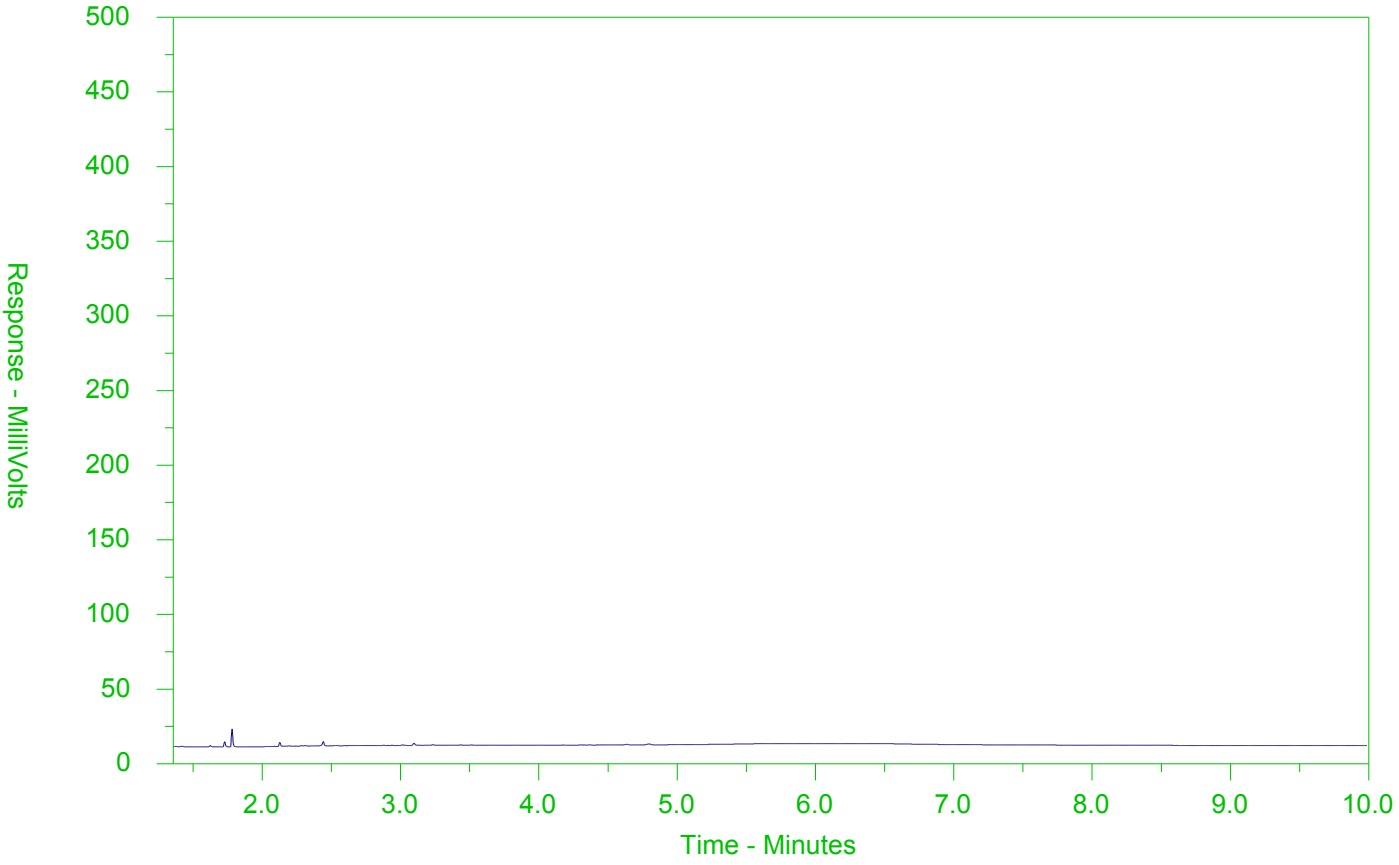
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-1
Client Sample ID: MW-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

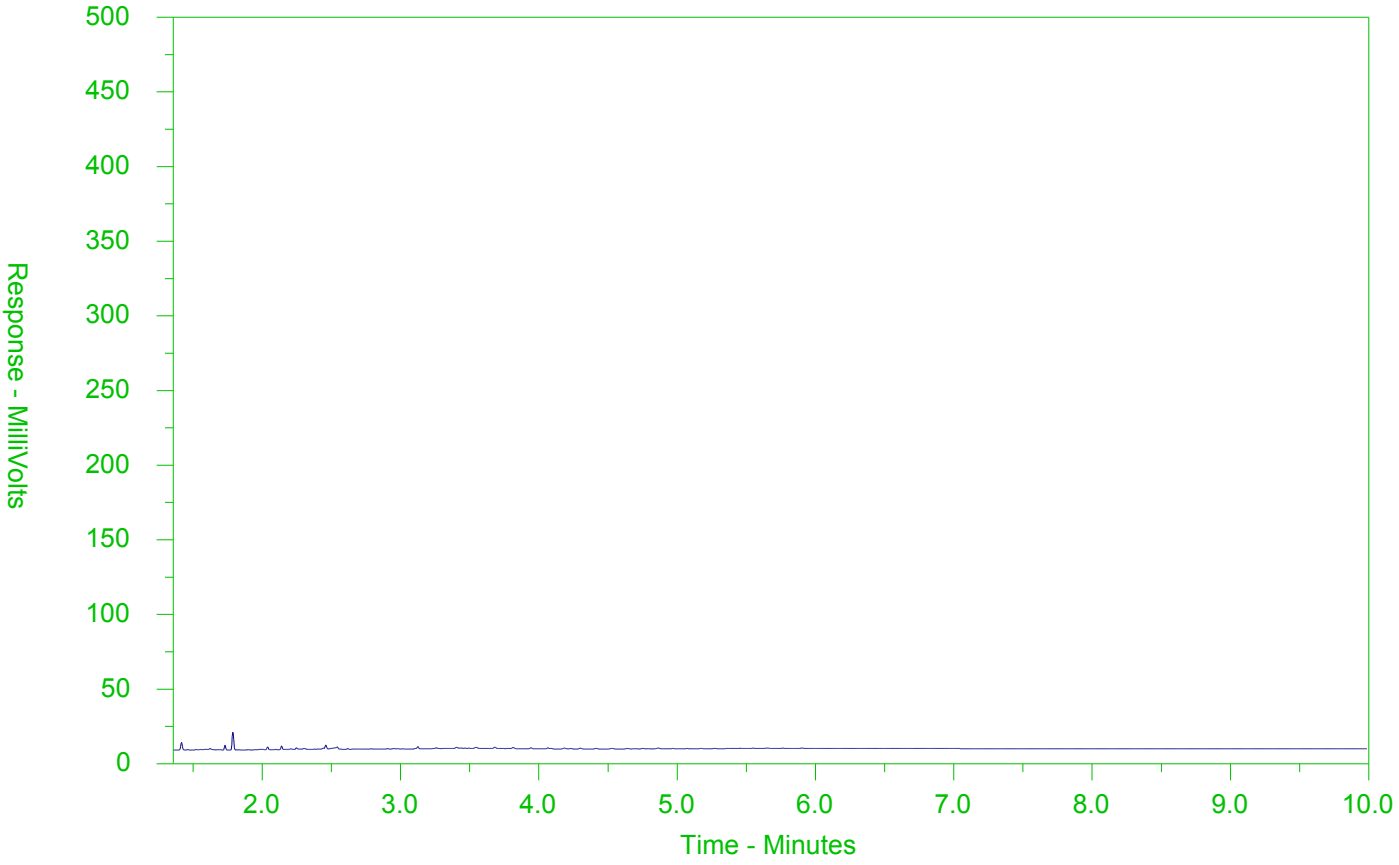
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-2
Client Sample ID: MW-1A



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

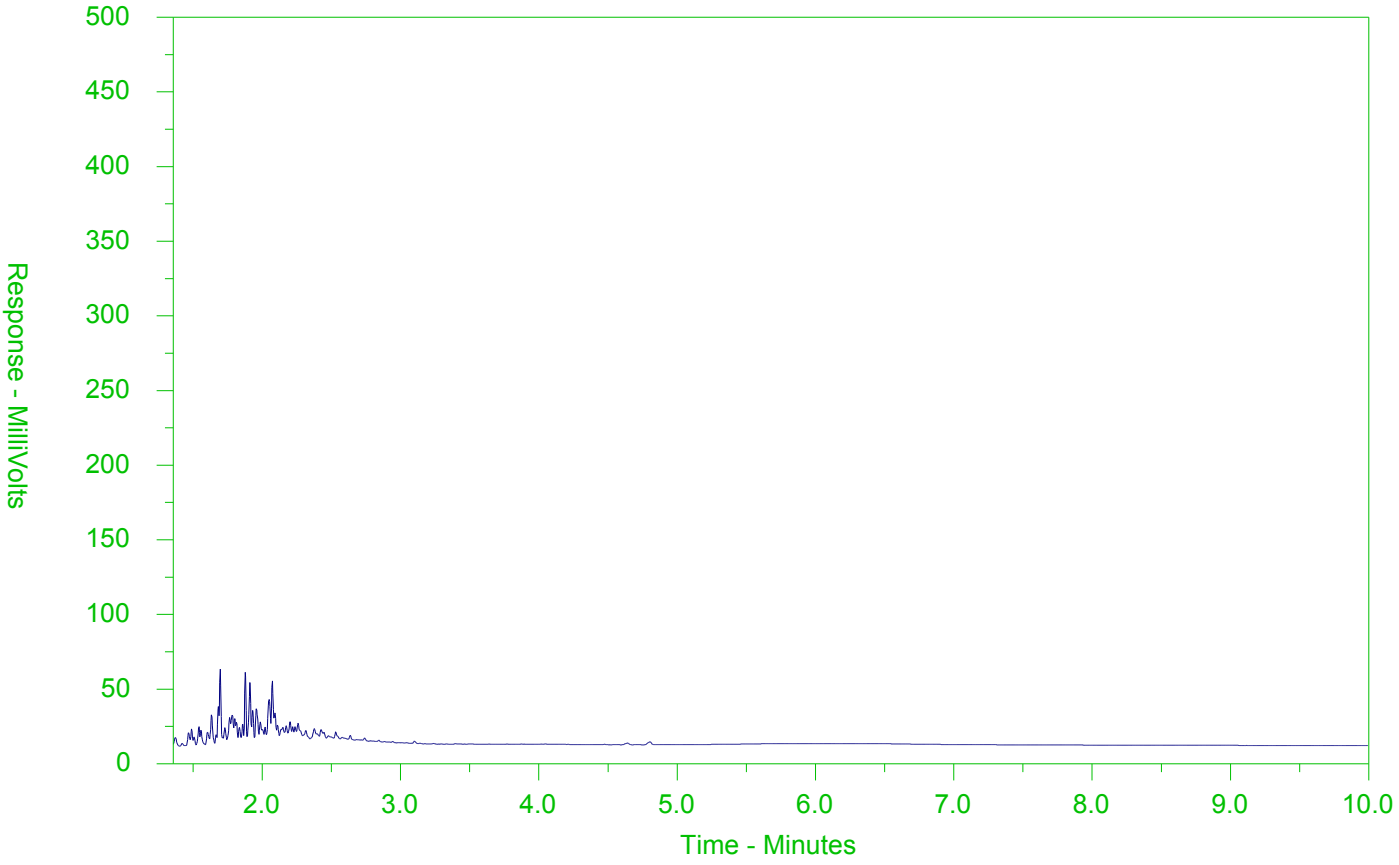
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-3
Client Sample ID: MW-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

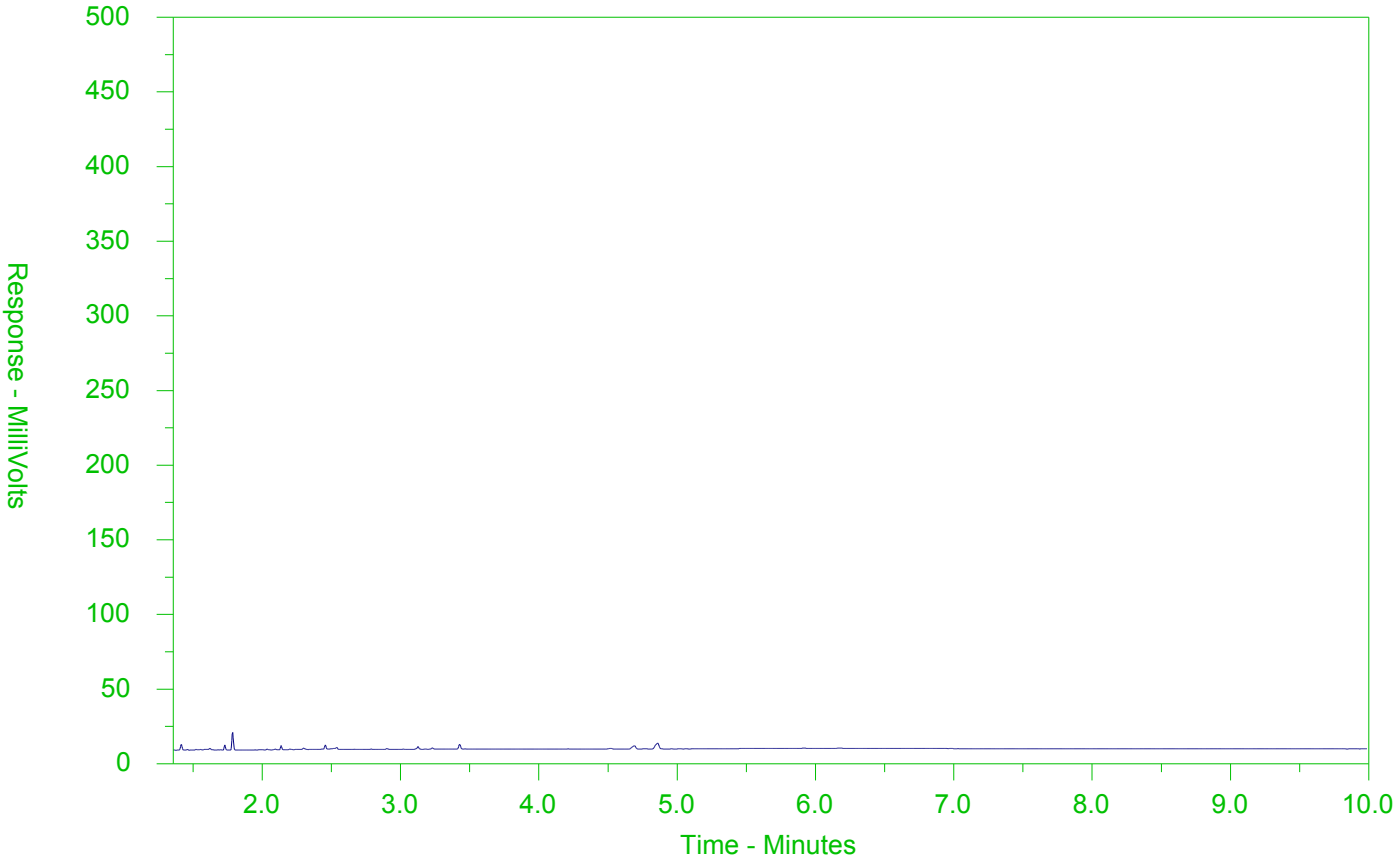
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-4
Client Sample ID: MW-4A



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

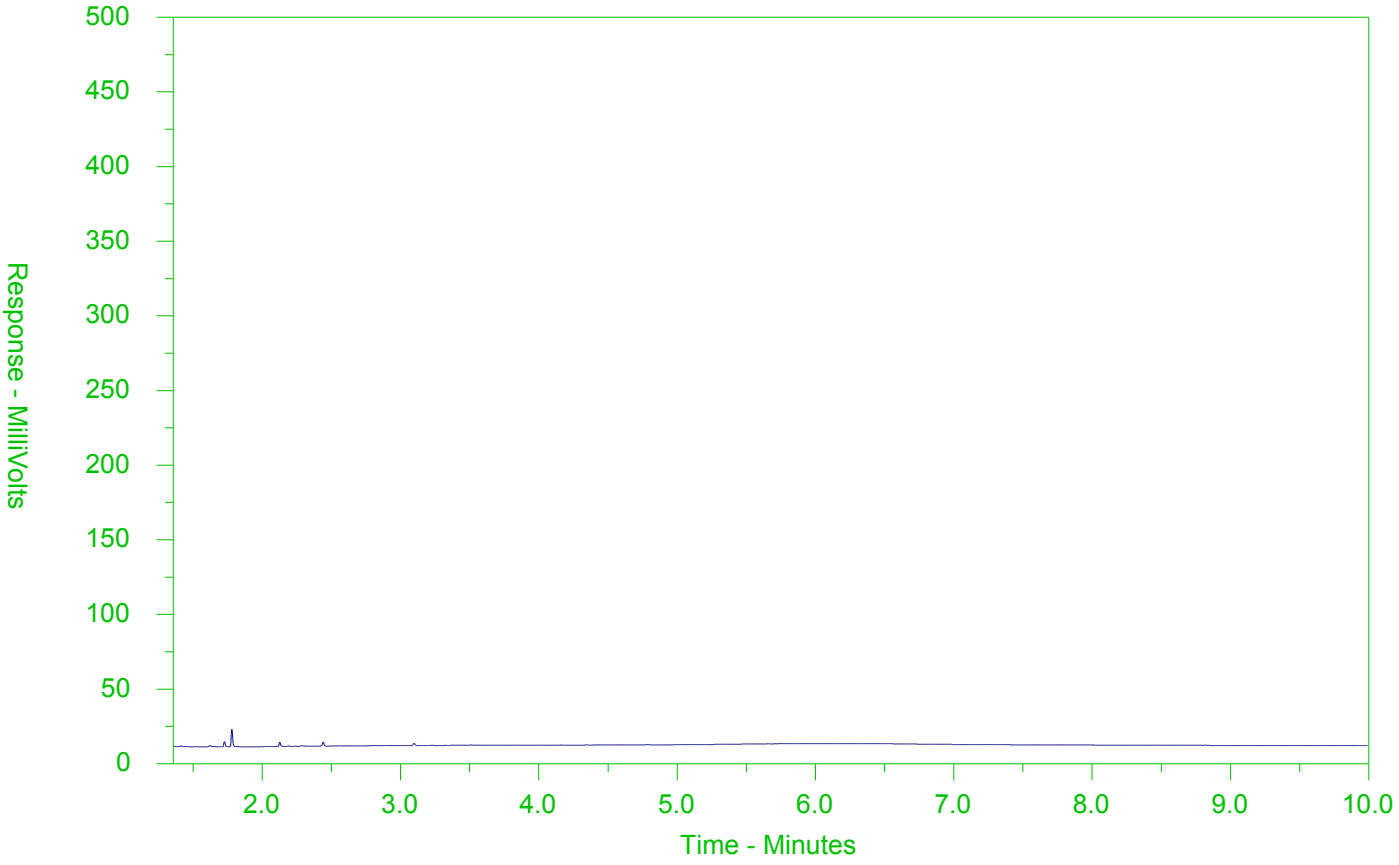
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-5
Client Sample ID: MW-4B



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

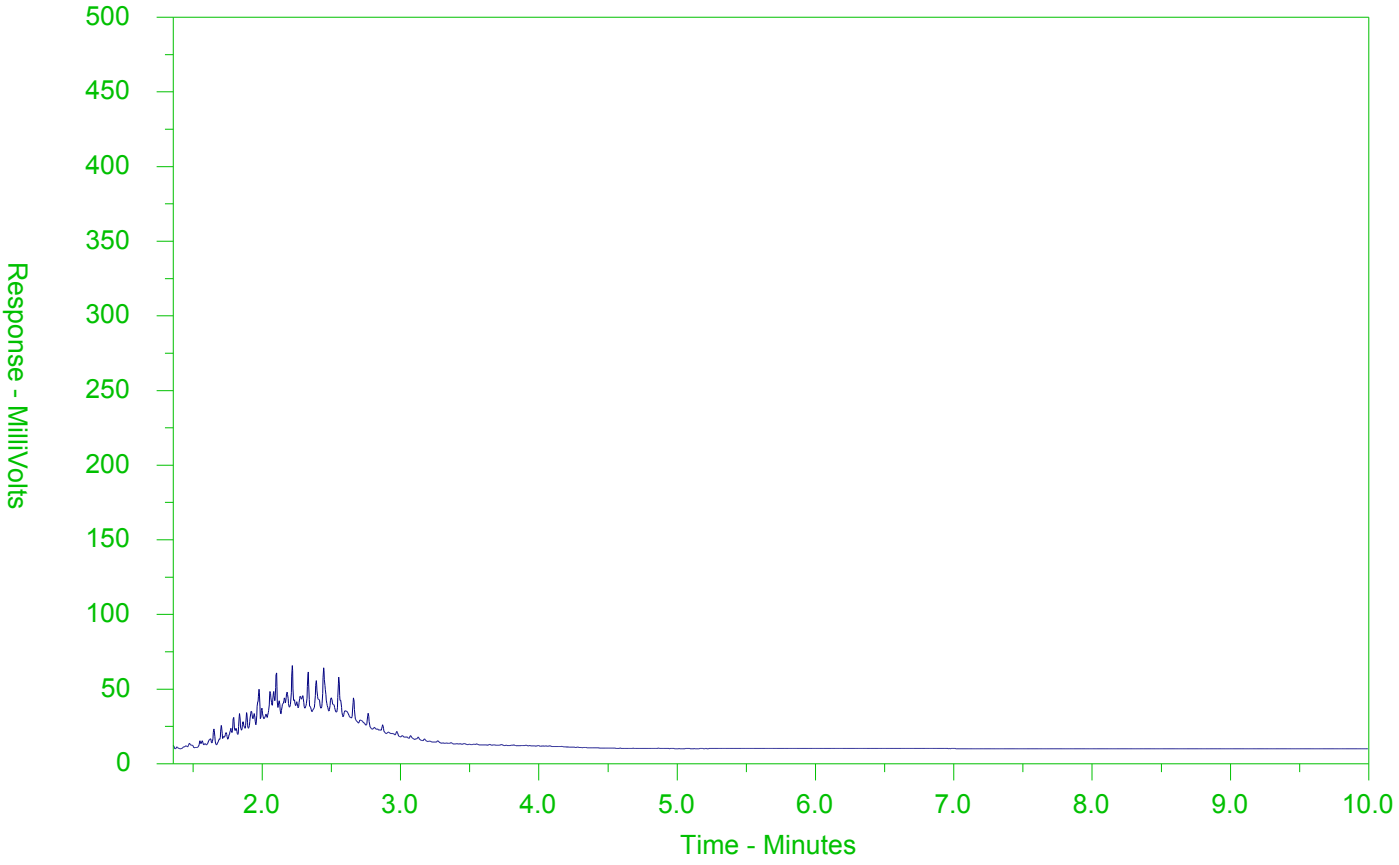
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-6
Client Sample ID: MW-6



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

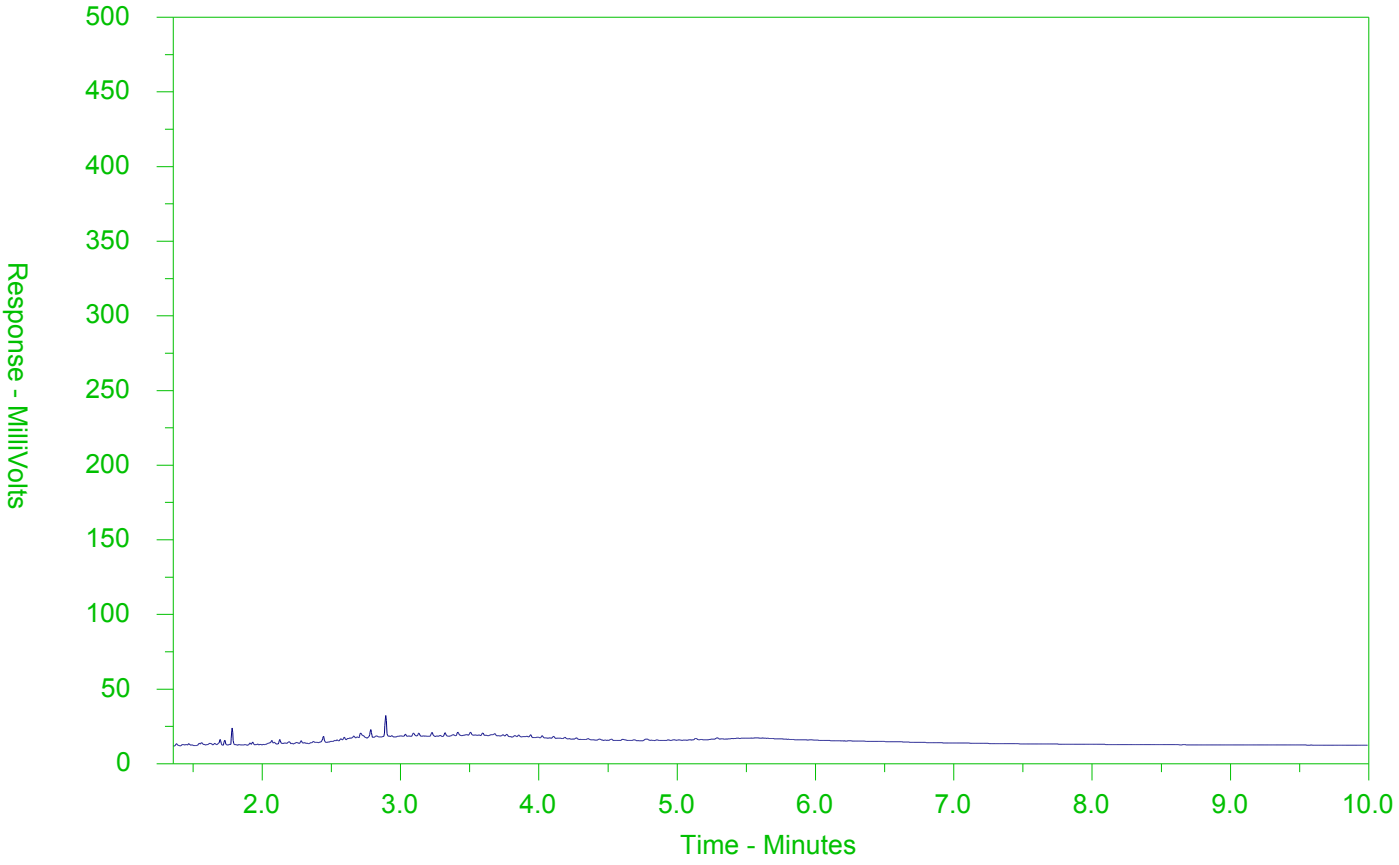
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-7
Client Sample ID: MW-7A



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

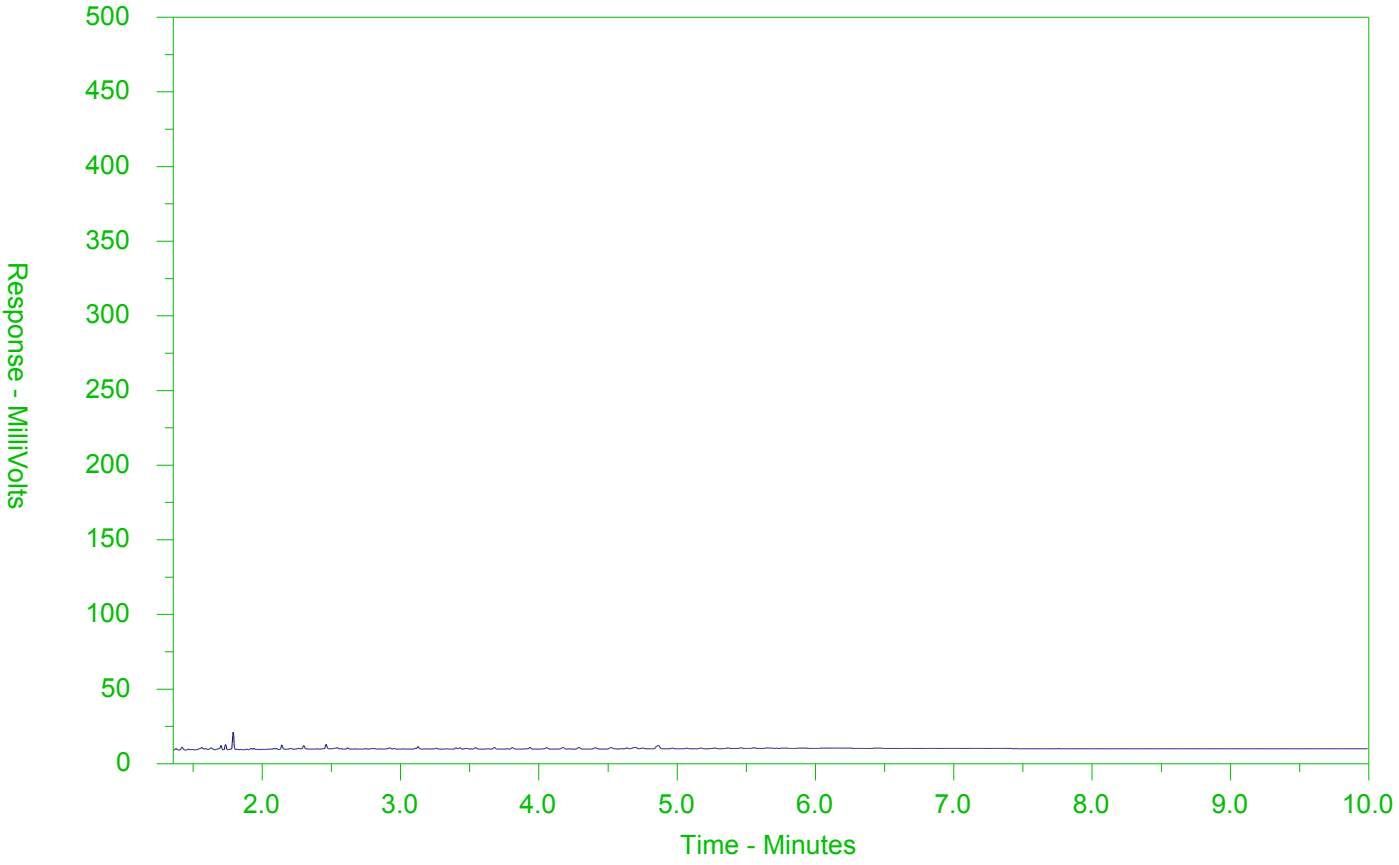
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2185953-8
Client Sample ID: MW-7B



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com
Canada Toll Free: 1 800 668 9878

L2185953-COFC

COC Number: 17
Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: laframboise.d@aquaforbeech.com
Email 2: cowlin.w@aquaforbeech.com
Email 3: bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Project Information

ALS Account # / Quote #: Q67885
Job #: MOHAWK LAKE
PO / AFE:
LSD:
ALS Lab Work Order # (lab use only): L2185953 COFC

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:
ALS Contact: Gayle Sampler:

...w - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐
EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	R511-INORGANICS-P-WT	TURBIDITY-WT	VOC-R511,F1-F4-P-WT BTEX	PAH-511-WT	FILTERS & SYRINGES	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	MW 1	23-10-18		Water	R	R	R	R				8
2	MW-1A	23-10-18		Water	R	R	R	R				8
3	MW-2	〃		Water	R	R	R	R				8
4	MW-4A	〃		Water	R	R	R	R				8
5	MW-4B	〃		water	↓	↓	↓	↓				8
6	MW-6	〃		water								8
7	MW-7A	〃		water								8
8	MW-7B	〃		water								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

-Need Report by Thursday Oct 25 2018

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			12.6		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
							Oct 23/2018	~~8:00~~ 19:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Appendix A-4 – Final Hydrogeological Assessment (Provided Under Separate Cover)

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A REPORT TO
AQUAFOR BEECH LTD.

HYDROGEOLOGICAL ASSESSMENT
MOHAWK LAKE CHARACTERIZATION STUDY

CITY OF BRANTFORD

REFERENCE NO. 1806-W012

MARCH 2020

DISTRIBUTION

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APPENDICES

1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. conducted a hydrogeological assessment for the characterization of Mohawk Lake and surrounding local vicinity, in the City of Brantford.

The subject site lies within the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The surface geological map of Ontario shows that the area has a complex mixture of glaciofluvial and glaciolacustrine native soil deposits, reworked by the present-day Grand River.

The subject site is located within Southern Grand River subwatershed of the Grand River Watershed.

A review of the local topography shows that the subject site has undulating relief, exhibiting a gentle decline in elevation relief towards Mohawk Lake.

The study has disclosed that beneath the existing layer of topsoil, or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits.

The findings of this study indicate that the groundwater level elevations range from 193.67 masl at the southern limits of the study area to 214.13 masl within the areas located north of Mohawk Lake. Review of the average groundwater elevations suggest that it flows in southerly and south-easterly directions, towards the Mohawk Lake and the adjacent canal.

The single well response tests (SWRT) provided estimated hydraulic conductivity (K) values for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s, the K estimate for the sand and silty clay unit is 1.5×10^{-5} m/s, the K estimate for the silty clay unit is 5.4×10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5×10^{-7} m/s, and the K estimate for the earth fill is 1.4×10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The above results suggest that the hydraulic conductivity for the groundwater-bearing soils at the depths of the well screens is low to high, with corresponding low to high groundwater seepage rates into open excavations, below the water table.

The Hazen Equation calculated permeability results derived from the soil grain size analysis indicates that the hydraulic conductivity (K) estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a depth of 4.57 mbgs at BH/MW 5 is 1.6×10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is

1.0×10^{-6} m/sec. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.

The Hazen Estimated hydraulic conductivity (K) results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. Given these, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.

The pressure transducer data loggers, which were installed within the groundwater monitoring wells in the vicinity of the Mohawk Lake indicates that the groundwater temperatures vary from 6.82 to 13.86º C. The warming and cooling trends reflects the annual seasonal cycle, with a cooling trend observed from November 2018, to late April 2019; after which a gradual warming trend was observed, extending to August 2019 during the summer months.

The logger data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations across the project areas.

Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

The areas north of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area. Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.

The data indicates that shallow groundwater showed a minimal response of about a 0.1 to 0.2 cm rise from the smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.

In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons compounds, which are associated with coal tar materials and waste and chlorides, indicating impacts from road salting.

2.0 INTRODUCTION

2.1 Project Description

In accordance with the authorization, dated May 24, 2018, from Mr. William Cowlin of Aquafor Beech Ltd., Soil Engineers Ltd. (SEL) conducted a hydrogeological assessment to characterize Mohawk Lake and local vicinity in support of the proposed Mohawk Lake Rehabilitation Program. The location of the subject site, the lake and study area are shown on Drawing No. 1.

2.2 Site History

The City of Brantford is located in southwestern Ontario, approximately 35 km from Hamilton, and 90 km from Toronto, both of which are located to the east and it is about 90 km from London to the west.

Brantford's economic development was spurned by the opening of the Grand River Navigation Company's canal that linked Brantford by water to the Welland Canal and to important cities like Buffalo, New York. In 1832 the Grand River Navigation Company began work on a system of canals, dams and locks along the Grand River in order to make the river navigable from Brantford down to Dunnville. The "Brantford Cut" or "Brantford Canal" was the final part of the system to be built and was opened to great fanfare in 1848. This canal brought freight and passengers right into Brantford's downtown and increased trade and attracted new businesses to the area. Beginning in the 1850s, Brantford was also quickly incorporated into the maze of rail-lines that soon linked it to places like Hamilton, Toronto, Port Dover, London, Buffalo, and Detroit.

Brantford's industrial development began in earnest in the 1850s with a host of new industries, including, foundries, stone ware factories, stove factories and various mills. From the 1870's to the 1890's Brantford became home to several significant agricultural equipment manufacturers. Starting in the early 1900's several of Brantford's industries built larger new factories on what became the Greenwich-Mohawk site.

The Greenwich-Mohawk site was a bustling industrial hub in what was a booming industrial city. But this all changed in the 1980's. Besides the social and economic problems of de-

industrialization in Brantford, there was also an environmental legacy: brownfield sites. Brownfields are defined as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination."

Over 36 hectares within the city were now abandoned and are considered contaminated post-industrial sites, or brownfields.

The Study Area, approximately 324 hectares in size, is located in the southeast corner of Brantford, adjacent to the north shore of the Grand River.

2.3 **Previous Investigations**

2.3.1 ***Union Gas Property***

In 1990, Terraqua Investigation Limited conducted detailed investigations on an abandoned coal gasification plant (Union Gas property), adjoining the Shallow Creek Park. This site was previously used as a waste disposal site for the former plant. Relatively thin discontinuous zone of coal tar was observed in their monitoring wells, along with ashes, cinders coal, bricks and spent oxides. The underlying silty clay deposits encountered were thought to restrict the mobility of coal tar materials.

2.3.2 ***Former Police Building***

In 1992, Waterloo Geoscience Consultants Ltd. conducted an environmental audit of the former police station lands, west of Shallow Creek Park. This included the drilling, monitoring well and installation, and monitoring of the groundwater monitoring wells. The investigations indicated that silty clay soil was encountered and coal tar and related contaminants were present throughout the site. It was indicated the granular soil deposits underlying the silty soil deposit beneath the fill are likely to be hydraulically connected with the Grand River and contaminant migration form the area may likely impact the surface water quality.

2.3.3 ***Shallow Creek Park Groundwater Investigation***

In 1992, Gore and Storrie Ltd., undertook an investigation which was aimed at characterizing the contaminants contained within the Shallow Creek Park, and to evaluate their potential impacts to the canal/lake system. The investigation included drilling, monitoring well installation, monitoring, testing and sampling of groundwater

monitoring wells, along with geophysical investigations. The investigation indicated that general groundwater flow direction is towards the southwest and that surface water elevations in the Eastward Creek were higher than the Lake water levels, indicating that the Eastward Creek is recharging of surface water to the subsurface (as a losing watercourse). In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons) compounds, which are characteristic of coal tar waste.

The geophysical investigations involving Electromagnetic (EM) surveys and Time Doman Electromagnetic (TDEM) soundings were conducted by Geomar Geophysics Ltd. (GGL), primarily to delineate the extent and nature of the contaminated zone beneath the study area. The survey was completed over the entire park area and to the east of Eastward Creek. The results indicated that the average soil electrical conductivity was very high and in the range of 5 mS/m, within most of the surveyed area. It was indicated that these high values indicate disturbed soils (i.e., fill material) with possible metal contamination and buried metallic objects.

Soil samples collected from boreholes located within the Union Gas property, indicated the presence of coal tar products, where the total detectable PAH concentrations of soil samples collected ranged from 19.5 to 12,600 parts per million (ppm). The predominant PAHs compounds present in the soil samples were typically phenanthrene, anthracene, naphthalene, acenaphthene, and pyrene, which indicates the presence of coal tar waste close to the Shallow Creek Parks' northern boundary.

In general, the groundwater across the entire site appears to have been impacted by polyaromatic hydrocarbon compounds which are characteristic of coal tar waste.

2.3.4 ***Mohawk Street Landfill Site***

The Town of Brantford initiated an annual groundwater and surface water monitoring program for the site. In 2016, WSP undertook the monitoring program, which included the installation of groundwater monitoring wells and establishment of surface water monitoring stations. The program has been expanded to include groundwater level monitoring, and sampling, and also sampling from pumping stations and selected groundwater monitors in the spring and fall of every year. The investigation indicated a groundwater interceptor trench has influenced the shallow groundwater table in the vicinity of Morrison Road where it flows, northerly towards the interceptor trench. It was indicated that leachate from the Landfill Site percolated down to the upper groundwater aquifer, where there is the potential for the contaminant plume within the

upper aquifer to move laterally below the landfill toward the Grand River and Morrison Road.

2.4 Remediation and Redevelopment

The City of Brantford has been working on a plan to revitalize the Mohawk Lake and Canal area for the last thirty years. Multiple plans have been created to reflect the communities' ideas in regard to land use in this area. The enhancement of the natural attributes and recreational usage of the Mohawk Lake area have consistently been a primary focus of both the community and the proposed plans. The Mohawk Lake Revitalization Plan developed in 1999 which aimed to restore the natural system and improve the recreational usage while respecting the cultural heritage of this site; this same goal is reflected in the Waterfront Master Plan.

Mohawk Lake and the surrounding parkland has been used for recreation for a few hundred years. After the construction of the canal, the water levels in the original wetland rose to form a pond, now Mohawk Lake. Recreational facilities include Mohawk Lake, Mohawk Park, and extensive pedestrian trails and circulation routes. The area has been used for both water-based and open space recreation. Past uses of Mohawk Park, include; the Brantford Street Electric Railway Station, an amusement park, as well as cycling competitions hosted on the first cinder bicycle track in Ontario. In the 1950's the canal ditch, west of Greenwich Street was backfilled creating Shallow Creek Park.

This report summarizes the initial findings of the field study and associated groundwater monitoring, providing a description and characterization of the hydrogeostratigraphy for the site and local surrounding area.

2.5 Project Objectives

The major objectives of this Hydrogeological Study Report are as follows:

1. Establish the local hydrogeological setting for Mohawk Lake and the surrounding areas;
2. Interpretation of shallow groundwater flow and runoff patterns;
3. Identify zones of higher groundwater yield as potential sources for ongoing shallow groundwater seepage;
4. Characterizing the hydraulic conductivity (K) for groundwater-bearing sub-soil strata;
5. Prepare an interpreted hydrostratigraphic cross-section across the subject site;

6. Evaluate the groundwater contribution to the Mohawk Lake and its environs.
7. Evaluate local groundwater quality for comparison evaluation against applicable provincial standards
8. Assess the fluctuation of shallow groundwater levels in response to local precipitation records.

2.6 **Scope of Work**

The scope of work for the Hydrogeological Study is summarized below:

1. Installation of ten (10) monitoring wells within the study area footprint;
2. Monitoring well development and groundwater level measurements at the ten (10) installed monitoring wells;
3. Performance of Single Well Response Tests (SWRTs) at the monitoring wells to estimate the hydraulic conductivity (K) for the groundwater-bearing subsoils at the depths of the well screens;
4. Describing the geological and hydrogeological setting for the site and surrounding local area;
5. Estimating the hydraulic conductivity (K) for the groundwater bearing subsoil strata, based on the SWRT results and from the soil grain size analyses.
6. Instrumentation of all monitoring wells with data loggers to monitor the shallow water table and any responses to precipitation received at the site
7. Characterizing the quality of shallow groundwater in the study area.
8. Evaluating the horizontal and vertical gradients for local groundwater to assess any losing or gaining status for local shallow groundwater relative to Mohawk Lake.

3.0 **METHODOLOGY**

3.1 **Borehole Advancement and Monitoring Well Installation**

The hydrogeological characterization study for Mohawk Lake included the drilling and installation of ten (10), 50- mm diameter PVC groundwater monitoring wells at seven (7) selected locations within the vicinity of Mohawk Lake and the associated study area. There are three (3) locations, where there is a shallow groundwater monitoring well installed adjacent to a deeper monitoring well, making them three (3) nested sets of groundwater monitoring wells. These proposed sets of nested wells were installed to assist with the determination of any vertical groundwater gradient in the vicinity of the lake, to determine if

there is groundwater discharge towards the Mohawk Lake, from the shallow aquifer, or if the lake loses water to recharge the shallow aquifer system.

These proposed wells were strategically placed to enable interpretation of a hydrogeostratigraphic profile across the lake area, and to determine background groundwater elevations, groundwater flow patterns, and to characterize the background shallow groundwater quality in the vicinity of the lake.

Borehole drilling and monitoring well construction were conducted on August 7, 8 and on September 4, 2018. The program comprised of the drilling of ten (10) boreholes (BH) and the installation of ten (10) monitoring wells, one in each of the (10) boreholes advanced beneath the site. The locations of the boreholes/monitoring wells are shown on Drawing No. 2. The groundwater monitoring well at BH/MW 5, was inadvertently knocked over by a vehicle between September 24, and October 25, 2018. A replacement well was installed on January 8, 2019. This replacement well is designated as BH/MW 5R.

The borehole drilling and monitoring well construction were completed by a licensed water well contractor, DBW Drilling Ltd., under the full-time supervision of a geotechnical technician from SEL, who also logged the soil sub-strata encountered during borehole advancement, and collected representative soil samples for textural classification. The boreholes were drilled using continuous flight power augers. Detailed descriptions of the encountered subsurface soil and groundwater conditions are presented on the borehole and monitoring well logs, on the enclosed Figures 1 to 10 inclusive.

The monitoring wells were constructed using 50-mm diameter PVC riser pipes and screens, which were and installed in each of the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were provided with monument-type protective steel casings and above the ground surface. The details of the monitoring well construction are provided on the enclosed Borehole Logs (Figures 1 to 10, inclusive).

The UTM coordinates at the borehole/monitoring well locations, together with the monitoring well construction details, are provided on Table 3-1.

Table 3-1 - Monitoring Well Installation Details

Well ID	Installation Date	UTM Coordinates		Monitoring Well Depth (mbgs)	Screen Interval (mbgs)	Casing Dia. (mm)
		East (m)	North (m)			
BH/MW 1S	August 7, 2018	562310	4776028	4.6	1.52-4.6	50
BH/MW 1D	August 7, 2018	562311	4776029	6.1	3.1-6.1	50
BH/MW 2	September 4, 2018	562333	4776272	6.1	3.1-6.1	50
BH/MW 3	August 7, 2018	562576	4776215	6.1	3.1-6.1	50
BH/MW 4S	August 7, 2018	563089	4776239	4.6	1.52-4.6	50
BH/MW 4D	August 7, 2018	563091	4776240	6.1	3.1-6.1	50
BH/MW 5/5R	August 8,2018* January 8,2019	562740	4775937	6.1	3.1-6.1	50
BH/MW 6	September 4,2018	562498	4775883	6.1	3.1-6.1	50
BH/MW 7S	August 8, 2018	562237	4775723	4.6	1.52-4.6	50
BH/MW 7D	August 8, 2018	562239	4775723	6.1	3.1-6.1	50

Notes:
mbgs -- metres below ground surface
* BH/MW 5 well destroyed and replaced on January 8, 2019

3.2 **Mapping of Ontario Water Well Records**

SEL received the Ministry of the Environment, Conservation and Parks (MECP) Water Well Records (WWRs) for the registered wells located at the subject site and within 500 m of the site boundaries (study area). The records indicate that seven hundred and eighty-eight (788) registered wells are located within the 500 m zone of influence study area. The well locations are shown on Drawing No. 7, and a summary of the WWRs reviewed for this study are listed in Appendix 'A'.

3.3 Groundwater Monitoring

The groundwater levels in the monitoring wells were measured, manually on September 24, October 25, November 22, December 21, 2018, and again on January 18, February 15, March 22, April 15, May 24, June 19, July 26, and August 22, 2019, to record the static and the seasonal groundwater table fluctuations.

A cluster of two mini-piezometers, consisting of a deep (D) and a shallow pipe installations unit (S), were installed at the BH/MWs 1, 4, and 7 locations, to monitor groundwater elevations and to determine the vertical hydraulic gradients relative to Mohawk Lake, and to assess groundwater contribution, if any, to Mohawk Lake.

Aquafor Beech installed one (1) automated data logger within each of the BH/MWs. These data loggers record the fluctuating groundwater levels and temperatures in the groundwater. The data loggers were used to record groundwater elevations and temperatures at fifteen (15) minutes intervals.

3.4 Monitoring Well Development and Single Well Response Tests

All of the deeper monitoring wells, except BH/MW 3, underwent development in preparation for single well response testing (SWRT) to estimate the hydraulic conductivity (K) for saturated subsoil strata at the depths of the monitoring well screens. Well development involved the purging and removal of several well casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the well screens, thereby improving the transmissivity of the saturated subsoil strata formation at the well screen depths.

The K values derived from the SWRT's provide an indication of the yield capacity for the groundwater-bearing soil strata, at the well screen depths, and can be used to estimate the flow of groundwater through the water-bearing subsoil strata.

The SWRT involves the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The rate at which the water level recovers to static conditions (falling head) is tracked using a pressure transducer data logger/, and/or manually using a water level tape. The rate at which the water table recovers to static conditions is used to estimate the K value for the groundwater-bearing strata formation at the well screen depth interval.

The SWRT could not be performed at BH/MW 3, due to the insufficient volume of groundwater within the well throughout the monitoring period.

The SWRT's were completed on October 25, 2019, and on June 19, 2019, with the results being provided in Table 6-2 and Appendix 'B'.

4.0 REGIONAL AND LOCAL SETTING

4.1 Regional Geology

The subject site lies within the Physiographic Region of Southern Ontario known as the Norfolk Sand Plain. The Norfolk sand plain is wedge shaped with a broad, curved base along the north shore of Lake Erie where it tapers northward to a point at Brantford on the Grand River. It includes the western half of the Regional Municipality of Haldimand-Norfolk (previously Norfolk County), the eastern end of Elgin County, southern Brant, and a small corner of Oxford, having a total an area of 3,136 square kilometres. The plain declines southward from about elevation 259 masl to the level of Lake Erie (174 masl) or from the west to the top of the shore cliff about 30.48 m or more above the lake.

The sands and silts of this region were deposited as a delta in the former glacial Lakes Whittlesey and Warren. A great discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta within the former lake, from west to east as the glacier withdrew. Thus, it covered most of the area west of the Galt Moraine. This and other moraines to the west are partly buried by sand; with some sections being entirely covered whereas other moraines still stand up about 15.24 to 22.86 m above the general ground level.

The drainage is through small rivers flowing directly into Lake Erie, except in a small area in the north which is tributary to the Grand River. These streams, the largest of which are; Otter Creek and Big Creek, have cut deep incised valleys across the sand plain, often about 22.86 to 30.48 m deep.

The surface geological map of Ontario shows that the area is a complex mixture of glaciofluvial and glaciolacustrine soil deposits, reworked by the present-day Grand River. Areas south of, and including Mohawk Lake and the canal are underlain by modern day alluvial sediments of the Grand River comprised of un-subdivided sand, silt, gravel clay and muck. Mohawk Lake and the canal almost form a boundary between the glaciolacustrine and older alluvial deposits to the north. Older alluvial terrace remnants, consisting of gravel and sand make up the southwest portion of the drainage area within the Brantford City core,

within a pocket on the north side of the canal, in the Glebe lands where it empties into Mohawk Lake. The latter location has had some aggregate extraction in the past, followed by landfilling activities.

The central and north areas of the drainage area located in the Brantford City core and areas on the north side of Mohawk Lake and the canal downstream of the lake are underlain by glacial-age Lake Warren and younger glaciolacustrine deep water deposits comprised of stratified to varved silt and clay with minor sand which are locally overlain by a veneer of sand, which is a pocked in the south central and peripheral areas in the northwest, north, northeast and east drainage areas are underlain by Lake Warren and younger glaciolacustrine sands with some silt of a shallow water and deltaic origin. Drawing No. 3, reproduced from Ontario Geological Survey (OGS) mapping, illustrates the Quaternary surface soil geology for the site and surrounding area.

The bedrock underlying the site is comprised, mainly of shale and dolomite belonging to the Salina Formation which is of Upper Silurian Age, which is underlain by dolostone of Guelph Formation. The bedrock surface elevation is at approximately 183.00 masl. (Bedrock Geology of Ontario, 1993).

4.2 **Physical Topography**

A review of the local topography shows that the subject site is undulating, exhibiting a gentle decline in elevation relief towards the Mohawk Lake. Surface runoff north of the Mohawk Lake is anticipated to also flow towards the lake. Surface runoff in areas south of the lake, generally flows in southerly direction.

As part of the Mohawk Lake Stormwater Management Study, (Gore and Storrie, 1995) it is indicated that about 82% of the annual lake inflow is surface runoff from the 755 ha area that drains to the West Canal and Lake via storm sewers and from East Ward Creek. The remaining 18% is baseflow and seepage from the groundwater table. Based on water budget computations, the annual volume of flow through Mohawk Lake is about 3,500,000 m^3, although it is suggested by the report that lake bed seepage loss was not considered. With the total Canal/Lake storage volume is estimated at 210,000 m^3. It was expected that larger events, such as the 5-yr event, could potentially displace the entire Lake volume.

Drawing No. 4 shows the mapped topographical contours for the site and surrounding area.

4.3 **Watershed Setting**

The study area is located within the Southern Grand River subwatershed of the Grande River Watershed. The Grand River has its headwaters near the town of Dundalk (Grey County) within one of the highest topographic elevations in Southern Ontario at 526 masl. It flows south for about 280 km to its mouth on Lake Erie at Port Maitland. The Grande River Watershed is the largest watershed in southern Ontario, and occupies an area of about 6,800 square kilometers. The Grand River has a dendritic drainage system with some major rivers such as the Conestoga, Nith, Speed and Eramosa. The Grand River is the predominant feature within Brantford, flowing from the northwest portion of the City in a southeasterly direction.

The central region of the watershed is the most populated, with large cities that include; Kitchener, Waterloo, Guelph, Cambridge and Brantford. A major challenge for the future is coping with significant population growth. Maintaining or even improving the quality of our waterways while conserving the natural heritage of wetlands, woodlands and wildlife habitat, will be a major challenge in light of these growth pressures.

Approximately 82% of the population of the Grand River watershed relies on groundwater as a clean, safe, domestic water supply. Groundwater resources are found within both bedrock and overburden aquifers. In addition to providing the population with a source of water, groundwater is also used in agriculture, industrial, and commercial operations.

There are 42 municipal supply systems within the Grand River watershed that rely on groundwater as a drinking water source. The systems are found in the following counties and cities: County of Grey (1 system), County of Dufferin (3 systems), County of Wellington (7 systems), County of Perth (1 system), City of Guelph (1 system), Regional Municipality of Waterloo (21 systems), County of Oxford (3 systems), County of Brant 4 systems) and City of Hamilton (1 system). Outside of municipal use, approximately 23,000 non-municipal domestic wells exist in the Grand River watershed. Of these wells, approximately 60% of these wells constructed in bedrock, and 40% are overburden wells. The bedrock wells for domestic uses, are located across the watershed; however domestic overburden wells, which are also located throughout the watershed, are found in clusters that correspond to the moraine features.

The Grand and Eramosa Rivers are valued as a municipal drinking water supply sources. Five communities rely on the river system as a source of drinking water: The Regional Municipality of Waterloo, City of Brantford, County of Brant (connected to the City of Brantford supply), Six Nations of the Grand River and City of Guelph.

The regional groundwater is interpreted to flow from the topographically higher elevations in the north towards the topographically lower elevations in the south. The Grand River and the most significant tributaries also have an influence on the shallow groundwater movement across the watershed.

While surface water quality has improved since the mid 1970's, there are frequent violations of dissolved oxygen in the central Grand and lower Speed Rivers. Routine monitoring indicates that total phosphorus levels in the upper basin are usually in compliance, but downstream total phosphorus levels usually exceed the PWQO. Groundwater quality within the basin has generally been impacted by manganese, nitrate, hardness and chloride, in which their concentrations typically exceeds the ODWQS.

Drawing No. 5 shows the location of the subject site within the Grand River Watershed and Southern Grande River Sub-watershed.

4.4 **Local Surface Water and Natural Features**

Mohawk Lake was constructed in the 1840's as part of the Mohawk Canal, located in the City of Brantford. The Mohawk Canal starts at Shallow Creek Park and continues to the Alfred Watts Hydro Generating Station Ruins at the Grand River, a federally recognized National Heritage River. The 4.8 km length canal is narrow and shallow with reinforced banks. Mohawk Lake is surrounded by trees with several small open areas that can be accessed for recreational purposes. The Mohawk Lake is shallow and has a surface area of approximately 13 hectares, with depths ranging from 1 to 3 m. Multiple stormwater management outlets are found along the canal, making stormwater runoff the primary water contribution source. Mohawk Lake's 839 ha drainage area is comprised of mainly of urbanized sub-catchments, including the Brantford neighbourhoods/districts of Lower Downtown, Colborne, and Mohawk Greenwich. The Six Nations owns 37 hectares of land directly on the north side of the lake, known as Glebe Farm No. 40B. The land directly adjacent to the south side of Mohawk Lake, and north of Six Nations Indian Reserve No. 40 are privately owned. The Grand River Conservation Authority (GRCA) owns the land abutting the Grand River. The City of Brantford owns the majority of the remaining adjacent lands.

The locations of the site and the noted natural features are shown on Drawing No. 6. The nearby wetlands shown on Drawing No.6, identified as other, have not been evaluated asbeing Provincially Significant.

5.0 SOIL LITHOLOGY

The study has disclosed that beneath the existing layer of topsoil, and earth fill materials, the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and assorted organics. The lithology for the previous BH/MW 5 were used to describe the lithology for the location of the replacement well BH/MW 5R. A Key Plan, and the interpreted geological cross-sections are presented on Drawing Nos. 8-1, 8-2A and 8-2B.

5.1 **Topsoil** (BH/MWs 1S, 1D, 2, 4S, 4D, 7S and 7D)

Topsoil, approximately 80 to 100 mm thick, was observed at the ground surface at the BH/MWs 1S, 1D, 2, 4S, 4D, 7S and 7D, locations.

5.2 **Earth Fill** (All BH/MWs)

Earth fill, was encountered beneath the topsoil layer, or at the ground surface at all of the BH/MW locations. The fill is generally brown in colour and consists of fine to medium grained sand, or silty sand having traces of gravel. At the BH/MWs 6, 7S and D, locations, the earth fill encountered was brown to black in colour, consisting of organics, sand and glass fragments which emitted a strong odour. The thickness of this fill unit generally ranges from 0.6 to 3.0 m. At BH/MW 7D, the earth fill was encountered at a depth of 0.1 mbgs where it extends to the maximum investigated depth of 6.5 m. A lower unit of earth fill was encountered at BH/MW 3, at a depth of 4.6 m. The fill unit is grey in colour, consisting of silty clay with some organics, and having a strong odour. This unit extends to the maximum investigation depth of 5.0 m at the BH/MW ,3 location.

5.3 **Silty Clay** (BH/MWs 1S, 1D, 2, 4S, 4D, 5 and 6)

Silty clay, was encountered at depths ranging from, 2.3 to 4.6 mbgs at BH/MWs 1S, 1D, 2, 4S, 4D, 5 and 6, locations. It is brown to grey in colour, is soft to stiff in consistency, having traces of sand and gravel, with traces of organic material and gravel. A lower unit of silty clay was encountered at a depth of 6.1 mbgs at the BH/MW 1D location. The thickness of the silty clay layer ranges from 0.1 to 2.3 m at BH/MWs 1S, 1D, 5 and 6 locations, where it extends to the maximum investigated depth of 6.5 m at the BH/MWs 2 and 4D, locations. The lower unit encountered in BH/MW 1D extends to the maximum investigated depth of 6.5 m. The moisture content for this silty clay unit ranges from 6% to 33%, indicating damp to very moist conditions.

5.4 **Silt** (BH/MWs 1S and 1D)

Silt, was encountered at a depth of 2.5 mbgs beneath the silty clay unit at the BH/MWs 1S and 1D locations. It is brown in colour and compact to dense in consistency. The unit is 2.1 m thick at BH/MW 1D, and at BH/MW 1S, it extends to the maximum borehole depth of 5.0 m. The moisture content for the sandy silt unit ranges from 17% to 19%, indicating moist conditions.

5.5 **Sandy Gravel (**BH/MW 5)

Sandy gravel, was encountered at a depth of 4.6 mbgs, beneath the silty clay unit at the BH/MW 5 location. It is brown in colour and is compact in consistency, having some silt with traces of clay. This unit extends to the maximum investigated depth of 6.5 m. The moisture content for the sandy gravel unit ranges from 20% to 23%, indicating moist conditions.

The estimated permeability for the sandy gravel unit encountered at BH/MW 5, at a depth of 4.57 mbgs is about 10^{-5} m/sec. Grain size analysis was performed on one (1) sample, and the gradation is plotted on Figure 11.

5.6 **Silty Sand** (BH/MWs 1D and 6)

Silty sand was encountered at depth of 4.6 mbgs, at BH/MWs 1D and 6 locations. It is brown to grey in colour, is loose to very loose in consistency, having a trace of clay. The unit is 1.5 m thick at BH/MW 1D where it extends to the maximum investigated depth of 6.5 m at the BH/MW 6, location. The moisture content for the silty sand unit ranges from 17% to 31%, indicating moist to very moist conditions.

The estimated permeability for the silty sand unit at BH/MW 6, at a depth of 6.1 mbgs is about 10^{-6} m/sec. Grain size analysis was performed on one (1) sample, and the gradation is plotted on Figure 12.

5.7 **Organics** (BH/MW 3)

A layer of organic material was encountered at a depth of 3.0 mbgs at the BH/MW 3 location. It is black in colour, and contains wood debris. It is approximately 1.6 m thick. The moisture content for the retrieved soil sample is 50%, indicating saturated conditions.

The sub- soils encountered indicate that the subsurface conditions in the area are complex due to the Quaternary glacial and post glacial processes and the depositional environments that were created by the Grand River in the vicinity.

The findings of this investigation and study, are consistent with the previous report by CH2MHill, 2014, which indicated that unconfined shallow aquifer comprised mainly of sand and gravel vary in thickness from 2.0 - 5.5 m, and extends to depths of 3.5 - 6.0 mbgs, is present beneath the site. The report indicated that underlying this shallow aquifer, are silty clay/clayey silt units, considered an aquitard, where vertical movement of groundwater is impeded. This aquitard unit is approximately 7 m thick, and separates the upper shallow aquifer from the lower aquifer, which is approximately 1 to 9 m thick, and consists of silt and silty sand units. This lower aquifer unit is further underlain by shaley dolostone, reported to be a part of the Salina Formation.

6.0 GROUNDWATER STUDY

6.1 Review of Ontario Water Well Records

The Ministry of the Environment, Conservation and Parks (MECP) water well records for the subject site and for the properties within a 500 m radius of the boundaries of the subject site (study area) were reviewed.

The records indicate that one hundred and seven hundred and eighty- eight (788) well records are located within the study area. The locations of these well records, based on the UTM coordinates provided by the records, are shown on Drawing No 7. Details of the MECP water well records that were reviewed are provided in Appendix ‘A’.

A review of the final status of the well records within the study area reveals that one (1) is registered as abandoned monitoring and test hole well, eighty-seven (87) wells are registered as abandoned other, one (1) well is registered as abandoned quality, five (5) are registered as abandoned supply wells, two (2) are registered as alteration wells, thirty-five (35) are registered as dewatering wells, fifty-four wells (54) are registered as monitoring and test holes. One hundred and ninety-one (191) are registered as observation wells, two (2) are registered as having other statuses, three (3) are registered as replacement wells, one hundred and sixty-one (161) are registered as test holes, thirty-six (36) are registered as water supply wells, and two hundred and ten (210) wells are registered as having unknown statuses.

A review of the first status of the well records within the study area reveals that six (6) are registered as commercial wells, four (4) wells are registered as being used for cooling and air conditioning, twenty-five (25) are registered as dewatering wells, twenty-two (22) are registered as domestic wells, eleven (11) wells are registered as being used for industrial purposes, one hundred and ninety one (191) are registered as monitoring wells, one hundred and two wells (102) are registered as monitoring and test hole wells, forty-eight (48) wells are registered as not being used, two (2) wells are registered as others, one(1) is registered as a public well, sixty-three (63) are registered as test hole wells, , and three hundred and thirteen (313) wells are registered as having unknown statuses.

6.2 **Groundwater Monitoring (Manual Readings)**

The groundwater levels in the monitoring wells were measured manually on twelve (12) occasions over the study period, on the following dates; September 18, October 25, November 22, December 21, 2018, and again on January 18, February 15, March 22, April 15, May 24, June 19, July 26, and August 22, 2019, to record the static and the seasonal groundwater table fluctuations. The water levels and corresponding elevations are given in Table 6-1.

Table 6-1 - Groundwater Level Measurements

Well ID		24-Sep-18	25-Oct-18	22-Nov-18	21-Dec-18	18-Jan-19	15-Feb-19	22-Mar-19	15-Apr-19	24-May-19	19-Jun-19	26-Jul-19	22-Aug-2019	Average	Fluctuation (m)
BH/MW 1S	mbgs	3.48	3.47	3.37	3.14	2.75	2.63	2.72	2.52	2.44	2.58	3.22	3.36	2.97	1.04
	masl	207.32	207.33	207.43	207.66	208.05	208.17	208.08	208.28	208.36	208.22	207.58	207.44	207.82	
BH/MW 1D	mbgs	3.70	3.64	3.51	3.27	3.00	2.69	2.90	2.61	2.52	2.64	3.40	2.94	3.07	1.18
	masl	207.05	207.11	207.24	207.48	207.75	208.06	207.85	208.14	208.23	208.11	207.35	207.81	207.68	
BH/MW 2	mbgs	4.72	5.25	4.00	3.65	3.31	4.12	2.72	2.36	2.65	2.94	2.81	4.55	3.59	2.89
	masl	211.77	211.24	212.49	212.84	213.18	212.37	213.77	214.13	213.84	213.55	213.68	211.94	212.90	
BH/MW 3	mbgs	>4.50	>4.50	>4.50	4.48	4.46	>4.50	>4.50	3.74	3.81	4.12	4.36	4.36	4.19	0.76
	masl	<207.07	<207.07	<207.07	207.09	207.11	<207.07	<207.07	207.83	207.76	207.45	207.21	207.21	207.31	
BH/MW 4S	mbgs	3.05	2.98	2.89	2.82	2.80	2.73	2.57	2.46	2.80	2.78	3.03	2.98	2.82	0.59
	masl	198.20	198.27	198.36	198.43	198.45	198.52	198.68	198.79	198.45	198.47	198.22	198.27	198.42	
BH/MW 4D	mbgs	3.07	3.03	2.94	2.86	2.84	2.75	2.71	2.49	2.83	2.82	3.05	3.02	2.87	0.58
	masl	198.25	198.29	198.38	198.46	198.48	198.57	198.61	198.83	198.49	198.50	198.27	198.30	198.45	
BH/MW 5/5R	mbgs	5.23	*	*	*	3.71	3.54	3.27	3.28	3.53	3.53	4.00	4.14	3.80	1.96
	masl	193.35	*	*	*	194.87	195.04	195.31	195.30	195.05	195.05	194.58	194.44	194.78	
BH/MW 6	mbgs	4.03	5.09	3.72	2.98	3.35	3.38	3.13	2.58	3.04	3.23	3.79	4.02	3.53	2.51
	masl	194.73	193.67	195.04	195.78	195.41	195.38	195.63	196.18	195.72	195.53	194.97	194.74	195.23	
BH/MW 7S	mbgs	3.57	3.58	3.57	3.52	3.51	3.51	3.49	3.46	3.45	3.47	3.56	3.58	3.52	0.13
	masl	195.72	195.71	195.72	195.77	195.78	195.78	195.80	195.83	195.84	195.82	195.73	195.71	195.77	
BH/MW 7D	mbgs	3.58	3.61	3.60	3.56	2.78	3.54	3.50	3.47	3.46	3.48	3.57	3.60	3.48	0.15
	masl	195.78	195.75	195.76	195.80	196.58	195.82	195.86	195.89	195.90	195.88	195.79	195.76	195.88	

Notes:
mbgs -- metres below ground surface
masl -- metres above sea level
* -- BH/MW 5 well destroyed between September 24, and October 25, 2018, and reinstalled on January 8, 2019

Table 6-2 - Summary of Manual Groundwater Elevations (October 2018 to October 2019)

Well ID	Minimum Groundwater Elevation (masl)	Maximum Groundwater Elevation (masl)	Average Groundwater Elevation (masl)
BH/MW 1S	207.32	208.36	207.82
BH/MW 1D	207.05	208.23	207.68
BH/MW 2	211.24	214.13	212.90
BH/MW 3	<207.07	207.83	207.31
BH/MW 4S	198.20	198.79	198.42
BH/MW 4D	198.25	198.83	198.45
BH/MW 5/5R	193.35	195.31	194.78
BH/MW 6	193.67	196.18	195.23
BH/MW 7S	195.71	195.84	195.77
BH/MW 7D	195.75	195.90	195.88

The general trend of the manual groundwater levels obtained during the monitoring period from September 24, 2018 to August 22, 2019, indicate the typical seasonal trend, whereby the groundwater levels are at their lowest during the late summer months of September and October 2018; the levels consistently increase after, to where they reach their highest levels during the spring months of April and May 2019.

6.2.1 Vertical Groundwater Gradient in the Vicinity of Mohawk Lake

BH/MWs 1S and 1D, 4S and 4D, and 7S and 7D, represent three (3) pairs of nested monitoring wells. BH/MWs 1S and D, are located north, and upgradient of Mohawk Lake, BH/MWs 4S and 4D, are located northeast of Mohawk Lake, and BH/MWs 7D and 7S, are located south and downgradient of Mohawk Lake. These nested wells were installed in the vicinity of Mohawk Lake, to assist in determining the vertical hydraulic gradients relative to Mohawk Lake, and to assess any groundwater contribution to the Lake. The potential recharge discharge areas can be delineated based on vertical differences in hydraulic head measurements as discussed below.

Although surface water features are typically associated with discharge features, surface water features such as the Mohawk Lake, sometimes recharge the underlying groundwater flow systems.

The groundwater levels recorded during the monitoring period indicated that the water table elevations in BH/MW 1S were higher than those recorded in the deeper nested monitoring well pair at BH/MW 1 D, on eleven (11) of the twelve (12) groundwater level monitoring events, throughout the monitoring period. This suggest that the local vertical gradient for groundwater is most often downward such that the shallower groundwater aquifer is recharging the deeper aquifer system. The groundwater levels measured in the deeper

nested well, BH/MW 1D was higher than that of the groundwater elevation in BH/MW 1S, on only occasion on August 22, 2019. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system, within the area north portion of the Mohawk Lake area, and that there is likely some groundwater contribution to the Mohawk Lake.

The groundwater levels recorded during the monitoring period indicated that the water table elevations in the deeper monitoring well BH/MW 4D were higher than those recorded in the shallower nested monitoring well pair at BH/MW 4S, on eleven (11) of the twelve (12) groundwater monitoring events, throughout the monitoring period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system. In March 22, 2019, a reversal in the groundwater gradient occurred whereby the shallow groundwater in BH/MW 4S was higher than levels observed in BH/MW 4D, and that the local vertical groundwater gradient for groundwater was interpreted as being downward such that the shallower groundwater aquifer is recharging the deeper aquifer system.

The groundwater elevation for the deeper monitoring well BH/MW 7D was consistently higher than that of the groundwater elevation in MP 7DS, on all of the monitoring events during the study period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system within the areas east and west of Mohawk Lake, and that there is likely groundwater recharge to Mohawk Lake from the deeper aquifer system.

6.2.2 **Shallow Groundwater Flow Pattern**

The shallow groundwater flow pattern was interpreted from the average of groundwater level measurements recorded in the BH/MWs. The measured levels indicate that shallow groundwater flows in southerly directions from an interpreted groundwater high area, located north of the Mohawk Lake. Groundwater flows south of the lake, is in a southerly direction. This data is consistent with those observed in the Gold Associates Report- 2010, which indicated that groundwater flow within the shallow aquifer was southwards, away from Mohawk Lake, and in the direction of the Grand River.

The interpreted shallow groundwater flow pattern for the site area is illustrated on Drawing No. 9.

6.3 Groundwater Monitoring-Logger Data - August 2018 to August 2019

Automated pressure transducer data loggers were installed in each of the ten (10) BH/MWs. The loggers were programmed to record the groundwater level elevations, and temperatures at fifteen (15) minutes intervals, from August 2018, to August 2019.

Daily precipitation record data was obtained and reviewed from the Wastewater Treatment Plant, which is the nearest weather station without significant interruptions for daily precipitation records. The station is located approximately 0.5 km south of Mohawk Lake, and is within the Southern Grand River Mohawk sub- watershed. The location of this station is shown on Drawing No.2. The local precipitation data was plotted against the interpreted groundwater level elevations, to assess the response times of the shallow aquifer to precipitation events. The monthly groundwater elevations and temperature variations are summarized on Tables 6-3 to 6-22 below, and the data is presented on Charts C-1 to C-10 in Appendix 'C'.

6.3.1 Groundwater Monitoring-Logger Data- BH/MW 1S

The logger data indicates that the monthly groundwater level elevations for BH/MW 1S, fluctuations range from a low of 207.11 masl to a high of 208.75 masl. The raw data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations. The monthly groundwater temperature data is summarized in Table 6-3 below, and is plotted on Chart C-1.

The groundwater level data was plotted against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, and is graphed on Chart C-1. The data indicates that shallow groundwater showed a moderate response of about 1 to 2 cm to smaller rainfall events, and during larger rainfall event, an increase of about 3 cm was observed in the groundwater levels.

Table 6-3 - BH/MW 1S Monthly Groundwater Level Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	208.26	208.27	208.26
September 2018	208.26	208.59	208.50
October 2018	208.39	208.74	208.51
November 2018	207.99	208.39	208.14
December 2018	207.16	207.99	207.47
January 2019	207.11	208.30	207.66
February 2019	207.77	208.75	208.22
March 2019	207.74	208.46	208.09
April 2019	208.06	208.26	208.19
May 2019	208.45	208.74	208.56
June 2019	208.10	208.52	208.31
July 2019	208.06	208.26	208.19
August 2019	207.11	207.64	207.32

Notes:
masl -- metres above sea level

6.3.2 **Groundwater Temperature -Logger Data- BH/W1 S**

The data logger records indicate that the average groundwater temperature for BH/MW 1S, range from 6.57 to 13.46° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from early November 2018, to late April 2019; after which a gradual warming trend was observed until August 2019 in the summer months.

The monthly groundwater temperature data is summarized in Table 6-4 and is plotted on Chart C-1.

Table 6-4 - BH/MW 1S Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.30	12.50	12.31
September 2018	12.30	12.98	12.70
October 2018	12.98	13.37	13.12
November 2018	12.50	13.46	12.97
December 2018	10.94	12.50	11.65
January 2019	9.28	10.94	10.02
February 2019	7.88	9.57	8.43
March 2019	6.98	8.38	7.47
April 2019	6.57	7.08	6.82
May 2019	6.98	7.88	7.43
June 2019	7.88	9.67	8.75
July 2019	9.67	10.85	10.33
August 2019	10.85	11.82	11.36

6.3.3 **Groundwater Monitoring-Logger Data - BH/MW 1D**

The data from the data logger installed in BH/MW 1D, indicates that the monthly groundwater level elevation fluctuations, range from a low of 205.12 masl in November 2018, to a high of 208.68 masl in May 2019. The raw data indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, then a gradual decrease in groundwater elevation to late August 2019.

The groundwater level data vs time was also plotted against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-2. The monitoring data indicates that shallow groundwater showed a minimal response of about 1 cm to smaller rainfall events, with the levels increasing by about 6 cm as recorded in direct response to larger rainfall events.

The monthly groundwater level elevations and temperature variations are summarized on Table 6-5 below.

Table 6-5 - BH/MW 1D Monthly Groundwater Level Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	207.43	207.47	207.45
September 2018	205.54	207.47	207.27
October 2018	205.13	207.45	207.24
November 2018	205.12	207.95	206.79
December 2018	205.13	207.82	207.64
January 2019	207.65	208.28	207.88
February 2019	207.68	208.61	208.16
March 2019	207.64	208.41	207.98
April 2019	207.89	208.25	208.11
May 2019	208.41	208.68	208.50
June 2019	208.21	208.48	208.34
July 2019	205.15	208.25	208.10
August 2019	207.11	207.53	207.32

Notes:
masl -- metres above sea level

6.3.4 **Groundwater Temperature -Logger Data - BH/W1D**

The groundwater temperatures in the vicinity of BH/MW 1D were monitored from August 2018, to August 2019. The data logger records indicate that the average groundwater temperature range from 7.38 to 12.01° C. The warming and cooling trend that was observed in the raw data, which reflects the annual seasonal cycle, with a cooling trend observed from early November 2018, to late April 2019; after which a gradual warming trend was observed until August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-6 and is plotted on Chart C-2.

Table 6-6 - BH/MW 1D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	10.55	10.85	10.56
September 2018	10.55	11.24	10.88
October 2018	11.24	12.01	11.47
November 2018	10.16	11.92	11.36
December 2018	11.24	11.82	11.63
January 2019	10.06	11.33	10.69
February 2019	8.58	10.46	9.34
March 2019	7.78	9.28	8.58
April 2019	7.38	8.48	7.79
May 2019	7.58	8.38	7.99
June 2019	8.28	8.98	8.63
July 2019	8.98	9.57	9.26
August 2019	9.57	10.26	9.89

6.3.5 **Groundwater Monitoring-Logger Data - BH/MW 2**

The data indicates that the monthly groundwater elevation for BH/MW 2, fluctuations range from a low of 210.73 masl to a high of 214.19 masl. The raw data, the logger data indicates that the monthly groundwater level elevations for BH/MW 2, fluctuations range from a low of 207.11 masl to a high of 208.75 masl. The raw data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation.

The groundwater level data was plotted against time and the precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-3. The data indicates that shallow groundwater showed a moderate response of about 1 to 2 cm to smaller rainfall events, and during larger rainfall events, an increase of about 4 to 5 cm was observed. The monthly groundwater elevations and temperature variations are summarized on Tables, 6-7 and 6-8, and the data is presented on Chart C-3 in Appendix ‘C’.

Table 6-7 - BH/MW 2 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	211.30	211.62	211.48
September 2018	210.89	211.79	211.65
October 2018	210.73	211.88	211.54
November 2018	211.87	212.70	212.37
December 2018	212.69	213.09	212.82
January 2019	212.86	213.19	212.97
February 2019	213.13	213.32	213.24
March 2019	213.10	213.98	213.57
April 2019	213.77	214.19	213.98
May 2019	211.30	211.62	211.48
June 2019	210.89	211.79	211.65
July 2019	210.73	211.88	211.54
August 2019	211.87	212.70	212.37

Notes:
masl -- metres above sea level

6.3.6 **Groundwater Temperature - Logger Data - BH/W2**

The groundwater temperatures in the vicinity of BH/MW 2 were monitored from August 2018, to August 2019. The data logger records indicate that the average groundwater temperature range from 7.28 to 12.21° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from November 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. Some fluctuations in temperatures were observed between late February 2019, and early May 2019.

Table 6-8 - BH/MW 2 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	10.94	11.24	10.95
September 2018	10.94	11.82	11.31
October 2018	11.14	12.21	11.87
November 2018	11.92	12.21	12.06
December 2018	10.94	12.01	11.56
January 2019	9.77	10.94	10.43
February 2019	9.08	9.77	9.42
March 2019	7.28	9.67	8.78
April 2019	7.28	8.68	7.72
May 2019	10.94	11.24	10.95
June 2019	10.94	11.82	11.31
July 2019	11.14	12.21	11.87
August 2019	11.92	12.21	12.06

6.3.7 **Groundwater Monitoring-Logger Data- BH/MW 3**

The groundwater levels in the BH/MW 3, often decreased to levels below the depth of the well, and were recorded as being dry during the summer months until March 2019. The logger data indicates that the monthly groundwater level elevations for BH/MW 3 fluctuations, range from a low of 207.58 masl to a high of 208.09 masl. The raw data, indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from March to May 2019, after which, there was a gradual decline in groundwater elevation, to where it decreased to below the bottom of the well for the remainder of the monitoring period. The groundwater level data was plotted against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, and is graphed on Chart C-4. The data indicates that shallow groundwater showed a moderate response of about 1 to 2 cm to smaller rainfall events, and during larger rainfall events, an increase of about 3 to 4 cm was observed. The monthly groundwater elevations and temperature variations are summarized on Tables 6-9, and 6-10, and the data is presented on Chart C-4 in Appendix ‘C’.

Table 6-9 - BH/MW 3 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	Groundwater Elevation Below the Bottom of the Monitoring Well		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019			
March 2019	207.58	207.69	207.58
April 2019	207.69	208.01	207.90
May 2019	207.81	208.09	207.98
June 2019	207.58	207.89	207.65
July 2019	Groundwater Elevation Below the Bottom of the Monitoring Well		
August 2019			

Notes:
masl -- metres above sea level

6.3.8 **Groundwater Temperature - Logger Data - BH/W3**

The automated data logger records indicate that the average groundwater temperature for BH/MW 3, range from 7.58 to 11.72° C. A cooling trend was observed from March 2018, to early May 2019; after which period, a gradual warming trend was observed to June 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-10 and is plotted on Chart C-4.

Table 6-10 - BH/MW 3 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	Groundwater Elevation Below the Bottom of the Monitoring Well		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019			
March 2019			
April 2019	6.98	9.47	7.97
May 2019	6.67	7.58	7.03
June 2019	7.58	9.18	8.41
July 2019	9.18	10.46	9.85
August 2019	10.36	11.72	11.02

6.3.9 **Groundwater Monitoring - Logger Data - BH/MW 4S**

The monthly groundwater elevations and temperature variations for BH/MW 4S, are summarized on Tables 6-11, and 6-12, below, and the data is presented on Chart C-5 in Appendix 'C'. The data indicates that the monthly groundwater elevation for BH/MW 4S, fluctuations range from a low of 198.10 masl to a high of 198.77 masl. The raw data, indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, then a gradual decrease in groundwater elevation to late August 2019.

Table 6-11 – BH/MW 4S Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	198.27	198.29	198.28
September 2018	198.17	198.30	198.24
October 2018	198.21	198.38	198.27
November 2018	198.32	198.65	198.40
December 2018	198.33	198.49	198.39
January 2019	198.30	198.50	198.38
February 2019	198.10	198.43	198.29
March 2019	198.17	198.55	198.31
April 2019	198.33	198.54	198.41
May 2019	198.32	198.77	198.52
June 2019	198.25	198.43	198.33
July 2019	198.33	198.54	198.41
August 2019	198.10	198.23	198.17

Notes:
masl -- metres above sea level

The groundwater level data was plotted against precipitation data collected from the Wastewater Treatment Plant, which located approximately 0.5 km south of Mohawk Lake, and is graphed on Chart C-5 The data indicates that shallow groundwater showed a moderate response of about 1 to 2 cm to smaller rainfall events, and during larger rainfall events, an increase of about 3 to 5 cm was observed.

6.3.10 **Groundwater Temperature - Logger Data - BH/W4S**

The data logger records indicate that the average groundwater temperature for BH/MW 4S, range from 9.18 to 19.85° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from September 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-12, and is plotted on Chart C-5.

Table 6-12 - BH/MW 4S Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	18.52	19.00	18.60
September 2018	18.62	19.85	19.35
October 2018	19.00	19.85	19.68
November 2018	17.00	19.19	18.13
December 2018	14.52	17.09	15.88
January 2019	12.79	14.71	13.78
February 2019	10.65	12.79	11.55
March 2019	9.28	10.85	10.09
April 2019	9.18	9.77	9.44
May 2019	9.57	11.33	10.32
June 2019	11.24	13.85	12.52
July 2019	13.75	16.52	15.20
August 2019	16.52	18.24	17.44

6.3.11 **Groundwater Monitoring - Logger Data - BH/MW 4D**

The monthly groundwater elevations and temperature variations for BH/MW 4D are summarized on Tables 6-1, and 6-14, and the data is presented on Chart C-5 in Appendix ‘C’. The data indicates that the monthly groundwater elevation for BH/MW 4D, fluctuations range from a low of 198.18 masl in September 2018, to a high of 198.88 masl in May 2019. The raw data, indicates that generally, there was a gradual increasing trend in groundwater elevation to May 2019, and afterwards there was a gradual decrease in groundwater elevations to late August 2019.

Table 6-13 - BH/MW 4D Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	198.25	198.28	198.26
September 2018	198.19	198.29	198.24
October 2018	198.24	198.39	198.28
November 2018	198.34	198.66	198.41
December 2018	198.35	198.51	198.41
January 2019	198.32	198.52	198.40
February 2019	198.31	198.65	198.50
March 2019	198.39	198.77	198.53
April 2019	198.55	198.76	198.63
May 2019	198.44	198.88	198.63
June 2019	198.32	198.55	198.43
July 2019	198.55	198.76	198.63
August 2019	198.18	198.30	198.24

Notes:
masl -- metres above sea level

The groundwater level data was plotted against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, and is graphed on Chart C-6. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.

6.3.12 **Groundwater Temperature - Logger Data - BH/W4D**

The data logger records indicate that the average groundwater temperature for BH/MW4 D, range from 9.77 to 20.42° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from September 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-14, and is plotted on Chart C-6.

Table 6-14 - BH/MW 4 D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	18.52	18.90	18.63
September 2018	18.62	20.42	19.27
October 2018	19.09	19.76	19.56
November 2018	17.19	19.19	18.28
December 2018	14.90	17.28	16.07
January 2019	12.98	14.90	13.97
February 2019	11.24	13.08	12.10
March 2019	9.97	11.33	10.65
April 2019	9.77	10.16	9.93
May 2019	9.97	11.63	10.65
June 2019	11.43	13.85	12.60
July 2019	13.65	16.33	14.99
August 2019	16.14	18.05	17.18

6.3.13 **Groundwater Monitoring - Logger Data - BH/MW 5 R**

An automated data logger was installed in BH/MW 5. The logger was programmed to record the groundwater temperature and elevations at fifteen (15) minutes intervals. The groundwater monitoring well at BH/MW 5, was inadvertently knocked over by a vehicle between September 24, and October 25, 2018. A replacement well, BH/MW 5 R, was installed on January 8,2019, and a data logger was installed in the replacement well on February 2, 2019.

The monthly groundwater elevations and temperature variations are summarized on Tables 6-15, and 6-16, and the data is presented on Chart C-7 in Appendix "C". The data indicates that the monthly groundwater elevation for BH/MW 4S, fluctuations range from a low of 194.18 masl in June 2019, and a high of 194.91 masl in May 2019; after which there was a gradual decrease in groundwater elevations.

Table 6-15 - BH/MW 5 R Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	Monitoring Well Destroyed, Replacement Well Installed on February 2, 2019		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019	194.35	194.54	194.42
March 2019	194.30	194.69	194.48
April 2019	194.56	194.69	194.63
May 2019	194.52	194.91	194.75
June 2019	194.18	194.65	194.41
July 2019	194.56	194.69	194.63
August 2019	193.68	193.85	193.75

Notes:
masl -- metres above sea level

The groundwater level data was plotted against time and against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-7. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.4 to 0.8 m was observed in the groundwater elevations, in response to larger rainfall events.

6.3.14 **Groundwater Temperature - Logger Data - BH/W5R**

The data logger records indicate that the average groundwater temperature for BH/MW 5R, range from 9.18 to 19.85° C. The warming and cooling trend that was observed in the raw data, reflects the annual seasonal cycle, with a cooling trend observed from February 2019, to between late May, and early June 2019; after which a gradual warming trend was observed to August 2019 in the summer months. The monthly groundwater temperature data is summarized in Table 6-16, and is plotted on Chart C-7.

Table 6-16 - BH/MW 5R Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	Monitoring Well Destroyed, Replacement Well Installed on February 2, 2019		
September 2018			
October 2018			
November 2018			
December 2018			
January 2019			
February 2019	12.11	12.21	12.14
March 2019	11.63	12.11	11.88
April 2019	11.04	11.63	11.36
May 2019	10.75	11.04	10.85
June 2019	10.75	11.24	10.85
July 2019	11.04	11.33	11.17
August 2019	11.33	11.72	11.53

6.3.15 **Groundwater Monitoring - Logger Data - BH/MW 6**

The monthly groundwater elevations and temperature variations for BH/MW 6, are summarized on Tables 6-17, and 6-18, and the data is presented on Chart C-8 in Appendix 'C'.

Table 6-17 - BH/MW 6 Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
September 2018	194.72	195.52	194.81
October 2018	194.55	195.74	194.93
November 2018	195.01	195.94	195.27
December 2018	195.13	195.89	195.31
January 2019	195.13	195.89	195.28
February 2019	195.12	195.42	195.31
March 2019	195.29	196.05	195.53
April 2019	195.92	196.13	196.02
May 2019	195.73	196.23	196.03
June 2019	195.28	195.93	195.57
July 2019	195.92	196.13	196.02
August 2019	194.73	194.94	194.82

Notes:
masl -- metres above sea level

The data indicates that the monthly groundwater elevations for BH/MW 6, fluctuations, range from a low of 194.55 masl in October 2018, to a high of 196.23 masl in May 2019, there was a gradual decrease in groundwater elevation to late August 2019. The raw data indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The groundwater level data was plotted against time and against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-8. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.

6.3.16 **Groundwater Temperature - Logger Data - BH/W 6**

The groundwater temperatures in the vicinity of BH/MW 6 were monitored from September 2018, to August 2019.

Table 6-18 - BH/MW 6 Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
September 2018	12.59	17.19	13.22
October 2018	11.72	16.43	13.86
November 2018	9.87	13.37	12.84
December 2018	9.97	13.08	12.33
January 2019	9.57	12.88	12.23
February 2019	12.30	12.79	12.43
March 2019	7.28	12.50	11.82
April 2019	7.48	11.24	9.52
May 2019	9.87	11.33	10.36
June 2019	10.46	11.53	10.84
July 2019	11.04	11.72	11.33
August 2019	11.53	11.92	11.77

The data logger records indicate that the groundwater temperature range from 7.28 to 17.19° C. The groundwater temperatures in BH/MW 6 fluctuated in the summer and winter months of 2018; it stabilized mid January 2019, to mid March 2019, and after declined to its lowest temperature of 7.28 ° C, in late March 2019. It afterwards, showed a gradual warming trend throughout the rest of the monitoring period. Fluctuation in temperature of up

to 4 ^{0}C was observed over the monitoring period. It is not clear as to the cause of these observed fluctuations, as in some instances, an increase in temperature appears to coincide with rainfall events, whereas in other cases it does not.

6.3.17 **Groundwater Monitoring - Logger Data - BH/MW 7S**

The logger data indicates that the monthly groundwater elevation for BH/MW 7S, fluctuations, range from a low of 195.66 masl in October 2018, to a high of 195.91 masl, in May 2019. The raw data, indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The monthly groundwater elevations and temperature variations are summarized on Tables 6-19, and 6-20, and the data is presented on Chart C-9 in Appendix 'C'.

Table 6-19 - BH/MW 7S Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2018	195.76	195.77	195.77
September 2018	195.71	195.78	195.76
October 2018	195.66	195.77	195.75
November 2018	195.72	195.78	195.75
December 2018	195.73	195.78	195.75
January 2019	195.70	195.79	195.75
February 2019	195.69	195.79	195.75
March 2019	195.73	195.82	195.77
April 2019	195.78	195.83	195.81
May 2019	195.84	195.91	195.88
June 2019	195.78	195.87	195.82
July 2019	195.78	195.83	195.81
August 2019	195.68	195.72	195.71

Notes:
masl -- metres above sea level

The groundwater level data was plotted against time and against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-9. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.3 to 0.4 m was observed in the groundwater elevations, in response to larger rainfall events.

6.3.18 Groundwater Temperature - Logger Data - BH/W 7S

The data logger records indicate that the groundwater temperature for BH/MW 7S, range from 11.14 to 14.42° C. A gradual warming trend observed from August 2018, to December 2019; a gradual cooling trend was observed to late May to early June 2019, after which a gradual warming trend was observed to the end of the monitoring period. The monthly groundwater temperature data is summarized in Table 6-20, and is plotted on Chart C-9.

Table 6-20 - BH/MW 7S Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.69	12.98	12.70
September 2018	12.69	13.46	13.05
October 2018	13.46	14.04	13.72
November 2018	13.94	14.23	14.09
December 2018	13.85	14.42	14.04
January 2019	13.37	13.94	13.65
February 2019	12.69	13.37	12.96
March 2019	11.72	12.69	12.12
April 2019	11.33	11.82	11.54
May 2019	11.14	11.33	11.21
June 2019	11.24	11.24	11.16
July 2019	11.24	11.72	11.43
August 2019	11.72	12.30	12.00

6.3.19 Groundwater Monitoring - Logger Data - BH/MW 7D

The monthly groundwater elevations and temperature variations for BH/MW 7D, are summarized on Tables 6-21 and 6-22, and the data is presented on Chart C-10 in Appendix ‘C’.

Table 6-21 - BH/MW 7D Monthly Groundwater Elevations - (Data Logger Records)

Month-Year	Minimum(masl)	Maximum (masl)	Average (masl)
August 2019	195.75	195.76	195.75
September 2018	195.73	195.77	195.75
October 2018	195.71	195.76	195.74
November 2018	195.73	195.79	195.76
December 2018	195.73	195.78	195.75
January 2019	195.72	195.79	195.76
February 2019	195.70	195.79	195.76
March 2019	195.75	195.83	195.79
April 2019	195.81	195.91	195.85
May 2019	195.85	195.93	195.89
June 2019	195.80	195.88	195.84
July 2019	195.81	195.85	195.83
August 2019	195.71	195.74	195.73

Notes:
masl -- metres above sea level

The data indicates that the monthly groundwater elevation for BH/MW 7D, fluctuations, range from a low of 195.70 masl to a high of 195.91 masl. The raw data, indicates that the groundwater elevation was relatively stable, with minor fluctuations throughout the monitoring period.

The groundwater level data was plotted against time and against precipitation data collected from the Wastewater Treatment Plant, which is located approximately 0.5 km south of Mohawk Lake, with the associated data being graphed on Chart C-10. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.

6.3.20 **Groundwater Temperature - Logger Data - BH/W 7D**

The data logger records indicate that the groundwater temperature for BH/MW 7D, range from 11.63 to 13.37° C. A gradual warming trend observed from August 2018, to December 2019; a gradual cooling trend was observed to late May to early June 2019, after which a gradual warming trend was observed to the end of the monitoring period. The monthly groundwater temperature data is summarized in Table 6-22, and is plotted on Chart C-10.

Table 6-22 - BH/MW 7D Monthly Temperature Data Variation (monthly) - Data Logger Records

Month-Year	Groundwater Temperature Minimum (^{0}C)	Groundwater Temperature Maximum (^{0}C)	Groundwater Temperature Average (^{0}C)
August 2018	12.21	12.40	12.21
September 2018	12.21	12.79	12.37
October 2018	12.50	13.08	12.77
November 2018	12.98	13.27	13.08
December 2018	13.17	13.37	13.28
January 2019	13.27	13.37	13.31
February 2019	12.88	13.37	13.11
March 2019	12.40	12.88	12.64
April 2019	12.01	12.40	12.31
May 2019	11.72	12.01	11.86
June 2019	12.21	12.21	11.71
July 2019	11.63	11.92	11.77
August 2019	11.82	12.01	11.95

6.4 Vertical Groundwater Gradient in the Shallow Aquifer in the Vicinity of Mohawk Lake - Comparison of Groundwater Logger Data (August 2018 to August 2019)

A comparison of the automated pressure transducer data for BH/MWs 1S, and 1D, indicates that the groundwater table elevations in BH/MW 1S, were higher than those recorded in the deeper nested monitoring well pair at BH/MW 1-D, for much of the monitoring period. This suggest that the local vertical gradient for groundwater is most often downward, such that the shallower groundwater aquifer is recharging the deeper aquifer system. The groundwater levels measured in the deeper nested well, BH/MW 1D, were higher than the groundwater elevations in BH/MW 1S, during the period, from late October through to early November 2018, and again from June through to early July 2019. These occasions coincide with periods of low or declining rainfall, during the fall and summer months.

The general trend indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system. This observation agrees with those observed in the manual groundwater level elevations, suggesting that the groundwater north of Mohawk Lake is has a downward vertical gradient. A comparison in groundwater level elevations, between the logger data for BH/MW 1S and 1D is provided on Chart C-11.

Previous studies by Gore and Storrie, 1995, indicate that groundwater discharge occurs from the north slope of the Glebe property and Mohawk Park via surface seeps, which is expected to contribute about 18% of its annual inflow in the form of baseflow and seepage to the Mohawk Lake. This study agrees with the current one, in that there is indication of groundwater flow contribution to Mohawk Lake, it however indicates that the contribution to the Lake is relatively small.

The groundwater levels recorded during the monitoring period indicated that the groundwater level elevation in both the deeper and shallow monitoring wells for BH/MW 4S and 4D, were similar, where the differences in elevations varying from 0.03 to 0.05 m. The groundwater elevations in the deeper monitoring well, BH/MW 4D, were consistently slightly higher than those in the shallower monitoring wells BH/MW 4S between late January through to early February 2019. There was a noted difference in groundwater level elevation, where the deeper groundwater levels were consistently higher than those of the shallower aquifer. This trend continued to the end of the monitoring period. The manual groundwater measurements also agree with the logger data, which indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system. A chart showing the comparison in groundwater elevations, between the logger data for BH/MW 4S and 4D is provided on Chart C-12.

The groundwater elevations for both deep and shallow monitoring wells, BH/MWs 7S and D, were similar for both wells. The elevations in the deeper monitoring well BH/MW 7D were however consistently slightly higher than the groundwater level elevations in MP 7S, during the study period. This indicates that the groundwater from the deeper aquifer is recharging the shallower aquifer system within the areas east and west of Mohawk Lake, and that there is likely groundwater recharge to Mohawk Lake from the deeper aquifer system.

The vertical groundwater gradient migration is important where the dominant groundwater migration pattern is downward which can provide a pathway for contaminants that originate at the ground surface into the underlying aquifer. The areas north of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area.

Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D

and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.

Whereas there was evidence of groundwater flow contribution to Mohawk Lake, during the monitoring period, the areas of discharge to the Lake, and the quantification of these flows, could not be conclusively determined from this study.

6.4.1 Groundwater Temperature

Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.

Large fluctuations in groundwater temperatures of up to 6^0 C, were noted in BH/MW 6, during summer, winter, and spring. There is the possibility that these increases could be associated with rainfalls events. This however could not be conclusively determined, as there were periods where the increase in rainfall events were accompanied by either an increase or a decrease in groundwater temperature.

6.4.2 Groundwater Response to Rainfall Events

The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm rise to smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.

Maximum increases in the groundwater levels, of up to 0.6 cm and 0.8 cm, were observed at BH/MWs 1D and 5 respectively, in response to larger rainfall events. The observed higher responses to rainfall events within these monitoring wells, could be attributed to the sandy gravel and silty sand sub-soil layers encountered within the areas where these wells are located and screened. These subsoils are anticipated to have a higher permeability, and hence facilitate preferred pathways for rainfall recharge. The rapid response of the groundwater levels to rainfall events suggests that direct recharge takes place within the earth fill, silty clay and sandy sub-soils encountered beneath the study area, strongly suggesting that the shallow aquifers within the study area are unconfined. The groundwater levels typically rise in response to the annual spring rainy season, followed by discrete peaks that correlate to periodic storms received during the rainy season. Seasonal high groundwater levels occur as multiple peaks or as a broad highs that coincides with extended

periods of rainfall. The groundwater levels begin to decline in late spring as rainfall diminishes, and continue to fall during the dry summer months.

6.4.3 Single Well Response Test Analysis

All of the deeper BH/MWs except BH/MW 3, underwent single well response tests (SWRTs) to assess the hydraulic conductivity (K) for saturated shallow aquifer sub-soils at the depths of the well screens. The SWRT could not be performed at BH/MW 3, due to the insufficient volumes of groundwater within the wells throughout the monitoring period.

The results of the SWRTs are presented in Appendix 'B', with a summary of the findings shown in Table 6-23.

Table 6-23 - Summary of SWRT Results

Well ID	Ground El. (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Screened Sub-Soil Strata	Hydraulic Conductivity (K) (m/sec)
BH/MW 1D	210.75	6.1	6.5	3.1-6.1	Silt, Silty Sand/Silty Clay	4.4×10^{-8}
BH/MW 2	216.49	6.1	6.5	3.1-6.1	Sand/ Silty Clay	1.5×10^{-5}
BH/MW 4D	201.32	6.1	6.5	3.1-6.1	Silty Clay	5.4×10^{-6}
BH/MW 5R	198.58	6.1	6.5	3.1-6.1	Silty Clay/Sandy Gravel	2.5×10^{-7}
BH/MW 6	198.76	6.1	6.5	3.1-6.1	Silty Clay/Silty Sand	4.1×10^{-5}
BH/MW 7D	199.36	6.1	6.5	3.1-6.1	Earth Fill	1.4×10^{-6}

Notes
mbgs -- metres below ground surface
masl -- metres above sea level
- -- Test not done due on BH/MW 3, due to insufficient volume of water within the well.

As shown above, the K estimates for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s, the K estimate for the sand and silty clay unit is 1.5×10^{-5} m/s, the K estimate for the silty clay unit is 5.4×10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5×10^{-7} m/s, and the K estimate for the earth fill is 1.4×10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The above results suggest that the hydraulic conductivity for the groundwater-bearing sub-soils at the depths of the well screens is low to high, with corresponding low to high groundwater seepage rates being anticipated into open excavations, below the water table.

6.4.4 Assessment of Hydraulic Conductivity Based on the Hazen Equation

The Hazen Equation method was also adopted to estimate the hydraulic conductivity (K) for different subsoil layers which may contain high groundwater levels during the seasonal (spring) period, or if encountered within the deeper excavations. These layers are primarily above the well screen depths.

The Hazen Equation method relies on the interrelationship between hydraulic conductivity and effective soil particle grain size, d_{10}, (mm) for the sub-soil media. This empirical relation predicts a power-law relation with K, as follow:

$$K = Ad_{10}^2$$

where;

d_{10}: Value of the soil grain size gradation curve (mm) as determined by sieve analysis, whereby 10% by weight of the soil particles are finer and 90% by weight of the soil particles are coarser.

A: Coefficient; it is equal to 1 when K is in m/sec and d_{10} is in mm

The Hazen Equation K estimation provides an indication for the yield capacity for groundwater-bearing subsoil strata at the depths where the soil samples that underwent grain size analyses were collected. The calculated results indicate that the K estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a depth of 4.57 mbgs at BH/MW 5 is 1.6 x 10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is 1.0 x 10^{-6} m/sec.

The results of the Hazen method determined K estimates are provided in Table 6-24 below. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.

Table 6-24 - Summary of Hazen Equation Estimated K Results

Well ID	Sample Depth (mbgs)	Sample El. (masl)	Description of Soil Strata	$D_{10\ (mm)}$	Hydraulic Conductivity (K) (m/sec)
BH/MW 5	6	194.01	Sandy Gravel, some silt, and a trace of clay	0.04	1.60 x 10^{-5}
BH/MW 6	6.1	192.66	Silty sand, a trace of clay	0.01	1.0 x 10^{-6}

Notes: mbgs -- metres below ground surface masl -- metres above sea level

The Hazen Estimated K results indicate moderate to high permeability for the sand, silty sand, and sand subsoil units. The results of the SWRT are in agreement with the Hazen Estimated K results, and also indicate moderate to high permeability for the underlying subsoils. The K estimates for the underlying subsoil comprising of sand silt, and gravel were notably higher than subsoils comprised of silty clay. Given these, and the relatively high groundwater elevations in the area, the shallow aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.

7.0 GROUNDWATER QUALITY MONITORING

One (1) groundwater sample was collected for analysis from each of the following monitoring wells; the BH/MWs 1S, 1D, 2, 4S, 4D, 6, 7S, and 7, by Aquafor Beech Ltd., on October 23, 2018. Groundwater samples were not collected from BH/MW 3, due to the insufficient volume of groundwater within the well throughout the monitoring period. Groundwater samples were also not collected from BH/MW 5 well, as this well was destroyed during the groundwater sampling programme. Some of the samples underwent field filtration during collection, prior to analyses for Metals.

The laboratory reported results from monitoring well samples which were compared to both the Ontario Drinking Water Quality Standards (ODWQS) and the Provincial Water Quality Objectives (PWQO) that relate to surface water. Surface water criteria was considered since shallow groundwater discharges to watercourses and waterbodies, and thus contributes to the surface water quality. Detailed laboratory reports are provided in the Appendix D and a summary of the exceedances are provided in Tables 7-1 and 7-2 below.

The following table summarizes exceedances of the ODWQS.

Table 7-1 - Exceedances of the Ontario Drinking Water Quality Standards

Parameter	Standard & Type	Reported Results (ug/L)		
		BH/MW 6	BH/MW 7S	BH/MW 7D
Barium	1,000 - MAC			1,160
Sodium	200,000- AO	525,000	310,000	289,000
Benzo (a) pyrene	0.01- MAC			0.048

Notes:
MAC- Maximum Acceptable Concentration
AO - Aesthetic Objective

Table 7-2 - Exceedances of the Provincial Water Quality Objectives

Parameter	Standard & Type	Reported Results (ug/L)				
		BH/MW 1S	BH/MW 2	BH/MW 6	BH/MW 7S	BH/MW 7D
Anthracene	0.0008 – Interim PWQO		0.041	0.062	0.029	0.147
Benzo(a)anthracene	0.0004- Interim PWQO		-	-	-	0.182
Boron	200- Interim PWQO				200	240
Chromium	1	1.39				
Benzo(g,h,i)perylene	0.00002-Interim PWQO		-	-	-	0.034
Benzo(k)fluoranthene	0.0002- Interim PWQO		-	-	-	0.041
Chrysene	0.0001- Interim PWQO		-	-	-	0.241
Fluoranthene	0.0008- Interim PWQO		-	0.027	0.053	0.475
Fluorene	0.2- Interim PWQO		1.43	0.319	0.207	0.336
1-Methylnaphthalene	2- Interim PWQO		6.55	-	-	-
2-Methylnaphthalene	2- Interim PWQO		2.54	-	-	-
Phenanthrene	0.03 – Interim PWQO		0.655	0.536	0.304	1.05

Groundwater quality at 3 of the BH/MWs locations, exceeded the Ontario Drinking Water Quality Objectives for 3 parameters (sodium, Barium and Benzo (a) pyrene), as shown in the above summary Table 7-1. Groundwater quality at 5 of the BH/MWs locations, exceeded the Provincial Water Quality Objectives for 12 parameters, as shown in the above summary table provided in Table 7-2. These wells are located both south and north of Mohawk Lake. The parameters exceeding the PWQO, mainly included; Polycyclic Aromatic Hydrocarbons (PAH's), which are associated with the coal tar materials and associated waste, along with sodium which also exceeds the ODWQ standards.

BH/MWs 1, 2 and 3, are located north of Mohawk Lake, and was thought to provide an ideal reference for natural groundwater quality in the upper aquifer. The results from BH/MW 2, however indicate that the water quality encountered within this well has also been impacted by PAHs. The source of this contamination appears to be localized, and only within the area of BH/MW 2, as PAHs were not detected within the groundwater encountered at BH/MWs 1S and D, which are located downgradient of BH/MW 2. Further investigations would be required to determine the contaminant source, and to determine whether this has impacted the surface water quality in the Mohawk Lake.

It was noted that groundwater quality in the shallow aquifer in the wells upgradient of Mohawk Lake was generally observed to be of a better quality than those observed in the wells located south of the lake, where there were only several exceedances in chromium and PAH's, observed in BH/MW s 1S, and 2 respectively. No exceedances of PWQO or ODWQ parameters were observed in the groundwater quality at BH/MW 1D, during the sampling event. This well could potentially be used as the ideal reference for natural groundwater quality, north of the lake for future studies, as it has not been impacted by road salting activities or any other activities. However, previous studies conducted by WSP in 2017, indicated that a well, BH1-07, installed in close proximity to BH/MW 3, indicated that sodium and chloride concentrations appear to be notably higher than the historic range.

BH/MWs 4 S, 4D, 6, and 7 S and 7D, are located south of the Mohawk Lake. The groundwater quality data indicates that there were no exceedances that were observed at the BH/MWs 4S, 4D locations, during the sampling event. Groundwater quality in BH/MWs 6, 7S and 7D indicate exceedances with respect to PAHs and sodium. The highest sodium concentration was observed in BH/MW 6. Previous studies by WSP in 2017, indicated that a well, BH8-1, installed in close proximity to BH/MW 6, indicated that sodium levels in this well had significantly increased since 1998, and particularly since 2014. The monitoring location plan from WSP 2017 Annual Monitoring Report is provided in Appendix E.

These wells are all located along Greenwich Street and it is likely that road salting activities along the road, and overland run-off influenced by road salting activities have impacted the shallow groundwater quality in this area. Previous studies by Terraqua Investigation Limited, in 1990, identified an abandoned coal gasification plant, now owned by Union Gas, as the source of coal tar materials (PAHs) in the underlying aquifer, where the plant produced coal, coke and associated ash, and a liquid residue consisting of a mixture of medium and heavy oils. Subsurface soil and fill investigations determined the site was significantly contaminated with polycyclic aromatic hydrocarbons (PAH). PAH's have contaminated the soil, and the shallow groundwater in the area, resulting in the relatively high electrical conductivity of the underlying aquifer sub-soils within the upper aquifer, as confirmed by the geophysical studies. All of the previous studies conducted within the study area, have also indicated that the upper aquifer has also been impacted by PAH's compounds. These studies also indicate that the lower aquifer has not been impacted by PAHs, due to the underlying aquitard units which separates the upper and lower aquifer units, and prevent contaminants from migrating downwards into the lower aquifer.

Given the industrial history of the Mohawk Canal, as well as the existing, and abandoned landfills within the area, there are many properties surrounding the Mohawk Canal that have the potential to act as contamination sources.

Historically, wastes from many of these industrial facilities, as well as from the local residential population, were disposed of in uncontrolled landfills. Previous factories in the immediate vicinity of Mohawk Lake have used the surrounding areas as fill deposition areas for waste products, these are considered abandoned landfills.

While some of the areas have been restored, there are still impacted areas. Stormwater and surface runoff, as well as associated erosion, may also contribute contaminants from the former industrial properties, former landfills and residential and commercial development within the drainage areas upstream of Mohawk Lake and Canal.

8.0 CONCLUSIONS

1. The subject site lies within the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The surface geological map of Ontario shows that the area has a complex mixture of glaciofluvial and glaciolacustrine native soil deposits, reworked by the present-day Grand River.
2. The subject site is located within Southern Grand River subwatershed of the Grand River Watershed.
3. A review of the local topography shows that the subject site has undulating relief, exhibiting a gentle decline in elevation relief towards Mohawk Lake.
4. The study has disclosed that beneath the existing layer of topsoil, or earth fill material the native soils underlying the subject site consists of silty clay, silt, sandy gravel, silty sand and organic soil deposits.
5. The findings of this study indicate that the groundwater level elevations range from 193.67 masl at the southern limits of the study area to 214.13 masl within the areas located north of Mohawk Lake. Review of the average groundwater elevations suggest that it flows in southerly and south-easterly directions, towards the Mohawk Lake and the adjacent canal.
6. The single well response tests (SWRT) provided estimated hydraulic conductivity (K) values for the silty sand and silty clay units ranges from 4.1×10^{-5} to 4.4×10^{-8} m/s, the K estimate for the sand and silty clay unit is 1.5×10^{-5} m/s, the K estimate for the silty clay unit is 5.4×10^{-6} m/s, the K estimate for the silty clay and sandy gravel unit is 2.5×10^{-7} m/s, and the K estimate for the earth fill is 1.4×10^{-6} m/s. The results of the SWRT provide an indication of the yield capacity for the groundwater-bearing sub-soil strata at the depths of the screens. The above results suggest that the hydraulic conductivity for the groundwater-bearing soils at the depths of the well screens is low to high, with corresponding low to high groundwater seepage rates into open excavations, below the water table.

7. The Hazen Equation calculated permeability results derived from the soil grain size analysis indicates that the hydraulic conductivity (K) estimate for the sandy gravel, having some silt, and a trace of clay, retrieved from a depth of 4.57 mbgs at BH/MW 5 is 1.6 x 10^{-5} m/sec., and for the silty sand, having a trace of clay, retrieved from a depth of 6.1 mbgs at BH/MW 6, is 1.0 x 10^{-6} m/sec. The K estimates determined from the Hazen Method suggests moderate to high hydraulic conductivity (K) estimates for the groundwater bearing sub-soil layers beneath the subject site.
8. The Hazen Estimated hydraulic conductivity (K) results indicate high to moderate permeability for the sand, silty sand, and sand subsoil. The SWRT results indicate moderate to high permeability for the underlying subsoils. Given these, and the relatively high groundwater elevations in the area, the aquifer is relatively vulnerable to potential contaminants and other anthropogenic activities.
9. The pressure transducer data loggers, which were installed within the groundwater monitoring wells in the vicinity of the Mohawk Lake indicates that groundwater temperatures vary from 6.82º C to 13.86º C. The warming and cooling trend reflects the annual seasonal cycle, with a cooling trend observed from November 2018, to late April 2019; after which a gradual warming trend was observed to August 2019 in the summer months.
10. The logger data indicates that the groundwater level elevation trends shows a consistent increase in groundwater elevation from late summer 2018 to spring 2019, after which, there was a gradual decline in groundwater elevation. The manual data collected, indicated a similar trend for the groundwater elevations across the project areas.
11. The data indicates that shallow groundwater showed a minimal response of about 0.1 to 0.2 cm to smaller rainfall events, and increases of about 0.3 to 0.5 cm was observed in the groundwater elevations, in response to larger rainfall events.
12. Groundwater temperatures in the BH/MWs, located north of Mohawk Lake were noticeably lower than those located south of the Lake. This could result from the fact that the area south of the lake, is a discharge area, where the warmer deeper groundwater recharges the shallow aquifer.
13. The areas north of Mohawk Lake, in the vicinity of BH/MW 1D and 1S, are at a higher topographic elevation than that of Mohawk Lake. These areas are also underlain by relatively permeable sub-soils. The groundwater gradient in these areas, is downward and there is a possibility, that potential contaminants located in these recharge areas, can contaminate the lake and the deeper aquifer system beneath the area. Conversely, areas where the dominant vertical groundwater migration direction is upwards, such as the areas east and west of Mohawk Lake, in the vicinity of BH/MWs 7D, 7S, and 4D and 4S, are said to be under discharging conditions, which are a significant source of water replenishment to the adjacent lake and watercourses.

14. In general, the groundwater across the site appeared to be impacted by PAH's (Poly Aromatic Hydrocarbons compounds, which are associated with coal tar materials and waste, and chlorides, indicating impacts from road salting.

9.0 RECOMMENDATIONS FOR FUTURE STUDIES

The following recommendations are suggested, as follows:

1. Conduct long term groundwater monitoring within the study area, would enable a better understanding of flow dynamics to provide a better understanding of local flow systems interactions and seasonal fluctuations.
2. Conduct a field survey to map areas of groundwater discharge within the Mohawk Lake, using water temperature and electrical conductivity profiling, or appropriate tracer methods. Delineation and quantification of the flows, using a seepage meter, or other similar devices to quantify groundwater flow within the lake to determine variation in groundwater contribution over the seasons.
3. Conduct further investigations to determine the source of contaminant to the water quality of BH/MW 2, which is upgradient of the Mohawk Lake
4. Conduct surface water monitoring, with water quality sampling and analysis to determine whether the contaminants observed in the monitoring wells, north and upgradient of the Mohawk Lake have impacted the surface water quality within the lake.

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FIGURES 1 to 12

BOREHOLE LOGS AND GRAIN SIZE DISTRIBUTION GRAPHS

REFERENCE NO. 1806-W012

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

□ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 1S

FIGURE NO.: 1

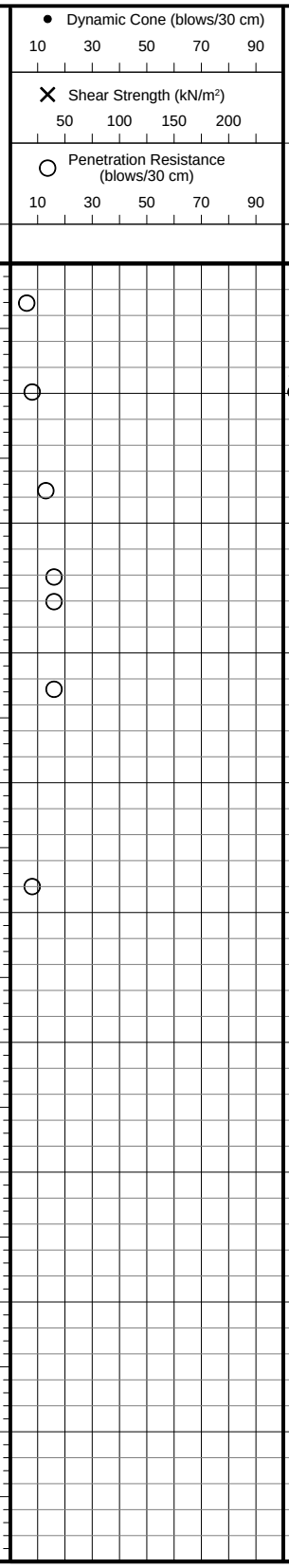
PROJECT DESCRIPTION: Mohawk Lake Characterization Study

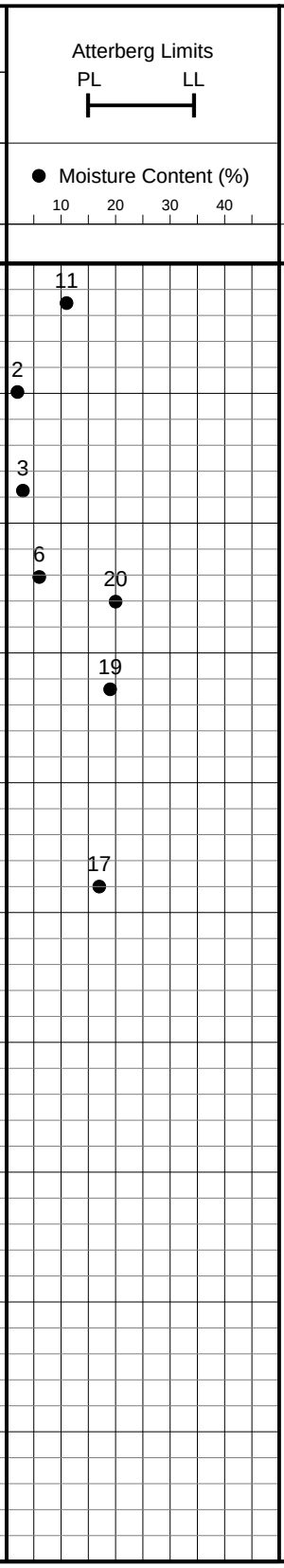
METHOD OF BORING: Flight Auger-Soild Stem

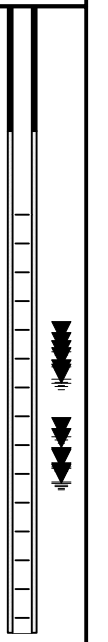
PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
210.8	Ground Surface				
0.0	100 mm TOPSOIL				0
0.1	Brown **EARTH Fill** sand, fine to medium grained, a trace to some gravel	1	DO		
		2	DO		1
		3	DO		2
208.4					
2.4	Brown, stiff	4A	DO		
2.5	**SILTY CLAY**	4B	DO		
	Brown, compact **SILT**	5	DO		3
		6	DO		4
205.8					5
5.0	END OF BOREHOLE Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.52 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing Groundwater Readings: W.L @ 207.32 masl on September 24, 2018 W.L @ 207.33 masl on October 25, 2018 W.L @ 207.43 masl on November 22, 2018 W.L @ 207.66 masl on December 21, 2018 W.L @ 208.05 masl on January 18, 2019 W.L @ 208.17 masl on February 15, 2019 W.L @ 208.08 masl on March 22, 2019 W.L @ 208.28 masl on April 15, 2019 W.L @ 208.36 masl on May 24, 2019 W.L @ 208.22 masl on June 19, 1019 W.L @ 207.58 masl on July 26, 2019 W.L @ 207.44 masl on August 23, 2019				6 7 8 9 10







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JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 1D

FIGURE NO.: 2

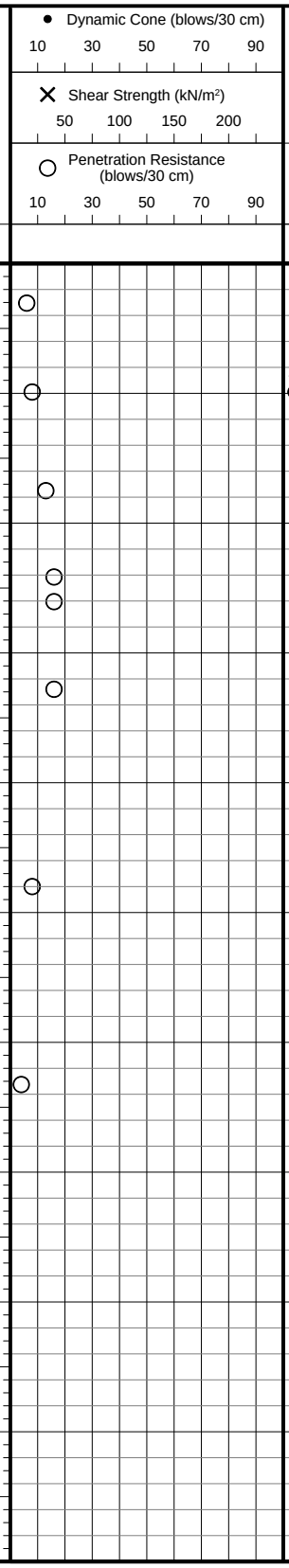
PROJECT DESCRIPTION: Mohawk Lake Characterization Study

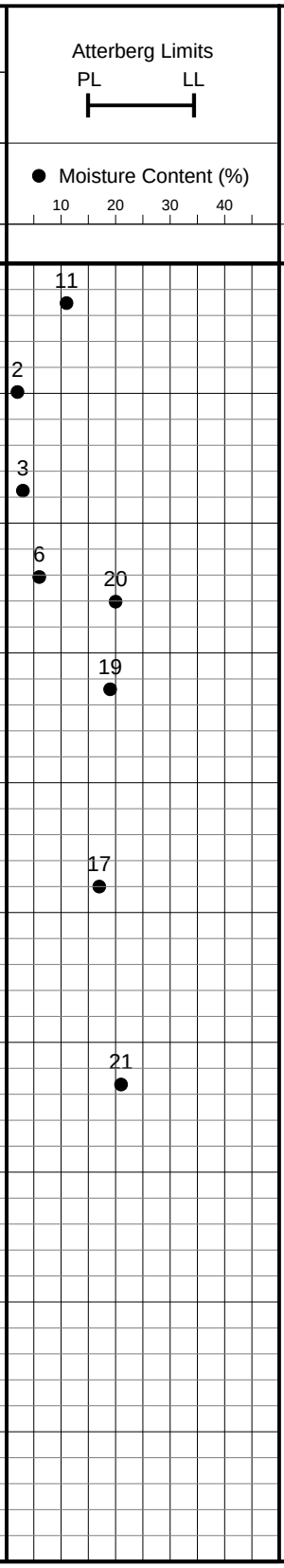
METHOD OF BORING: Flight Auger-Soild Stem

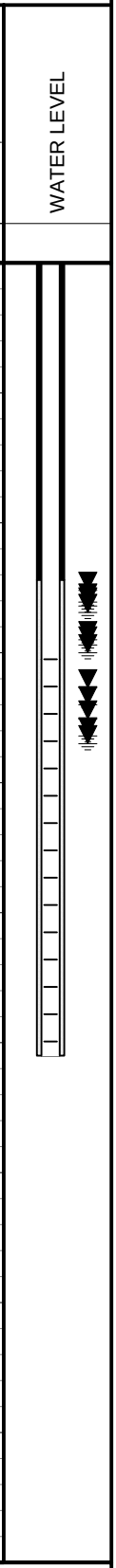
PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
210.8	Ground Surface				
0.0	100 mm TOPSOIL				0
0.1	Brown **EARTH Fill** sand, fine to medium grained, a trace to some gravel	1	DO		
		2	DO		1
		3	DO		2
208.4					
2.4	Brown, stiff	4A	DO		
2.5	**SILTY CLAY**	4B	DO		
	Brown, compact **SILT**	5	DO		3
206.2					4
4.6	Brown, loose **SITY SAND**	6	DO		5
204.7					6
6.1	Grey, soft **SILTY CLAY** sand layers	7	DO		
204.2					7
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 207.05 masl on September 24, 2018 W.L @ 207.11 masl on October 25, 2018 W.L @ 207.24 masl on November 22, 2018 W.L @ 207.48 masl on December 21, 2018 W.L @ 207.75 masl on January 18, 2019 W.L @ 208.06 masl on February 15, 2019 W.L @ 207.85 masl on March 22, 2019 W.L @ 208.14 masl on April 15, 2019 W.L @ 208.23 masl on May 24, 2019 W.L @ 208.11 masl on June 19, 1019 W.L @ 207.35 masl on July 26, 2019 W.L @ 207.81 masl on August 23, 2019				8 9 10







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JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 2

FIGURE NO.: 3

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: September 4, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
216.5	Ground Surface				
0.0	170 mm TOPSOIL				0
0.2	Brown **EARTH Fill** silty sand	1	DO		
215.7					
0.8	Brown, loose to compact **SAND** fine to medium grained	2	DO		1
		3	DO		2
		4	DO		
		5	DO		3
211.9					4
4.6	Grey, stiff **SILTY CLAY**	6	DO		5
		7	DO		6
209.9					
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 211.77 masl on September 24, 2018 W.L @ 211.24 masl on October 25, 2018 W.L @ 212.49 masl on November 22, 2018 W.L @ 212.84 masl on December 21, 2018 W.L @ 213.18 masl on January 18, 2019 W.L @ 212.37 masl on February 15, 2019 W.L @ 213.77 masl on March 22, 2019 W.L @ 214.13 masl on April 15, 2019 W.L @ 213.84 masl on May 24, 2019 W.L @ 213.55 masl on June 19, 1019 W.L @ 213.68 masl on July 26, 2019 W.L @ 211.94 masl on August 23, 2019				7 8 9 10

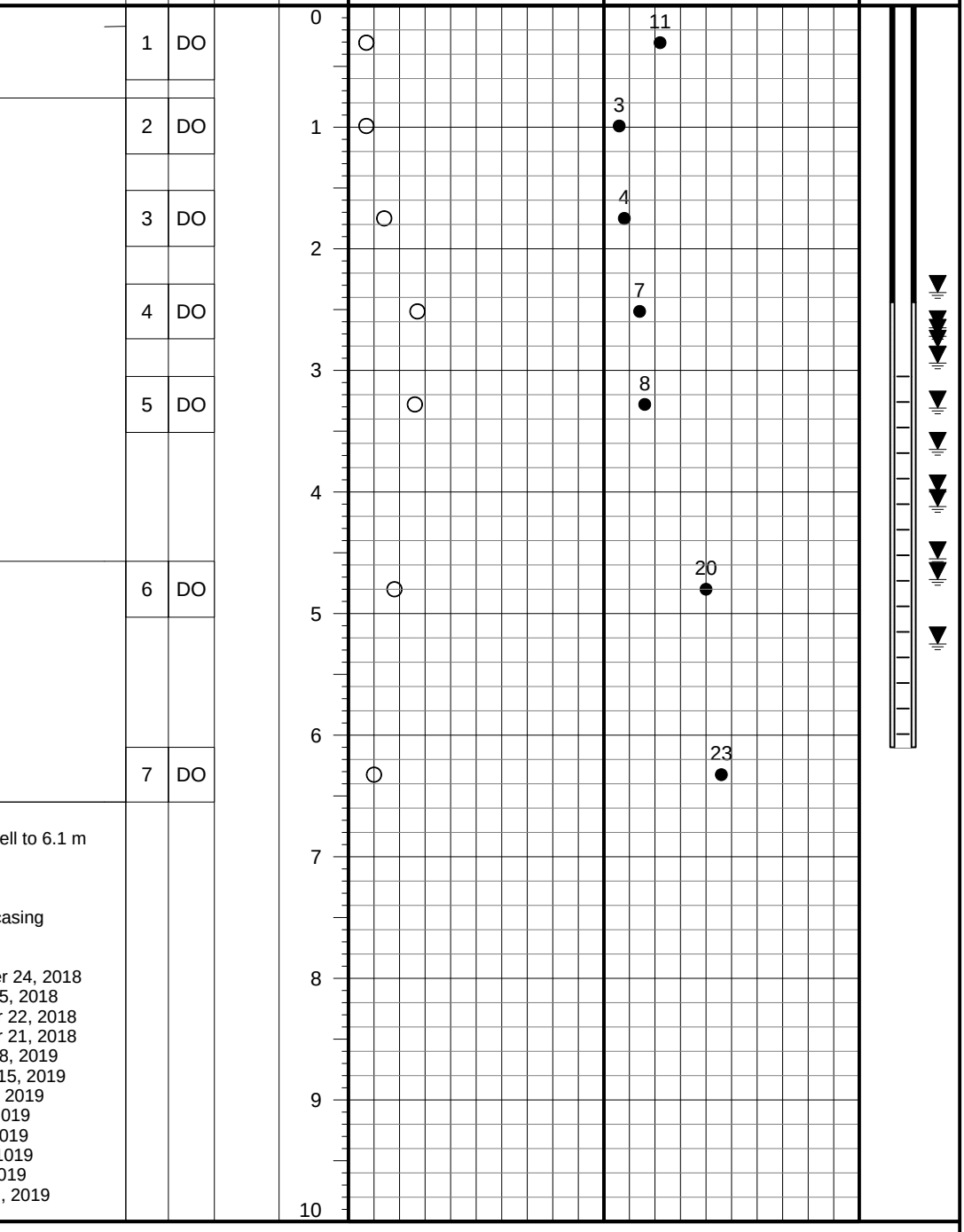
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 3

FIGURE NO.: 4

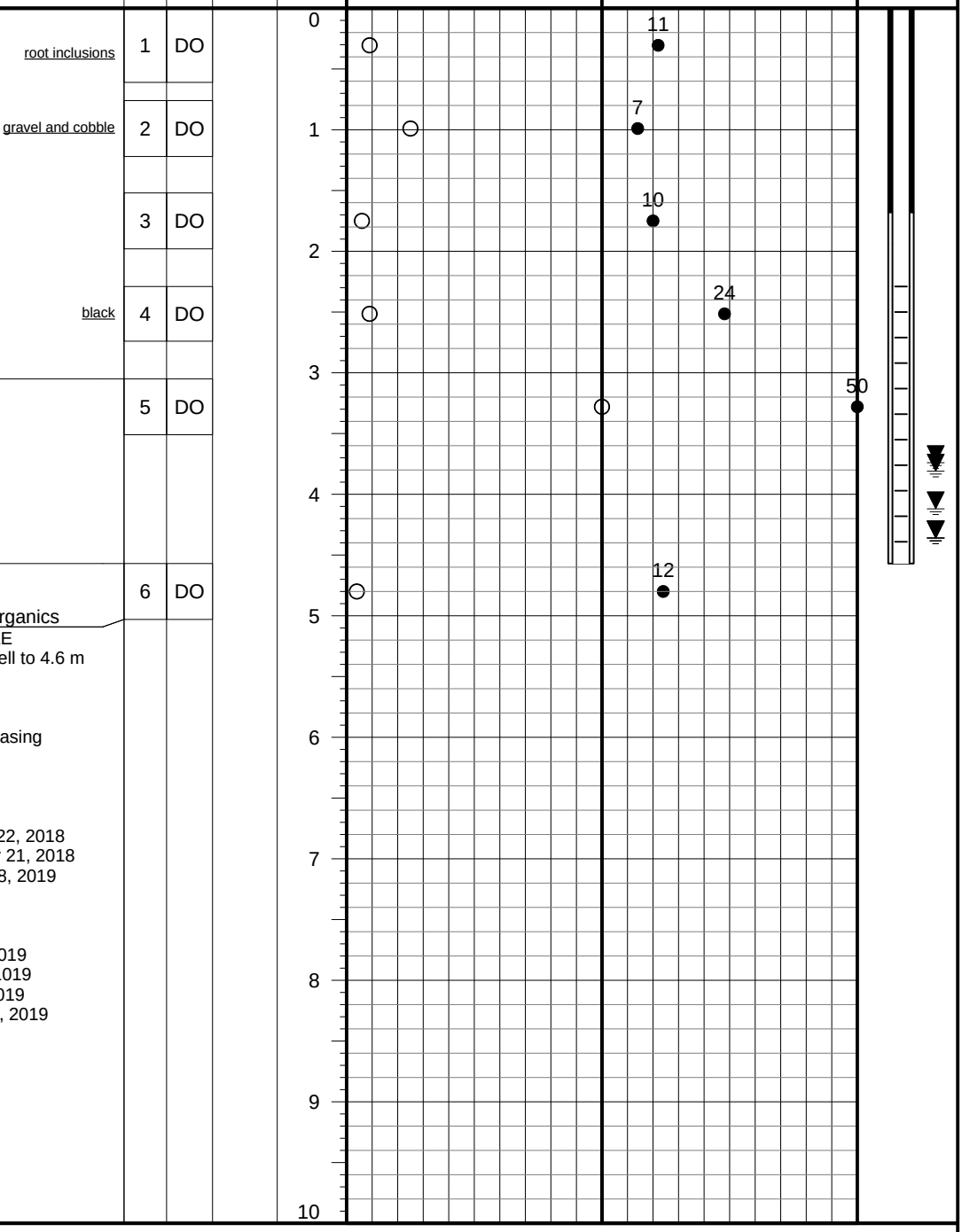
PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
211.6 / 0.0	Ground Surface			
	Brown **EARTH Fill** sand root inclusions	1	DO	
	gravel and cobble	2	DO	
		3	DO	
	black	4	DO	
208.5 / 3.0	Black **ORGANICS** wood debris	5	DO	
207.0 / 4.6	Grey **EARTH Fill**	6	DO	
206.5 / 5.0	silty clay, strong odour, some organics END OF BOREHOLE Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.5 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing Groundwater Readings: DRY on September 24, 2018 DRY on October 25, 2018 N/A (lock jammed) on November 22, 2018 W.L @ 207.09 masl on December 21, 2018 W.L @ 207.11 masl on January 18, 2019 DRY on February 15, 2019 DRY on March 22, 2019 DRY on April 15, 2019 W.L @ 207.76 masl on May 24, 2019 W.L @ 207.45 masl on June 19, 1019 W.L @ 207.21 masl on July 26, 2019 W.L @ 207.21 masl on August 23, 2019			



Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 4S

FIGURE NO.: 5

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
201.3	Ground Surface							
0.0	80 mm TOPSOIL				0			
0.1	Brown **EARTH Fill** silty sand, trace of organics	1	DO				8	
	trace of gravel	2	DO		1		9	
		3	DO		2		12	
199.0								
2.3	Grey, soft to stiff **SILTY CLAY**	4	DO				21	
		5	DO		3		24	
	trace of gravel	6	DO		4		23	
196.2					5			
5.0	END OF BOREHOLE				6			
	Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.52 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing				7			
	Groundwater Readings: W.L @ 198.20 masl on September 24, 2018 W.L @ 198.27 masl on October 25, 2018 W.L @ 198.36 masl on November 22, 2018 W.L @ 198.43 masl on December 21, 2018 W.L @ 198.45 masl on January 18, 2019 W.L @ 198.52 masl on February 15, 2019 W.L @ 198.68 masl on March 22, 2019 W.L @ 198.79 masl on April 15, 2019 W.L @ 198.45 masl on May 24, 2019 W.L @ 198.47 masl on June 19, 1019 W.L @ 198.22 masl on July 26, 2019 W.L @ 198.27 masl on August 23, 2019				8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 4D

FIGURE NO.: 6

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 7, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
201.3	Ground Surface							
0.0	80 mm TOPSOIL				0			
0.1	Brown **EARTH Fill** silty sand, trace of organics	1	DO				8	
	trace of gravel	2	DO		1		9	
		3	DO		2		12	
199.0								
2.3	Grey, soft to stiff **SILTY CLAY**	4	DO				21	
		5	DO		3		24	
	trace of gravel	6	DO		4		23	
		7	DO		5		27	
194.8					6			
6.5	END OF BOREHOLE				7			
	Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing				8			
	Groundwater Readings: W.L @ 198.25 masl on September 24, 2018 W.L @ 198.29 masl on October 25, 2018 W.L @ 198.38 masl on November 22, 2018 W.L @ 198.46 masl on December 21, 2018 W.L @ 198.48 masl on January 18, 2019 W.L @ 198.57 masl on February 15, 2019 W.L @ 198.61 masl on March 22, 2019 W.L @ 198.83 masl on April 15, 2019 W.L @ 198.49 masl on May 24, 2019 W.L @ 198.50 masl on June 19, 1019 W.L @ 198.27 masl on July 26, 2019 W.L @ 198.30 masl on August 23, 2019				9			
					10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 5R

FIGURE NO.: 7

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: January 8, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
198.6	Ground Surface							
0.0	Brown **EARTH Fill** silty sand gravel	1	DO		0		7	
		2	DO		1		8	
		3	DO		2		12	
196.3								
2.3	Grey, firm **SILTY CLAY** trace of organics	4	DO		3		23	
		5	DO				31	
194.0					4			
4.6	Brown, compact **SANDY GRAVEL** some silt a trace of clay	6	DO		5		23	
		7	DO		6		20	
192.0								
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 193.35 masl on September 24, 2018 W.L N/A on October 25, 2018 W.L N/A on November 22, 2018 W.L N/A on December 21, 2018 W.L @ 194.87 masl on January 18, 2019 W.L @ 195.04 masl on February 15, 2019 W.L @ 195.31 masl on March 22, 2019 W.L @ 195.30 masl on April 15, 2019 W.L @ 195.05 masl on May 24, 2019 W.L @ 195.05 masl on June 19, 1019 W.L @ 194.58 masl on July 26, 2019 W.L @ 194.44 masl on August 23, 2019					7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 6

FIGURE NO.: 8

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: September 4, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
198.8	Ground Surface							
0.0 198.0	Brown **EARTH Fill** silty clay, some sand, organics	1	DO		0		22	
0.8 197.2	Brown **EARTH Fill** silty sand, a trace of gravel	2	DO		1		16 50	
1.5 196.5	Black **EARTH Fill** organics, sandy, a trace of gravel, odour	3	DO		2		50	
2.3 195.7	Black **EARTH Fill** sand, some organics, gravelly	4	DO				30	
3.0 194.2	Grey, soft **SILTY CLAY**	5	DO		3		33	
4.6 192.2	Grey, very loose **SILTY SAND** a trace of clay	6	DO		4		31	
		7	DO		5		13	
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 194.73 masl on September 24, 2018 W.L @ 193.67 masl on October 25, 2018 W.L @ 195.04 masl on November 22, 2018 W.L @ 195.78 masl on December 21, 2018 W.L @ 195.41 masl on January 18, 2019 W.L @ 195.38 masl on February 15, 2019 W.L @ 195.63 masl on March 22, 2019 W.L @ 196.18 masl on April 15, 2019 W.L @ 195.72 masl on May 24, 2019 W.L @ 195.53 masl on June 19, 1019 W.L @ 194.97 masl on July 26, 2019 W.L @ 194.74 masl on August 23, 2019				6 7 8 9 10			

Soil Engineers Ltd.

JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 7S

FIGURE NO.: 9

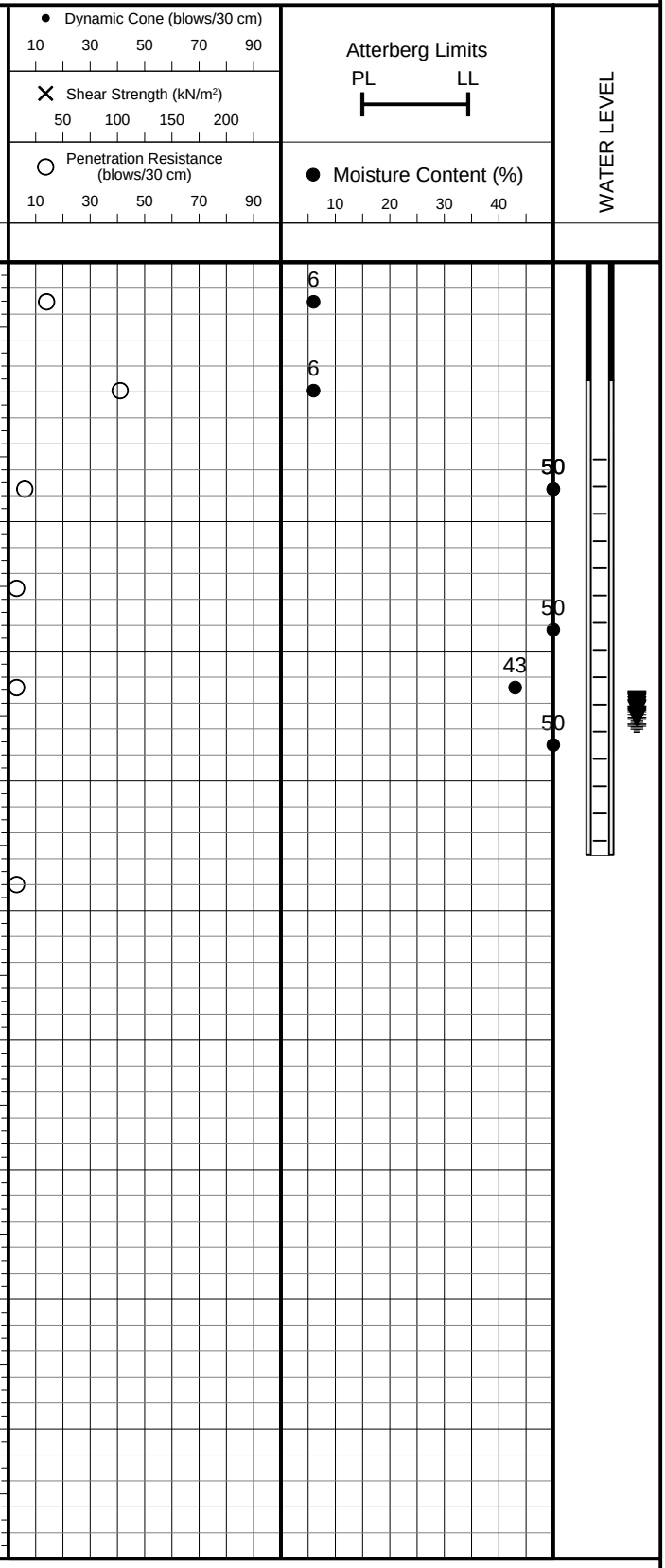
PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 8, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
199.3	Ground Surface				
0.0	80 mm TOPSOIL				0
0.1 / 198.5	Brown **EARTH Fill** silty sand, a trace of gravel	1	DO		
0.8 / 197.8	Brown **EARTH Fill** sand, fine to medium grained, a trace of gravel	2	DO		1
1.5 / 197.0	Brown **EARTH Fill** silty sand, a trace of gravel, strong odour	3	DO		2
2.3	Black **EARTH Fill** sand	4	DO		
	organics	5	DO		3
194.3		6	DO		4
5.0	END OF BOREHOLE				5
	Installed 50 mm dia. monitoring well to 4.6 m Slotted screen from 1.52 to 4.6 m Sand backfill from 0.9 to 4.6 m Bentonite seal from 0.0 to 0.9 m Provided with a steel monument casing				6
	Groundwater Readings: W.L @ 195.72 masl on September 24, 2018 W.L @ 195.71 masl on October 25, 2018 W.L @ 195.72 masl on November 22, 2018 W.L @ 195.77 masl on December 21, 2018 W.L @ 195.78 masl on January 18, 2019 W.L @ 195.78 masl on February 15, 2019 W.L @ 195.80 masl on March 22, 2019 W.L @ 195.83 masl on April 15, 2019 W.L @ 195.84 masl on May 24, 2019 W.L @ 195.82 masl on June 19, 1019 W.L @ 195.73 masl on July 26, 2019 W.L @ 195.76 masl on August 23, 2019				7
					8
					9
					10



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JOB NO.: 1806-W012

LOG OF BOREHOLE NO.: BH/MW 7D

FIGURE NO.: 10

PROJECT DESCRIPTION: Mohawk Lake Characterization Study

METHOD OF BORING: Flight Auger-Soild Stem

PROJECT LOCATION: North of Forest Road, Brantford

DRILLING DATE: August 8, 2018

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
199.4	Ground Surface							
0.0	80 mm TOPSOIL				0		6	
0.1 / 198.6	Brown **EARTH Fill** silty sand, a trace of gravel	1	DO					
0.8 / 197.8	Brown **EARTH Fill** sand, fine to medium grained, a trace of gravel	2	DO		1		6	
1.5 / 197.1	Brown **EARTH Fill** silty sand, a trace of gravel, strong odour	3	DO		2		50	
2.3	Black **EARTH Fill** sand	4	DO				50	
	organics	5	DO		3		43	
194.8							50	
4.6	Brown **EARTH Fill** sand, glass fragments	6	DO		4			
					5		50	
192.8		7	DO		6		42	
6.5	END OF BOREHOLE Installed 50 mm dia. monitoring well to 6.1 m Slotted screen from 3.1 to 6.1 m Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 to 2.4 m Provided with a steel monument casing Groundwater Readings: W.L @ 195.78 masl on September 24, 2018 W.L @ 195.75 masl on October 25, 2018 W.L @ 195.76 masl on November 22, 2018 W.L @ 195.80 masl on December 21, 2018 W.L @ 196.58 masl on January 18, 2019 W.L @ 195.82 masl on February 15, 2019 W.L @ 195.86 masl on March 22, 2019 W.L @ 195.89 masl on April 15, 2019 W.L @ 195.90 masl on May 24, 2019 W.L @ 195.88 masl on June 19, 1019 W.L @ 195.79 masl on July 26, 2019 W.L @ 195.76 masl on August 23, 2019				7 8 9 10			

Soil Engineers Ltd.

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

FIGURES 11 to 12

GRAIN SIZE DISTRIBUTION GRAPHS

REFERENCE NO. 1806-W012

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

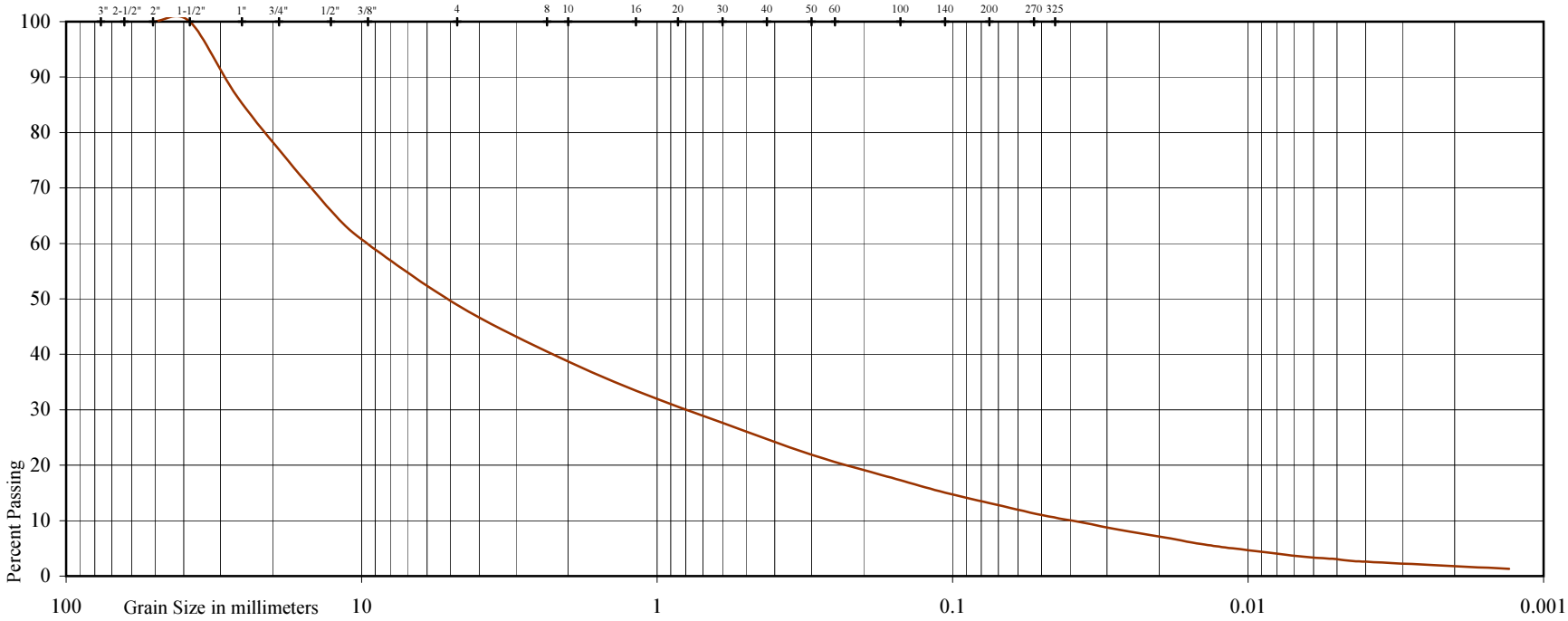
Reference No: 1806-W012

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Mohawk Lake Characterization Study

Location: North of Forest Road and South of Greenwich Street , Brantford

Borehole No: 5

Sample No: 6

Depth (m): 4.57

Elevation (m): 194.0

Estimated Permeability (m./sec.) = 10^{-5}

Classification of Sample [& Group Symbol]: SANDY GRAVEL, some silt, a trace of clay

Figure 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

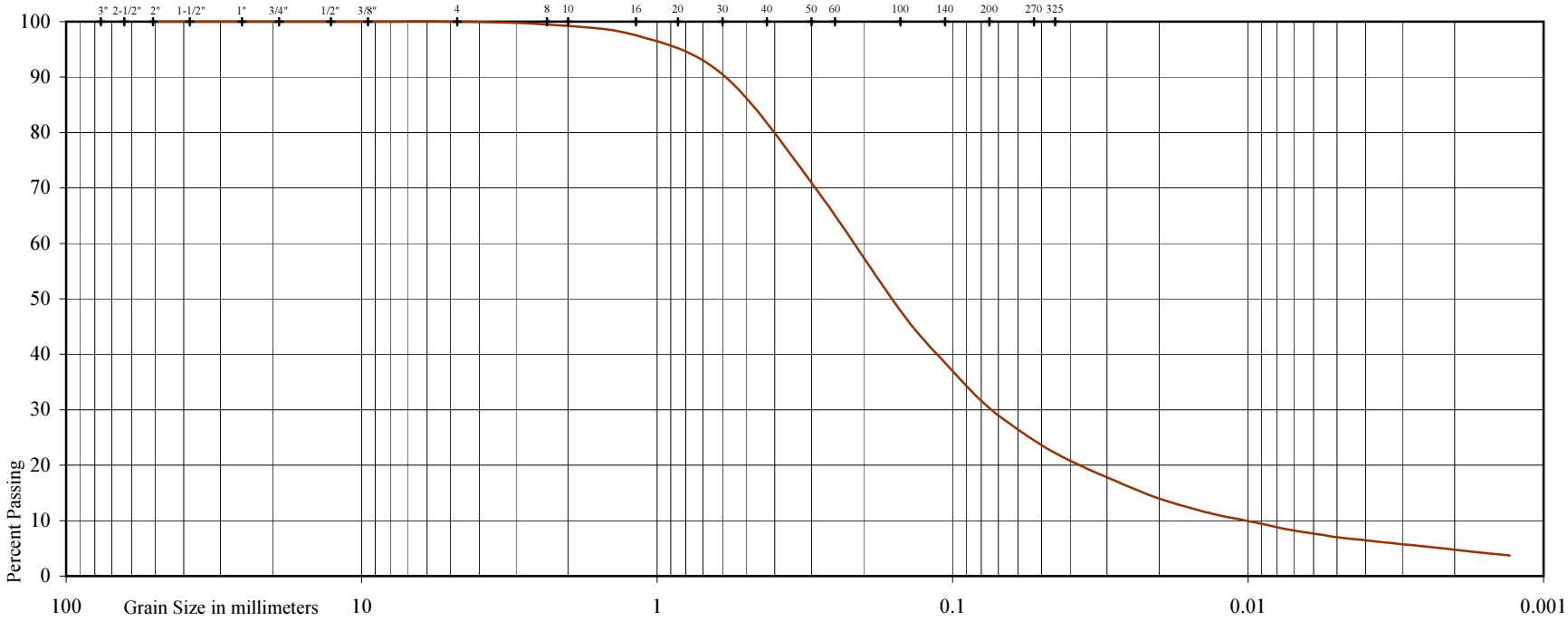
Reference No: 1806-W012

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Mohawk Lake Characterization Study

Location: North of Forest Road and South of Greenwich Street , Brantford

Borehole No: 6

Sample No: 7

Depth (m): 6.1

Elevation (m): 192.6

Estimated Permeability (m./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SILTY SAND, a trace of clay

Figure 12

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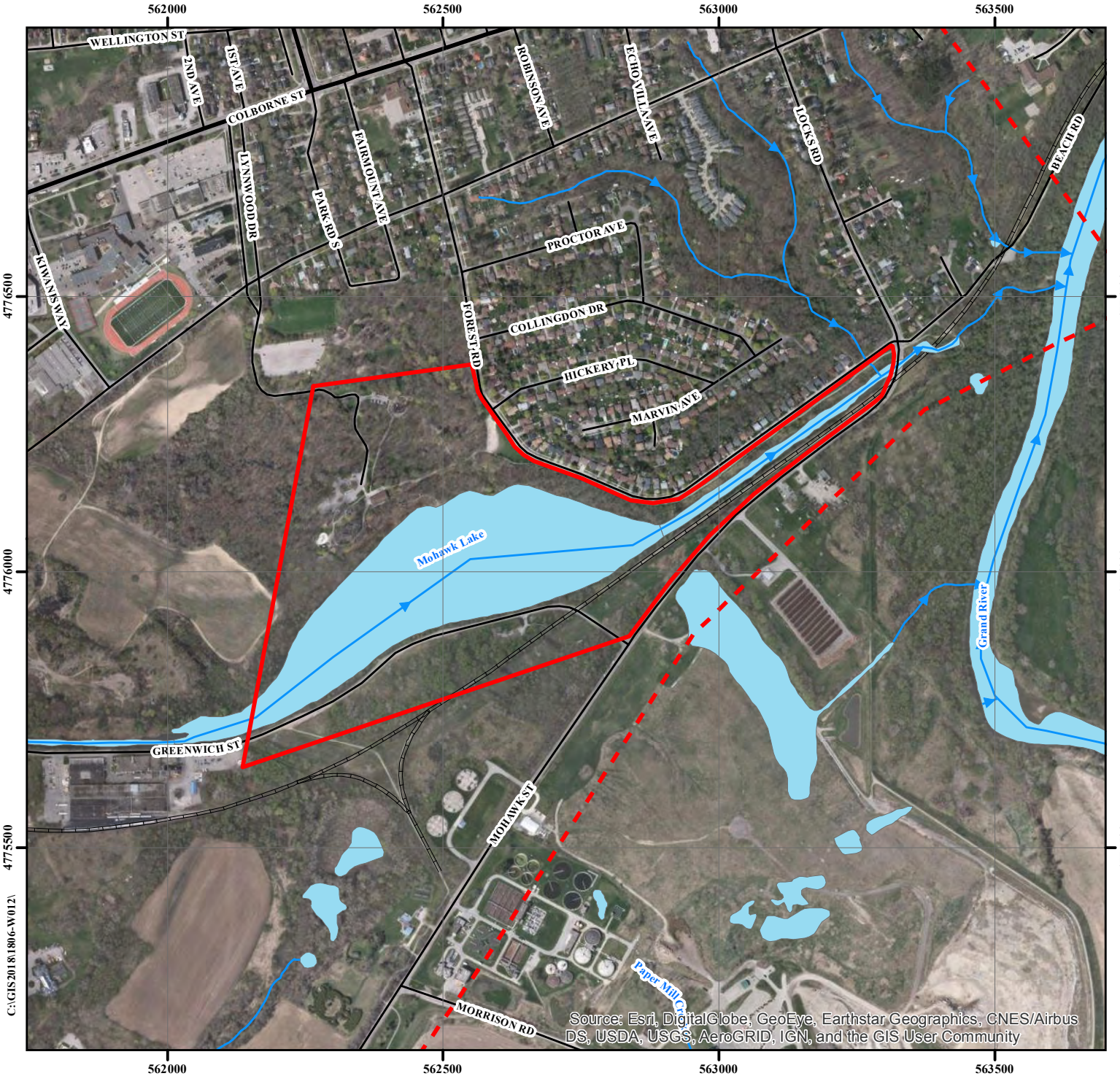
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

DRAWINGS 1 to 8

REFERENCE NO. 1806-W012



N

Approximate Boundary of Subject Site
Study Area
Waterbody
Watercourse
Major Road
Local Road
Railway

Soil Engineers Ltd.

Title: Site Location Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 50 100 200 300 400 500
Metres

Drawing No. 1

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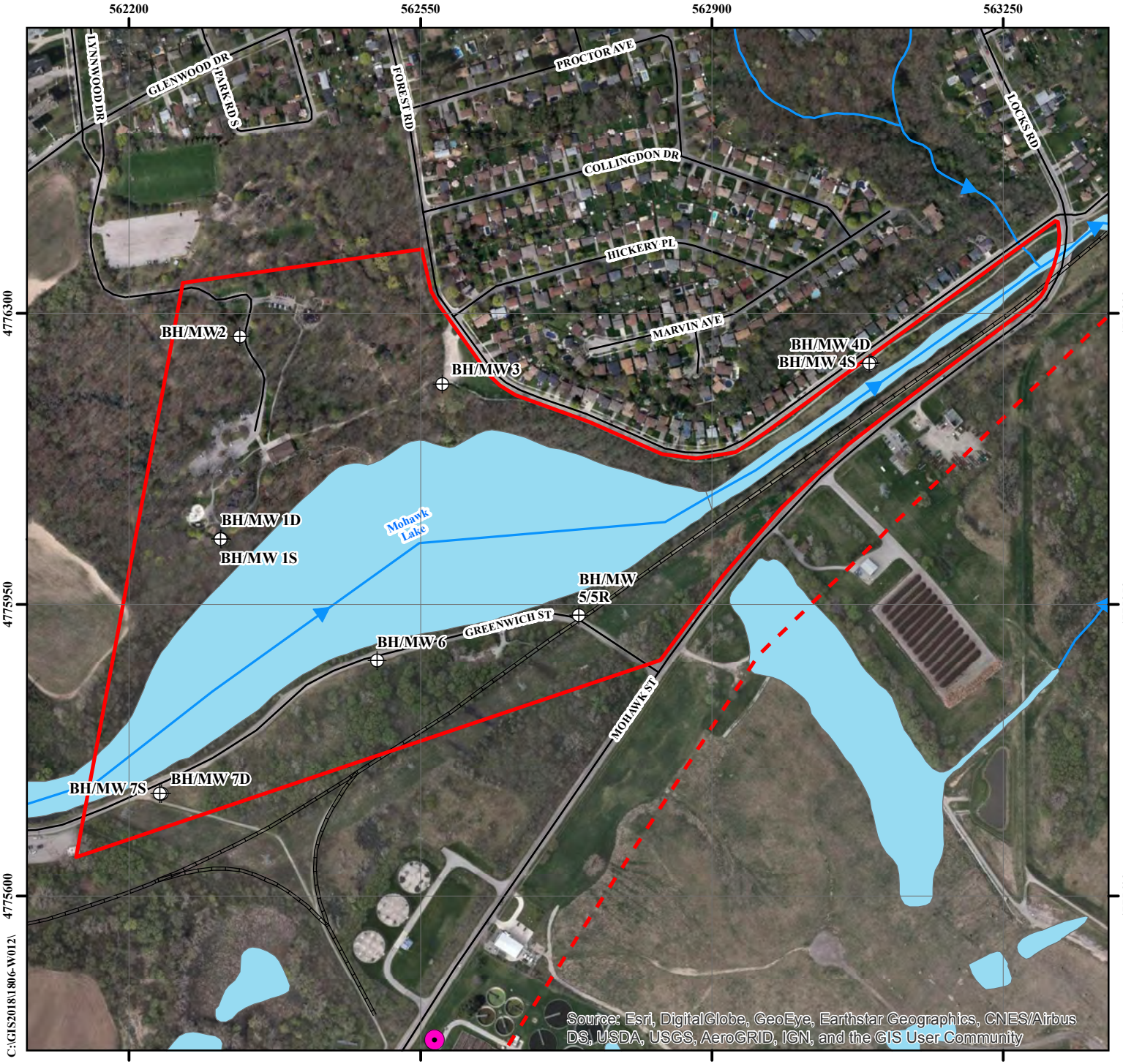

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Source: Water Course, Ontario Ministry of Natural Resources and Forestry
©Queen's Printer for Ontario

Source: Water Body, Ontario Ministry of Natural Resources and Forestry
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N

Approximate Boundary of Subject Site

Study Area

Borehole with Monitoring Well

Rainfall Station - Wastewater Treatement Plant

Waterbody

Watercourse

Local Road

Railway

Soil Engineers Ltd.

Title: Borehole and Monitoring Well Location Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

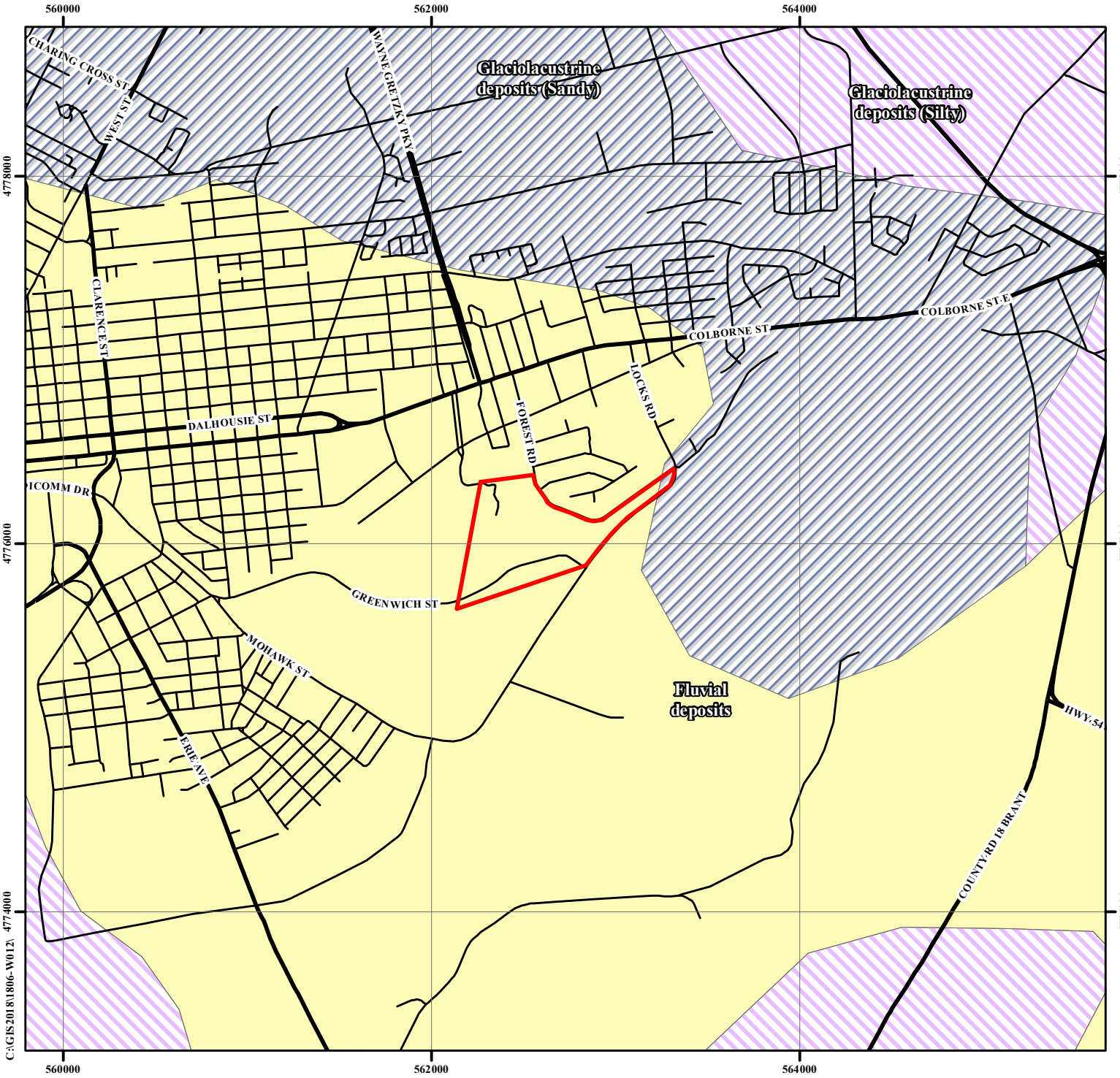
Date: March 17, 2020

Scale:

0 30 60 120 180 240 300

Metres

Drawing No. 2



N

- Approximate Boundary of Subject Site
- Fluvial deposits
  Material: gravel, sand, silt and clay, deposited on modern flood plains
- Glaciofluvial outwash deposits
  Material: gravel and sand, includes proglacial river and deltaic deposits
- Glaciolacustrine deposits (Sandy)
  Material: sand, gravelly sand and gravel, nearshore and beach deposits
- Glaciolacustrine deposits (Silty)
  Material: silt and clay, minor sand, basin and quiet water deposits
- Wentworth Till
  material: sandy silt to silt matrix, becoming finer grained to silty clay near Lake Erie, highly calcareous, clast content moderate to low decreasing southward
- Expressway/Freeway
- Major Road
- Local Road

Source:Ontario Geological Survey, 1997, Surface Geology of Ontario; Ontario Geological Survey, Miscellaneous Released-Data 0014

Soil Engineers Ltd.

Title: Quarternary and Surface Geology Map

Project:

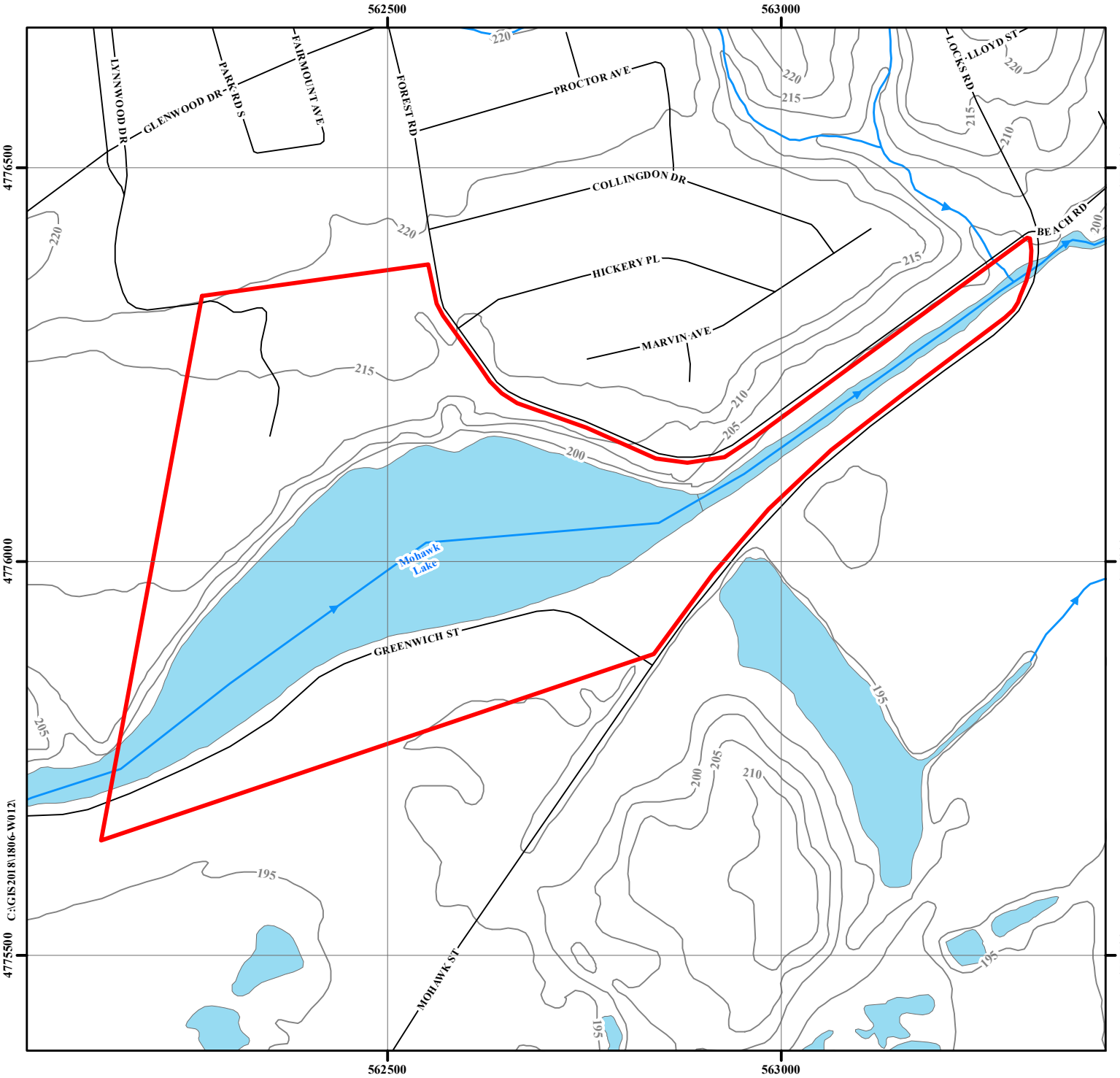
Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:
0 155 310 620 930 1,240 1,550
Metres

Drawing No. 3



N

Approximate Boundary of Subject Site

Waterbody

Watercourse

Local Road

200 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Topographic Map

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 35 70 140 210 280 350

Metres

Drawing No. 4

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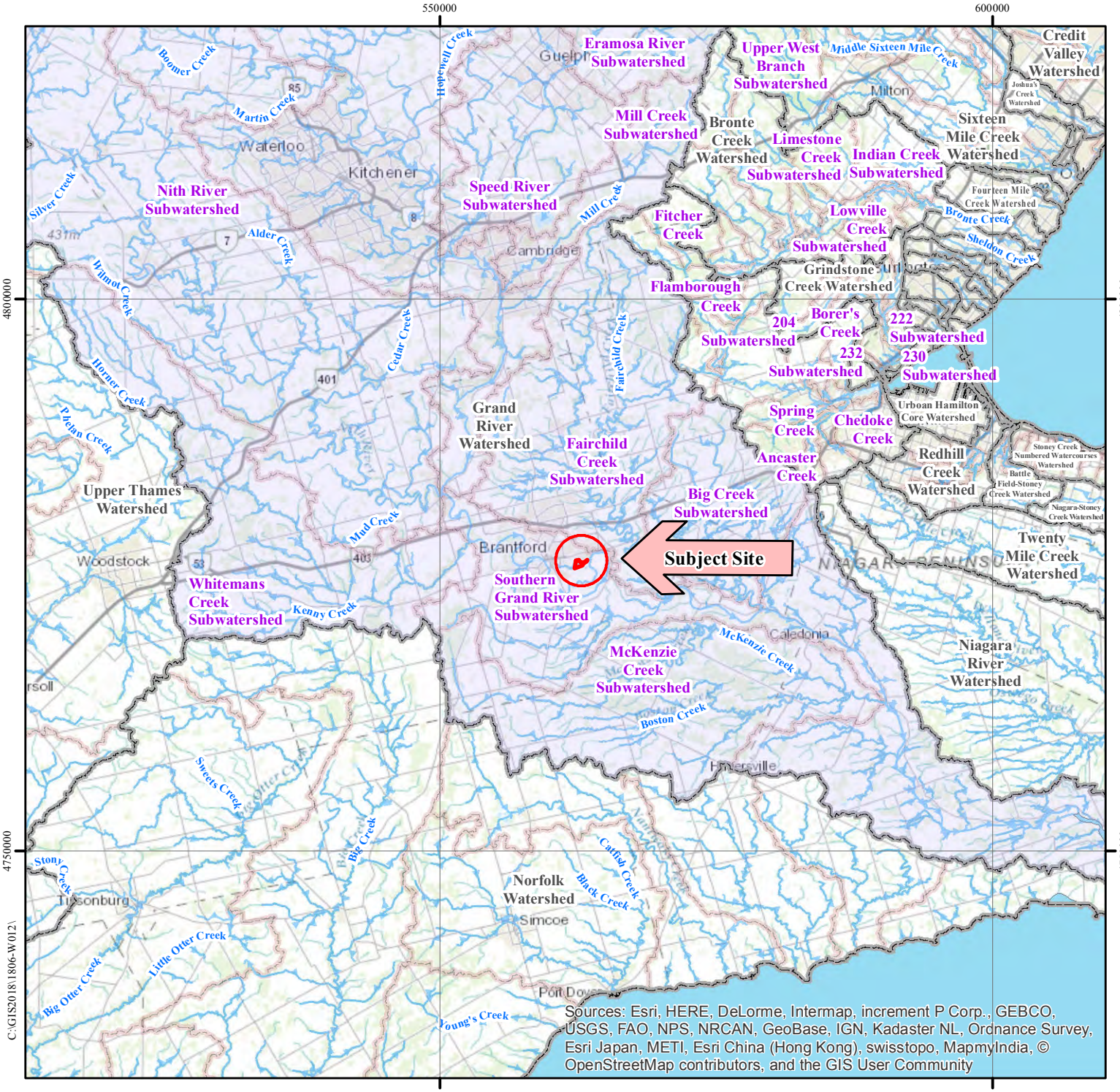
Source: Contour, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

Source: Water Body, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015

Source: Water Course, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015



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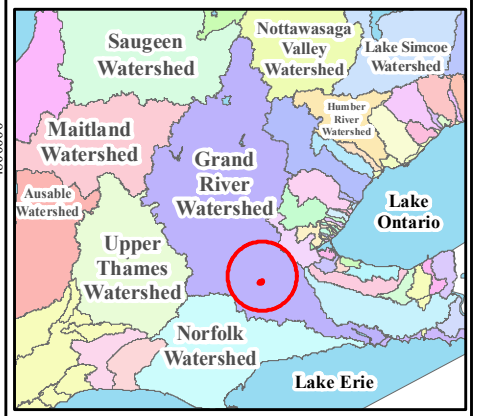
this mapping was produced by SEL and should be used for information purposes only.
Data sources used in its production are of varying quality and accuracy and all boundaries should be considered approximate.

N

Watershed:



Approximate Boundary of the Subject Site

Watershed Boundaries

Water Body

Watercourse

Expressway/Major Road

Soil Engineers Ltd.

Title: Watershed and Subwatershed Map

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

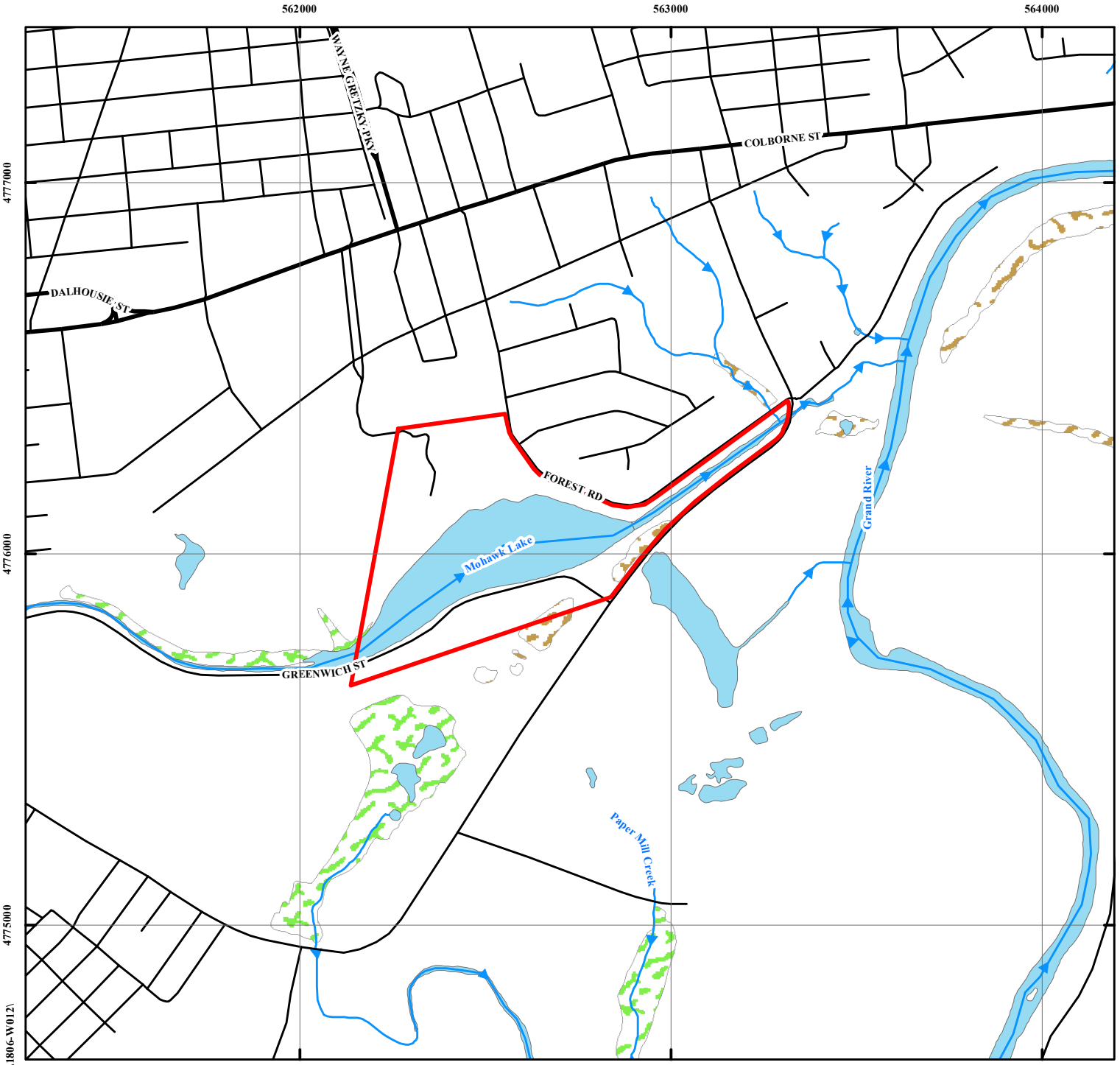
Date: October 17, 2018

Scale:

0 18,750 37,500 75,000 112,500 150,000 187,500

Metres

Drawing No. 5



N

- Approximate Boundary of Subject Site
- Wetland (classified as Other)
- Wetland (Not Evaluated per OWES)
- Water Body
- Watercourse
- Major Road
- Local Road

Soil Engineers Ltd.

Title: Natural Features and Protection Area Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 17, 2018

Scale:

0 75 150 300 450 600 750

Metres

Drawing No. 6

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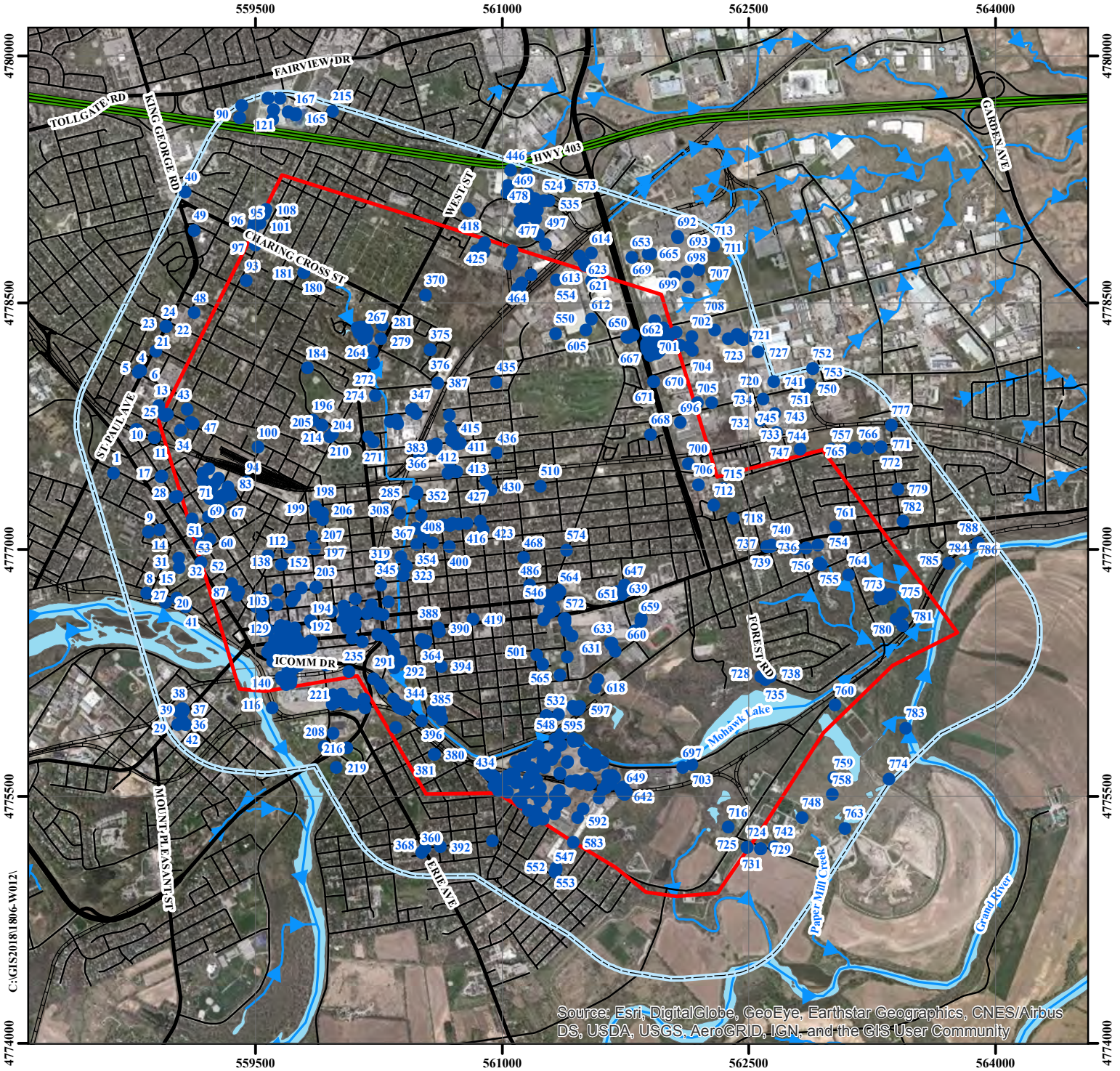

C:\GIS2018\1806-W012\

Source: Water Course, Ontario Ministry of Natural Resources and Forestry
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Source: Water Body, Ontario Ministry of Natural Resources and Forestry
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N

- Approximate Boundary of Subject Site
- 500 metres from Subject Site Boundary
- Well Locations from MECP Well Records (see Appendix 'A')
- Waterbody
- Watercourse
- Expressway/Freeway
- Major Road
- Local Road
- Railway

Soil Engineers Ltd.

Title: MOECC Well Location Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
North of Forest Road and
South of Greenwhich Street
City of Brantford

Reference No. 1806-W012

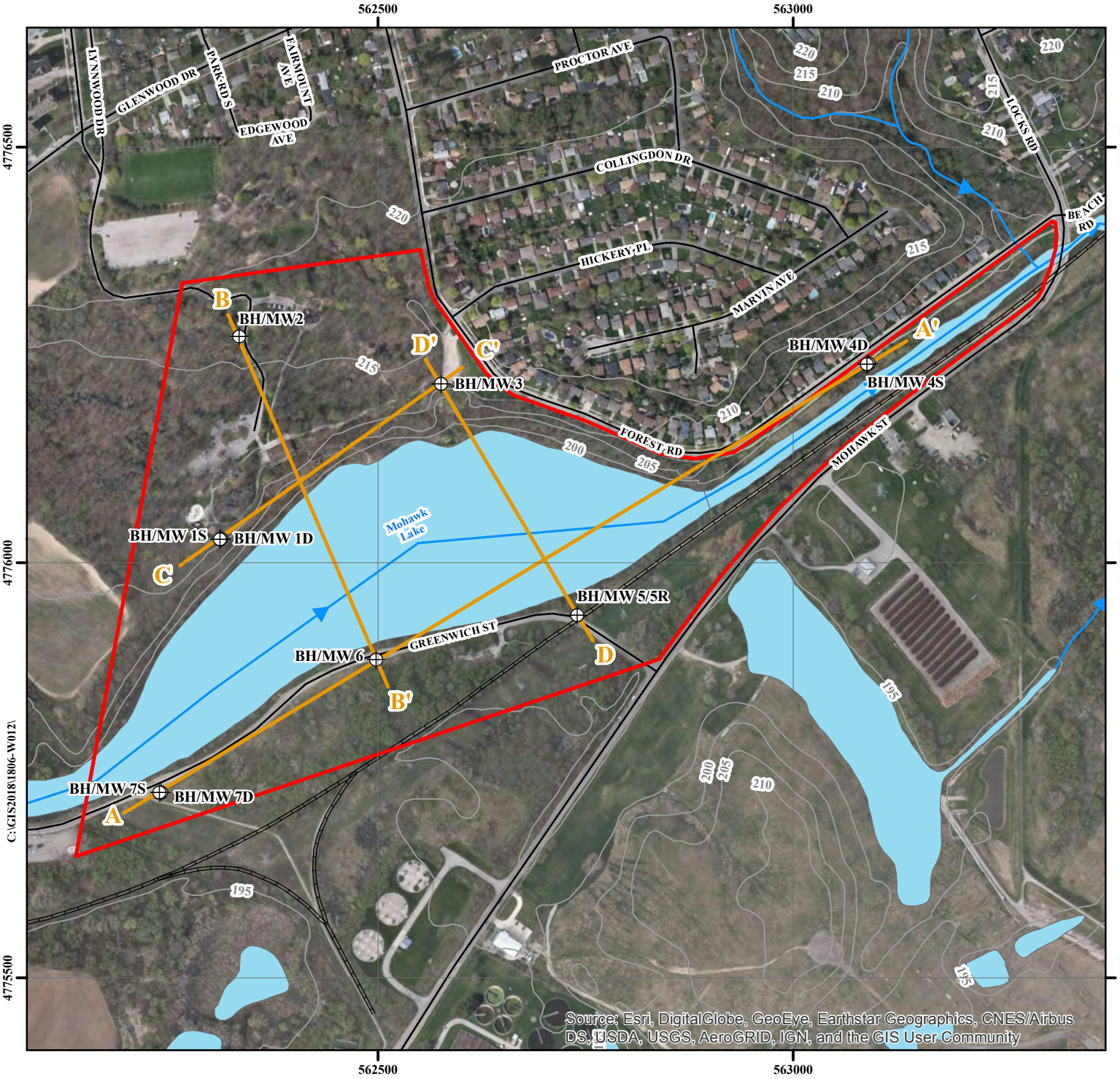
Date: February 11, 2020

Scale:

0 170 340 680 1,020 1,360 1,700

Metres

Drawing No. 7



Source: Contour, Ontario Ministry of Natural Resources and Forestry, 2015
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Source: Water Body, Ontario Ministry of Natural Resources and Forestry, 2015
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Source: Water Course, Ontario Ministry of Natural Resources and Forestry, 2015
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Approximate Boundary of Subject Site

Borehole with Monitoring Well

Waterbody

Watercourse

Local Road

Railway

A A' Cross-Section Direction

200 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

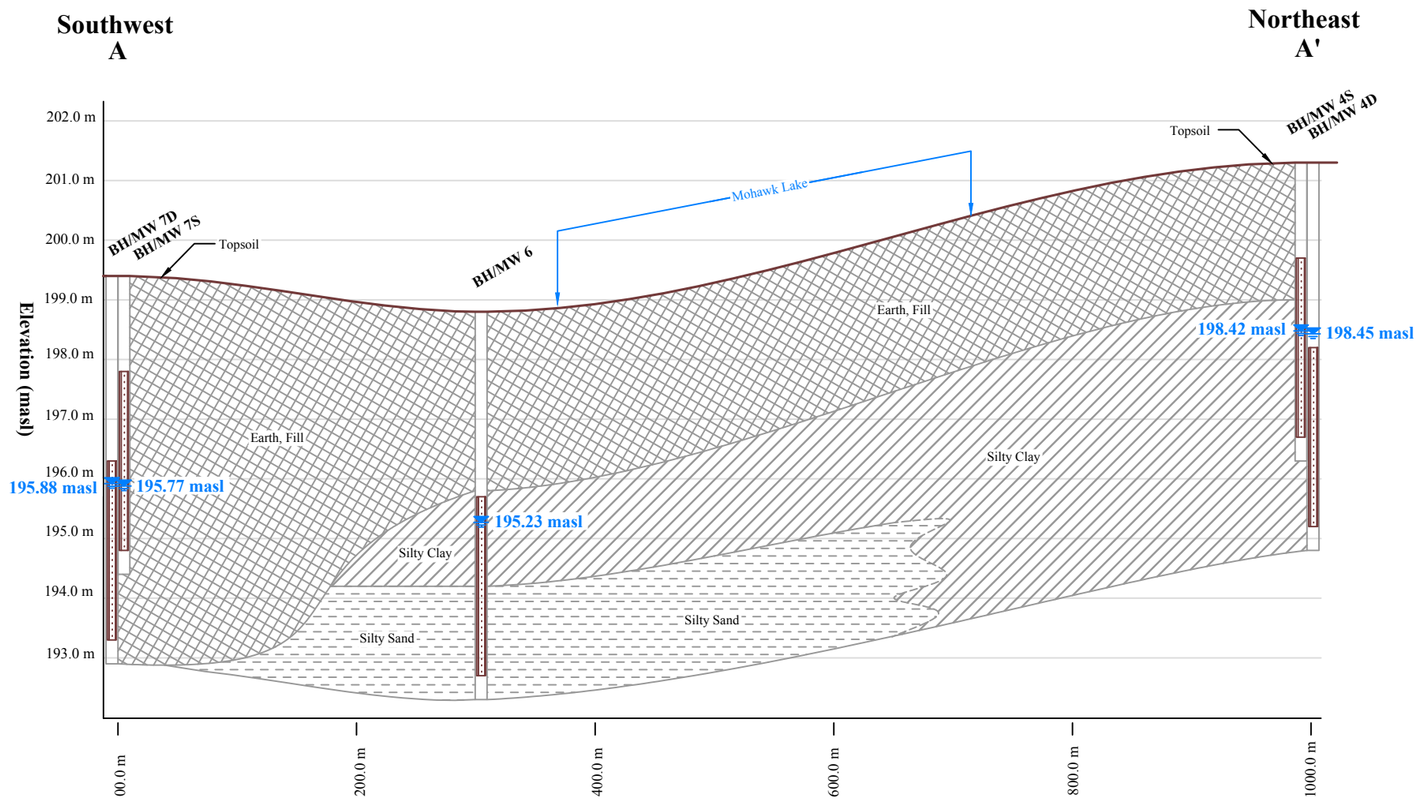
Reference No. 1806-W012

Date: October 4, 2019

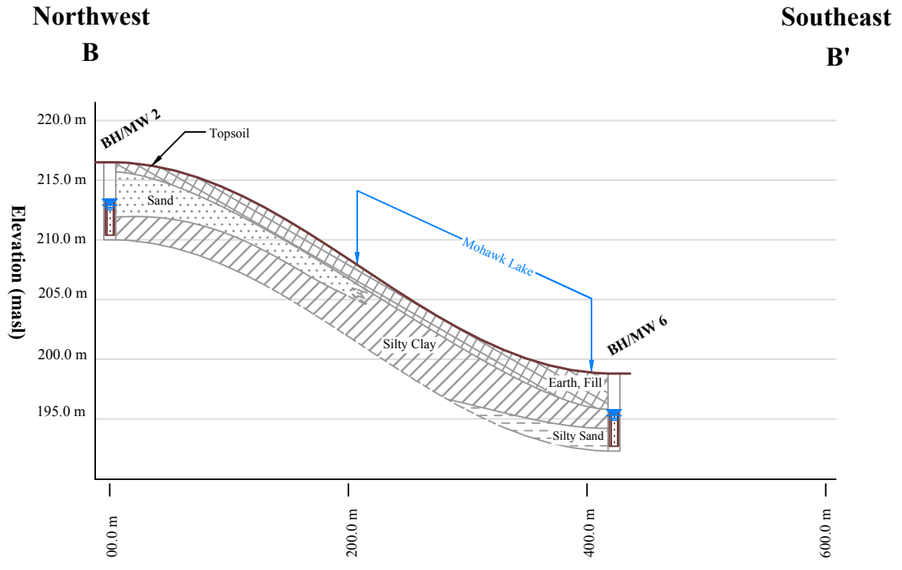
Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 8-1



Section A-A'
(V. Scale: 1:100)



Section B-B'
(V. Scale: 1: 500)

Earth, Fill
Silty Clay
Sand
Silty Sand
Screen
Water Table

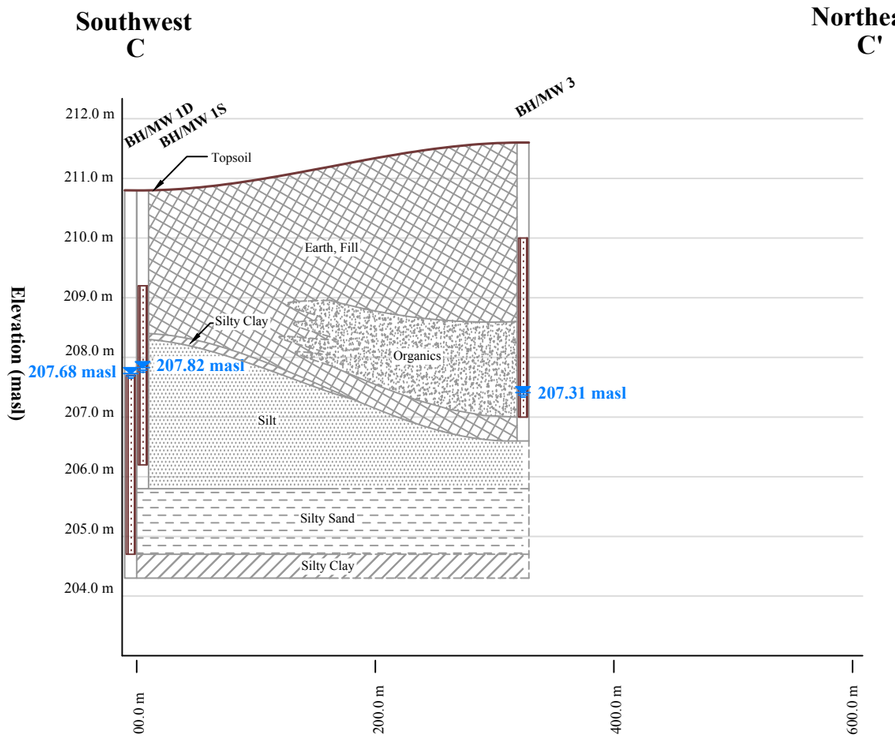
C:\Projects\2018 Jobs\1812-W012

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

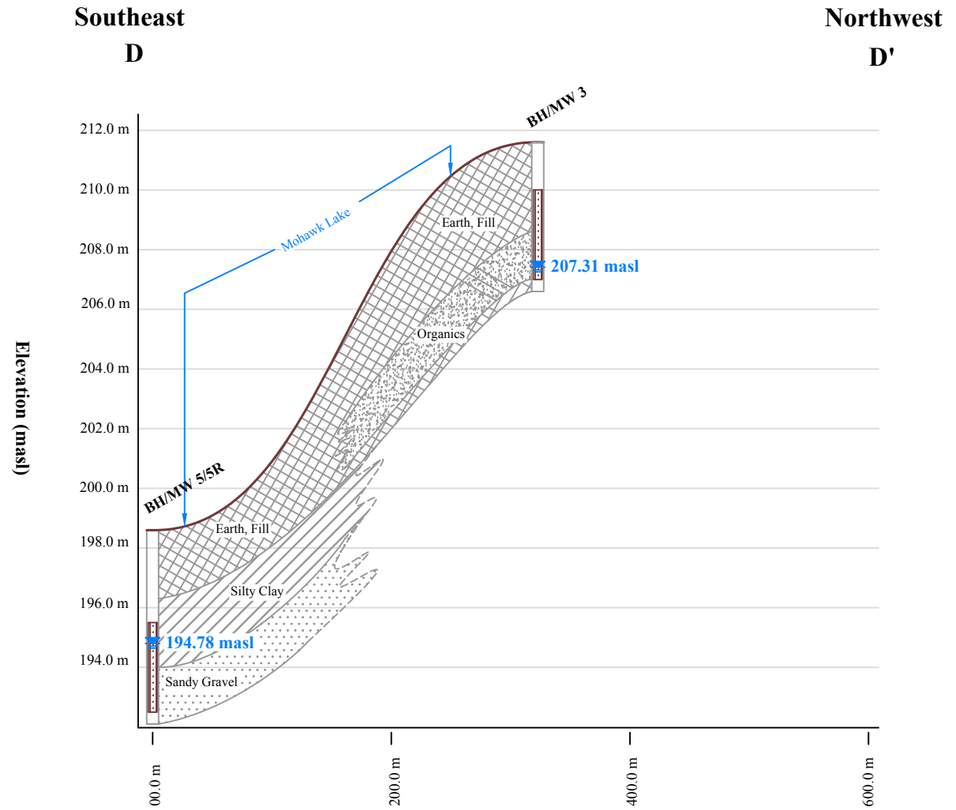
Title: Geological Cross-Section (A-A' and B-B')

Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	8-2A



Section C-C'
(V. Scale: 1:100)



Section D-D'
(V. Scale: 1: 200)

Earth, Fill
Silt
Silty Clay
Silty Sand
Organics
Sandy Gravel
Screen
Water Table

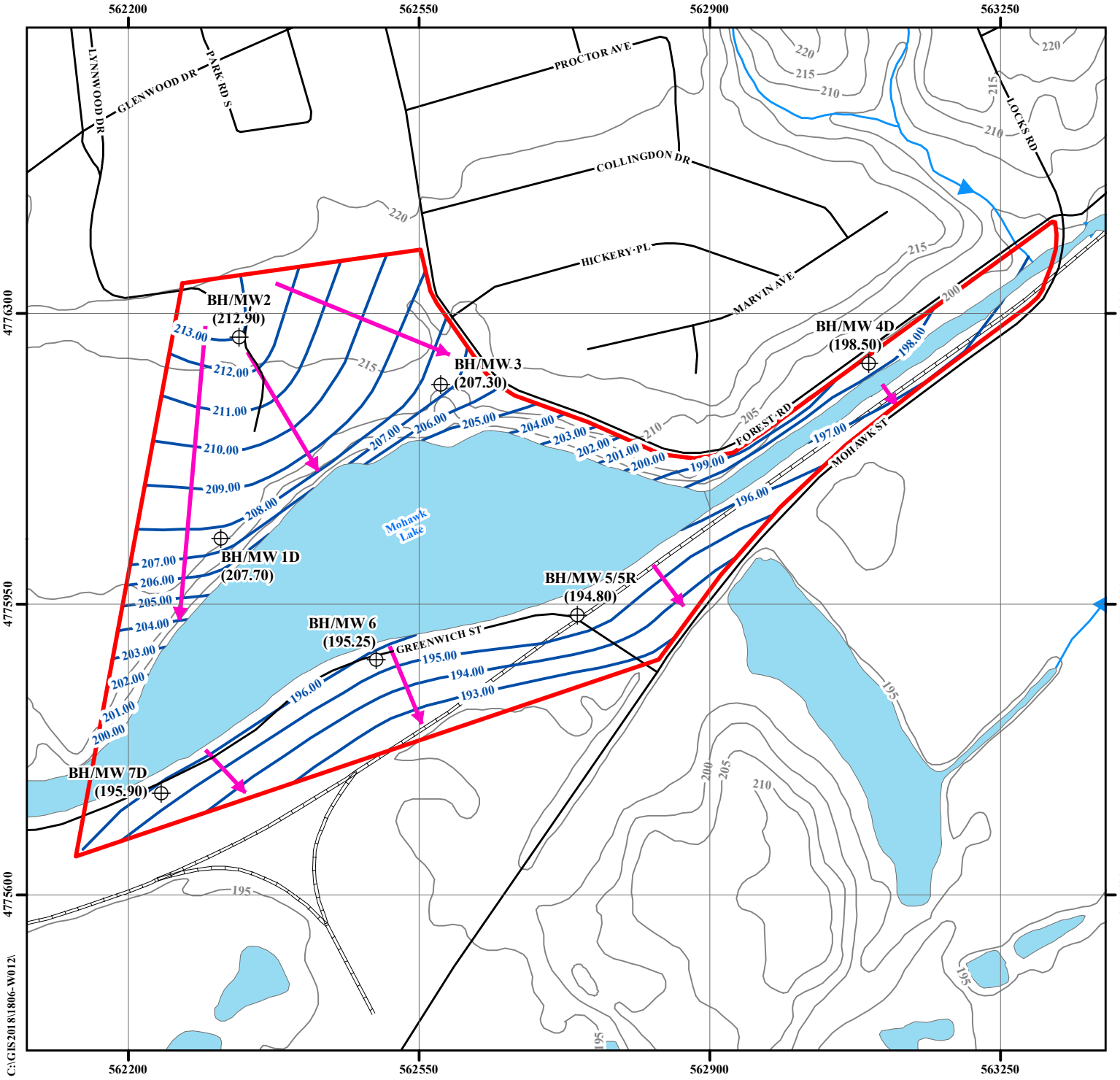
C:Projects/2018 Jobs/1812-W012

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (C-C' and D-D')

Project: Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street, City of Brantford

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1806-W012	October, 2019	-	1:500	8-2B



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Source: Ministry of Natural Resources and Forestry
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Soil Engineers Ltd.

Title: Shallow Groundwater Flow Pattern Plan

Project:

Hydrogeological Assessment
Mohawk Lake Characterization Study
Forest Road and south of Greenwich Street
City of Brantford

Reference No. 1806-W012

Date: October 4, 2019

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 9

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'A'

MECP WATER WELL RECORDS SUMMARY

REFERENCE NO. 1806-W012

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
1	7258436	-	-	-	-	-	-	-
2	7140402	Boring	Test Hole	Monitoring	4.90	-	-	-
3	7143756	-	-	-	4.40	-	-	-
4	7152946	Boring	Test Hole	Monitoring	-	-	3.00	6.10
5	7152946	Boring	Test Hole	Monitoring	-	-	3.00	6.10
6	7152946	Boring	Test Hole	Monitoring	-	-	3.00	6.10
7	7152946	Boring	Test Hole	Monitoring	-	-	-	-
8	7047861	Boring	Observation Wells	-	4.60	-	3.05	6.10
9	7242968	-	Abandoned-Other	-	4.88	-	-	-
10	7143756	-	-	-	-		-	-
11	7140402	Boring	Test Hole	Monitoring	-	3.50	4.50	4.50
12	7232213	-	-	-	-		-	-
13	7118156	otary (Conver	Monitoring and Test Hole	Monitoring	12.20	-	10.68	13.73
14	7242967	-	Abandoned-Other	-	7.02	-	-	-
15	7225149	-	-	-	0.00	-	-	-
16	7220643	Boring	Observation Wells	Monitoring	2.40	-	3.00	4.50
17	7258873				-	-	-	-
18	7105526	ROTARY	Test Hole	Monitoring	-	-	4.80	7.30
19	7105526	ROTARY	Test Hole	Monitoring	-	-	4.80	7.30
20	7116470	BORING	Test Hole	Monitoring	-	4.00	7.20	4.20
21	7180538	Direct Push	Observation Wells	Monitoring	-	-	5.49	8.54
22	7180542	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	6.10	9.15
23	7180543	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	5.49	8.54
24	7180544	Direct Push	Observation Wells	Monitoring	-	-	5.49	8.54
25	7105526	otary (Conver	Test Hole	Monitoring	-	-	-	-
26	7220642	Boring	Observation Wells	Monitoring	-	-	4.50	6.00
27	7116470	Boring	Test Hole	Monitoring	-	4.00	7.30	4.30
28	7258872	-	-	-	-	-	-	-
29	7178106	-	Observation Wells	Monitoring	3.15	-	3.00	4.80
30	7129841	Auger	Test Hole	Test Hole	-		3.00	6.00
31	7124569	-	Abandoned-Other	-	-	-	-	-
32	1306456	Other Method	Observation Wells	Not Used	-	-	3.00	6.10
33	1303920	Boring	Dewatering	-	3.36	3.36	-	-
34	1303920	Boring	Dewatering	-	4.88	3.36	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
35	7129841	Auger	Test Hole	Test Hole	4.00	-	-	-
36	7178104	otary (Conver	Observation Wells	Monitoring	3.00	-	3.00	4.90
37	7129841	Auger	Test Hole	Test Hole	-	-	3.00	6.00
38	7129841	Auger	Test Hole	Test Hole	-	-	3.00	6.00
39	7129841	Auger	Test Hole	Test Hole	-	-	3.00	6.00
40	7258853	Boring	Observation Wells	Monitoring	-	-	3.05	6.10
41	7229271	-	-	-	-	-	-	-
42	7178105	otary (Conver	Observation Wells	Monitoring	2.92	-	3.00	4.80
43	7258438	-	-	-	-	-	-	-
44	7243128	-	-	-	-	-	-	-
45	7212912	-	-	-	-	-	-	-
46	7243477	-	Abandoned-Other	Not Used	-	-	-	-
47	1306704	Boring	Observation Wells	-	6.80	-	5.60	7.10
48	1306443	Other Method	Observation Wells	-	-	-	17.00	32.00
49	7164829	-	-	-	-	-	-	-
50	7220644	Boring	Observation Wells	Monitoring	3.00	-	6.10	7.60
51	7201396	Boring	Observation Wells	Monitoring	4.00	-	2.10	5.10
52	1306539	Other Method	Observation Wells	Not Used	-	-	3.10	4.60
53	1306616		Abandoned-Other		-	-	3.10	4.60
54	7211362	otary (Conver	Test Hole	Test Hole	-	-	5.80	2.75
55	7191783	-	-	-	-	-	-	-
56	7188462	-	-	-	-	-	-	-
57	7201397	Boring	Observation Wells	Monitoring	4.20	-	2.10	5.10
58	7219685				-	-	-	-
59	7201398	Boring	Observation Wells	Monitoring	3.30	-	1.50	3.90
60	7201395	Boring	Observation Wells	Monitoring	3.10	-	1.40	4.40
61	7203993	-	-	-	-	-	-	-
62	7189082	-	-	-	-	-	-	-
63	7201399	Boring	Observation Wells	Monitoring	3.60	-	1.50	4.50
64	7258409	-	-	-	-	-	-	-
65	7258433	-	-	-	-	-	-	-
66	7188460	-	-	-	-	-	-	-
67	7203992	-	-	-	-	-	-	-
68	7258413	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
69	7248379	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
70	7248379	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	-	-
71	7248379	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
72	7248379	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	-	-
73	7248378	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	-	-
74	7248378	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
75	7248378	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	-	-
76	7248378	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
77	7219684				-	-	-	-
78	7248377	Driving	Monitoring and Test Hole	Monitoring and Test Hole	-	-	0.00	0.00
79	7248377	Driving	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
80	7248377	Driving	Monitoring and Test Hole	Monitoring and Test Hole	-	-	-	-
81	7248377	Driving	Monitoring and Test Hole	Monitoring and Test Hole	-	-	12.20	13.70
82	7188861	-	-	-	-	-	-	-
83	1306323	otary (Conver	Observation Wells	-	-	-	1.50	4.50
84	7188862	-	-	-	-	-	-	-
85	7220641	Boring	Observation Wells	Monitoring	-	-	6.00	7.60
86	7230629	-	-		-	-	-	-
87	7230630				1.30	-	-	-
88	7188449				-	-	-	-
89	7139482	Boring	Test Hole	Monitoring	2.50	-	-	-
90	7141974				2.50	-	-	-
91	7139482	Boring	Test Hole	Monitoring	-	-	3.60	4.50

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
92	7141974	-	-	-	-	-	-	-
93	1306610	-	-	-	-	-	-	-
94	1306510	Boring	Observation Wells	-	-	-	1.50	4.50
95	7167673	Direct Push	Test Hole	Monitoring and Test Hole	-	-	6.20	9.20
96	7167672	Direct Push	Test Hole	Monitoring and Test Hole	-	-	6.00	9.00
97	7263009	-	-		-	-	-	-
98	7251788	otary (Conver	Observation Wells	Monitoring and Test Hole	3.66	-	2.44	5.49
99	7281674	-	-	-	-	-	-	-
100	7127080	Boring	Observation Wells	Other	-	-	4.60	7.60
101	7167671	Direct Push	Test Hole	Monitoring and Test Hole	-	-	6.00	9.00
102	7181979	Boring	Test Hole	Test Hole	4.30	-	3.10	6.20
103	7167013	-	-	-	-	-	-	-
104	7226195	Boring	Observation Wells	Monitoring and Test Hole	5.49	-	3.97	7.02
105	7283710	-	-		0.00	-	0.00	0.00
106	7226196	Boring	-	Monitoring and Test Hole	5.49	-	3.97	7.02
107	7181980	Boring	Test Hole	Test Hole	4.30	-	3.10	6.20
108	7277020	otary (Conver	Observation Wells	Monitoring	-	-	9.15	12.20
109	7230657	-	Abandoned-Other	Monitoring	2.85	-	-	-
110	7132487	BORING	Test Hole	Monitoring	0.00	3.00	3.00	4.50
111	7140396	-	-	-	-	-	-	-
112	7040357	Boring	Observation Wells	-	4.30	-	2.50	5.60
113	7230658	-	Abandoned-Other	Monitoring	3.07	-	-	-
114	7226197	Boring	Observation Wells	Monitoring and Test Hole	5.49	-	3.97	7.02
115	7135146	Boring	Observation Wells	Monitoring	-	-	21.35	24.40
116	1306571	Boring	Observation Wells		6.50	-	1.20	7.80
117	7259431				-		-	-
118	7132487	Boring	Test Hole	Monitoring	-	2.20	3.00	4.50

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
119	7140396	-	-		-	-	-	-
120	7140396	-	-		-	-	-	-
121	7132487	Boring	Test Hole	Monitoring	-	3.30	4.50	6.00
122	1306139	otary (Conver	Observation Wells	-	-	-	1.90	4.90
123	7210581	Boring	Observation Wells	Monitoring	-	-	3.90	7.00
124	7210583	Boring	Observation Wells	Monitoring	-	-	1.50	4.60
125	1306136	Driving	Observation Wells	Not Used	1.00	-	1.80	4.90
126	7225956	-	-	-	-	-	-	-
127	7230693	-	Abandoned-Other	Monitoring	5.85	-	-	-
128	7210582	Boring	Observation Wells	Monitoring	-	-	4.60	7.60
129	1305814	Other Method	Observation Wells	-	3.66	-	3.97	5.49
130	7210584	Boring	Observation Wells	Monitoring	-	-	3.10	6.10
131	7230687	-		Monitoring	3.10	-	-	-
132	1305813	Other Method	Observation Wells	-	2.14	-	1.53	3.05
133	7132487	Boring	Test Hole	Monitoring	-	3.60	4.50	6.00
134	7133133	Boring	Test Hole	Test Hole	-	-	4.20	6.00
135	7133133	Boring	Test Hole	Test Hole	-	-	-	-
136	7244821	Boring	Observation Wells	Monitoring and Test Hole	5.49	-	4.58	7.63
137	7139617	Boring	Observation Wells	Monitoring	-	-	-	-
138	7143068	Direct Push	Test Hole	Monitoring	-	-	-	-
139	7230656		Abandoned-Other	Monitoring	5.05	-	-	-
140	1306340	Boring	Observation Wells	-	7.00	-	7.00	12.00
141	7230655	-	Abandoned-Other	Monitoring	5.90	-	-	-
142	7240575	-	-		1.74	-	-	-
143	7245939	Boring	Water Supply	Monitoring and Test Hole	1.53	-	3.97	7.02
144	1305815	Other Method	Observation Wells	-	2.44	-	0.92	2.44
145	7217177	-	-	-	-	-	-	-
146	7245941	Boring	Observation Wells	Monitoring and Test Hole	4.27	-	3.97	7.02
147	7242521	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
148	7132487	Boring	Test Hole	Monitoring	2.40	-	-	-
149	7140396				2.40	-	-	-
150	7132487	Boring	Test Hole	Monitoring	-	-	-	-
151	7230654	-	Abandoned-Other	Monitoring	-	-	-	-
152	1306569	Other Method	Observation Wells	-	-	-	7.00	15.00
153	7240552	-	-	-	3.10	-	-	-
154	7244822	Boring	Observation Wells	Monitoring and Test Hole	5.49	-	3.97	7.02
155	7113425	Auger	Observation Wells	Monitoring	-	-	6.10	9.15
156	7211123	-	-	-	-	-	-	-
157	7230688	-	Abandoned-Other	Monitoring	2.58	-	-	-
158	7193594	Boring	Observation Wells	Monitoring	4.58	-	4.58	7.63
159	7216972	-			0.00	-	-	-
160	7230694	-	Abandoned-Other	Monitoring	9.90	-	-	-
161	7245938	Boring	Observation Wells	Monitoring and Test Hole	4.27	-	3.97	7.02
162	7230695	-	Abandoned-Other	Monitoring	5.25	-	-	-
163	7179412	-		-	-	-	-	-
164	1306646	Boring	Observation Wells	-	3.10	-	3.10	6.20
165	7140396	-	-	-	-	-	-	-
166	7132487	Boring	Test Hole	Monitoring	-	3.00	3.60	6.00
167	7139482	Boring	Test Hole	Monitoring	-	3.30	6.70	7.60
168	7133133	Boring	Test Hole	Test Hole	-	-	0.90	2.40
169	7245940	Boring	Observation Wells	Monitoring and Test Hole	4.27	-	3.97	7.02
170	7230689		Abandoned-Other	Monitoring	3.00	-	-	-
171	7160367	Boring	Observation Wells	Monitoring	10.90	-	12.50	15.60
172	7160369	Boring	Observation Wells	Monitoring	6.20	-	6.20	9.30
173	7230653	-	Abandoned-Other	Monitoring	5.52	-	-	-
174	7230696	-	Abandoned-Other	Monitoring	4.85	-	-	-
175	7043201	Boring	Observation Wells	-	3.10	-	2.10	5.30
176	7249863	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
177	7240574	-	-	-	1.54	-	-	-
178	7230690	-	Abandoned-Other	Monitoring	2.58	-	-	-
179	7160368	Boring	Observation Wells	Monitoring	4.60	-	11.25	14.30
180	1303230	Cable Tool	Water Supply	Domestic	65.88	19.83	-	-
181	1303230	Cable Tool	Water Supply	Domestic	50.33	19.83	-	-
182	7230691	-	Abandoned-Other	Monitoring	4.20	-	-	-
183	7242523	-	-	-	-	-	-	-
184	1306708	Boring	Observation Wells	-	-	-	9.00	10.60
185	7252530	Boring	Observation Wells	Monitoring	-	-	17.10	20.10
186	7252530	Boring	Observation Wells	Monitoring	-	-	17.10	20.10
187	7160366	-	Observation Wells	Monitoring	-	-	3.10	6.20
188	7230692	-	Abandoned-Other	Monitoring	4.83	-	-	-
189	7139437	-	Test Hole	Test Hole	-	-	-	-
190	7139437	Boring	Test Hole	Test Hole	-	-	0.60	1.60
191	7230698	-	Abandoned-Other	Monitoring	5.90	-	-	-
192	7230697	-	Abandoned-Other	Monitoring	5.70	-	-	-
193	7124782	Direct Push	Test Hole	Test Hole	-	-	0.30	0.91
194	7124782	Direct Push	Test Hole	Test Hole	-	-	0.61	2.10
195	7048116	Other Method	Observation Wells	-	-	-	3.10	6.10
196	1303231	Cable Tool	Water Supply	Cooling And A/C	57.03	4.58	-	-
197	1306647	Boring	Observation Wells	Not Used	4.50	-	3.00	6.00
198	1305852	Other Method	Observation Wells	-	3.66	-	1.53	4.58
199	1305849	Other Method	Observation Wells	-	3.66	-	2.14	6.71
200	7117440	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.96	7.01
201	7117439	Driving	-	Monitoring and Test Hole	-	-	3.96	7.01
202	7117438	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.46	7.01

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
203	7117437	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.96	7.01
204	1303119	Cable Tool	Water Supply	Cooling And A/C	33.55	2.44	-	-
205	1303119	Cable Tool	Water Supply	Cooling And A/C	42.70	2.44	-	-
206	1305850	Other Method	Observation Wells	-	3.66	-	1.53	4.58
207	1305851	Other Method	Observation Wells	-	3.97	-	1.83	4.88
208	1306481	Boring	Observation Wells	-	2.30	-	1.50	4.50
209	7103768	AUGER	Abandoned-Other	-	-	-	-	-
210	1305370	Boring	Abandoned-Supply	Not Used	-	-	-	-
211	7109568	Driving	Test Hole	Monitoring	-	4.00	3.10	6.20
212	7102696	Boring	Test Hole	Monitoring	6.20		0.00	0.00
213	7109568	Driving	Test Hole	Monitoring	-	4.00	3.10	6.20
214	1305369	Boring	Abandoned-Supply	Not Used	-		0.00	0.00
215	7139482	Boring	Test Hole	Monitoring	-	3.00	3.80	5.30
216	7128793	Boring	Test Hole	Monitoring	-	-	-	-
217	7130107	-	Abandoned-Other	-	-	-	-	-
218	1306665	Boring	Observation Wells	-	4.50	-	-	-
219	1306711	Boring	Observation Wells	-	4.00	-	4.30	5.60
220	7109568	Driving	Test Hole	Monitoring	4.00	-	3.10	6.20
221	7237240	-	-	-	-	-	-	-
222	1306598	Boring	Observation Wells	-	3.30	-	1.50	4.50
223	7179630	-	-	-	-	-	-	-
224	7103281	Boring	Test Hole	Monitoring	-	5.00	8.00	8.00
225	7105323	-	Abandoned-Other	-	-	-	-	-
226	7103281	Boring	Test Hole	Monitoring	-	4.00	7.00	7.00
227	7109567	Driving	Test Hole	Monitoring	4.00		3.10	6.20
228	7103281	Boring	Test Hole	Monitoring	-	4.00	5.10	7.50
229	1306547	Boring	Observation Wells	-	2.50	-	1.50	4.60
230	1306289	otary (Conver	Test Hole	-	3.00	-	2.00	5.00
231	7269009	Boring	Abandoned-Other	Monitoring	4.30	-	-	-
232	7269010	Boring	Test Hole	Monitoring	4.30	-	3.00	6.10
233	7193014	-	-	-	-	-	-	-
234	7282718	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
235	7282720	-	-	-	-	-	-	-
236	7189734	-	-	-	-	-	-	-
237	7193013	-	-	-	-	-	-	-
238	7266338	-	-	-	-	-	-	-
239	7103281	Boring	Test Hole	Monitoring	3.00	-	-	-
240	7109567	Driving	Test Hole	Monitoring	-	4.00	3.10	6.20
241	7145115	-	Abandoned-Other	-	-	-	6.50	7.50
242	7145115	-	Abandoned-Other	-	-	-	6.00	7.00
243	7143579	-		-	-	-	-	-
244	7145115	-	Abandoned-Other	-	4.30	-	-	-
245	7145115	-	Abandoned-Other	-	-	-	6.50	7.50
246	7145115	-	Abandoned-Other	-	-	-	6.00	7.00
247	7145115	-	Abandoned-Other	-	-	-	6.50	7.50
248	7145115	-	Abandoned-Other	-	-	-	6.50	7.50
249	7145115	-	Abandoned-Other	-	-	-	6.50	7.50
250	7145115	-	Abandoned-Other	-	-	-	6.00	7.00
251	7145115	-	Abandoned-Other	-	-	-	6.00	7.00
252	7192965	-		-	-	-	-	-
253	7149427	Boring	Test Hole	Monitoring	-	0.30	1.30	3.70
254	7156414	Boring	Test Hole	Monitoring	2.20	-	-	-
255	7225767	-	-	-	-	-	-	-
256	7149427	Boring	Test Hole	Monitoring	-	-	1.30	3.70
257	7052237	Other Metho	Observation Wells	Not Used	3.10	-	-	-
258	7156414	Boring	Test Hole	Monitoring	-	0.30	2.10	4.50
259	7161899	otary (Conver	Test Hole	Test Hole	-	-	3.05	6.10
260	7156414	Boring	Test Hole	Monitoring	-	2.00	3.60	6.00
261	7109567	Driving	Test Hole	Monitoring	-	4.00	3.10	6.20
262	7282719	-	-	-	-	-	-	-
263	7149427	Boring	Test Hole	Monitoring	-	0.60	1.30	3.70
264	7149427	Boring	Test Hole	Monitoring	1.00	-	-	-
265	7109292	Boring	Test Hole	Test Hole	-	1.20	1.10	4.10
266	7188656	-	-	-	-	-	-	-
267	7149427	Boring	Test Hole	Monitoring	-	0.30	1.30	3.70
268	1306292	Other Metho	Test Hole	Not Used	3.00	-	1.50	5.00
269	7225136				-	-	-	-
270	7109292	Boring	Test Hole	Test Hole	-	2.10	1.80	4.90
271	1306698	Boring	Observation Wells	-	1.87	-	1.20	4.30

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
272	1306540	Other Method	Observation Wells	Not Used	-	-	1.50	4.60
273	1306701	Boring	Observation Wells	-	4.00	-	3.90	5.40
274	1306548	Boring	Observation Wells	-	3.40	-	3.10	6.20
275	7226743	-	-	-	-	-	-	-
276	7181657	Boring	Observation Wells	Monitoring	-	-	1.53	4.58
277	7281226	-	-	-	-	-	-	-
278	7224691	-	-	-	-	-	-	-
279	7109292	Boring	Test Hole	Test Hole	-	1.20	0.90	4.00
280	1306457	Other Method	Observation Wells	-	-	-	1.53	6.10
281	7210056	-	-	-	-	-	-	-
282	1306295	Other Method	Observation Wells	Not Used	3.50	-	3.00	6.00
283	7051536	-	Observation Wells	-	-	-	1.50	6.10
284	1306699	Boring	Observation Wells	-	4.00	-	2.90	6.00
285	7160601			-	-	-	-	-
286	1306482	Boring	Test Hole	-	3.60	-	2.10	5.10
287	7108373	-	Abandoned-Supply	-	-	-	-	-
288	1305869	Other Method	Observation Wells	Not Used	2.14	-	2.14	3.66
289	7249884	-	-	-	-	-	-	-
290	7135396	-	Other Status	-	-	-	-	-
291	7135399	otary (Conver	Test Hole	Test Hole	-	-	3.05	4.58
292	7135397		Other Status		-	-	-	0.00
293	7135398	otary (Conver	Test Hole	Test Hole	-	-	1.53	3.05
294	1306702	Boring	Observation Wells		4.60	-	3.10	4.60
295	7047341	Boring	Observation Wells	Monitoring	1.80	-	-	-
296	7236756	otary (Conver	Observation Wells	Monitoring	2.28	-	1.25	4.30
297	7137321	Boring	Test Hole	Monitoring	4.40	-	-	-
298	7165433	otary (Conver	Dewatering	Domestic	15.86	2.14	15.86	17.08
299	7165433	otary (Conver	Dewatering	Domestic	18.30	2.14	15.86	17.08
300	7165433	otary (Conver	Dewatering	Domestic	15.86	2.14	15.86	17.08
301	7165433	otary (Conver	Dewatering	Domestic	18.30	2.14	15.86	17.08
302	7179764	-	Abandoned-Other	-	-	-	15.86	17.08
303	7165434	otary (Conver	Dewatering	Dewatering	18.30	2.14	15.86	17.08
304	7165434	otary (Conver	Dewatering	Dewatering	15.86	2.14	15.86	17.08
305	7165434	otary (Conver	Dewatering	Dewatering	18.30	2.14	15.86	17.08
306	7179763	-	-	-	-	-	16.16	17.08

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
307	7165434	otary (Conver	Dewatering	Dewatering	15.86	2.14	15.86	17.08
308	1305870	Other Method	Observation Wells	Not Used	0.92	-	1.53	3.05
309	7179762	-	Abandoned-Other	-	-	-	16.32	17.54
310	7165450	otary (Conver	Dewatering	Dewatering	18.30	2.14	16.32	17.54
311	7165450	otary (Conver	Dewatering	Dewatering	15.86	2.14	16.32	17.54
312	7165450	otary (Conver	Dewatering	Dewatering	15.86	2.14	16.32	17.54
313	7165450	otary (Conver	Dewatering	Dewatering	18.30	2.14	16.32	17.54
314	7165435	otary (Conver	Dewatering	Dewatering	15.86	2.14	16.93	18.15
315	7165435	otary (Conver	Dewatering	Dewatering	18.30	2.14	16.93	18.15
316	7179760	-	Abandoned-Other	-	-	-	16.93	18.15
317	7165435	otary (Conver	Dewatering	Dewatering	15.86	2.14	16.93	18.15
318	7165435	otary (Conver	Dewatering	Dewatering	18.30	2.14	16.93	18.15
319	7137321	Boring	Test Hole	Monitoring	0.00	2.50	8.00	8.00
320	7261638	-	-	-	-	-	-	-
321	7161862	-	-	-	-	-	-	-
322	1306707	Boring	Observation Wells	-	3.40	-	3.00	4.50
323	7137321	Boring	Test Hole	Monitoring	0.00	4.40	6.70	4.70
324	7165440	otary (Conver	Dewatering	Dewatering	18.30	3.05	16.77	18.00
325	7165440	otary (Conver	Dewatering	Dewatering	16.77	3.05	16.77	18.00
326	7165440	otary (Conver	Dewatering	Dewatering	18.30	3.05	16.77	18.00
327	7165440	otary (Conver	Dewatering	Dewatering	16.77	3.05	16.77	18.00
328	7179765	-	Abandoned-Other	-	-	-	16.77	18.00
329	7165436	otary (Conver	Dewatering	Dewatering	18.30	3.05	16.47	17.69
330	7165436	otary (Conver	Dewatering	Dewatering	16.47	3.05	16.47	17.69
331	7165436	otary (Conver	Dewatering	Dewatering	16.47	3.05	16.47	17.69
332	7165436	otary (Conver	Dewatering	Dewatering	18.30	3.05	16.47	17.69
333	7179761	-	Abandoned-Other	-	-	-	16.47	17.69
334	7165437	otary (Conver	Dewatering	Domestic	18.30	3.05	16.62	17.84
335	7165437	otary (Conver	Dewatering	Domestic	16.77	3.05	16.62	17.84
336	7165437	otary (Conver	Dewatering	Domestic	16.77	3.05	16.62	17.84
337	7179758	otary (Conver	Abandoned-Other	Dewatering	0.00	-	16.62	17.84
338	7165437	otary (Conver	Dewatering	Domestic	18.30	3.05	16.62	17.84
339	7179759	-	Abandoned-Other	-	0.00	-	16.77	18.00
340	7165438	-	Dewatering	Dewatering	16.77	3.05	16.77	18.00
341	7165438	-	Dewatering	Dewatering	18.30	3.05	16.77	18.00
342	7165438	-	Dewatering	Dewatering	16.77	3.05	16.77	18.00
343	7165438	-	Dewatering	Dewatering	18.30	3.05	16.77	18.00
344	7041407	Boring	Observation Wells	-	4.30		3.00	6.00
345	7137321	Boring	Test Hole	Monitoring	-	4.20	6.00	6.00

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
346	7111776	Boring	Abandoned-Other	Monitoring	-	1.92	2.14	3.66
347	7111776	Boring	Abandoned-Other	Monitoring	2.00	2.00	-	-
348	7111776	Boring	Abandoned-Other	Monitoring	-	1.92	2.14	3.66
349	7139459	Boring	Test Hole	Not Used	-	-	1.50	3.05
350	1305863	Other Method	Observation Wells	Not Used	2.44	-	2.44	3.97
351	7111776	Boring	Abandoned-Other	Monitoring	-	1.92	1.53	3.05
352	7139459	Driving	Test Hole	Not Used	-	-	-	-
353	7139459	Direct Push	Test Hole	Not Used	-	-	1.50	3.05
354	7223884	Boring	Observation Wells	Monitoring	-	-	3.05	4.58
355	7139459	Direct Push	Test Hole	Not Used	-	-	1.50	3.05
356	7257233	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
357	1306130	Other Method	Observation Wells	Not Used	2.00	-	6.50	8.25
358	1305868	Other Method	Observation Wells	Not Used	1.83	-	2.14	3.66
359	7133613	-	Abandoned-Other	Not Used	-	-	-	-
360	7220636	-	-	-	-	-	-	-
361	7040259	-	Abandoned-Other	-	-	-	-	-
362	7108523	Boring	Test Hole	Monitoring	-	5.20	4.60	7.60
363	7108523	otary (Conver	Test Hole	Monitoring	-	5.30	-	-
364	7109749				-		-	-
365	7108523	Boring	Test Hole	Monitoring	-	5.70	4.60	7.60
366	7265982	-	Abandoned-Other	-	-	-	-	-
367	1305866	Other Method	Observation Wells	Not Used	2.14	-	2.75	4.27
368	7228681	Boring		Monitoring	0.00	-	1.53	4.58
369	7049294	Boring	Observation Wells	Monitoring	6.10	-	-	-
370	1306395	Boring	Observation Wells	Not Used	-	-	10.00	14.00
371	1305871	Other Method	Observation Wells	Not Used	2.75	-	2.44	3.97
372	7108523	Boring	Test Hole	Monitoring	-	5.20	4.60	7.60
373	7265985	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	4.20	5.80
374	7265984	-	Abandoned-Other	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
375	1305938	Cable Tool	Water Supply	Domestic	8.23	6.10	10.07	11.29
376	1305938	Cable Tool	Water Supply	Domestic	11.90	6.10	10.07	11.29
377	1305878	Other Method	Observation Wells	Not Used	2.75	-	2.75	4.27
378	7223883	Boring	Observation Wells	Monitoring	-	-	3.05	4.58
379	7120702	Boring		Monitoring	-	-	1.80	4.80
380	7155615	Boring	Observation Wells	Monitoring	4.49	-	3.75	5.00
381	7155615	Boring	Observation Wells	Monitoring	4.49	-	3.75	5.00
382	7265986	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	4.00	5.50
383	7265987	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	4.00	5.50
384	7265983	-	Abandoned-Other	-	-	-	-	-
385	7120702	Boring	-	Monitoring	-	-	1.80	4.80
386	7120702	Driving	-	Monitoring	-	-	-	-
387	7240087	otary (Conver	Observation Wells	Monitoring	-	-	3.81	2.29
388	7126931	otary (Conver	Test Hole	Test Hole	-	-	3.05	7.63
389	7129736	Boring	Test Hole	Test Hole	-	-	3.00	6.10
390	7129737	Boring	Test Hole	Test Hole	-	-	3.00	6.10
391	7120702	Boring		Monitoring	-	-	1.50	4.50
392	7246649		Abandoned-Other	Monitoring	2.25	-	-	-
393	7120702	Boring		Monitoring	-	-	1.80	4.80
394	7134871	Boring	Observation Wells	Monitoring	-	-	-	-
395	1305872	Other Method	Observation Wells	Not Used	2.75	-	2.44	3.97
396	1300027	Cable Tool	Water Supply	Commerical	27.45	2.75	-	-
397	1303250	Cable Tool	Water Supply	Cooling And A/C	25.93	0.31	-	-
398	1306683	Other Method	Observation Wells	-	1.50	-	1.50	4.50
399	7122166	Driving	Observation Wells	Test Hole	-	-	-	-
400	7133618	-	Abandoned-Other	-	-	-	-	-
401	7131437	Boring	Test Hole	Monitoring	-	1.50	0.90	4.50
402	7177678	-	-	-	-	-	-	-
403	1305875	Other Method	Observation Wells	Not Used	2.75	-	2.44	3.97
404	7131437	Boring	Test Hole	Monitoring	-	1.50	0.90	4.50

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
405	7133618	-	Abandoned-Other	-	-	-	-	-
406	1305865	Other Method	Observation Wells	Not Used	1.83	-	2.44	3.97
407	7202271	Boring	Abandoned-Other	Monitoring	0.15	-	2.14	3.66
408	7201077	-	-	-	-	-	-	-
409	7133618	-	Abandoned-Other		-	-	-	-
410	7131437	Boring	Test Hole	Monitoring	1.00	-	-	-
411	7206130	-	-	-	-	-	-	-
412	7173278	-	-	-	-	-	-	-
413	7176651	-	-	-	-	-	-	-
414	1305864	Other Method	Observation Wells	Not Used	2.75	-	2.44	3.97
415	7199261	-	-	-	-	-	-	-
416	1305873	Other Method	Observation Wells	Not Used	3.05	-	2.44	3.97
417	7240017	-	-	-	-	-	-	-
418	7240018	-	-	-	-	-	-	-
419	7239446	-	Abandoned-Other	-	-	-	-	-
420	7280237	otary (Conver	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
421	1305874	Other Method	Observation Wells	Not Used	2.44	-	2.75	4.27
422	7280239	otary (Conver	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
423	1305867	Other Method	Observation Wells	Not Used	2.75	-	2.75	4.27
424	7280241	otary (Conver	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
425	7280240	otary (Conver	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
426	7247403				-	-	-	-
427	1305876	Other Method	Observation Wells	Not Used	1.83	-	1.53	3.05
428	7281158	-	-	-	-	-	-	-
429	7247400	-	-	-	-	-	-	-
430	1305877	Other Method	Observation Wells	Not Used	1.83	-	1.53	3.05
431	1306741	Boring	Observation Wells	-	2.00	-	1.60	4.60
432	7246650	-	Abandoned-Other	Monitoring	2.75	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
433	7275756	-	-	-	0.00	-	-	-
434	7039418	Boring	Observation Wells	-	3.00	-	8.00	9.40
435	7218768		-	-	0.00	-	-	-
436	7046193	Boring	Observation Wells	Monitoring	2.40	-	-	-
437	1306128	Boring	Test Hole	Not Used	3.50	-	3.00	4.50
438	7247406	-	-	-	-	-	-	-
439	7281133	-	-	-	-	-	-	-
440	7265196	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	4.58
441	7275758	Boring	Observation Wells	Monitoring	-	-	0.28	1.21
442	7281132	-	-	-	-	-	-	-
443	7265195	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
444	7149507	Boring	Observation Wells	Monitoring and Test Hole	-	-	3.00	6.00
445	7039195	Boring	Observation Wells		2.50	-	1.60	4.60
446	7265194	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
447	7281160	-	-	-	-	-	0.00	0.00
448	7281156	-	-	-	-	-	0.00	0.00
449	7281134	-	-	-	-	-	0.00	0.00
450	7149507	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	0.00	0.00
451	7149507	Boring	Observation Wells	Monitoring and Test Hole	-	-	3.00	6.00
452	7247394	-	-	-	-	-	0.00	0.00
453	7265193	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
454	7247398	-	-	-	-	-	-	-
455	7247404	-	-	-	-	-	-	-
456	7223350	-	-	-	-	-	-	-
457	1302381	Cable Tool	Water Supply	Industrial	41.78	9.46	-	-
458	7223349	-	-	-	-	-	-	-
459	7281157	-	-	-	-	-	-	-
460	7149507	Boring	Observation Wells	Monitoring and Test Hole	-	-	2.70	5.70
461	7243801	-	-	-	-	-	1.22	3.66

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
462	7243800	-	-	-	-	-	1.22	4.27
463	7230243	-	-	-	-	-	-	-
464	1306356	otary (Conver	Observation Wells	Not Used	-	-	7.00	12.00
465	7247397				-	-	-	-
466	7243803				-	-	1.22	3.66
467	7275755				-	-	-	-
468	7041530	Driving	Test Hole		-	-	3.00	4.50
469	7265192	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
470	7041579	Boring	Observation Wells	Not Used	2.20	-	1.20	4.30
471	7275740				-	-	-	-
472	7206274	Boring	Test Hole	Test Hole	-	-	1.50	4.60
473	7275753				-	-	-	-
474	7268640	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.50	3.60
475	7268639	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	7.60	9.10
476	7265191	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
477	7206272	Boring	Test Hole	Test Hole	-	-	2.10	5.30
478	7243805				-	-	1.22	3.66
479	7256179	Boring	Observation Wells	Monitoring	-	-	3.05	6.10
480	7275757	Boring	Observation Wells	Monitoring	-	-	1.52	3.96
481	7268658	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	7.60	9.10
482	7268657	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.20	3.30
483	7247399	-	-	-	-	-	-	-
484	7247393	-	-	-	-	-	-	-
485	7220004	-	-	-	-	-	-	-
486	7258169	Boring	Observation Wells	Monitoring	-	-	3.05	4.57
487	7214613	-	-	-	-	-	-	-
488	7149507	Boring	Observation Wells	Monitoring and Test Hole	-	-	3.00	6.00
489	7281162				-	-	-	-
490	7268654	Boring	Test Hole	Test Hole	2.40	-	1.50	4.50
491	7268655	Boring	Test Hole	Test Hole	2.40	-	7.60	9.10

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
492	1306669	Boring	Observation Wells		3.00	-	2.10	5.50
493	7225750	Boring		Test Hole	1.80	-	2.28	5.33
494	7240079	otary (Revers	Observation Wells	Monitoring	4.58	-	4.88	7.93
495	7230192	Boring	Observation Wells	Monitoring and Test Hole		-	1.20	4.30
496	7275741	-	-	-	-	-	-	-
497	7206273	Boring	Test Hole	Test Hole	-	-	4.60	7.80
498	7243804		-	-	-	-	1.22	4.27
499	7243806	Boring	-	-	-	-	1.22	4.27
500	7275754	-	-	-	-	-	-	-
501	7202219	-	-	-	-	-	-	-
502	7281161	-	-	-	-	-	-	-
503	7232439	-	-	-	-	-	-	-
504	7247396	-	-	-	-	-	-	-
505	7230240	-	-	-	-	-	-	-
506	7206275	Boring	Test Hole	Test Hole	-	-	2.10	5.30
507	7247402	-	-	-	-	-	-	-
508	7265589	Boring	Observation Wells	Monitoring	-	-	4.57	6.10
509	7247401	-	-	-	-	-	-	-
510	1300029	Boring	Water Supply	Domestic	5.19	3.36	-	-
511	7268638	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.80	4.20
512	7268637	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	7.60	9.10
513	7212911	-	-	-	-	-	-	0.00
514	7247395	-	-	-	-	-	-	0.00
515	7215840	Boring	Water Supply	Commerical	25.62	4.27	-	0.00
516	7215840	Boring	Water Supply	Commerical	25.62	4.27	-	0.00
517	7215840	Boring	Water Supply	Commerical	25.62	4.27	-	0.00
518	7275742				0.00	-	-	0.00
519	7268653	Boring	Test Hole	Test Hole	2.10	-	1.50	3.90
520	7268652	Boring			2.10	-	7.60	9.10
521	7268641	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	7.60	9.10
522	7196645				0.00	-	0.00	0.00
523	7108854	Boring	Observation Wells	Other	0.00	-	0.00	0.00
524	7117341		Abandoned-Supply		0.00	-	0.00	0.00
525	7281159				0.00	-	0.00	0.00
526	7048943	Boring	Observation Wells	Not Used	3.90	-	3.00	6.10

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
527	7212437	Air Percussio	Water Supply	Industrial	100.04	-	0.00	0.00
528	7212437	Air Percussio	Water Supply	Industrial	100.04	-	0.00	0.00
529	7212437	Air Percussio	Water Supply	Industrial	48.19	-	0.00	0.00
530	7212437	Air Percussio	Water Supply	Industrial	48.19	-	0.00	0.00
531	7212437	Air Percussio	Water Supply	Industrial	100.04	-	0.00	0.00
532	7212437	Air Percussio	Water Supply	Industrial	48.19	-	0.00	0.00
533	1306198	Boring	Observation Wells		3.00	-	1.55	4.55
534	7048333		Abandoned-Other		0.00	-	0.00	0.00
535	7117340	otary (Conver	Observation Wells	Monitoring	0.00	-	0.00	0.00
536	4116164	Boring	Observation Wells		0.00	-	6.10	9.15
537	1306421	Boring	Observation Wells		1.53	-	3.05	6.10
538	7140741	Boring	Observation Wells	Monitoring	0.00	-	3.00	6.00
539	7140741	Boring	Observation Wells	Monitoring	0.00	-	3.00	6.00
540	7220003				0.00	-	0.00	0.00
541	7140741	Boring	Observation Wells	Monitoring	0.00	-	3.00	6.00
542	7140741	Boring	Observation Wells	Monitoring	4.50	-	0.00	0.00
543	7140741	Boring	Observation Wells	Monitoring	0.00	-	3.00	6.00
544	7230244				0.00	-	0.00	0.00
545	7231796	Boring	Observation Wells	Monitoring	0.00	-	5.80	6.10
546	7140740	Boring	Test Hole	Monitoring	0.00	-	3.00	6.10
547	7243124	Boring	Abandoned-Other	Not Used	0.00	-	0.00	0.00
548	7191454	Boring	Abandoned-Other		0.00	-	0.00	0.00
549	7247511				0.00	-	0.00	0.00
550	7229607				0.00	-	0.00	0.00
551	7140740	Boring	Test Hole	Monitoring	0.00	-	0.00	0.00
552	7243123	Boring	Observation Wells	Monitoring	0.00	-	3.36	4.88
553	1306712	Boring	Observation Wells		2.80	-	3.10	4.60
554	7203988				0.00	-	0.00	0.00
555	7247407				0.00	-	0.00	0.00
556	7140740	Boring	Test Hole	Monitoring	0.00	-	3.00	6.10
557	7215907				0.00	-	0.00	0.00
558	7140740	Boring	Test Hole	Monitoring	0.00	-	3.00	6.10
559	7268644	Boring	Test Hole	Test Hole	2.40	-	1.50	4.50
560	7268643	Boring	Test Hole	Test Hole	2.40	-	7.60	9.10

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
561	7274566	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	0.60	1.80
562	7268656	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	1.50	4.60
563	7268642	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	7.60	9.10
564	7140740	Boring	Test Hole	Monitoring	0.00	-	3.00	6.10
565	7227473				0.00	-	0.00	0.00
566	7274565	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	8.20	9.80
567	7191455	Boring	Abandoned-Other		0.00	-	0.00	0.00
568	1306585	Boring	Observation Wells		2.00	-	3.00	6.00
569	7275752				0.00	-	0.00	0.00
570	7275751				0.00	-	0.00	0.00
571	7043597	Other Method	Abandoned-Other		0.00	-	0.00	0.00
572	7168689	otary (Revers	Abandoned Monitoring and Test Hole	Monitoring	3.66	-	0.00	0.00
573	7237032	otary (Revers	Observation Wells	Monitoring	2.44	-	10.68	12.20
574	1306293	Other Method	Observation Wells		3.00	-	3.00	5.00
575	1306341	Boring	Observation Wells	Not Used	5.47	-	3.05	6.10
576	7274568	Boring	Monitoring and Test Hole	Monitoring and Test Hole	0.00	-	7.60	9.10
577	1306454	Boring	Observation Wells		2.20	-	3.00	4.50
578	7274564	Boring	Monitoring and Test Hole	Test Hole	0.00	-	0.90	4.00
579	7219877	Driving	Observation Wells	Monitoring	0.00	-	1.20	4.20
580	1306630	-	-	-	5.20	-	3.10	6.20
581	7240065	Boring	Observation Wells	Monitoring	3.05	-	6.10	7.63
582	7254441	-	Abandoned-Other	-	-	-	-	-
583	7239413	-	-	-	-	-	-	-
584	7215854	Boring	Water Supply	Industrial	26.54	6.59	0.00	0.00
585	7215841	Boring	Alteration	Test Hole	26.54	8.24	24.09	27.45
586	7215854	Boring	Water Supply	Industrial	26.54	6.59	0.00	0.00

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
587	7215841	Boring	Alteration	Test Hole	26.54	8.24	24.09	27.45
588	7198268	-	-	-	-	-	-	-
589	7198269	-	-	-	-	-	-	-
590	7215855	Boring	Abandoned-Supply	Test Hole	27.75	7.02	24.70	28.06
591	7219873	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
592	7246960	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
593	7034498	Boring	Observation Wells	Not Used	-	-	3.00	6.00
594	7212438	Air Percussio	Water Supply	Industrial	43.92	-	-	-
595	7212438	Air Percussio	Water Supply	Industrial	43.92	-	-	-
596	7115663	Direct Push	-	Test Hole	-	-	1.83	4.27
597	7244560	Boring	Observation Wells	Monitoring	9.15	-	9.15	12.20
598	7219876	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
599	7179993	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
600	7246961	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	9.15	12.20
601	7219872	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
602	7115672	Direct Push		Test Hole	-	-	1.50	3.66
603	7191450	Boring	Abandoned-Other	-	-	-	0.00	0.00
604	7115661	Boring	-	Test Hole	-	-	1.50	3.66
605	7115662	Direct Push	-	Test Hole	-	-	1.50	3.66
606	7274567	Boring	Monitoring and Test Hole	-	-	-	7.60	9.10
607	7274563	Boring	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.50	3.10
608	7219992	Boring	Test Hole	Test Hole	1.20	-	0.90	3.30
609	7219992	Boring	Test Hole	Test Hole	1.20	-	0.90	3.30
610	7219875	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
611	7219878				-	-	1.20	4.20
612	7236072				-	-	-	-
613	7281925				-	-	-	-
614	7116022	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	1.80	4.80
615	7230241	-	-	-	-	-	-	-
616	7220005	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
617	7176336	-	-	-	-	-	-	-
618	7206129	-	-	-	-	-	-	-
619	7247392	-	-	-	-	-	-	-
620	7047177	otary (Conver	Test Hole	-	3.00	-	2.25	5.25
621	7281926			-	-	-	-	-
622	7246959	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
623	7116021	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	1.80	4.80
624	7219871	Driving	Observation Wells	-	-	-	1.20	4.20
625	7191451	Boring	Abandoned-Other	-	-	-	0.00	0.00
626	7219869	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
627	7246958	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	1.07	4.12
628	7230242				-	-	0.00	0.00
629	7254035	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
630	7219870	Driving	Observation Wells	Monitoring	-	-	1.20	4.20
631	7254034	Direct Push	Observation Wells	Monitoring and Test Hole	-	-	1.53	4.58
632	7254064	Direct Push	Abandoned-Other	Monitoring and Test Hole	-	-	0.00	6.10
633	7254036	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
634	7254037	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
635	7247405	-	-	-	-	-	-	-
636	7220065	Boring	Observation Wells	Test Hole	5.80	-	4.60	7.60
637	7246962	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	9.76	12.81
638	7254063	DIRECT PUS	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.53	4.58
639	7245610	otary (Conver	Test Hole	Monitoring	7.63	-	6.10	9.15

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
640	7219874	Driving	Observation Wells	Monitoring	-	-	-	-
641	7220066	Boring	Observation Wells	Test Hole	7.30	-	6.10	9.10
642	7205588	Direct Push	Test Hole	Test Hole	2.10	-	0.90	3.90
643	7205588	Direct Push	Test Hole	Test Hole	2.10	-	0.90	3.90
644	7236655				-	-	-	-
645	7205587	Boring	Test Hole	Test Hole	2.10	-	0.90	3.90
646	7205587	Boring	Test Hole	Test Hole	2.10	-	0.90	3.90
647	1306218	Boring	Observation Wells		3.50	-	3.05	4.50
648	7205589	Diamond	Test Hole	Test Hole	2.10	-	0.90	3.90
649	7205589	Diamond	Test Hole	Test Hole	2.10	-	0.90	3.90
650	7262605	-	-	-	-	-	-	-
651	7042848	Boring	Observation Wells	Not Used	-	-	1.52	4.57
652	7102022	Driving	Test Hole	Monitoring	-	-	-	-
653	7040255	Other Method	Abandoned-Other	-	-	-	-	-
654	7265588	Boring	Observation Wells	Monitoring	-	-	1.52	3.05
655	7225902	Driving	Observation Wells	Monitoring and Test Hole	2.44	-	1.53	4.58
656	7236987	Direct Push	Dewatering	Monitoring and Test Hole	-	-	-	-
657	7225903	Driving	Observation Wells	Monitoring and Test Hole	2.44	-	1.53	4.58
658	7236988	Direct Push	Abandoned-Other	Monitoring and Test Hole	-	-	-	-
659	7212913				-	-	-	-
660	7160364				-	-	-	-
661	1306459	Other Method	Abandoned-Other		-	-	2.13	3.66
662	7179996	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
663	7182898	-	Abandoned-Other	-	-	-	1.50	4.50
664	7179998	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
665	7281863	-	-	-	-	-	-	-
666	7127344	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
667	7179992	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
668	1306727	Boring	Observation Wells		2.00	-	4.00	6.00
669	7281862				-	-	-	-
670	7182890	Direct Push	Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
671	7182891	-		-	-	-	0.61	1.22
672	7182895	-	Abandoned-Other	-	-	-	1.50	4.50
673	7127344	-		-	-	-	-	-
674	1306488	-		-	-	-	6.00	9.00
675	7281910	-		-	-	-	-	-
676	7182896	-	Abandoned-Other	-	-	-	4.50	7.50
677	7179987	Direct Push	Test Hole	Monitoring and Test Hole	-	-	5.70	8.00
678	7179994	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
679	7182897	-	Abandoned-Other		-	-	1.50	4.50
680	7180596	Direct Push	Test Hole	Monitoring and Test Hole	-	-	1.83	4.88
681	7179997	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
682	7127344	-	-	-	-	-	-	-
683	7127344	-	-	-	-	-	-	-
684	1306466	Other Method	Observation Wells	Not Used	-	-	0.60	3.70
685	7179995	otary (Conver	Test Hole	Monitoring and Test Hole	-	-	1.50	4.50
686	7162880	Boring	Observation Wells	Monitoring	-	-	3.05	4.58
687	7182852	-	Abandoned-Other	-	-	-	1.50	4.50
688	7182851	-	Abandoned-Other	-	-	-	1.50	4.50
689	7127344	-	-	-	-	-	-	-
690	7281860	-	-	-	-	-	-	-
691	7127344	-	-	-	-	-	-	-
692	7281911	-	-	-	-	-	-	-
693	7281914	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
694	7127344	-	-	-	-	-	-	-
695	7127344	-	-	-	-	-	-	-
696	7164314	Driving	Test Hole	Test Hole	-	-	5.49	3.05
697	7270642	-	-	-	-	-	-	-
698	7281861	-	-	-	-	-	-	-
699	7281859	-	-	-	-	-	-	-
700	7237368	-	-	-	-	-	-	-
701	1306508	Boring	Observation Wells	-	-	-	3.05	6.10
702	7044707	Other Method	Observation Wells	-	-	-	3.10	6.10
703	1306703	Boring	Observation Wells	-	2.80	-	2.90	6.00
704	1306507	Boring	Observation Wells	Not Used	2.00	-	1.37	3.05
705	1304566	Cable Tool	Water Supply	Commerical	48.80	16.78	-	-
706	1300022	Cable Tool	Water Supply	Public	45.14	22.88	-	-
707	7281858	-	-	-	-	-	-	-
708	7142897	Boring	Abandoned-Other	Monitoring	-	-	-	-
709	7142896	Boring	Replacement Well	Monitoring	-	-	-	-
710	7047866	Boring	Observation Wells	Monitoring	1.80	-	-	-
711	7281917	-	-	-	-	-	-	-
712	7161247	-	-	-	-	-	-	-
713	7281918	-	-	-	-	-	-	-
714	7116017	Driving	Observation Wells	Monitoring	-	-	-	-
715	7191892				-	-	-	-
716	7194543	Boring	Abandoned-Other	Test Hole	-	-	-	-
717	7260622	-	-	-	-	-	-	-
718	1305682	Cable Tool	Water Supply	Domestic	10.37	0.92	-	-
719	7122210	Boring	Test Hole	Monitoring	0.00	-	1.52	3.05
720	1306534	Boring	Observation Wells		1.50	-	0.90	2.40
721	7122210	Boring	Test Hole	Monitoring	-	-	1.52	3.05
722	7122210	Direct Push	Test Hole	Monitoring	-	-	-	-
723	7122210	Direct Push	Test Hole	Monitoring	-	-	-	-
724	7239424	Boring	-	Monitoring and Test Hole	-	-	6.10	9.15
725	7239424	Boring	-	Monitoring and Test Hole	7.63	-	6.10	9.15
726	7118280	-	Abandoned-Quality	Commerical	-	-	-	-
727	7193420	-	-	-	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
728	7211340	-	Abandoned-Other	-	-	-	-	5.00
729	7239425	Boring	Abandoned-Other	Monitoring and Test Hole	-	-	3.05	4.58
730	7239425	Boring	Abandoned-Other	Monitoring and Test Hole	-	-	3.05	4.58
731	7239426	Boring	Abandoned-Other	Monitoring and Test Hole	-	-	2.14	5.19
732	7240349	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
733	7240349	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
734	7240319	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
735	7195516	Boring	Observation Wells	Test Hole	4.58	-	5.80	4.27
736	7139516	Direct Push	Test Hole	Not Used	-	-	2.10	3.66
737	7139516	Driving	Test Hole	Not Used	-	-	-	-
738	7050162	Boring	Observation Wells	Monitoring	-	-	-	-
739	7139516	Direct Push	Test Hole	Not Used	-	-	1.50	3.05
740	7139516	Direct Push	Test Hole	Not Used	-	-	1.50	3.05
741	7152871	otary (Conver	Observation Wells	Monitoring	0.84	-	0.99	1.46
742	7194546	Boring	Test Hole	Test Hole	8.40	-	9.30	6.90
743	7240351	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
744	7240350	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
745	7240350	Direct Push	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
746	7213130	otary (Conver	Observation Wells	Monitoring	-	-	6.10	3.05
747	7265547				-	-	-	-
748	7116489	Boring	Test Hole	Monitoring	5.50	-	-	-
749	7263008				-	-	-	-
750	7227131	Other Method	Observation Wells	Monitoring	-	-	2.44	5.49
751	7156259	Boring	Test Hole	Test Hole	-	-	-	-
752	7156260	Boring	Test Hole	Test Hole	-	-	-	-

WELL ID	MECP WWR ID	Construction Method	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
			Final Status	First Use				
753	7156261	Boring	Test Hole	Test Hole	-	-	-	-
754	1306637	Boring	Observation Wells	-	3.30	-	1.50	4.50
755	7104597	Boring	Test Hole	Test Hole	3.70		1.50	4.60
756	7104597	Boring	Test Hole	Test Hole	-	3.70	1.50	4.60
757	7105635	Boring	Test Hole	Monitoring	-	0.80	1.60	4.60
758	1306719	Diamond	Test Hole	-	-	-	31.72	33.24
759	1306718	Diamond	Abandoned-Other	-	-	-	-	-
760	1301669	Boring	Water Supply	Domestic	1.22	-	-	-
761	1300018	Cable Tool	Water Supply	Domestic	20.74	18.91	20.13	20.74
762	7105635	Boring	Test Hole	Monitoring	-	0.80	1.60	4.60
763	7194545	Boring	-	-	-		7.10	8.75
764	7171508	Boring	Observation Wells	Monitoring	1.07	-	1.53	2.44
765	7105635	Boring	Test Hole	Monitoring	-	0.80	1.60	4.60
766	7105635	Boring	Test Hole	Monitoring	-	0.80	1.60	4.60
767	7157252	Boring	Test Hole	Monitoring	-	2.40	12.20	10.20
768	7157252	Boring	Test Hole	Monitoring	-	3.00	5.00	3.80
769	7258418	-	-	-	-	-	-	-
770	7157252	Boring	Test Hole	Monitoring	2.30	-	-	-
771	7116481	-	Abandoned-Other	-	1.00	-	-	-
772	7105635	Boring	Test Hole	Monitoring	1.00	-	-	-
773	7157252	Boring	Test Hole	Monitoring	-	3.00	5.00	3.80
774	7194544	-	Abandoned-Other	Test Hole	-	-	-	-
775	7157252	Boring	Test Hole	Monitoring	-	4.00	12.60	10.10
776	7157252	Boring	Test Hole	Monitoring	-	1.20	2.00	1.40
777	1306567	Boring	Observation Wells	-	1.50	-	1.50	4.50
778	1300030	Boring	Water Supply	Domestic	3.05	3.05	-	-
779	7281172	-	-	-	0.00	-	-	-
780	1300032	Boring	Water Supply	Domestic	1.83	1.83	-	-
781	1300031	Boring	Water Supply	Domestic	1.83	1.83	-	-
782	7258462	-	-	-	-	-	-	-
783	1300047	Cable Tool	Test Hole	-	-	-	-	-
784	7120044	Auger	Replacement Well	Monitoring	-	18.20	40.00	40.50
785	7120044	Auger	Replacement Well	Monitoring	18.00	-	-	-
786	1303329	Boring	Water Supply	Domestic	2.44	2.44	-	-
787	1303374	Boring	Water Supply	Domestic	2.44	2.44	-	-
788	1303374	Boring	Water Supply	Domestic	6.71	2.44	-	-

Notes:

onservation, and Parks - Water Well Records Identification

s below ground surface

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'B'

RESULT OF SINGLE WELL RESPONSE TESTS

REFERENCE NO. 1806-W012

Falling Head Test (Slug Test)

Test Date:		25-Oct-19	
Piezometer/Well No.:		BH/MW 1D	
Ground level:		210.75	m
Screen top level:		207.75	m
Screen bottom level:		204.65	m
Test El. (at midpoint of screen):		206.2	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.245	m
Initial water depth		3.64	m
Aquifer material:		**SILT/SILTY SAND/SILTY CLAY**	

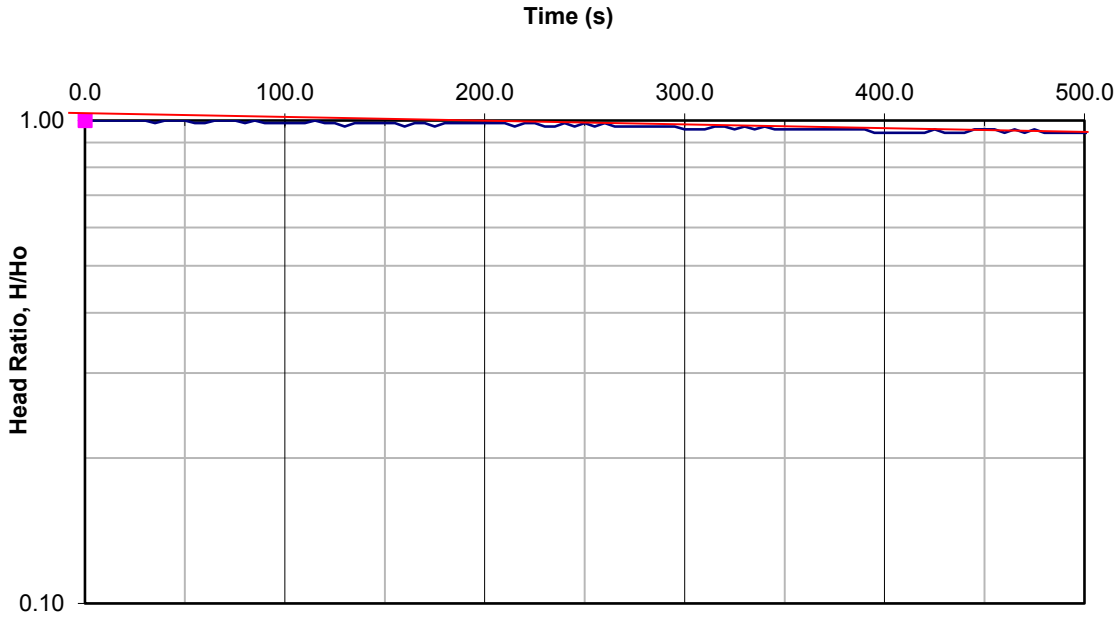
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.0001317$

K= **4.4E-06** cm/s

4.4E-08 m/s



Falling Head Test (Slug Test)

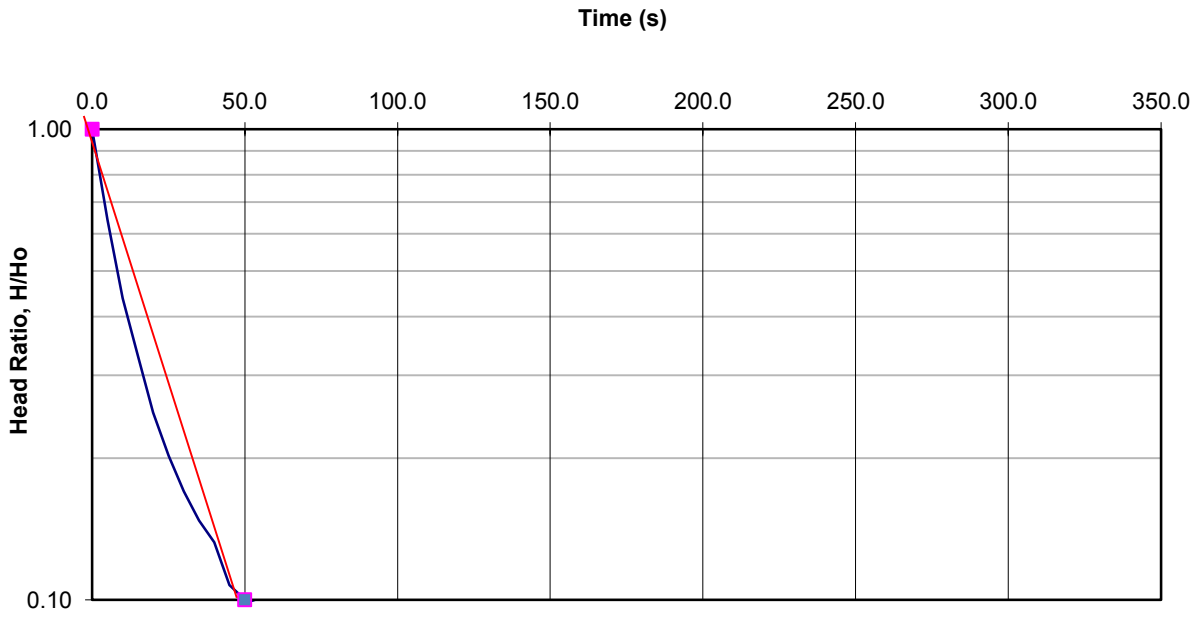
Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 2	
Ground level:		216.49	m
Screen top level:		213.49	m
Screen bottom level:		210.39	m
Test El. (at midpoint of screen):		211.94	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion (	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.4	m
Initial water depth		2.94	m
Aquifer material:		**SAND/SILTY CLAY**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.0460517$

K= **1.5E-03** cm/s
1.5E-05 m/s



Falling Head Test (Slug Test)

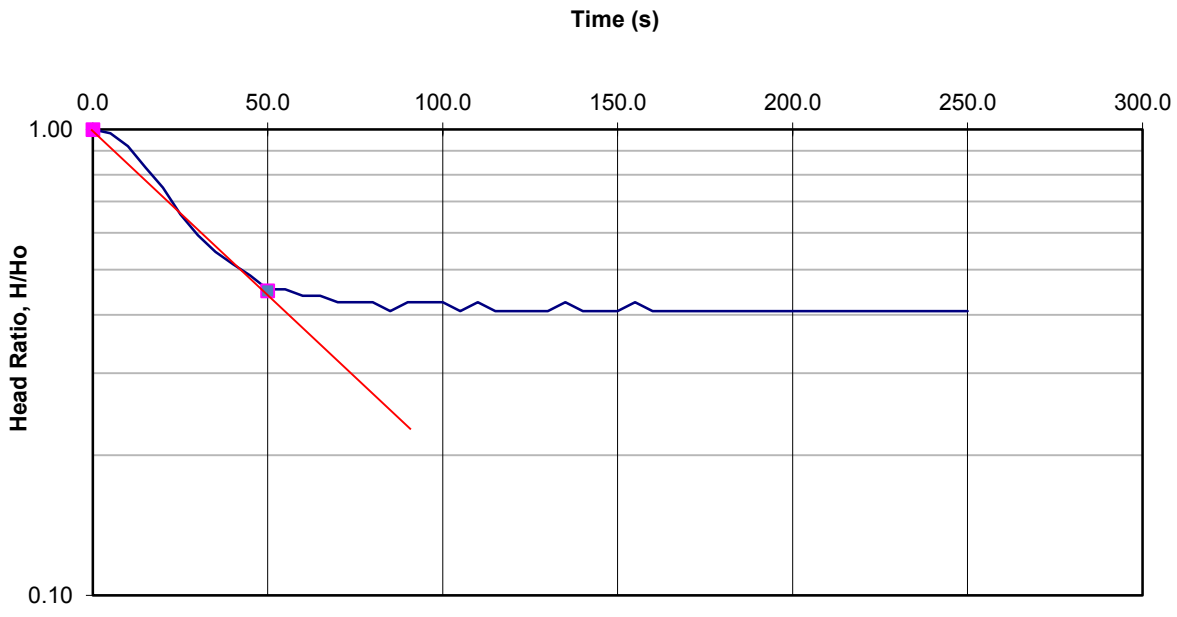
Test Date:		25-Oct-18	
Piezometer/Well No.:		BH/MW 4D	
Ground level:		201.32	m
Screen top level:		198.32	m
Screen bottom level:		195.22	m
Test El. (at midpoint of screen):		196.77	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.216	m
Initial water depth		3.03	m
Aquifer material:		**SILTY CLAY**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.01597015$

K= **5.4E-04** cm/s
5.4E-06 m/s



Falling Head Test (Slug Test)

Test Date:		25-Oct-18	
Piezometer/Well No.:		BH/MW 5R	
Ground level:		198.58	m
Screen top level:		195.58	m
Screen bottom level:		192.48	m
Test El. (at midpoint of screen):		194.03	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.401	m
Initial water depth		3.53	m
Aquifer material:		**SILTY CLAY/SANDY GRAVEL**	

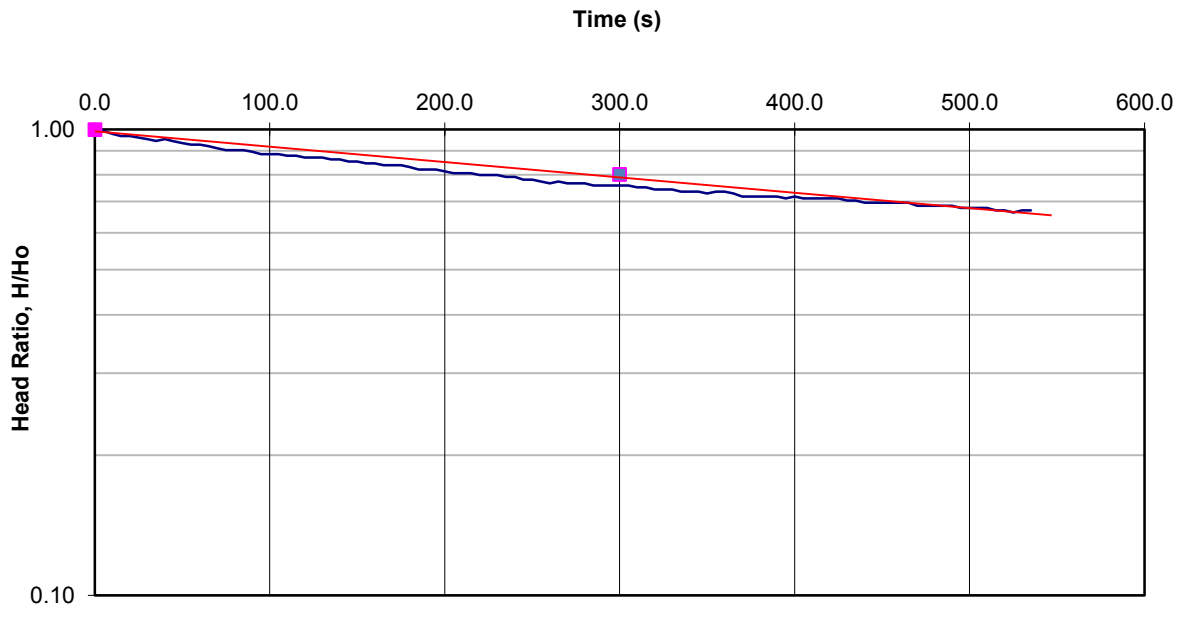
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00074381$

K= **2.5E-05** cm/s

2.5E-07 m/s



Falling Head Test (Slug Test)

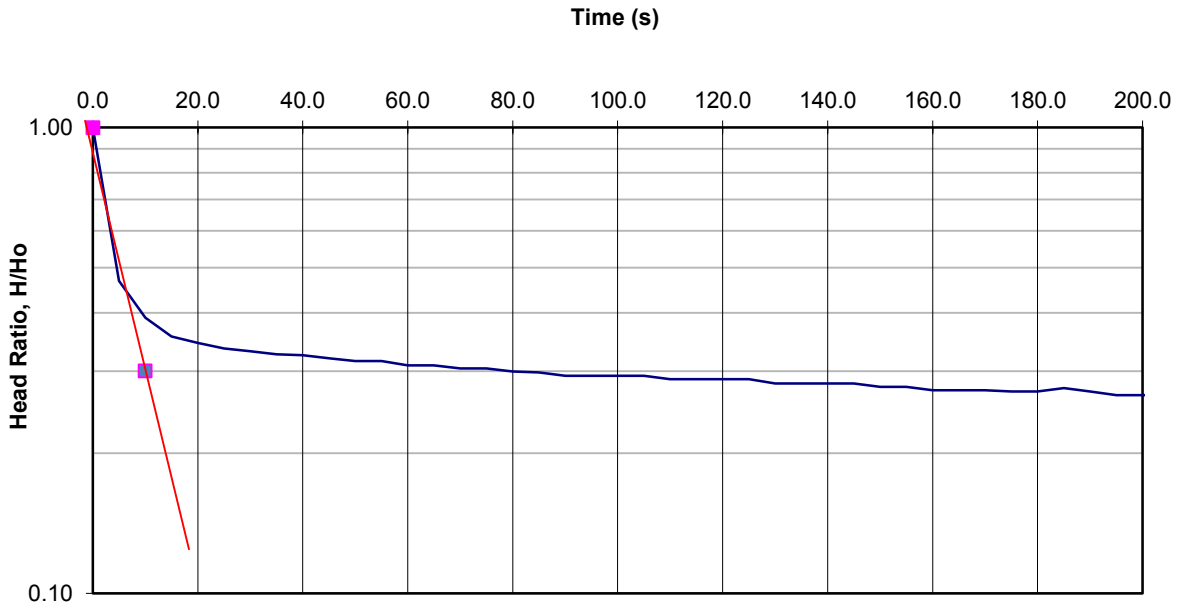
Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 6	
Ground level:		198.76	m
Screen top level:		195.76	m
Screen bottom level:		192.66	m
Test El. (at midpoint of screen):		194.21	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.638	m
Initial water depth		3.23	m
Aquifer material:		**SILTY CLAY/SILTY SAND**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.12039728$

K= **4.1E-03** cm/s
4.1E-05 m/s



Falling Head Test (Slug Test)

Test Date:		19-Jun-19	
Piezometer/Well No.:		BH/MW 7D	
Ground level:		199.36	m
Screen top level:		196.36	m
Screen bottom level:		193.26	m
Test El. (at midpoint of screen):		194.81	m
Test depth (at midpoint of screen):		4.55	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.666	m
Initial water depth		3.48	m
Aquifer material:		**EARTH FILL**	

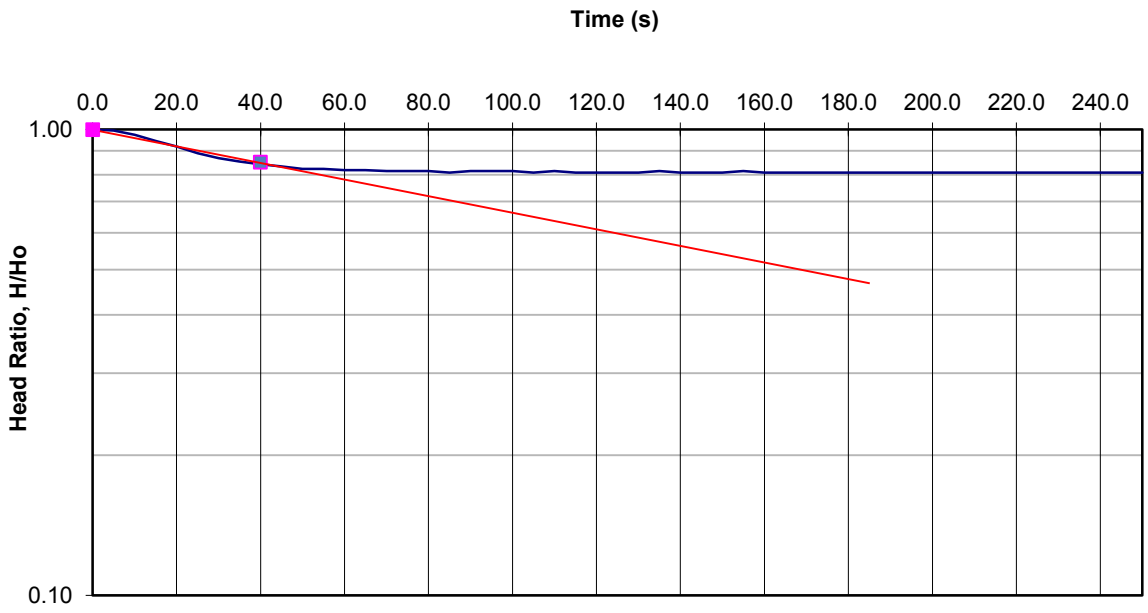
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00406297$

K= **1.4E-04** cm/s

1.4E-06 m/s



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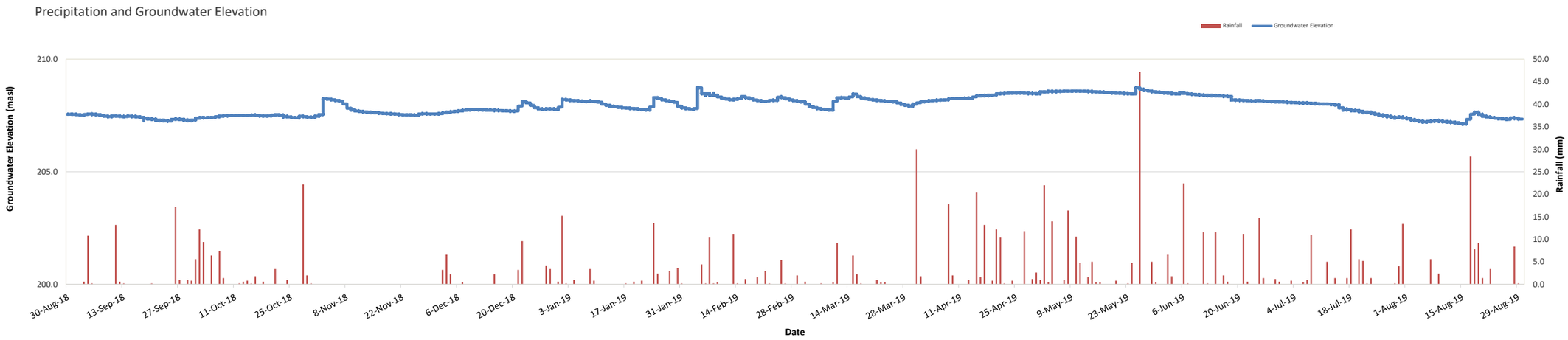
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'C'

GROUNDWATER LOGGER MONITORING DATA

REFERENCE NO. 1806-W012

Chart C-1
Groundwater Levels BH/MW 1S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



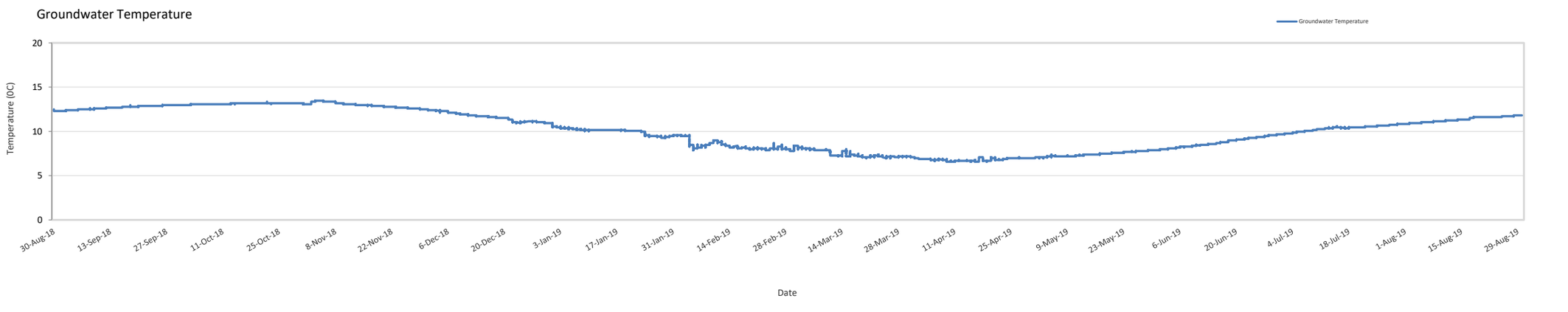
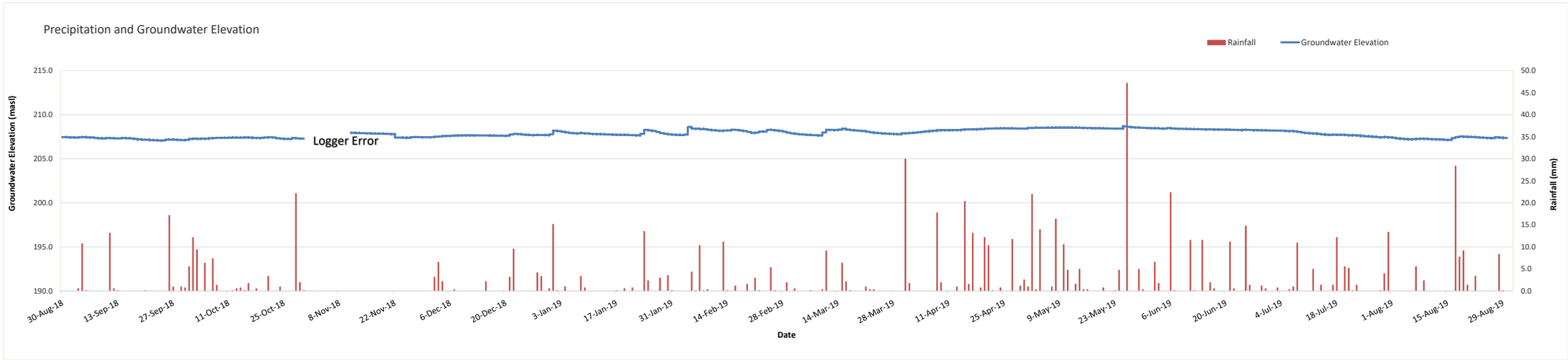


Chart C-2
Groundwater Levels BH/MW 1D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



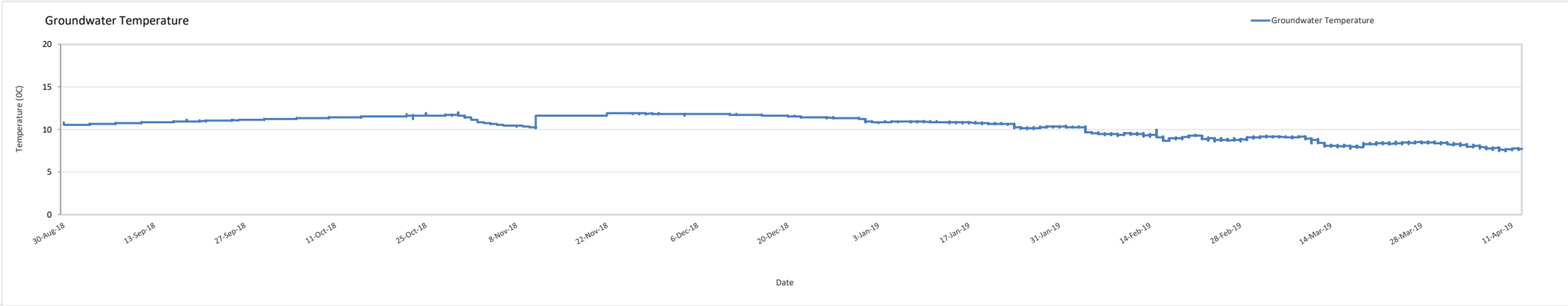
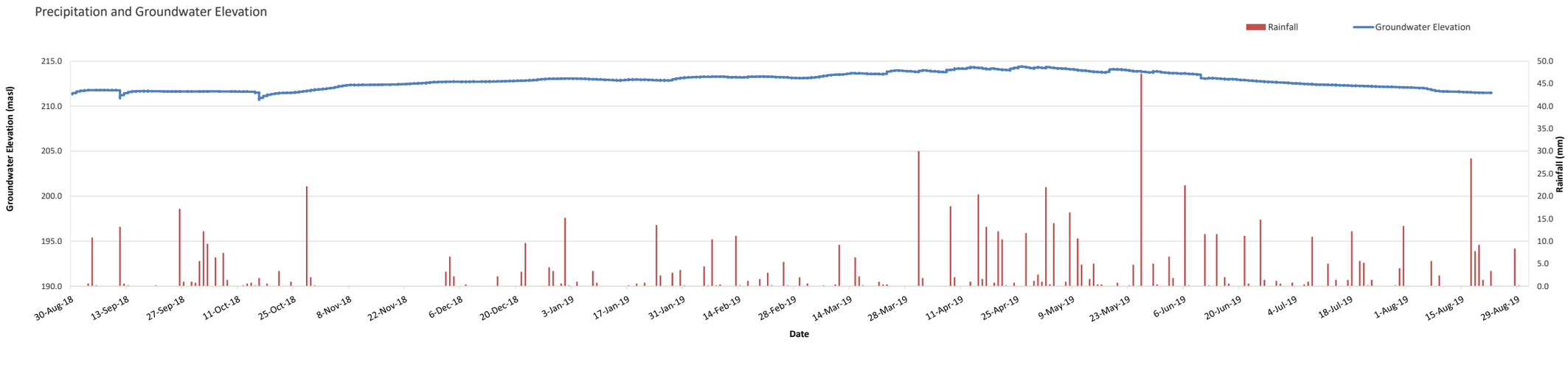


Chart C-3
Groundwater Levels BH/MW 2
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



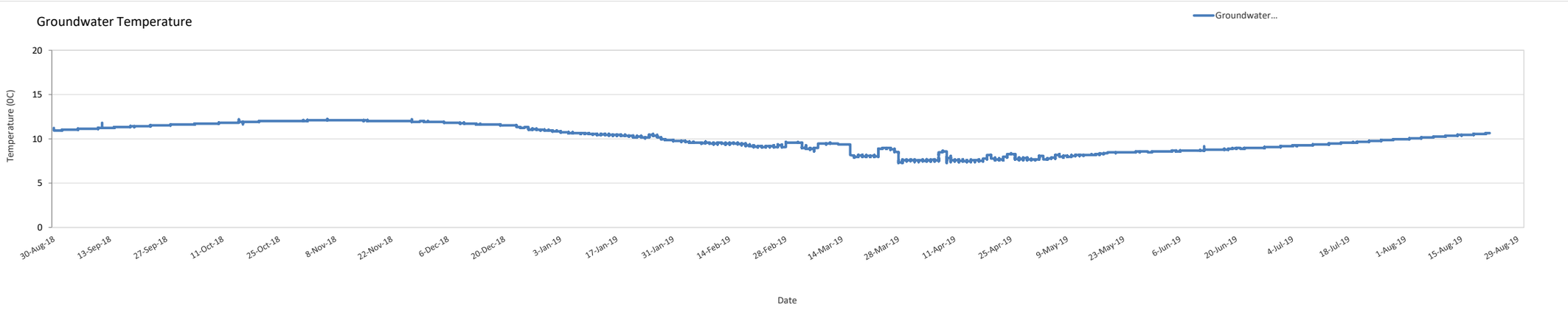
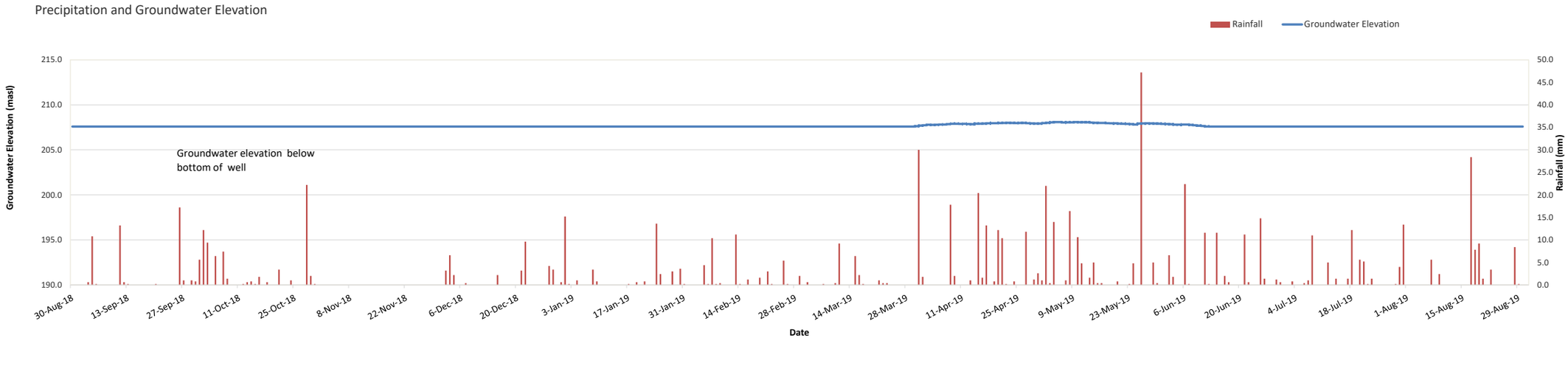


Chart C-4
Groundwater Levels BH/MW 3
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



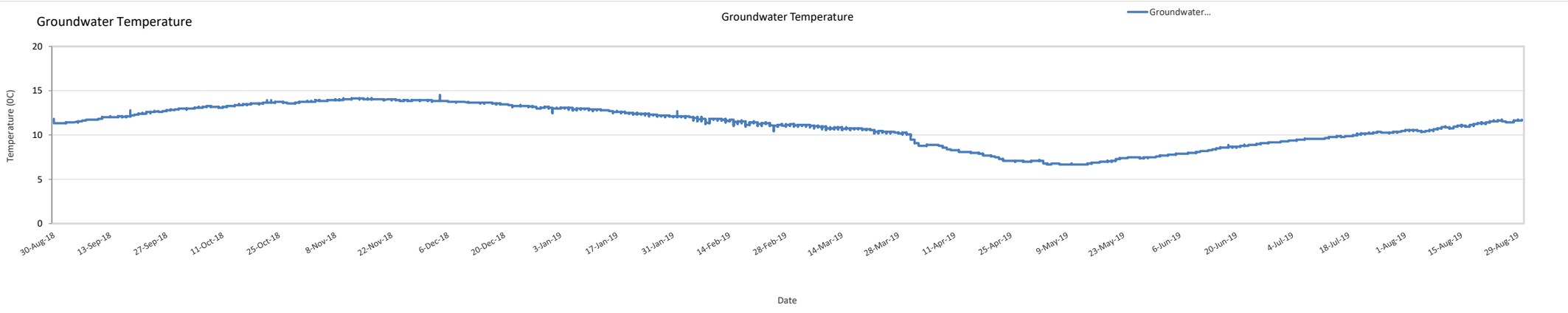
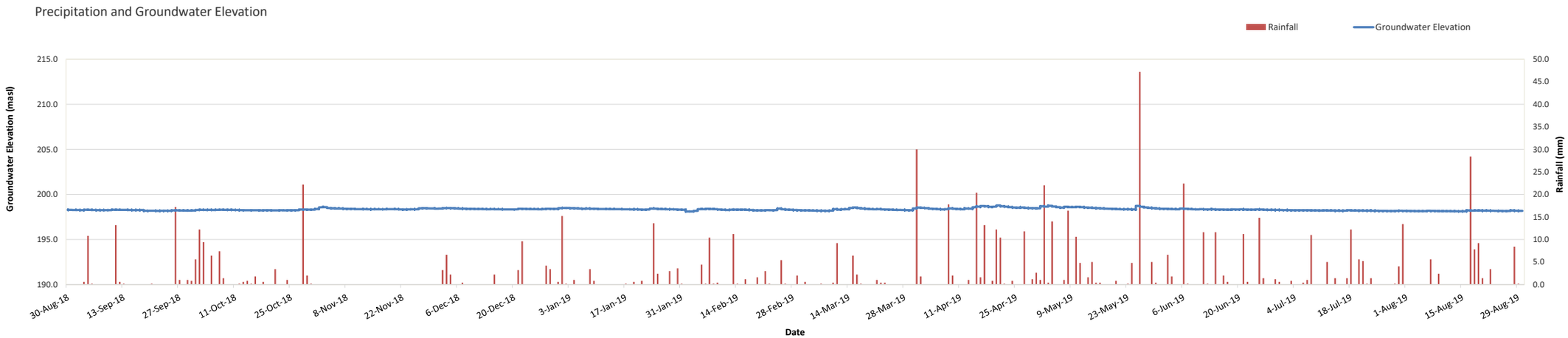


Chart C-5
Groundwater Levels BH/MW 4S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30,2019



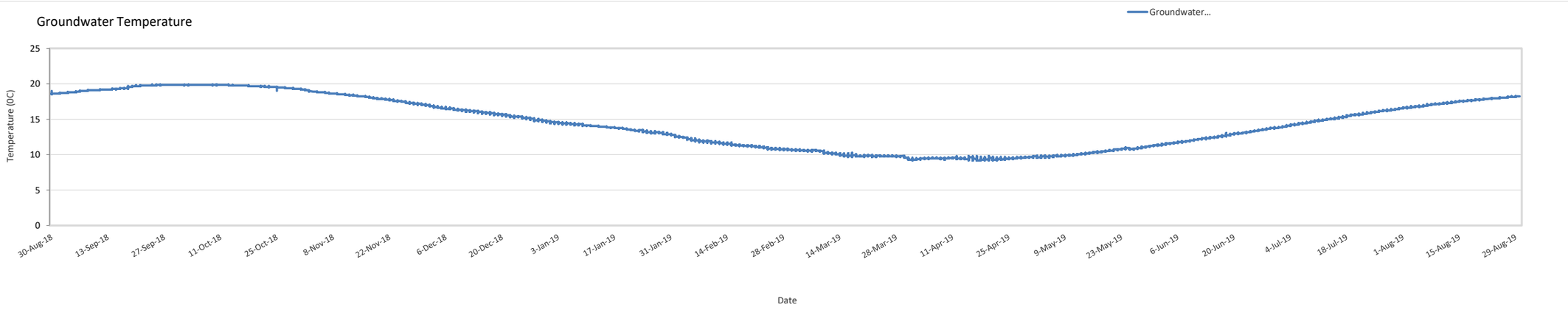
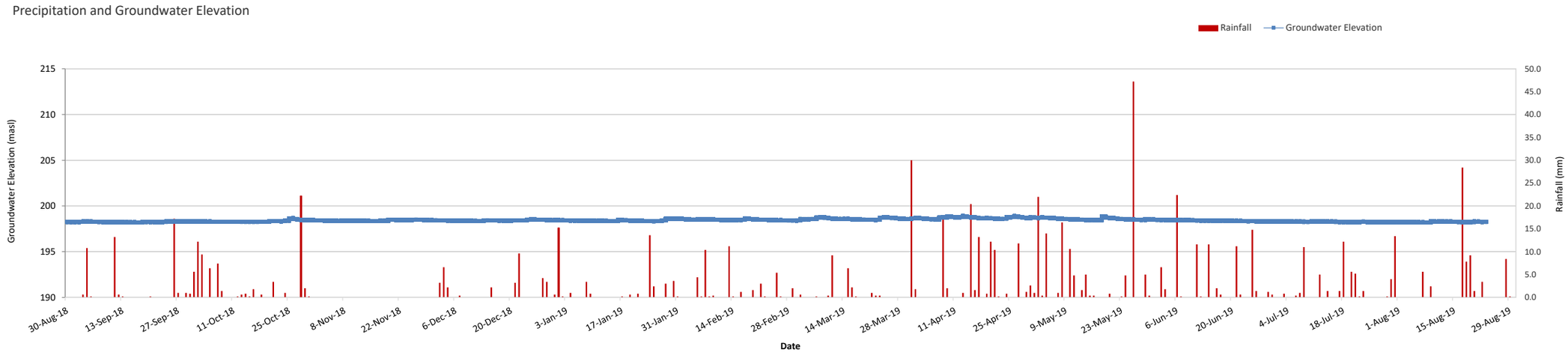


Chart C-6
Groundwater Levels BH/MW 4 D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



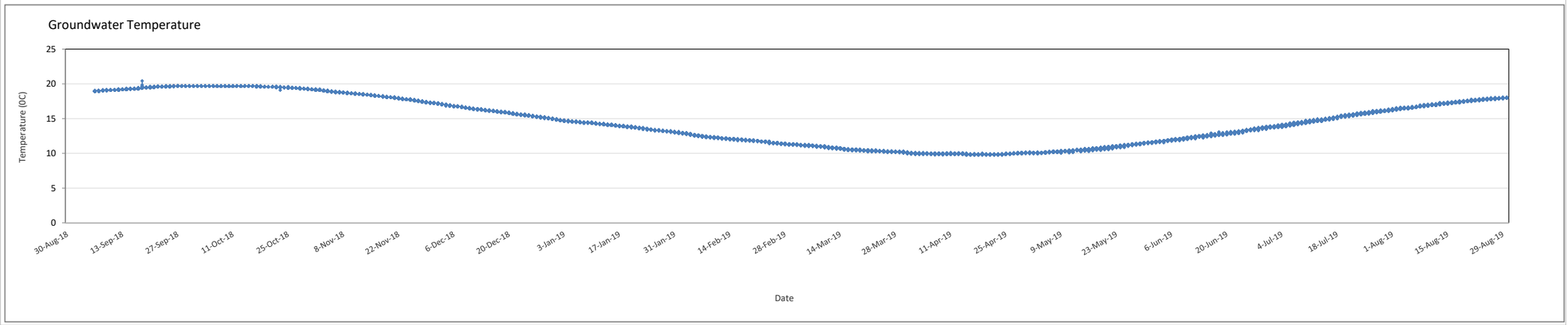
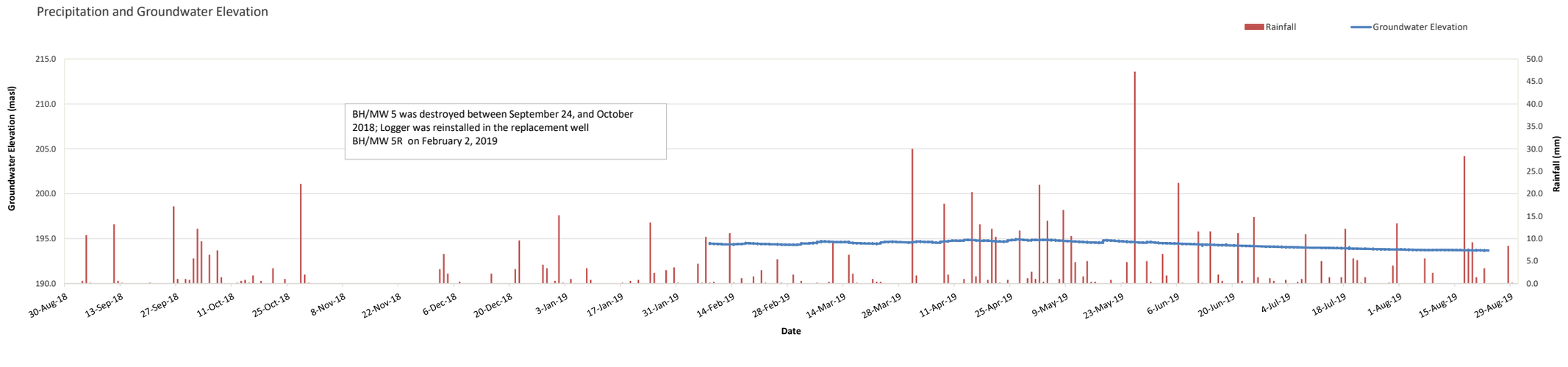


Chart C-7
Groundwater Levels BH/MW 5R
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



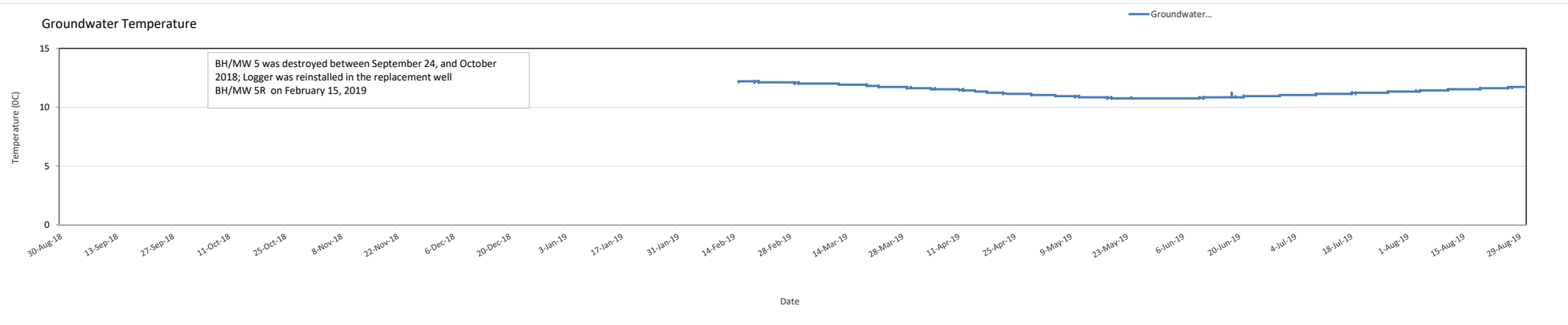
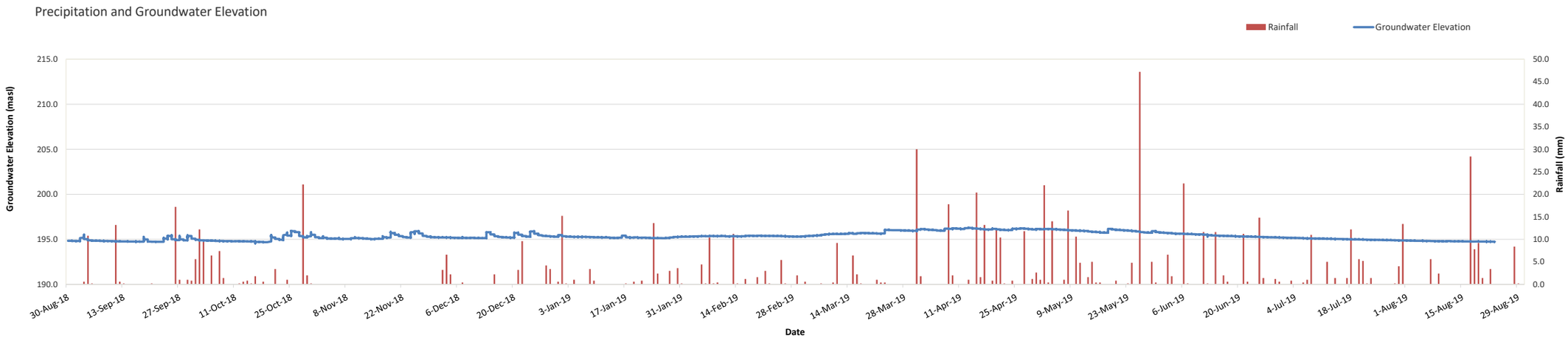


Chart C-8
Groundwater Levels BH/MW 6
Groundwater Logger Monitoring Data, September 9, 2018 to August 30, 2019



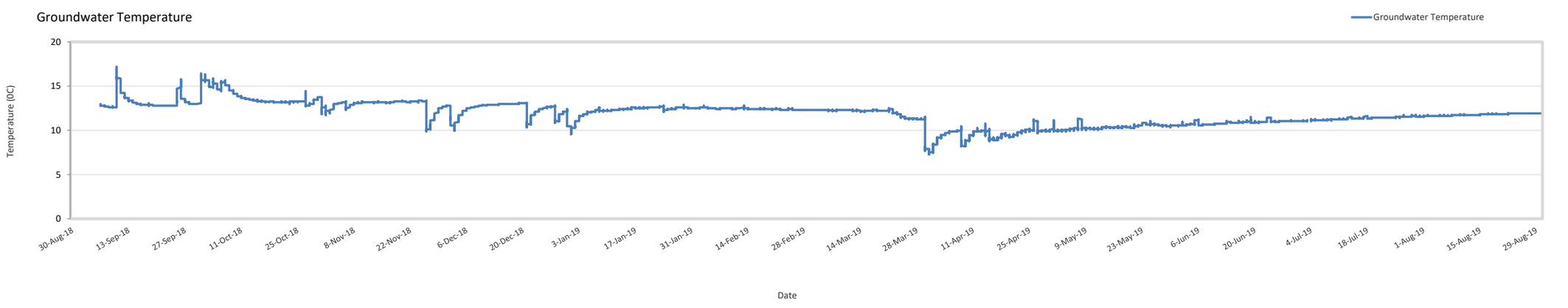
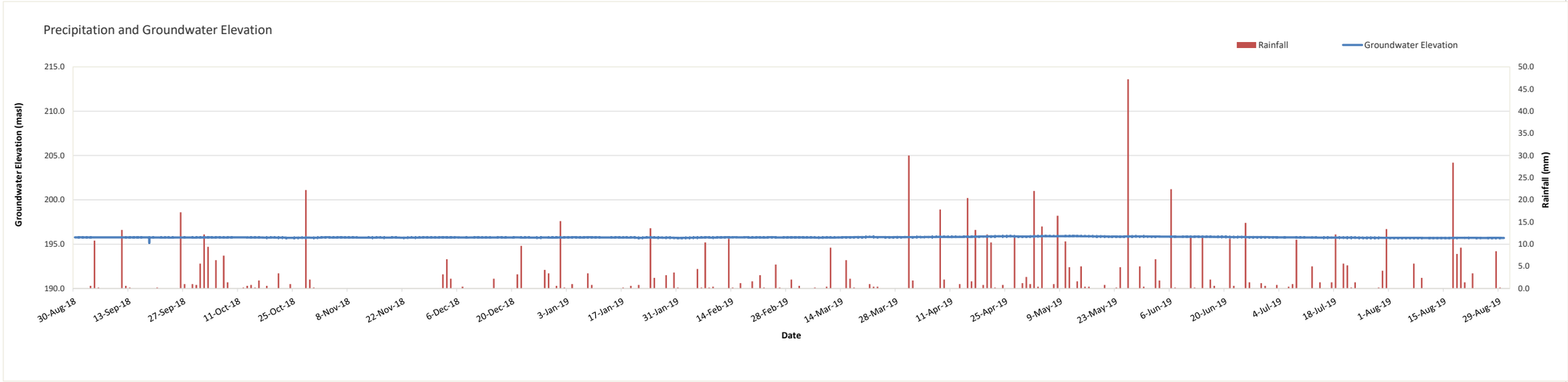


Chart C-9
Groundwater Levels BH/MW 7S
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



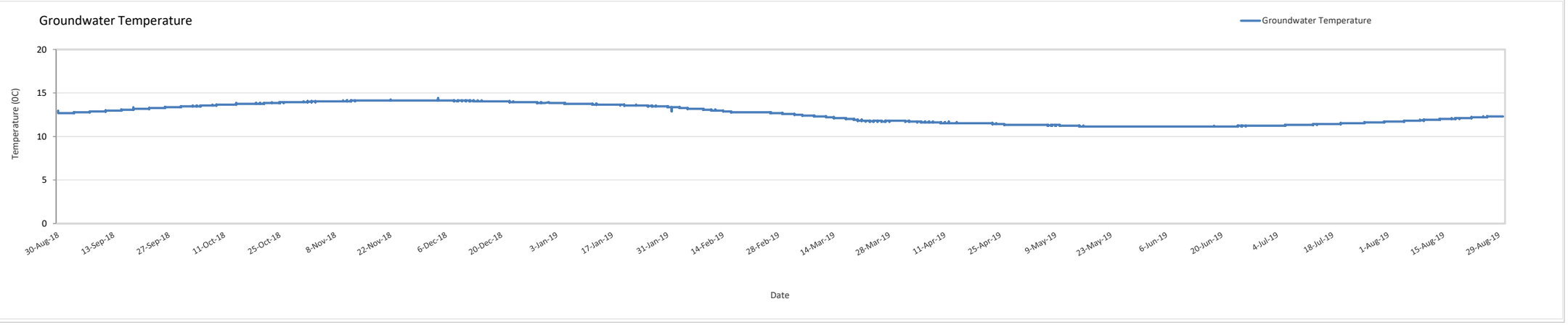
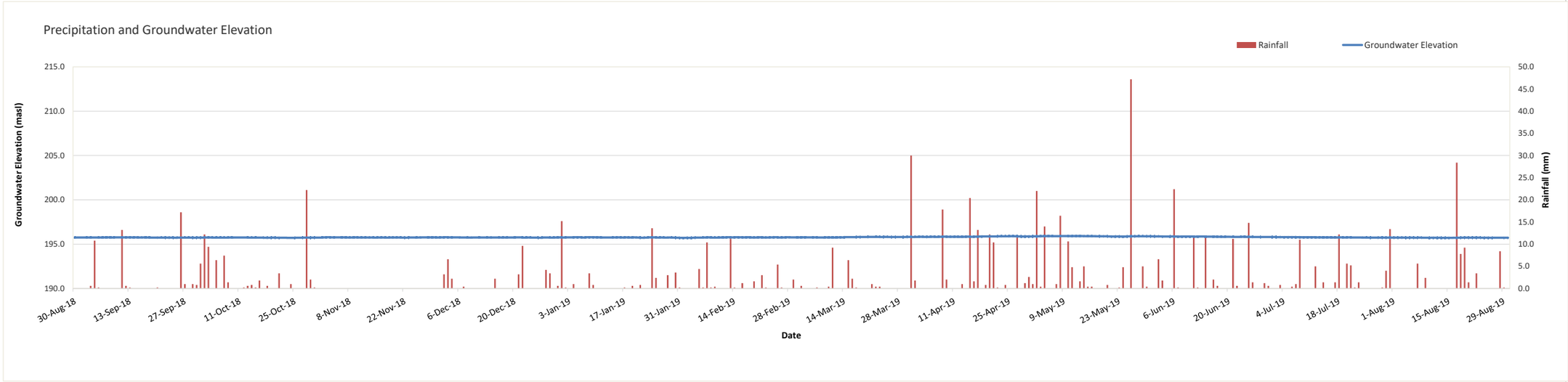


Chart C-10
Groundwater Levels BH/MW 7D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30, 2019



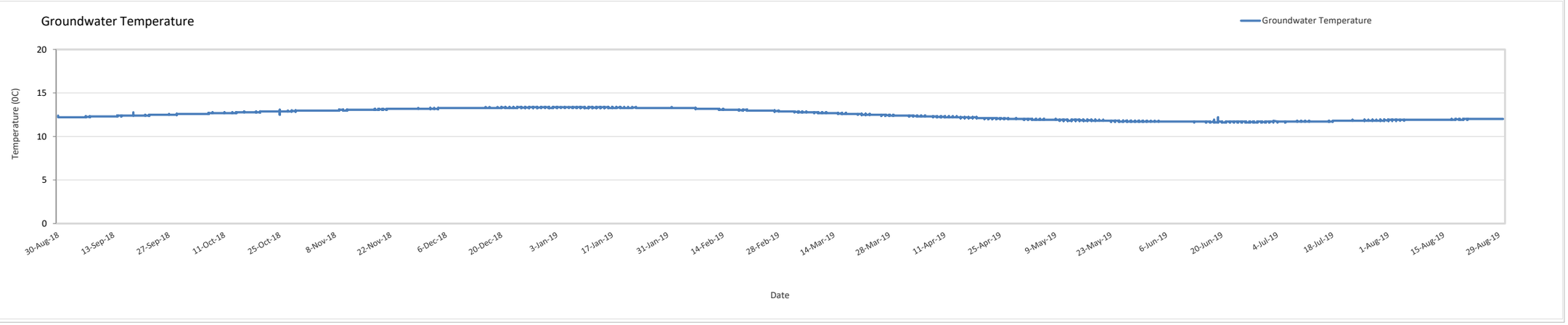


Chart C-11
Comparison ofGroundwater Levels- BH/MW 1D and 1S
Groundwater Logger Data, August 30, 2018 to August 30, 2019

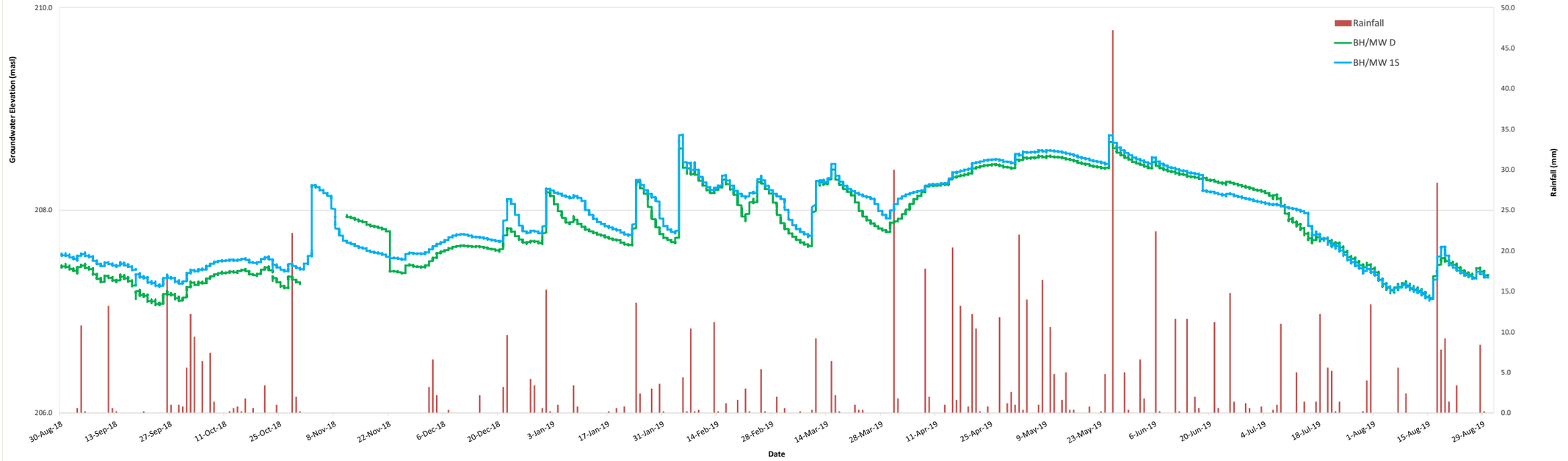


Chart C-12
Comparison of Groundwater Levels- BH-4S and 4D
Groundwater Logger Data August 30, 2018 to August 30, 2019

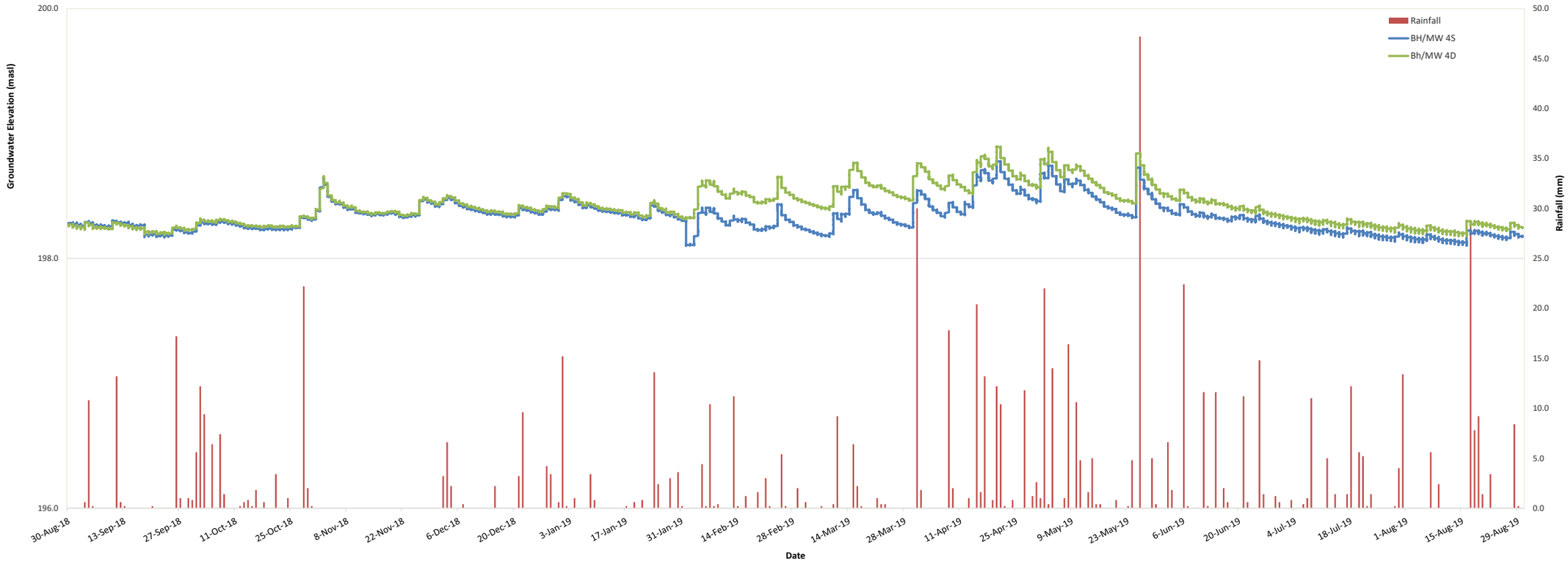
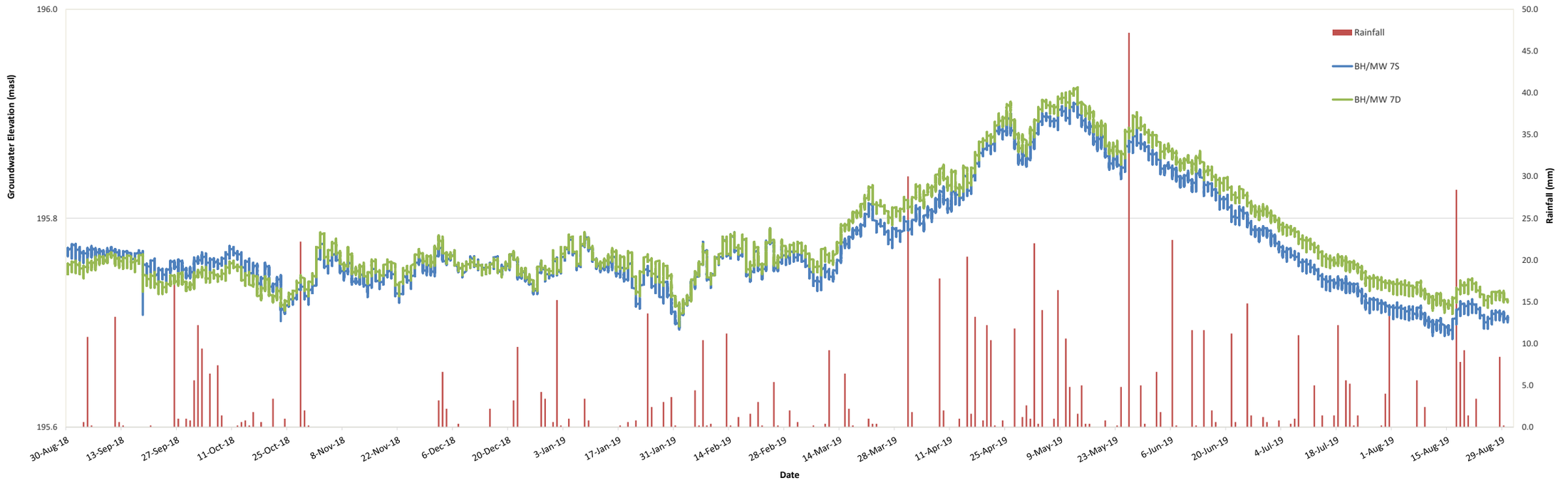


Chart C-13
Comparison of Groundwater Elevation - BH/MW 7S and 7D
Groundwater Logger Monitoring Data, August 30, 2018 to August 30,2019



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APPENDIX 'D'

WATER QUALITY ANALYSIS

REFERENCE NO. 1806-W012

Table D-1 Groundwater Chemistry

Client Sample ID					MW-1S	MW-1D	MW-2	MW-4D	MW-4S	MW-6	MW-7D	MW-7S
Date Sampled					23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018
Time Sampled					0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
ALS Sample ID					L2185953-1	L2185953-2	L2185953-3	L2185953-4	L2185953-5	L2185953-6	L2185953-7	L2185953-8
Parameter	Lowest Detection Limit	Units	ODWQS (ug/l)	PWQO (ug/l)	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests (Water)												
Conductivity	0.0030	mS/cm			0.948	0.969	3.06	1.41	1.35	3.62	2.70	2.62
pH	0.10	pH units	6.5-8.5[(D)]	6.5-8-5	7.64	7.65	7.41	7.52	7.49	6.91	6.95	7.15
Turbidity	0.10	NTU			6.90	14.4	2.16	128	55.6	669	439	520
Anions and Nutrients (Water)												
Chloride (Cl)	0.50	mg/L	250,000		64.4	76.4	854	145	165	956	772	<2.5
Cyanides (Water)												
Cyanide, Weak Acid Diss	2.0	ug/L		5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dissolved Metals (Water)												
Dissolved Mercury Filtration Location		-			FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		-			FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Antimony (Sb)-Dissolved	0.10	ug/L	6	20	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Arsenic (As)-Dissolved	0.10	ug/L	25	100	0.14	0.13	<1.0	4.66	7.62	1.6	2.1	1.5
Barium (Ba)-Dissolved	0.10	ug/L	1,000		27.9	29.1	188	198	220	811	1160	818
Beryllium (Be)-Dissolved	0.10	ug/L		11-1100	<0.10	<0.10	<1.0	<0.10	<0.10	<1.0	<1.0	<1.0
Boron (B)-Dissolved	10	ug/L	5,000	200	19	21	<100	154	100	170	240	200
Cadmium (Cd)-Dissolved	0.010	ug/L	5	0.2	0.013	0.010	0.051	<0.010	<0.010	<0.050	<0.050	<0.050
Chromium (Cr)-Dissolved	0.50	ug/L	50	1	1.39	0.97	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Cobalt (Co)-Dissolved	0.10	ug/L	1,000	0.9	<0.10	<0.10	3.0	1.27	1.78	1.1	1.4	1.3
Copper (Cu)-Dissolved	0.20	ug/L	1,000	5	2.26	1.11	<2.0	0.27	0.34	<2.0	<2.0	<2.0
Lead (Pb)-Dissolved	0.050	ug/L	10		<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	0.58	<0.50
Mercury (Hg)-Dissolved	0.010	ug/L	1	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum (Mo)-Dissolved	0.050	ug/L		40	0.483	0.389	0.90	22.9	6.05	0.95	3.08	0.70
Nickel (Ni)-Dissolved	0.50	ug/L		25	0.56	0.69	7.6	1.20	1.46	<5.0	<5.0	<5.0
Selenium (Se)-Dissolved	0.050	ug/L	10	100	0.371	0.511	<0.50	0.362	0.256	<0.50	<0.50	<0.50
Silver (Ag)-Dissolved	0.050	ug/L		0.1	<0.050	<0.050	<0.50	<0.050	<0.050	<0.50	<0.50	<0.50
Sodium (Na)-Dissolved	500	ug/L	200,000		82,600	74,800	120,000	119,000	63,400	525,000	289,000	310,000
Thallium (Tl)-Dissolved	0.010	ug/L		0.3	<0.010	0.012	<0.10	<0.010	<0.010	<0.10	<0.10	<0.10
Uranium (U)-Dissolved	0.010	ug/L		5	0.538	0.795	4.01	3.77	0.529	0.12	<0.10	<0.10
Vanadium (V)-Dissolved	0.50	ug/L		6	<0.50	<0.50	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0
Zinc (Zn)-Dissolved	1.0	ug/L	5,000	30	85.9	179	107	54.2	29.9	91	69	26
Speciated Metals (Water)												
Chromium, Hexavalent	0.50	ug/L	50	1	1.43	1.09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Volatile Organic Compounds (Water)												
Acetone	30	ug/L	0		<30	<30	<30	<30	<30	<30	<30	<30
Benzene	0.50	ug/L		100 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	2.0	ug/L	100	200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	5.0	ug/L	100	60	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	0.50	ug/L		0.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	0.20	ug/L	50		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	0.50	ug/L	80 (30**)	15	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	2.0	ug/L	0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	1.0	ug/L	100		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.20	ug/L			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	0.50	ug/L	200 (3**)	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	0.50	ug/L		2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	0.50	ug/L	5 (1**)	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	2.0	ug/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	0.50	ug/L	14		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	0.50	ug/L	5*		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	0.50	ug/L	14	40 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	0.50	ug/L		200 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	0.50	ug/L		200 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	5.0	ug/L	50	100 [(I)]	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	0.50	ug/L		0.7 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	0.30	ug/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	0.30	ug/L			<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	0.50	ug/L	2.4**	8 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	20	ug/L		400 [(I)]	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	20	ug/L			<20	<20	<20	<20	<20	<20	<20	<20
MTBE	2.0	ug/L		200 [(I)]	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	0.50	ug/L			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1,2-Tetrachloroethane	0.50	ug/L		20 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	0.50	ug/L		70 [(I)]	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Table D-1 Groundwater Chemistry

Client Sample ID					MW-1S	MW-1D	MW-2	MW-4D	MW-4S	MW-6	MW-7D	MW-7S
Date Sampled					23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018	23-Oct-2018
Time Sampled					0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
ALS Sample ID					L2185953-1	L2185953-2	L2185953-3	L2185953-4	L2185953-5	L2185953-6	L2185953-7	L2185953-8
Parameter	Lowest Detection Limit	Units	ODWQS (ug/l)	PWQO (ug/l)	Water	Water	Water	Water	Water	Water	Water	Water
Tetrachloroethylene	0.50	ug/L	30	50 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	0.50	ug/L	24**	0.8 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	0.50	ug/L		10 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	0.50	ug/L		800 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	0.50	ug/L	5	20 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	5.0	ug/L			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	0.50	ug/L	2	600 (i)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene	0.30	ug/L		40 (i)	<0.30	<0.30	1.20	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	0.40	ug/L	300**		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	0.50	ug/L			<0.50	<0.50	1.2	<0.50	<0.50	<0.50	<0.50	<0.50
4-Bromofluorobenzene		%			97	97.3	98.6	98.7	97.8	98.3	99.5	98.6
1,4-Difluorobenzene		%			97.6	97	97.2	96.8	96.9	97.1	97	96.1
Hydrocarbons (Water)												
F1 (C6-C10)	25	ug/L			<25	<25	28	<25	<25	<25	<25	<25
F1-BTEX	25	ug/L			<25	<25	26	<25	<25	<25	<25	<25
F2 (C10-C16)	100	ug/L			<100	<100	560	<100	<100	900	110	<100
F2-Naphth	100	ug/L			<100	<100	560	<100	<100	900	110	<100
F3 (C16-C34)	250	ug/L			<250	<250	<250	<250	<250	990	570	<250
F3-PAH	250	ug/L			<250	<250	<250	<250	<250	990	570	<250
F4 (C34-C50)	250	ug/L			<250	<250	<250	<250	<250	<250	280	<250
Total Hydrocarbons (C6-C50)	370	ug/L			<370	<370	580	<370	<370	1890	960	<370
Chrom. to baseline at nC50		-			YES	YES	YES	YES	YES	YES	YES	YES
2-Bromobenzotrifluoride		%			98.5	86.3	95.3	91.5	98.3	89.8	92.2	94.8
3,4-Dichlorotoluene		%			81.6	76.7	77.2	67.2	68	72.9	75.2	71.6
Polycyclic Aromatic Hydrocarbons (Water)												
Acenaphthene	0.020	ug/L			<0.020	<0.020	0.964	<0.020	<0.020	0.218	0.272	0.188
Acenaphthylene	0.020	ug/L			<0.020	<0.020	0.147	<0.020	<0.020	0.051	<0.020	<0.020
Anthracene	0.020	ug/L		0.0008 (i)	<0.020	<0.020	0.041	<0.020	<0.020	0.062	0.147	0.029
Benzo(a)anthracene	0.020	ug/L		0.0004 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.182	<0.020
Benzo(a)pyrene	0.010	ug/L	0.01		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.048	<0.010
Benzo(b)fluoranthene	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.172	<0.020
Benzo(g,h,i)perylene	0.020	ug/L		0.00002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.034	<0.020
Benzo(k)fluoranthene	0.020	ug/L		0.0002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.041	<0.020
Chrysene	0.020	ug/L		0.0001 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.241	<0.020
Dibenzo(ah)anthracene	0.020	ug/L		0.002 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	0.020	ug/L		0.0008 (i)	<0.020	<0.020	<0.020	<0.020	<0.020	0.027	0.475	0.053
Fluorene	0.020	ug/L		0.2 (i)	<0.020	<0.020	1.43	<0.020	<0.020	0.319	0.336	0.207
Indeno(1,2,3-cd)pyrene	0.020	ug/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	<0.020
1+2-Methylnaphthalenes	0.028	ug/L			<0.028	<0.028	9.1	0.03	<0.028	1.68	1.32	0.831
1-Methylnaphthalene	0.020	ug/L		2 (i)	<0.020	<0.020	6.55	0.030	0.020	0.730	0.748	0.476
2-Methylnaphthalene	0.020	ug/L		2 (i)	<0.020	<0.020	2.54	<0.020	<0.020	0.950	0.576	0.355
Naphthalene	0.050	ug/L		7 (i)	<0.050	<0.050	<0.630	<0.050	<0.050	<0.350	0.196	0.084
Phenanthrene	0.020	ug/L		0.03(i)	<0.020	<0.020	0.655	<0.020	<0.020	0.536	1.05	0.304
Pyrene	0.020	ug/L			<0.020	<0.020	0.094	<0.020	<0.020	0.192	0.500	0.044
d10-Acenaphthene		%			94.4	91.6	93.9	98.4	93.6	84.9	88.4	91.5
d12-Chrysene		%			64.3	66.6	67.4	73.7	67.3	82.8	62.5	64.3
d8-Naphthalene		%			99.6	96	87.1	102.7	99.2	85.4	90.8	95.5
d10-Phenanthrene		%			101	97.3	102.5	105.3	99.9	106.3	96.2	99.9

Notes :

All concentrations are in ug/L unless indicated otherwise

ODWQS- Onatario Drinking Water Quality Standards (MOE June 2003, revised June 2006)

PWQO- Provincinal Water Quality Objective (1995, and July 1998 updates)

(1) *-Maximum Acceptable Concentration

(2) (o) - Operational Guideline

(3) **-Aesthetic Objective

(4) (i) Interim PWQO Standard

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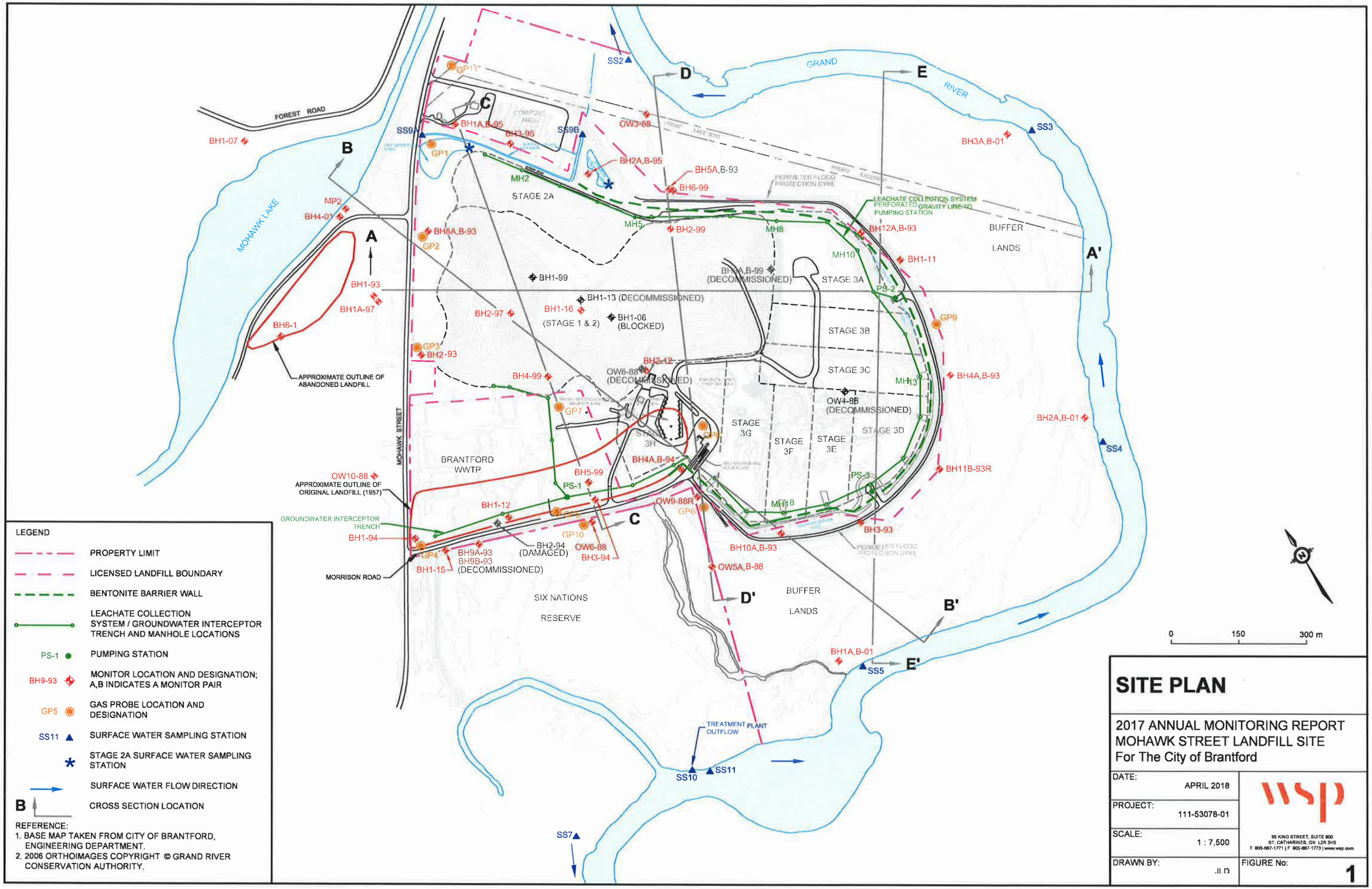
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'E'

MONITORING WELL LOCATION PLAN FROM WSP REPORT DATED APRIL 2018 - MOHAWK STREET LANDFILL SITE, 2017 ANNUAL MONITORING REPORT, CORPORATION OF THE CITY OF BRANTFORD,



LEGEND

- PROPERTY LIMIT
- LICENSED LANDFILL BOUNDARY
- BENTONITE BARRIER WALL
- LEACHATE COLLECTION SYSTEM / GROUNDWATER INTERCEPTOR TRENCH AND MANHOLE LOCATIONS
- PS-1 — PUMPING STATION
- BH9-93 — MONITOR LOCATION AND DESIGNATION; A,B INDICATES A MONITOR PAIR
- GP5 — GAS PROBE LOCATION AND DESIGNATION
- SS11 — SURFACE WATER SAMPLING STATION
- * — STAGE 2A SURFACE WATER SAMPLING STATION
- SURFACE WATER FLOW DIRECTION
- B — CROSS SECTION LOCATION

REFERENCE:
1. BASE MAP TAKEN FROM CITY OF BRANTFORD, ENGINEERING DEPARTMENT.
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SITE PLAN

2017 ANNUAL MONITORING REPORT
MOHAWK STREET LANDFILL SITE
For The City of Brantford

DATE: APRIL 2018	
PROJECT: 111-53078-01	
SCALE: 1 : 7,500	
DRAWN BY: JLD	FIGURE No: 1

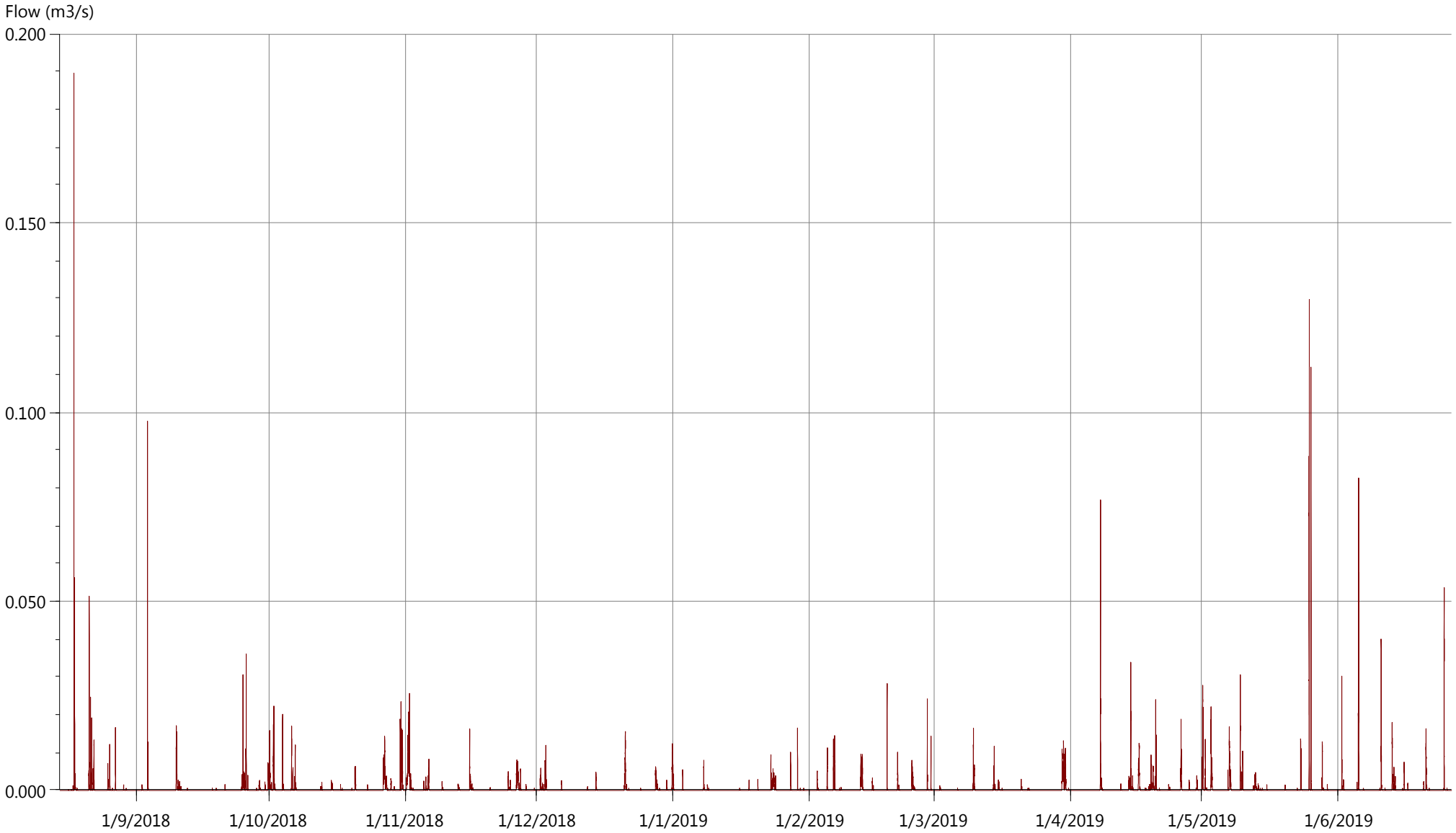
wsp
55 KING STREET, SUITE 800
ST. CATHARINES, ON L2R 3H5
T 905-687-1771 | F 905-687-1773 | www.wsp.com

H:\PROJECTS\2011\111-53078 MOHAWK ST. LF\01 2017\001 2017 MONITORING\GRAPHICS\53078-01-001-F1-SP.DWG

Appendix B – Hydrology Model Results

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

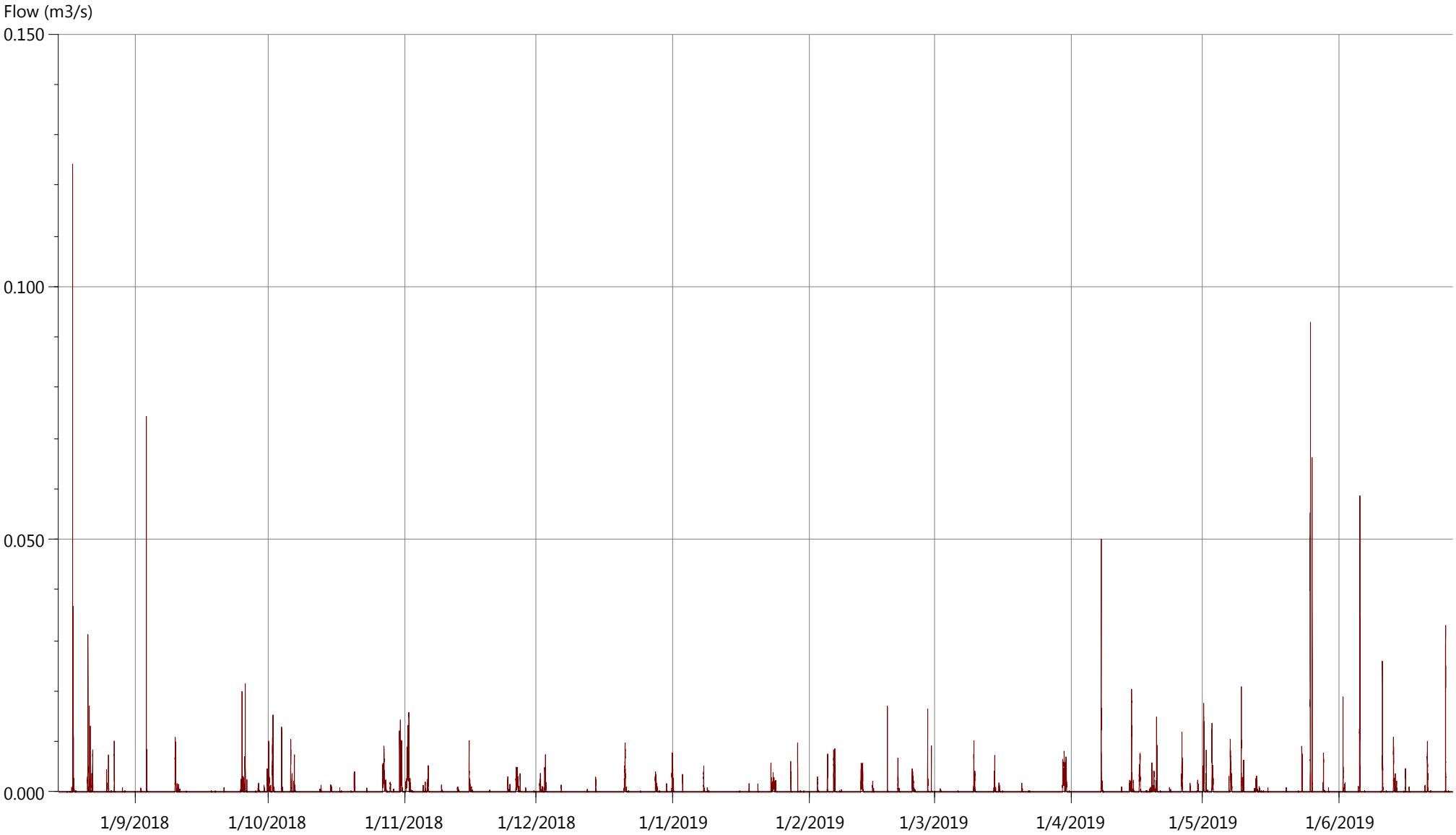
Model Location (Pred.) U/S 01M011.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.190	9431.011

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

Model Location (Pred.) U/S 01M013.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.124	5809.143

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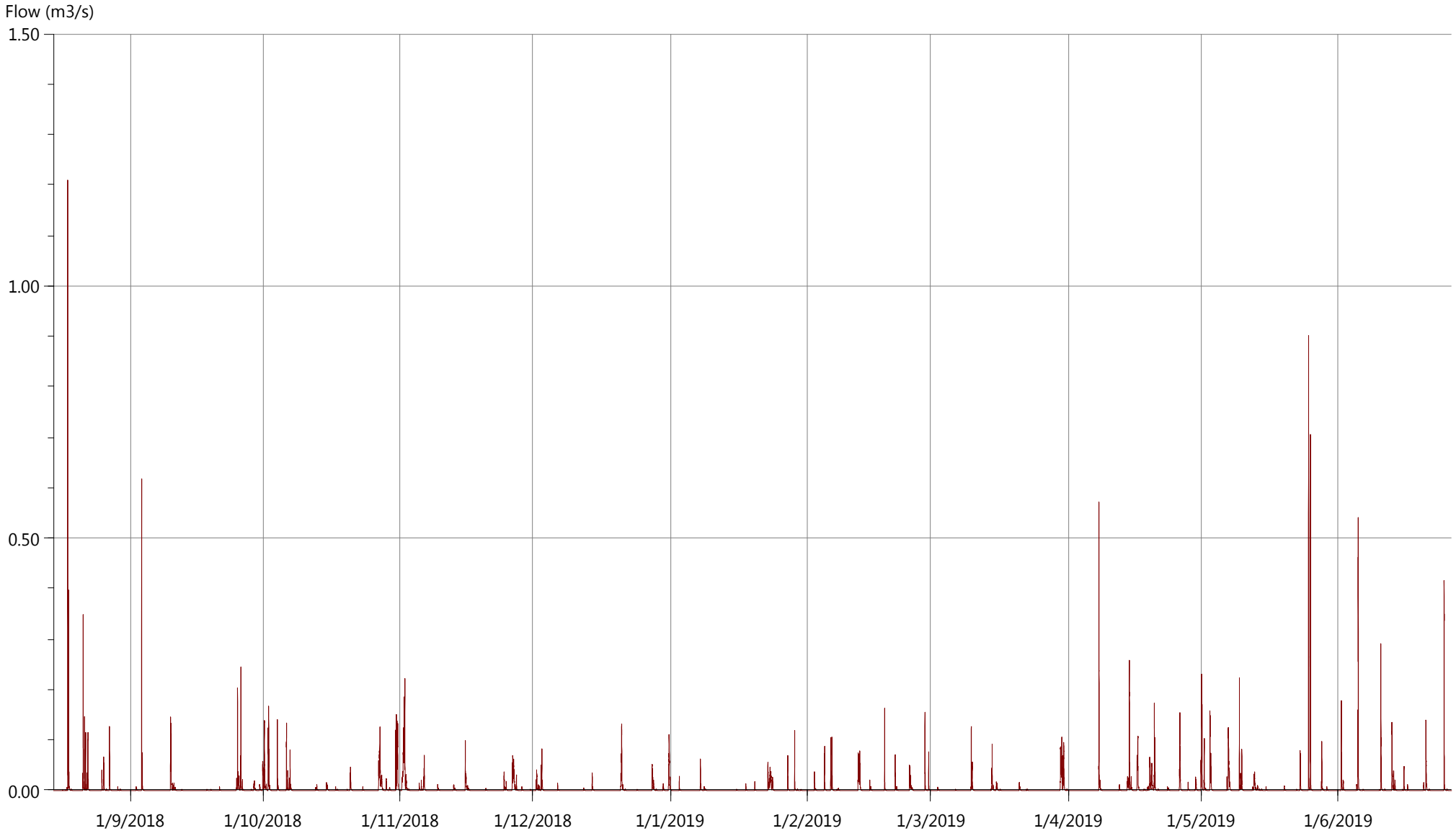
Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

Model Location (Pred.) U/S 02M055.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	1.210	90855.082

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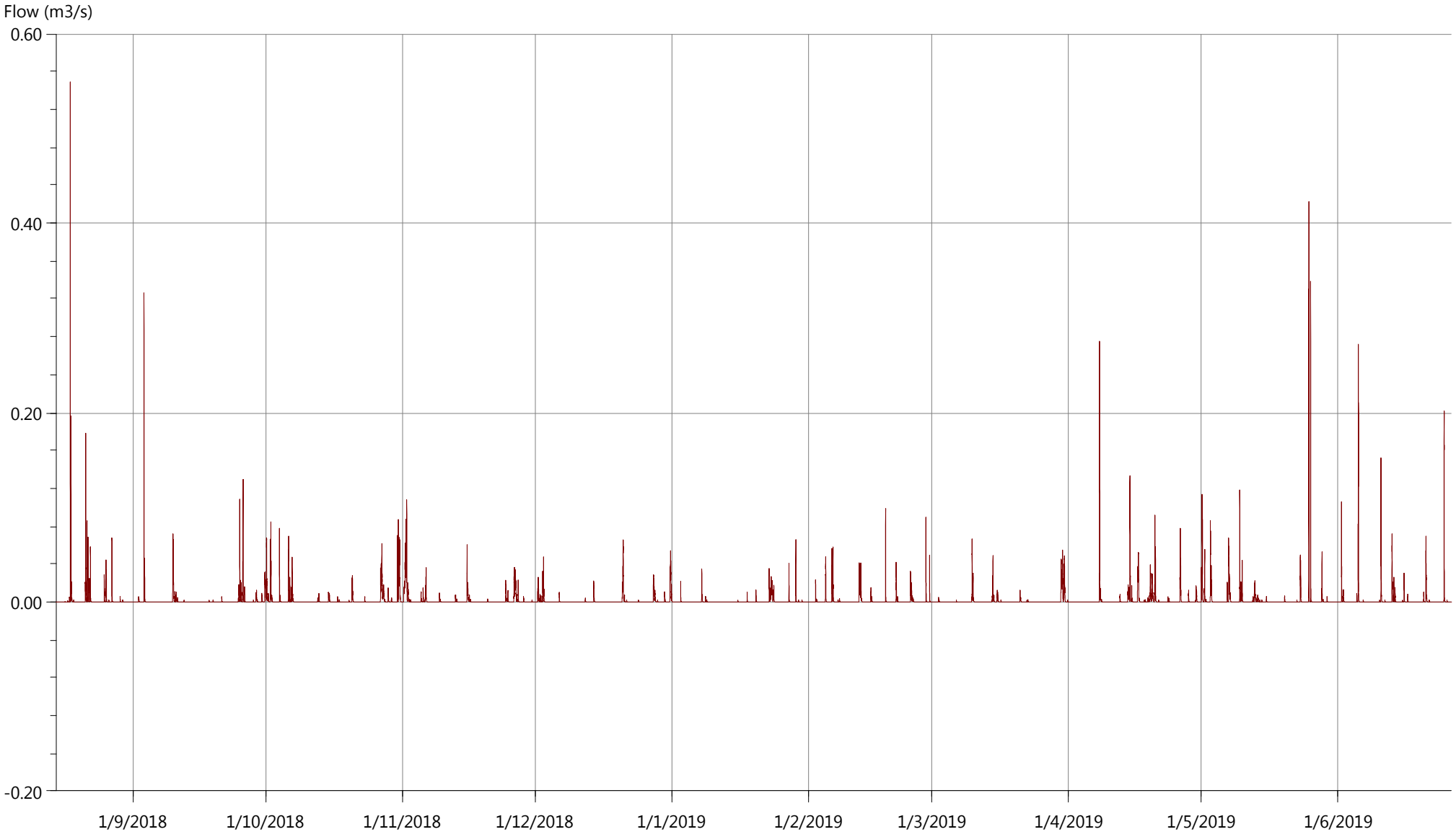
Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

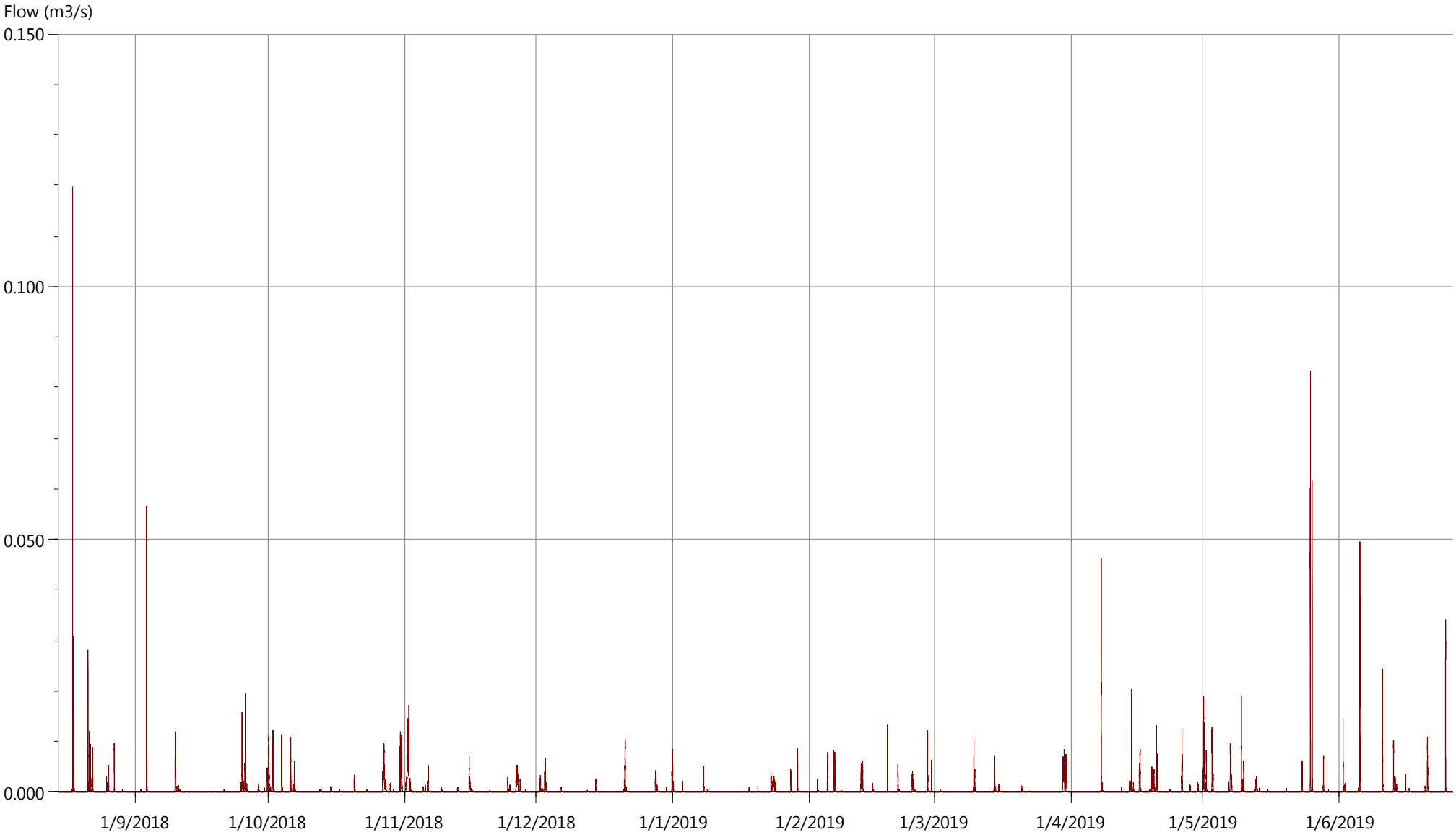
Model Location (Pred.) U/S 02M064.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	-0.000	0.549	45324.533

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

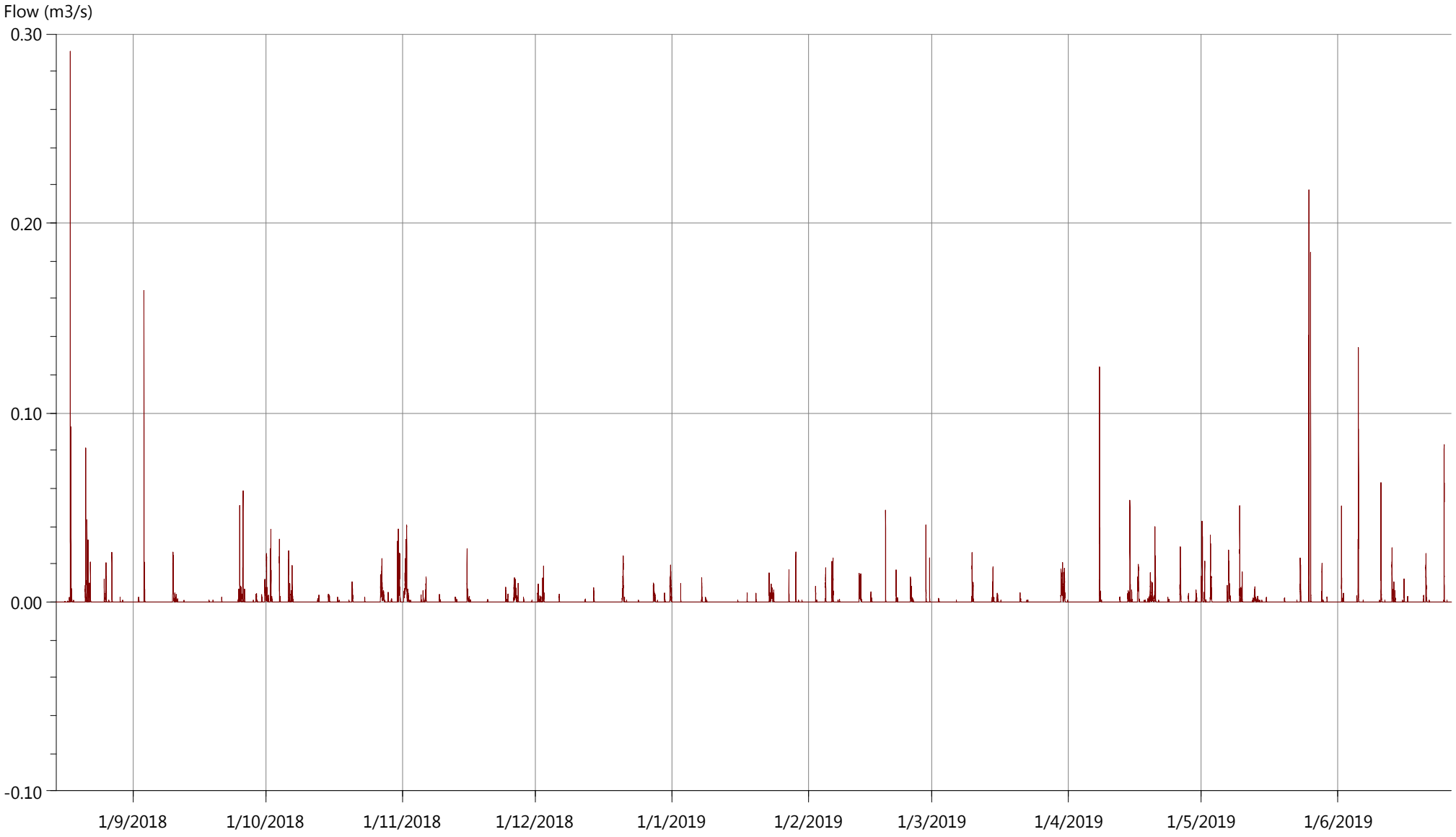
Model Location (Pred.) U/S 02M070.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.120	7129.407

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

Model Location (Pred.) U/S 02M094.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	-0.000	0.291	14624.390

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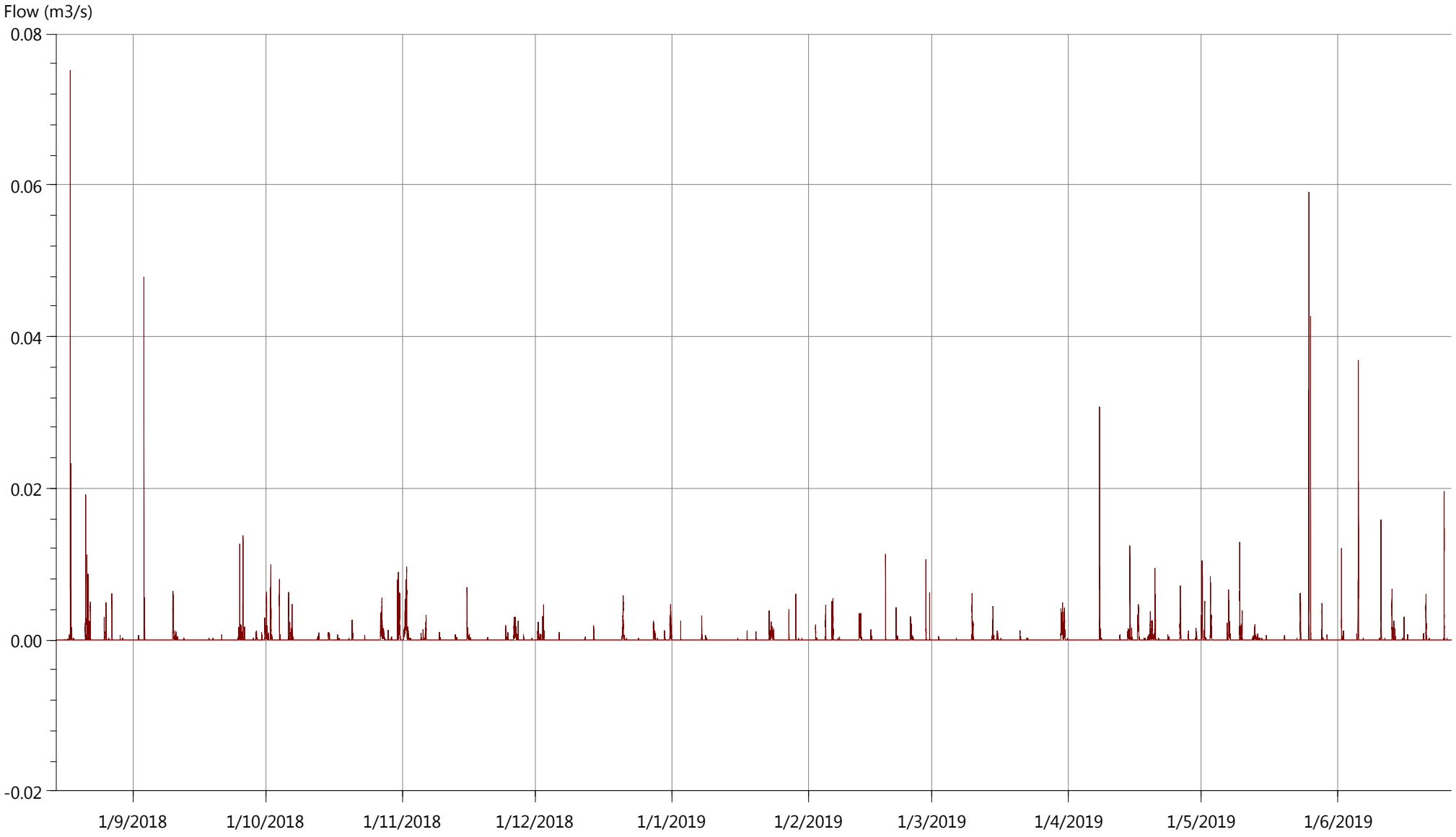
Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

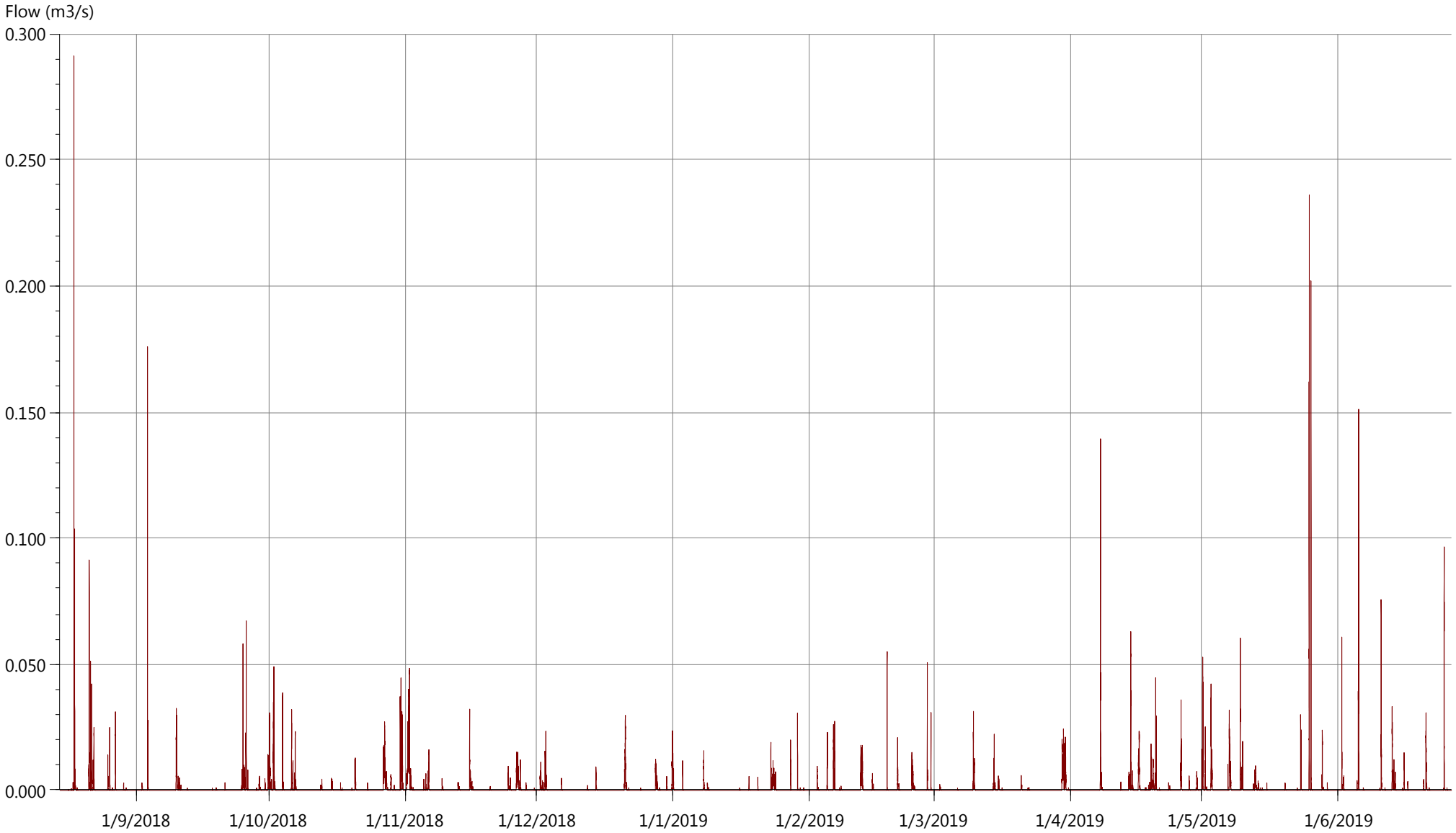
Model Location (Pred.) U/S 02M106.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	-0.000	0.075	3378.429

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

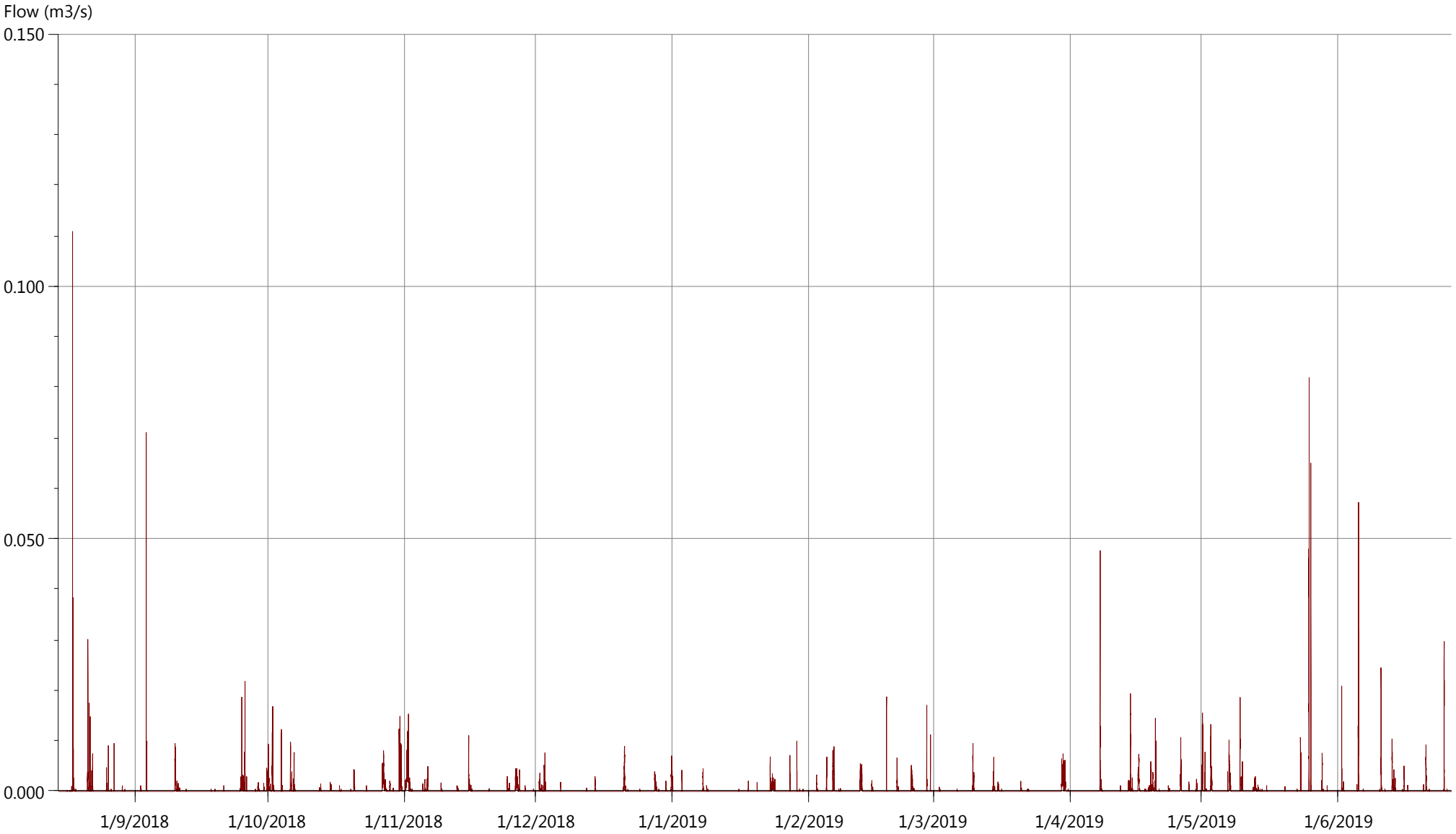
Model Location (Pred.) U/S 03M005.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.291	17414.305

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

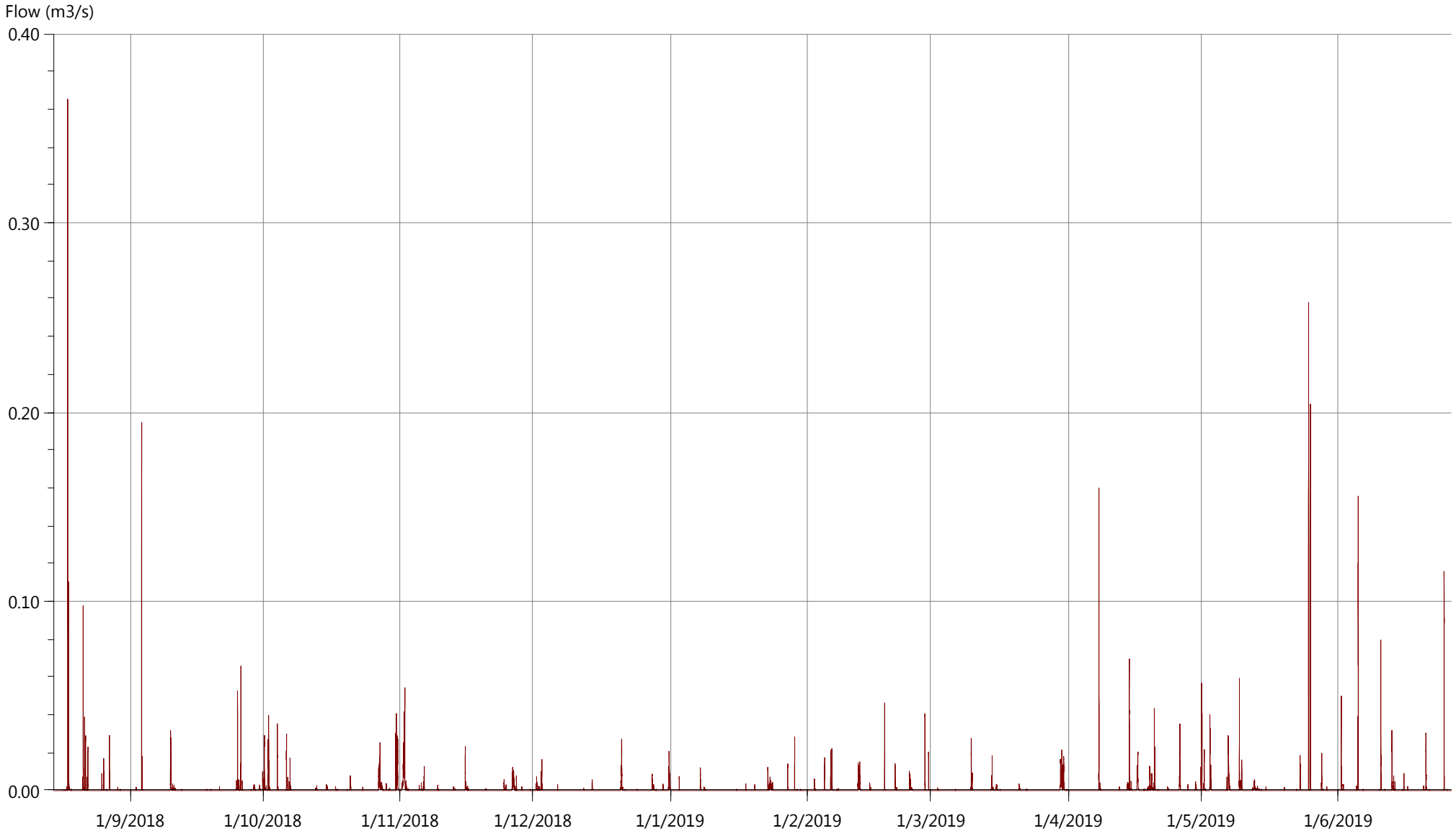
Model Location (Pred.) U/S 04M013.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.111	4975.212

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

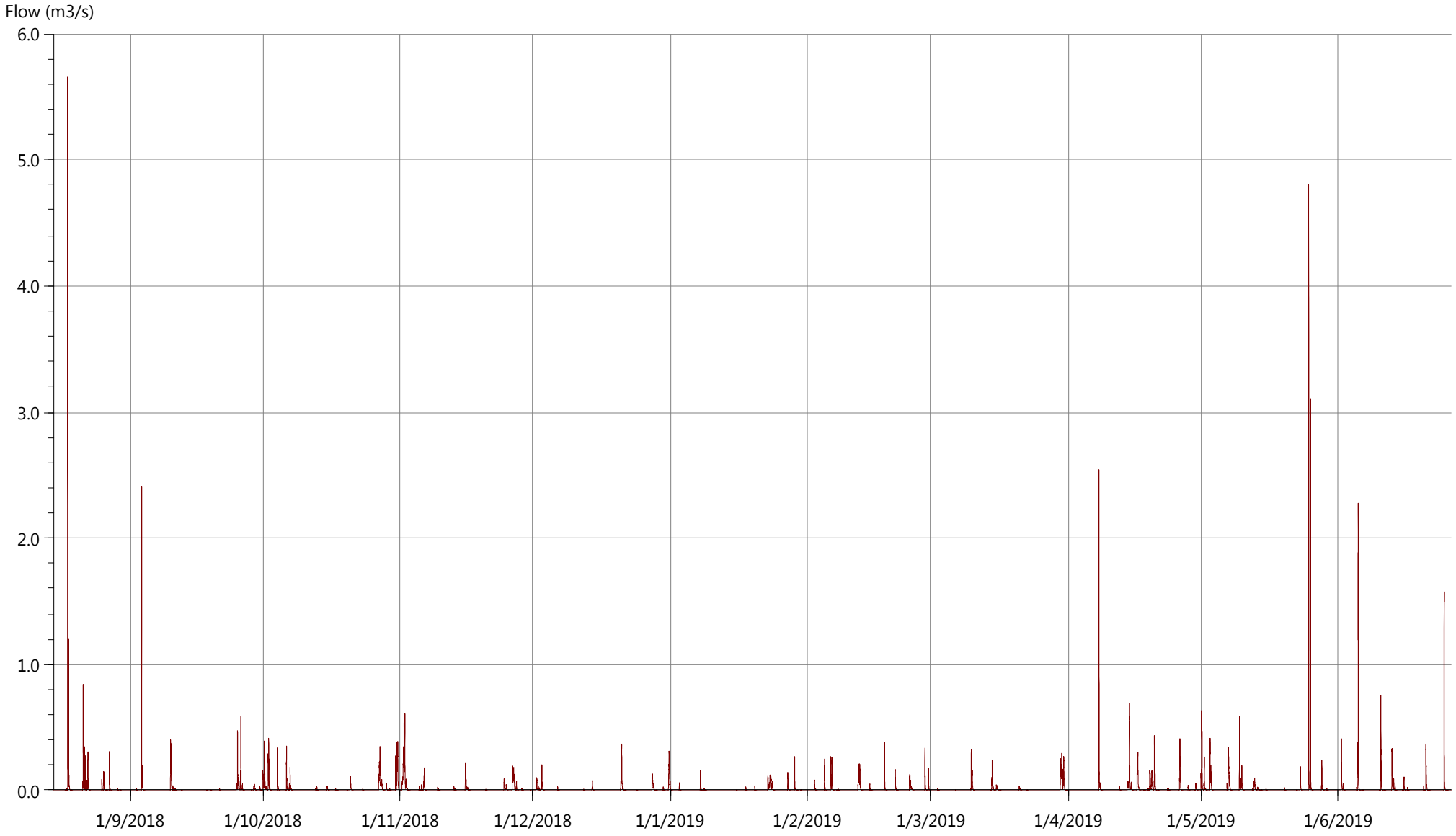
Model Location (Pred.) U/S 05M037.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.365	14575.652

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

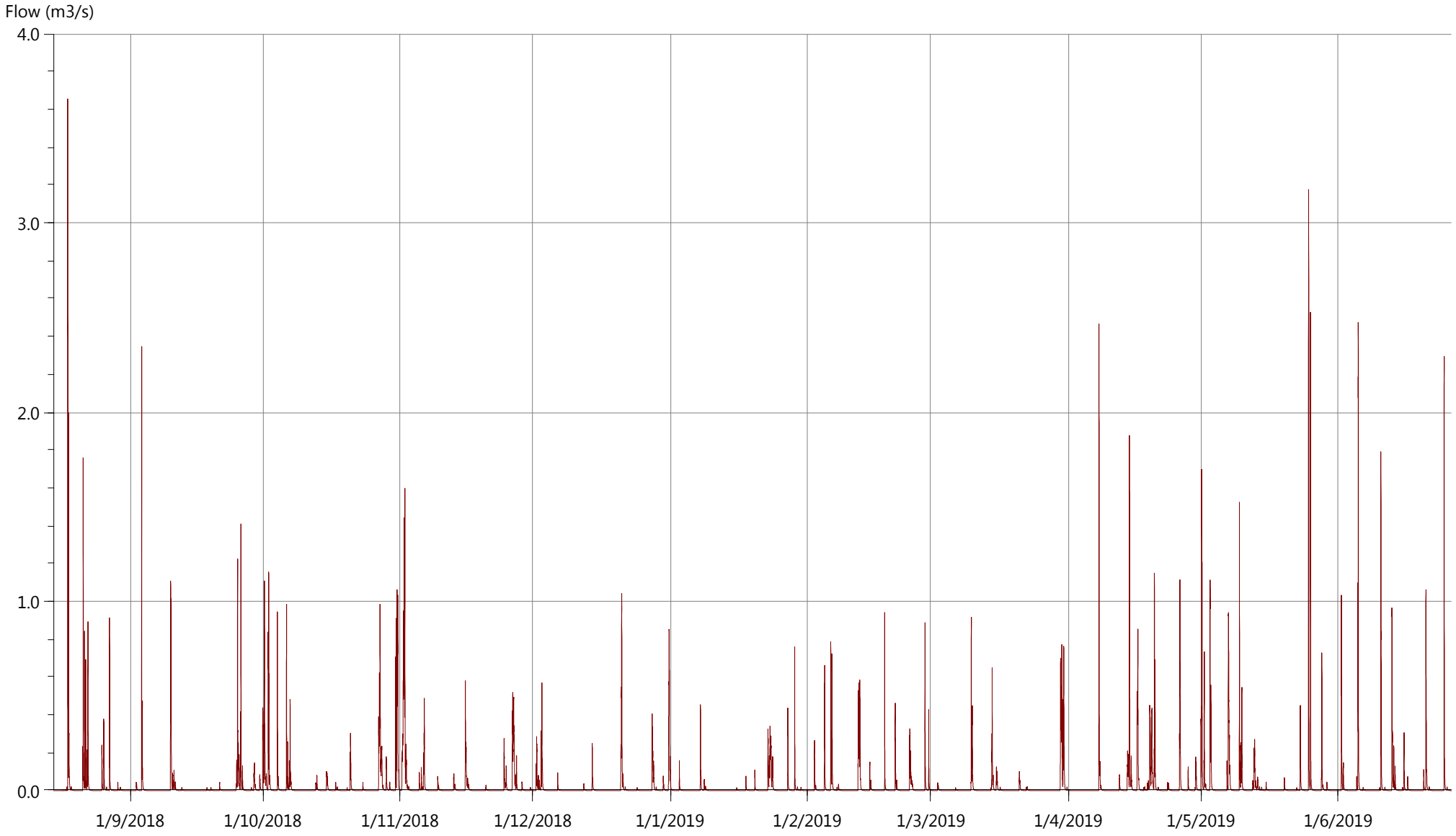
Model Location (Pred.) U/S 06M221.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	5.655	302569.215

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

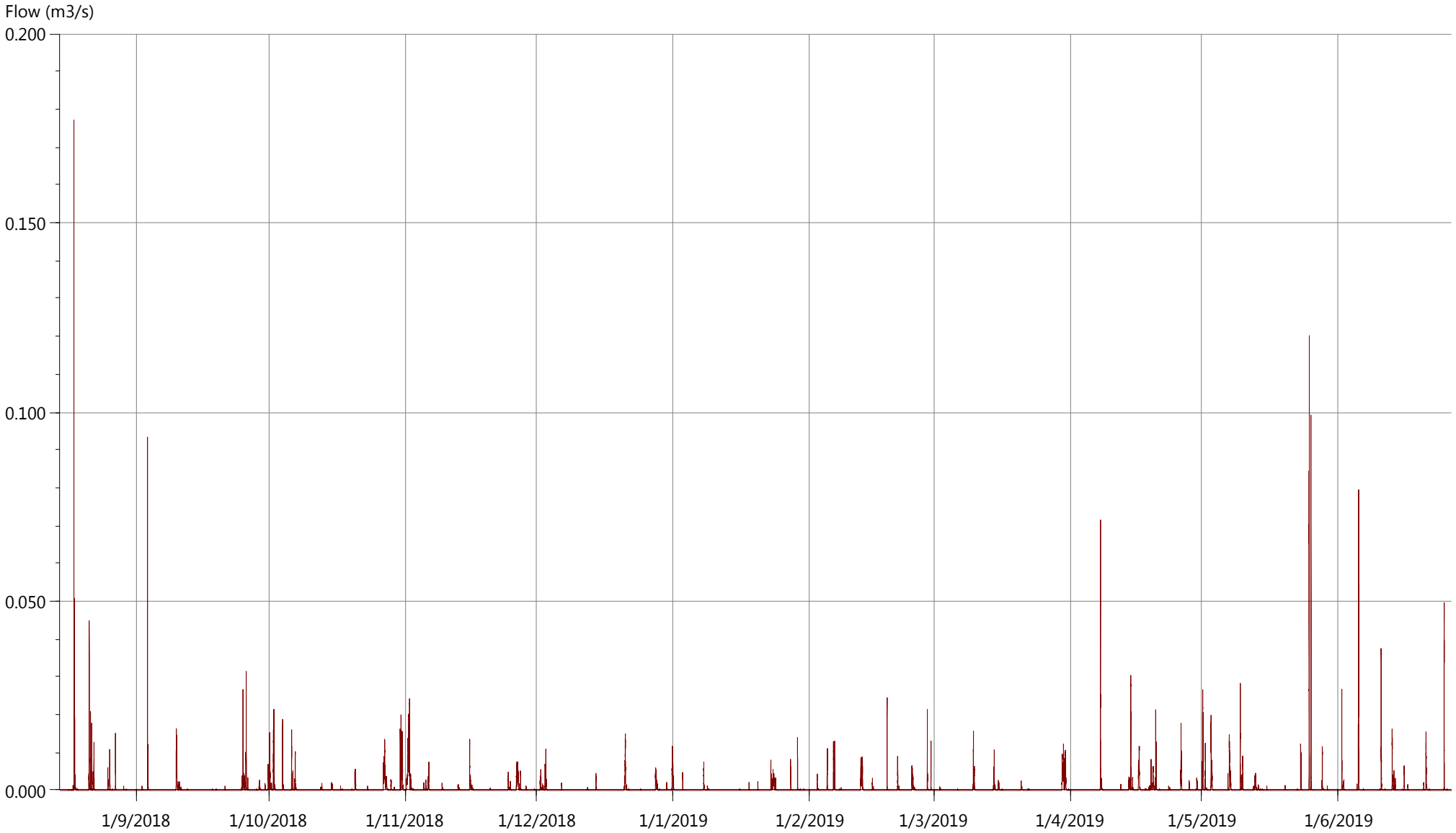
Model Location (Pred.) U/S 07M193.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	3.654	744265.936

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

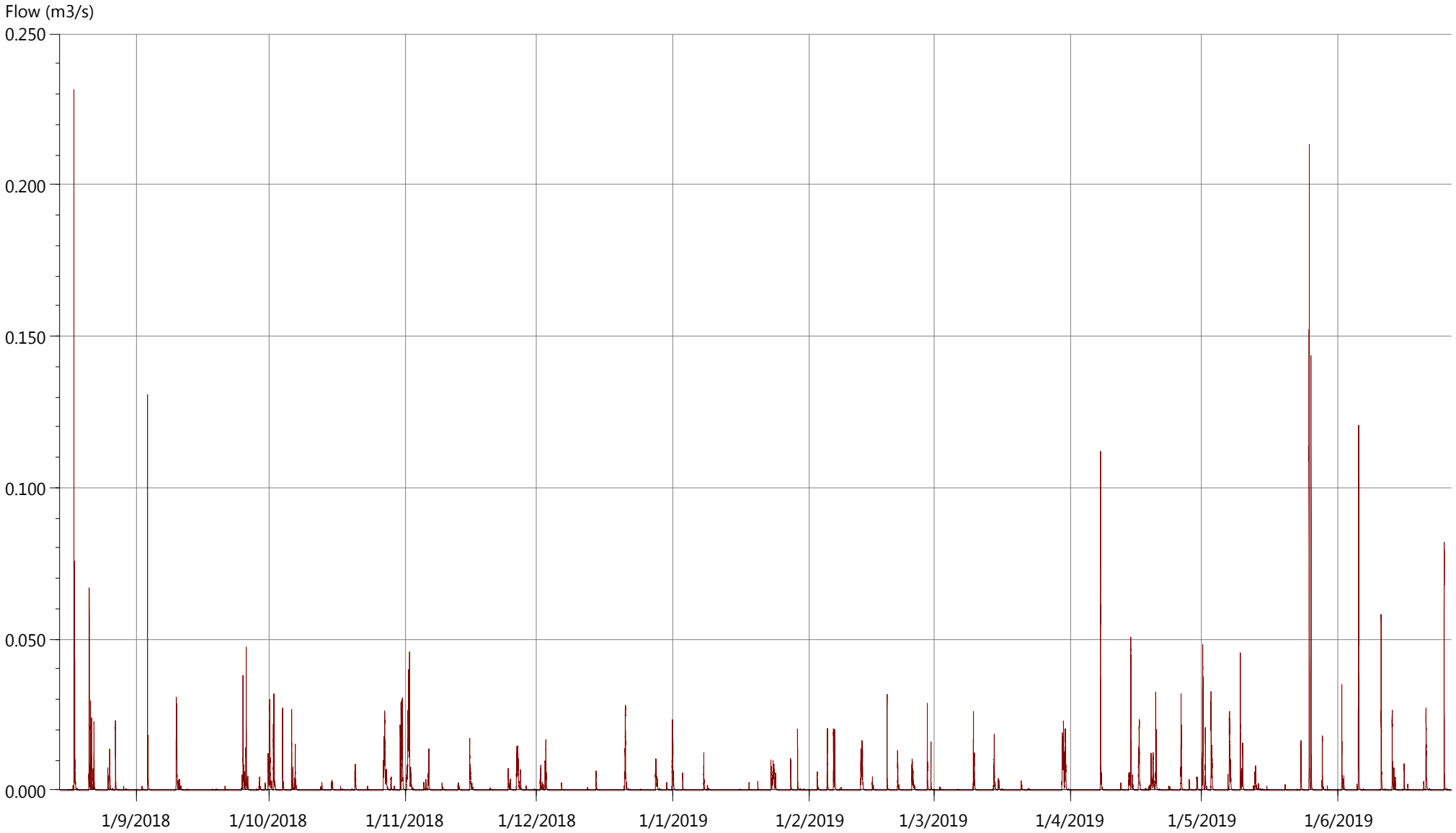
Model Location (Pred.) U/S 07M206.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.177	9230.990

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

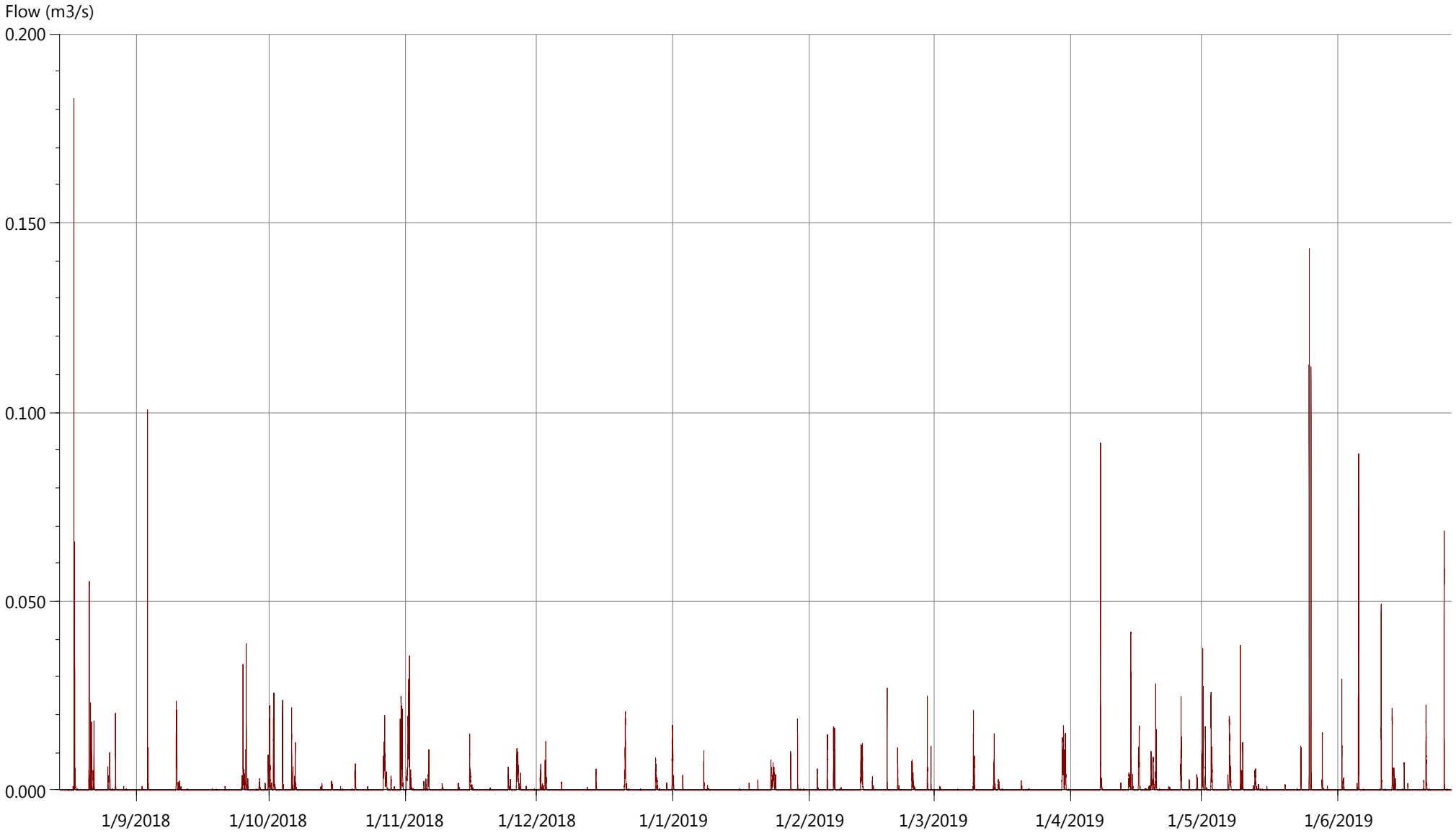
Model Location (Pred.) U/S 08M003.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.231	21132.976

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

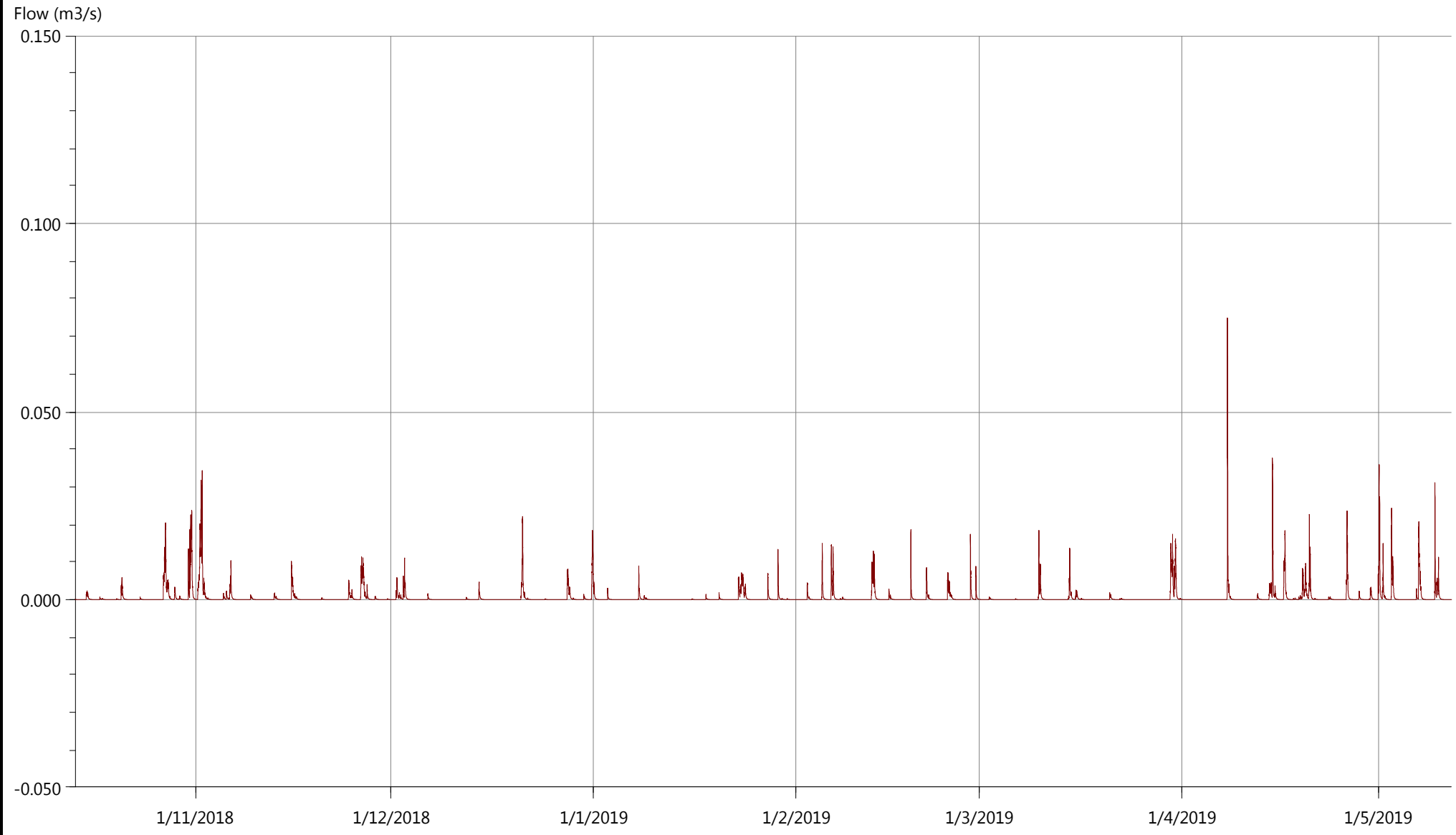
Model Location (Pred.) U/S 09M007.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.183	14196.548

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

Model Location (Pred.) U/S 10M043.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.075	10710.882

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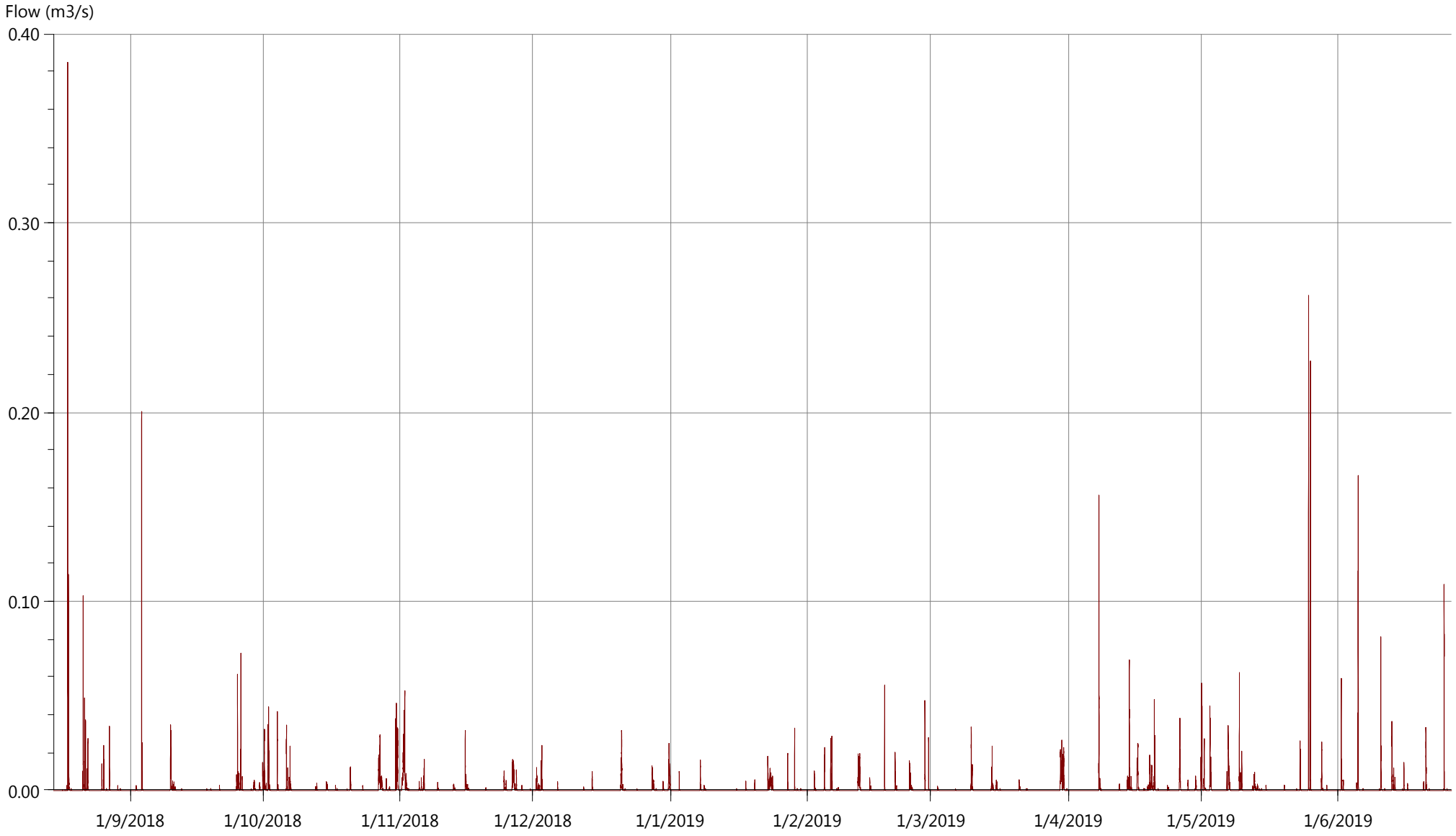
Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

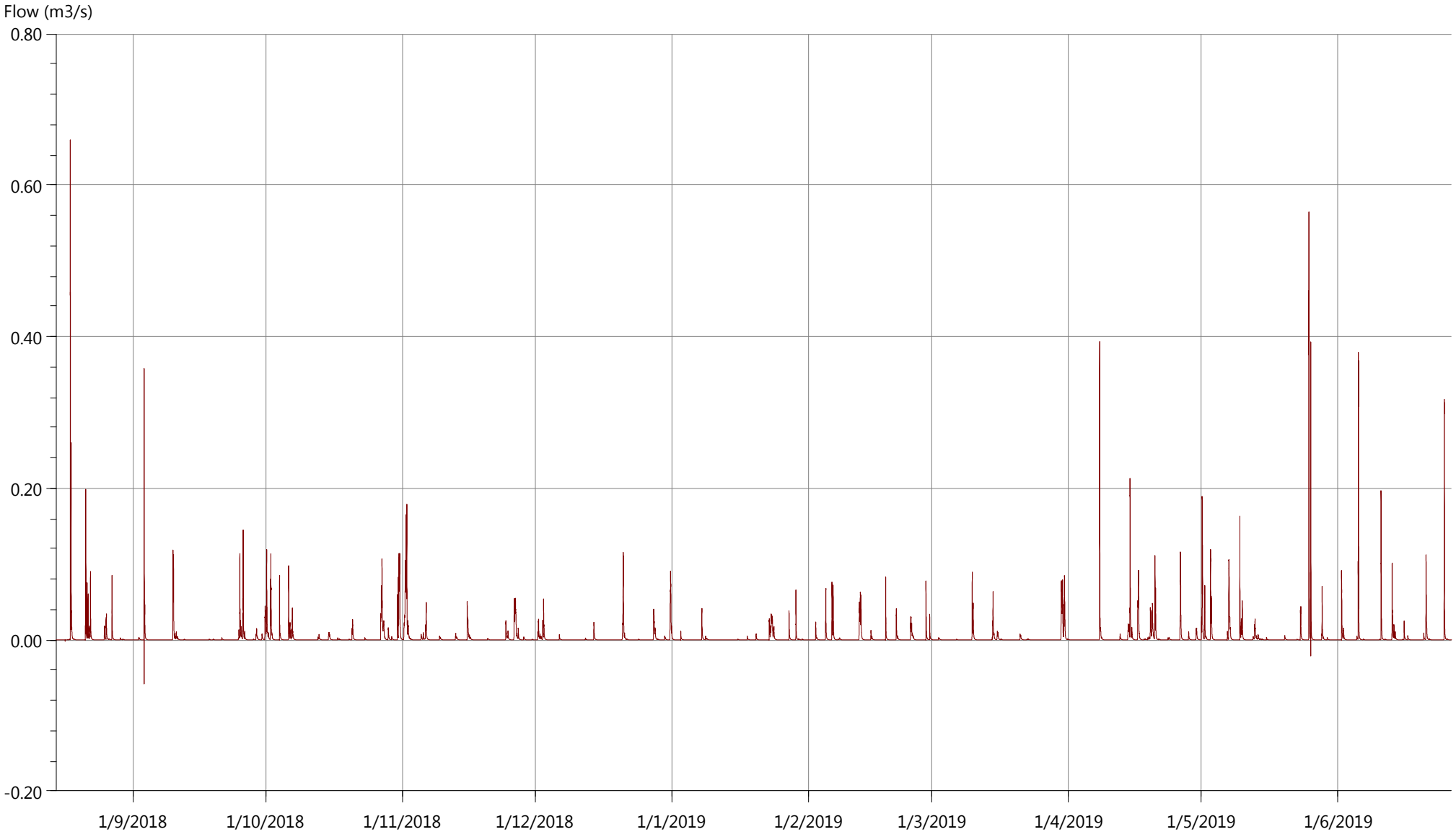
Model Location (Pred.) U/S 10M076.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	0.385	19389.008

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

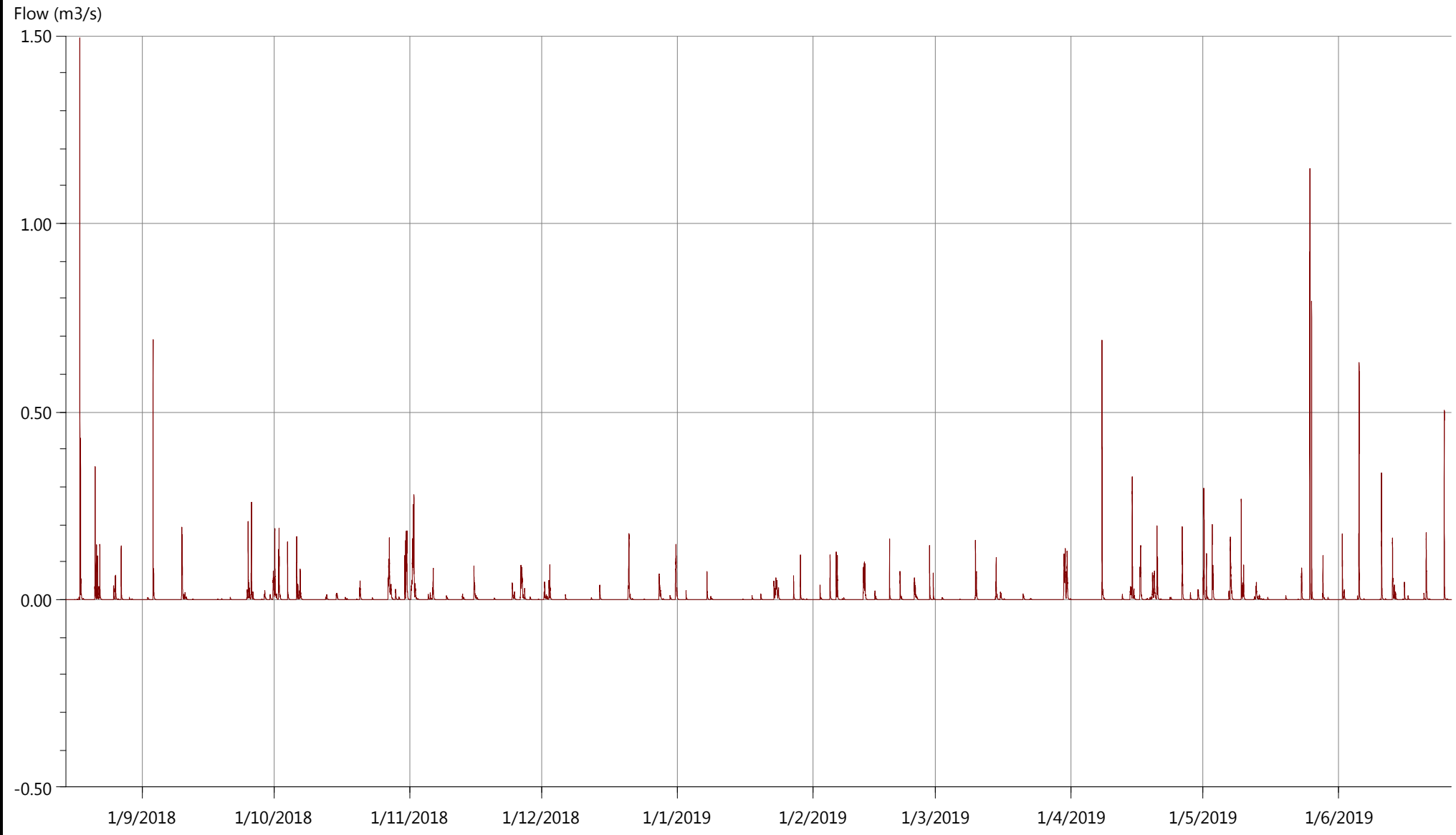
Model Location (Pred.) U/S 10M097.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	-0.058	0.660	91850.641

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

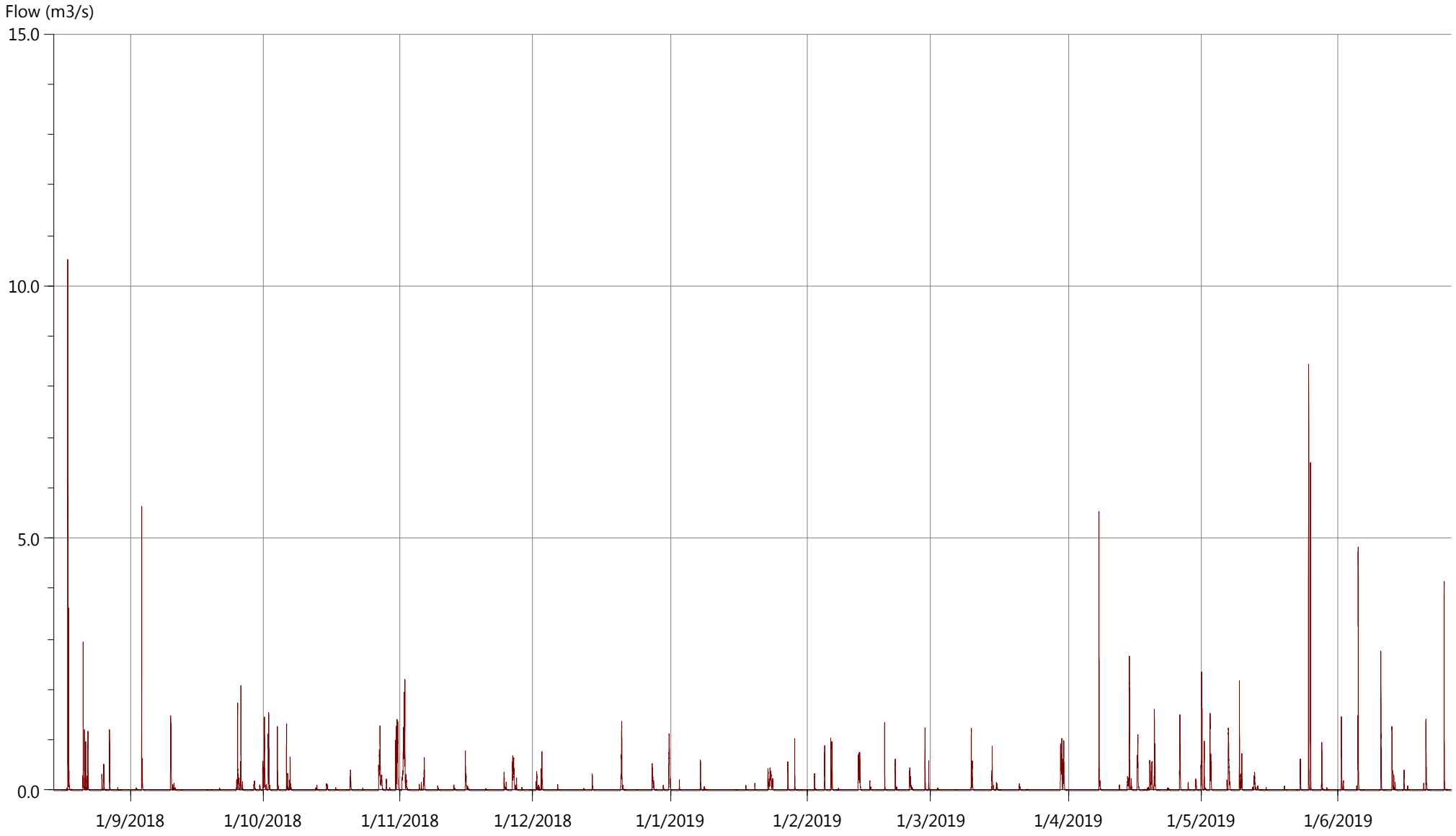
Model Location (Pred.) U/S 11M482.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	-0.000	1.493	132062.017

Sim: >CoB_Model>Run Groups>Mohawk Subwatershed>2018-19 Continuous Run!>Aug 2018 through July 2019 (01/10/2019 3:57:58 PM)

Model Location (Pred.) U/S 11M484.1



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...us Run!>Aug 2018 through July 2019	0.000	10.524	990461.093

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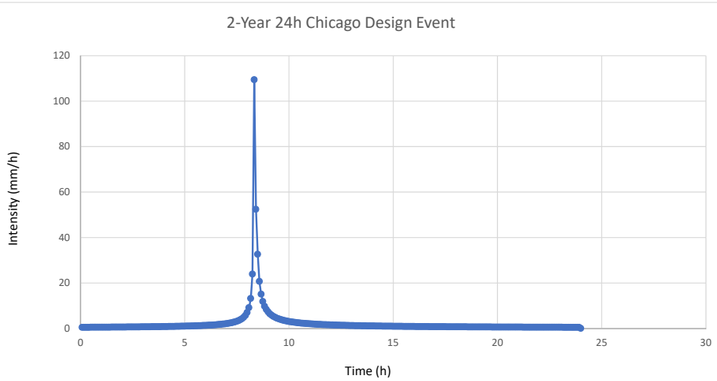
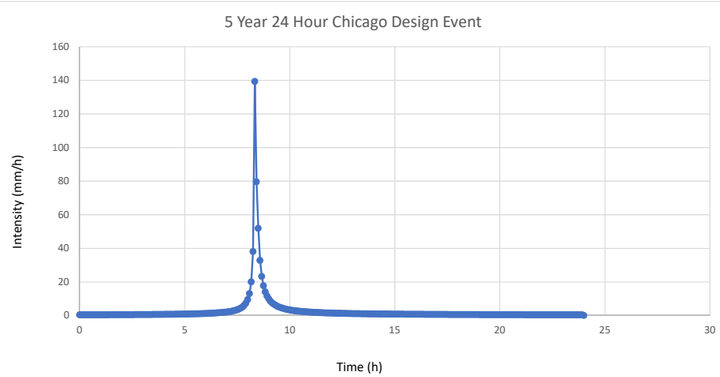
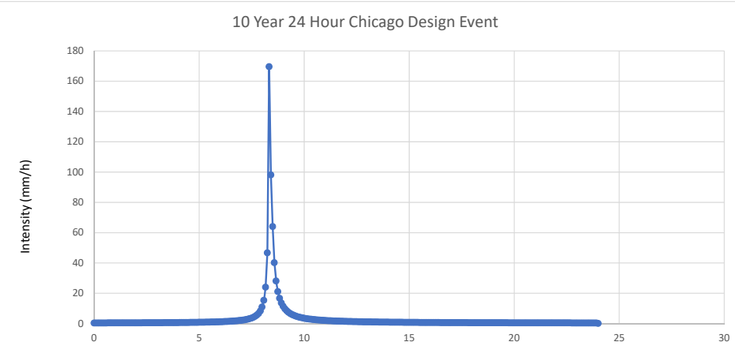
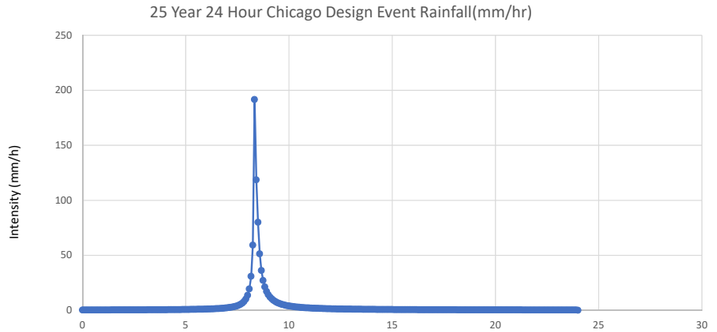
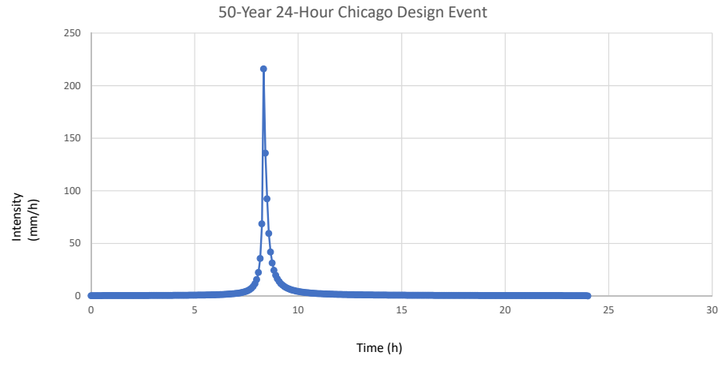
Design Storm Events

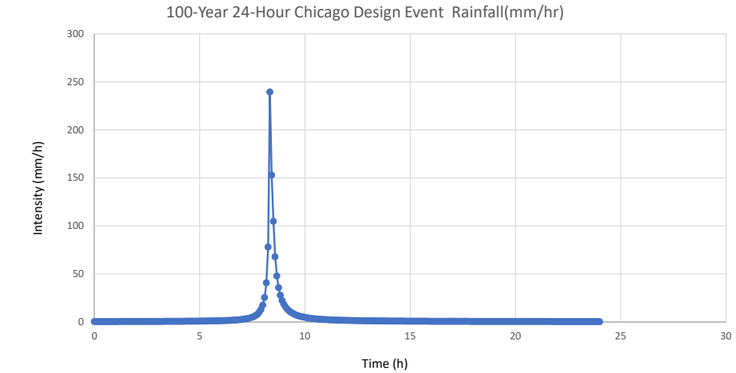


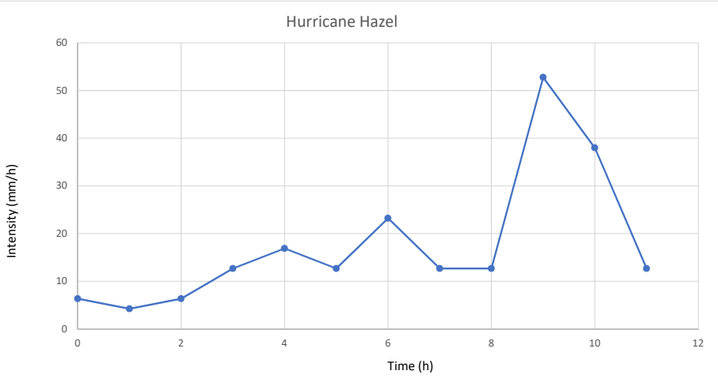












Design Event	ID	Average Depth (m)	Maximum Depth (m)	Maximum HGL (m)	Max.Depth Day-Time (day-time)	Total Inflow Volume (ML)	Flow Frequency (%)	Average Flow (m3/s)	Maximum Flow (m3/s)
2YR	JCT-74	0.283	0.599	192.599	0 - 10:23 hrs	143.607	90.788	2.694	8.041
5YR	JCT-74	0.326	0.737	192.737	0 - 10:10 hrs	180.106	90.666	3.687	12.154
10YR	JCT-74	0.372	0.827	192.827	0 - 10:03 hrs	224.298	91.29	4.592	15.334
25YR	JCT-74	0.447	0.944	192.944	0 - 10:00 hrs	312.952	91.872	6.53	19.975
50YR	JCT-74	0.501	1.052	193.052	0 - 09:57 hrs	383.306	92.207	8.177	24.789
100YR	JCT-74	0.549	1.145	193.145	0 - 09:57 hrs	447.125	92.57	9.651	29.37
HAZEL	JCT-74	0.813	1.409	193.409	0 - 11:15 hrs	1,135.65	98.913	18.505	44.51

10-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.467	193.735	low Link Crov	6.265	0 - 10:03 hrs	0.000	14.875	0.000	215.357	347.848	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	1.520	193.917	low Link Crov	6.083	0 - 10:03 hrs	0.000	14.861	0.000	215.042	256.686	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	1.560	194.356	low Link Crov	6.644	0 - 10:00 hrs	0.011	14.022	0.090	198.883	683.136	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	1.564	194.725	low Link Crov	6.275	0 - 09:59 hrs	0.000	14.034	0.000	197.550	632.091	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	1.838	195.380	low Link Crov	3.825	0 - 09:53 hrs	0.017	15.027	0.129	199.976	2,946.575	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	2.156	197.554	low Link Crov	3.507	0 - 09:26 hrs	0.435	13.922	7.144	198.929	930.270	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	2.039	197.578	low Link Crov	2.422	0 - 09:26 hrs	0.000	10.491	0.000	160.219	1,201.494	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	1.329	197.809	low Link Crov	3.191	0 - 09:25 hrs	0.012	8.079	0.050	104.093	239.183	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	1.659	197.643	low Link Crov	4.357	0 - 09:26 hrs	0.000	7.572	0.000	106.229	461.377	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	1.572	197.671	low Link Crov	3.329	0 - 09:26 hrs	0.055	7.778	0.613	104.795	363.005	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	1.606	198.258	low Link Crov	2.742	0 - 09:15 hrs	0.012	8.110	0.145	102.660	88.669	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	1.533	198.287	low Link Crov	1.793	0 - 09:14 hrs	0.000	8.283	0.000	100.475	350.719	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.279	193.365	low Link Crov	5.248	0 - 10:03 hrs	0.000	15.336	0.000	224.579	280.416	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.286	197.860	low Link Crov	5.039	0 - 09:23 hrs	0.000	8.066	0.000	103.281	64.936	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	1.621	198.254	low Link Crov	3.606	0 - 09:15 hrs	0.000	8.047	0.003	102.571	43.266	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	1.547	194.053	low Link Crov	7.567	0 - 10:02 hrs	0.005	14.855	0.028	214.538	436.483	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	1.546	198.281	low Link Crov	1.780	0 - 09:14 hrs	0.000	7.993	0.000	101.308	75.931	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	0.845	198.285	low Link Crov	2.715	0 - 09:11 hrs	0.010	0.093	0.096	1.234	1.161	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.716	200.356	low Link Crov	2.610	0 - 08:53 hrs	0.045	8.481	1.285	93.910	103.520	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.069	199.800	low Link Crov	3.257	0 - 09:04 hrs	0.000	0.041	0.003	0.757	3.733	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.231	200.126	low Link Crov	2.920	0 - 08:40 hrs	0.000	0.098	0.000	0.835	0.542	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	0.209	200.119	low Link Crov	2.816	0 - 08:42 hrs	0.028	0.054	0.180	0.332	0.188	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	0.220	201.850	low Link Crov	1.785	0 - 08:41 hrs	0.050	0.120	1.063	1.656	0.643	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
24	☐	07M193	1.368	199.758	w Maximum D	1.951	0 - 08:48 hrs	0.000	3.354	0.000	54.290	13.898	1.279	0.243	1.951	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	1.191	198.431	low Link Crov	3.383	0 - 08:53 hrs	0.000	4.518	0.000	32.841	20.146	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.186	199.456	low Link Crov	7.860	0 - 08:42 hrs	0.000	0.317	0.000	1.933	0.638	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	1.812	201.082	w Maximum D	0.771	0 - 08:34 hrs	0.187	0.244	1.506	1.890	1.787	1.159	1.407	0.771	0.000	0.000	0.000	0 - 00:00 hrs
28	☐	JCT-68	0.589	200.251	low Link Crov	2.737	0 - 09:03 hrs	0.000	1.653	0.000	16.391	79.934	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.176	199.526	low Link Crov	2.517	0 - 08:36 hrs	0.023	0.155	0.142	0.943	0.297	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.179	198.999	low Link Crov	1.209	0 - 08:36 hrs	0.046	0.073	0.382	0.570	0.124	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.170	198.636	low Link Crov	3.892	0 - 08:53 hrs	0.001	1.091	0.004	9.584	12.902	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.085	204.435	low Link Crov	1.866	0 - 08:34 hrs	0.000	0.093	0.000	0.517	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	0.588	201.268	low Link Crov	2.738	0 - 09:03 hrs	0.037	0.311	0.221	2.041	1.808	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

25-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.655	193.923	low Link Crov	6.077	0 - 10:00 hrs	0.000	19.320	0.000	299.495	398.347	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	1.719	194.116	low Link Crov	5.884	0 - 09:59 hrs	0.000	19.294	0.000	298.890	295.105	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	1.773	194.569	low Link Crov	6.431	0 - 09:57 hrs	0.014	18.089	0.289	274.256	783.541	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	1.781	194.942	low Link Crov	6.058	0 - 09:56 hrs	0.000	18.070	0.000	270.870	724.739	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	2.057	195.599	low Link Crov	3.606	0 - 09:51 hrs	0.021	19.277	0.423	273.601	3,546.415	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	2.335	197.733	low Link Crov	3.328	0 - 09:22 hrs	0.570	17.897	11.052	270.794	872.302	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	2.221	197.760	low Link Crov	2.240	0 - 09:22 hrs	0.000	13.032	0.000	213.418	1,308.950	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	1.527	198.007	low Link Crov	2.993	0 - 09:23 hrs	0.015	10.224	0.069	138.785	256.367	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	1.851	197.835	low Link Crov	4.165	0 - 09:23 hrs	0.000	9.827	0.000	141.827	551.341	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	1.766	197.865	low Link Crov	3.135	0 - 09:23 hrs	0.072	9.857	0.861	139.899	421.245	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	1.853	198.505	low Link Crov	2.495	0 - 09:15 hrs	0.016	10.298	0.215	136.827	98.025	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	1.777	198.531	low Link Crov	1.549	0 - 09:17 hrs	0.000	10.634	0.000	133.707	396.584	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.427	193.513	low Link Crov	5.100	0 - 10:00 hrs	0.000	19.977	0.000	313.270	316.368	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.483	198.057	low Link Crov	4.842	0 - 09:22 hrs	0.000	10.211	0.000	137.634	70.085	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	1.868	198.501	low Link Crov	3.359	0 - 09:15 hrs	0.000	10.200	0.007	136.741	47.431	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	1.753	194.259	low Link Crov	7.361	0 - 09:59 hrs	0.006	19.264	0.065	297.972	500.471	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	1.791	198.526	low Link Crov	1.535	0 - 09:15 hrs	0.000	10.182	0.000	134.794	83.912	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	1.092	198.532	w Maximum D	2.468	0 - 09:17 hrs	0.013	0.121	0.130	1.521	1.392	0.433	0.042	2.468	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.814	200.454	low Link Crov	2.512	0 - 08:55 hrs	0.061	11.106	1.730	125.721	100.204	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.071	199.802	low Link Crov	3.255	0 - 09:11 hrs	0.000	0.045	0.007	0.941	3.723	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.268	200.163	low Link Crov	2.883	0 - 08:41 hrs	0.000	0.126	0.000	1.151	0.545	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	0.319	200.229	low Link Crov	2.706	0 - 08:48 hrs	0.035	0.078	0.259	0.516	0.192	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	0.993	202.623	w Maximum D	1.012	0 - 08:36 hrs	0.066	0.155	1.410	2.240	0.710	0.414	0.693	1.012	0.000	0.000	0.000	0 - 00:00 hrs
24	☐	07M193	1.487	199.877	w Maximum D	1.833	0 - 08:44 hrs	0.000	3.731	0.000	72.181	16.184	1.894	0.362	1.833	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	1.355	198.595	low Link Crov	3.219	0 - 08:52 hrs	0.000	5.609	0.000	47.877	21.728	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.210	199.480	low Link Crov	7.835	0 - 08:42 hrs	0.000	0.394	0.000	3.141	0.824	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	2.371	201.641	w Maximum D	0.212	0 - 08:34 hrs	0.239	0.311	3.262	3.844	3.893	1.734	1.966	0.212	0.000	0.000	0.000	0 - 00:00 hrs
28	☐	JCT-68	0.676	200.337	low Link Crov	2.650	0 - 09:00 hrs	0.000	2.067	0.000	24.516	92.837	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.202	199.552	low Link Crov	2.491	0 - 08:36 hrs	0.029	0.196	0.221	1.412	0.297	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.207	199.027	low Link Crov	1.181	0 - 08:40 hrs	0.060	0.093	0.598	0.901	0.196	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.191	198.657	low Link Crov	3.871	0 - 08:52 hrs	0.001	1.415	0.011	14.189	15.420	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.095	204.445	low Link Crov	1.856	0 - 08:34 hrs	0.000	0.117	0.000	0.804	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	0.902	201.582	low Link Crov	2.424	0 - 09:08 hrs	0.047	0.395	0.303	2.854	1.437	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

50-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.823	194.091	low Link Crov	5.909	0 - 09:57 hrs	0.000	23.879	0.000	365.927	422.222	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	1.897	194.294	low Link Crov	5.706	0 - 09:57 hrs	0.000	23.837	0.000	365.062	313.003	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	1.962	194.758	low Link Crov	6.242	0 - 09:56 hrs	0.017	22.108	0.466	333.456	832.646	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	1.971	195.132	low Link Crov	5.868	0 - 09:55 hrs	0.000	22.022	0.000	328.068	770.011	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	2.245	195.787	low Link Crov	3.418	0 - 09:51 hrs	0.025	23.340	0.692	330.987	3,960.162	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	2.476	197.874	low Link Crov	3.187	0 - 09:22 hrs	0.703	21.778	14.899	326.801	702.858	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	2.365	197.904	low Link Crov	2.096	0 - 09:22 hrs	0.000	15.619	0.000	251.493	1,355.727	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	1.693	198.173	low Link Crov	2.827	0 - 09:22 hrs	0.018	12.210	0.084	166.496	258.962	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	2.007	197.991	low Link Crov	4.009	0 - 09:22 hrs	0.000	12.134	0.000	170.542	591.318	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	1.925	198.024	low Link Crov	2.976	0 - 09:22 hrs	0.088	12.061	1.065	168.052	451.309	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	2.080	198.732	low Link Crov	2.268	0 - 09:18 hrs	0.019	12.245	0.275	164.207	101.632	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	2.001	198.755	low Link Crov	1.325	0 - 09:18 hrs	0.000	12.508	0.000	160.299	421.588	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.559	193.645	low Link Crov	4.968	0 - 09:57 hrs	0.000	24.791	0.000	383.639	332.410	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.650	198.224	low Link Crov	4.675	0 - 09:22 hrs	0.000	12.164	0.000	165.080	71.856	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	2.095	198.728	low Link Crov	3.132	0 - 09:18 hrs	0.001	12.151	0.010	164.107	48.887	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	1.937	194.443	low Link Crov	7.177	0 - 09:56 hrs	0.007	23.776	0.094	363.814	529.227	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	2.016	198.751	low Link Crov	1.310	0 - 09:17 hrs	0.000	12.130	0.000	161.567	86.832	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	1.325	198.765	w Maximum D	2.235	0 - 09:18 hrs	0.016	0.145	0.157	1.717	1.528	1.149	0.275	2.235	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.883	200.523	low Link Crov	2.443	0 - 09:00 hrs	0.078	13.048	2.126	151.971	87.053	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.073	199.804	low Link Crov	3.253	0 - 09:23 hrs	0.001	0.051	0.010	1.047	3.649	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.301	200.196	low Link Crov	2.850	0 - 08:40 hrs	0.000	0.150	0.000	1.406	0.526	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	0.735	200.645	w Maximum D	2.291	0 - 08:44 hrs	0.042	0.111	0.322	0.736	0.174	0.647	0.360	2.291	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	1.466	203.096	w Maximum D	0.539	0 - 08:30 hrs	0.083	0.187	1.704	2.724	0.714	1.119	1.166	0.539	0.000	0.000	0.000	0 - 00:00 hrs
24	☐	07M193	1.562	199.952	w Maximum D	1.757	0 - 08:41 hrs	0.000	3.975	0.000	81.473	16.515	2.501	0.437	1.757	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	1.448	198.688	low Link Crov	3.125	0 - 08:49 hrs	0.000	6.224	0.000	62.033	22.305	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.229	199.499	low Link Crov	7.817	0 - 08:41 hrs	0.000	0.454	0.000	4.147	1.055	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	2.583	201.853	Surcharged	0.000	0 - 08:33 hrs	0.286	0.373	5.053	5.793	5.471	5.302	2.178	0.000	0.003	0.115	0.013	0 - 08:34 hrs
28	☐	JCT-68	0.743	200.405	low Link Crov	2.583	0 - 09:03 hrs	0.000	2.383	0.000	31.172	98.687	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.226	199.576	low Link Crov	2.468	0 - 08:34 hrs	0.035	0.234	0.285	1.788	0.293	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.233	199.053	low Link Crov	1.155	0 - 08:34 hrs	0.071	0.112	0.779	1.178	0.215	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.209	198.675	low Link Crov	3.853	0 - 08:53 hrs	0.001	1.705	0.017	18.147	16.505	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.104	204.454	low Link Crov	1.847	0 - 08:34 hrs	0.000	0.140	0.000	1.034	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	1.274	201.954	low Link Crov	2.052	0 - 09:22 hrs	0.055	0.470	0.368	3.512	0.788	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	2.322	194.590	low Link Crov	5.410	0 - 11:18 hrs	0.000	40.676	0.000	1,065.879	523.078	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	2.421	194.818	low Link Crov	5.182	0 - 11:18 hrs	0.000	40.434	0.000	1,061.470	398.004	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	2.486	195.282	low Link Crov	5.718	0 - 11:18 hrs	0.177	34.842	2.880	944.824	1,042.092	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	2.484	195.645	low Link Crov	5.355	0 - 11:18 hrs	0.000	34.395	0.000	924.652	920.635	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	2.736	196.278	low Link Crov	2.927	0 - 11:17 hrs	0.257	34.352	4.471	923.965	3,325.232	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	2.700	198.098	low Link Crov	2.963	0 - 11:07 hrs	3.153	33.557	78.568	907.957	2,501.129	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	2.603	198.142	low Link Crov	1.858	0 - 11:06 hrs	0.000	22.832	0.000	641.876	1,561.207	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	2.019	198.499	low Link Crov	2.501	0 - 11:03 hrs	0.023	17.848	0.277	458.297	313.680	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	2.286	198.270	low Link Crov	3.730	0 - 11:04 hrs	0.000	18.442	0.000	471.847	731.542	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	2.216	198.315	low Link Crov	2.685	0 - 11:04 hrs	0.225	18.233	3.738	465.136	501.382	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	2.554	199.206	low Link Crov	1.794	0 - 11:00 hrs	0.062	17.553	1.101	451.057	105.628	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	2.473	199.227	low Link Crov	0.853	0 - 11:02 hrs	0.000	17.030	0.000	437.974	404.519	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.977	194.063	low Link Crov	4.550	0 - 11:15 hrs	0.000	44.511	0.000	1,136.035	418.064	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.981	198.555	low Link Crov	4.344	0 - 11:03 hrs	0.000	17.538	0.000	453.438	77.422	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	2.570	199.203	low Link Crov	2.657	0 - 11:00 hrs	0.005	17.484	0.050	451.237	51.900	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	2.476	194.982	low Link Crov	6.638	0 - 11:18 hrs	0.035	40.070	0.477	1,055.521	677.146	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	2.488	199.223	low Link Crov	0.838	0 - 11:00 hrs	0.000	17.230	0.000	442.109	93.034	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	1.815	199.255	w Maximum D	1.745	0 - 11:00 hrs	0.031	0.310	0.507	4.463	0.380	4.398	0.765	1.745	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	1.032	200.672	low Link Crov	2.294	0 - 10:53 hrs	0.336	18.504	7.862	412.586	64.186	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.082	199.813	low Link Crov	3.244	0 - 10:38 hrs	0.005	0.074	0.054	2.393	2.341	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.652	200.547	w Maximum D	2.499	0 - 10:00 hrs	0.000	0.284	0.000	4.633	0.428	1.325	0.047	2.499	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	2.651	202.561	w Maximum D	0.375	0 - 10:00 hrs	0.081	0.218	1.136	3.430	0.156	3.686	2.276	0.375	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	2.005	203.635	Surcharged	0.000	0 - 09:11 hrs	0.281	0.474	5.664	9.026	0.847	5.476	1.705	0.000	1.820	3.360	0.242	0 - 11:00 hrs
24	☐	07M193	1.710	200.100	w Maximum D	1.609	0 - 10:00 hrs	0.000	4.419	0.000	170.615	19.400	7.511	0.585	1.609	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	1.684	198.924	low Link Crov	2.890	0 - 11:00 hrs	0.000	7.605	0.000	189.005	23.142	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.300	199.570	low Link Crov	7.746	0 - 11:11 hrs	0.000	0.690	0.000	14.060	0.982	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	2.583	201.853	Surcharged	0.000	0 - 08:57 hrs	1.460	1.555	34.899	37.127	11.367	17.690	2.178	0.000	16.480	9.413	1.195	0 - 11:00 hrs
28	☐	JCT-68	2.329	201.991	low Link Crov	0.997	0 - 11:11 hrs	0.000	5.335	0.000	111.373	111.293	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	1.386	200.736	w Maximum D	1.308	0 - 09:45 hrs	0.079	0.491	1.115	6.621	0.179	1.735	1.011	1.308	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	1.057	199.877	w Maximum D	0.331	0 - 10:59 hrs	0.197	0.303	3.170	4.806	0.184	2.538	0.652	0.331	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.315	198.781	low Link Crov	3.747	0 - 11:10 hrs	0.008	3.869	0.088	70.675	20.685	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.155	204.505	low Link Crov	1.796	0 - 10:00 hrs	0.000	0.297	0.000	4.002	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	3.275	203.955	low Link Crov	0.051	0 - 10:36 hrs	0.089	0.764	1.209	11.350	-6.685	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

2-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.083	193.351	low Link Crov	6.649	0 - 10:22 hrs	0.000	7.787	0.000	138.051	269.260	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	1.111	193.508	low Link Crov	6.492	0 - 10:22 hrs	0.000	7.779	0.000	137.904	198.886	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	1.117	193.913	low Link Crov	7.087	0 - 10:21 hrs	0.006	7.318	0.021	128.202	529.157	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	1.112	194.273	low Link Crov	6.727	0 - 10:17 hrs	0.000	7.309	0.000	127.623	486.609	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	1.371	194.913	low Link Crov	4.292	0 - 10:11 hrs	0.009	7.670	0.034	129.093	1,766.556	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	1.709	197.107	low Link Crov	3.954	0 - 09:38 hrs	0.214	7.235	4.522	129.282	1,243.455	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	1.589	197.128	low Link Crov	2.872	0 - 09:40 hrs	0.000	6.126	0.000	109.200	1,010.003	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	0.874	197.354	low Link Crov	3.646	0 - 09:36 hrs	0.006	4.137	0.031	68.575	210.844	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	1.193	197.177	low Link Crov	4.823	0 - 09:40 hrs	0.000	3.841	0.000	69.704	310.923	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	1.104	197.203	low Link Crov	3.797	0 - 09:41 hrs	0.027	4.065	0.399	68.937	276.017	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	1.082	197.734	low Link Crov	3.266	0 - 09:17 hrs	0.006	4.096	0.093	67.581	71.246	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	1.016	197.770	low Link Crov	2.310	0 - 09:15 hrs	0.000	4.116	0.000	66.294	264.973	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	0.976	193.062	low Link Crov	5.551	0 - 10:23 hrs	0.000	8.041	0.000	143.830	225.755	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	0.846	197.420	low Link Crov	5.479	0 - 09:32 hrs	0.000	4.113	0.000	68.056	54.935	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	1.095	197.728	low Link Crov	4.132	0 - 09:17 hrs	0.000	4.083	0.000	67.511	35.788	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	1.125	193.631	low Link Crov	7.989	0 - 10:22 hrs	0.003	7.773	0.010	137.672	337.994	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	1.028	197.763	low Link Crov	2.298	0 - 09:15 hrs	0.000	4.026	0.000	66.837	61.441	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	0.325	197.765	low Link Crov	3.235	0 - 09:15 hrs	0.005	0.038	0.063	0.824	0.952	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.492	200.132	low Link Crov	2.834	0 - 09:00 hrs	0.023	4.053	0.826	61.952	108.199	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.067	199.798	low Link Crov	3.259	0 - 08:55 hrs	0.000	0.037	0.000	0.583	2.505	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.162	200.057	low Link Crov	2.989	0 - 08:41 hrs	0.000	0.048	0.000	0.542	0.418	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	0.118	200.028	low Link Crov	2.907	0 - 08:44 hrs	0.014	0.021	0.113	0.172	0.117	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	0.139	201.769	low Link Crov	1.866	0 - 08:45 hrs	0.025	0.059	0.694	1.075	0.511	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
24	☐	07M193	1.107	199.497	low Link Crov	2.212	0 - 09:14 hrs	0.000	2.507	0.000	39.688	9.784	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	0.654	197.894	low Link Crov	3.919	0 - 09:03 hrs	0.000	1.456	0.000	16.460	16.483	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.128	199.398	low Link Crov	7.918	0 - 08:44 hrs	0.000	0.156	0.000	1.068	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	0.548	199.818	w Maximum D	2.036	0 - 08:37 hrs	0.092	0.120	0.823	1.045	0.216	0.495	0.143	2.036	0.000	0.000	0.000	0 - 00:00 hrs
28	☐	JCT-68	0.402	200.063	low Link Crov	2.924	0 - 09:12 hrs	0.000	0.828	0.000	10.044	51.446	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.121	199.471	low Link Crov	2.573	0 - 08:36 hrs	0.012	0.078	0.084	0.569	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.122	198.942	low Link Crov	1.266	0 - 08:40 hrs	0.023	0.036	0.235	0.346	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.125	198.591	low Link Crov	3.937	0 - 09:00 hrs	0.000	0.533	0.001	6.058	9.044	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.060	204.410	low Link Crov	1.891	0 - 08:36 hrs	0.000	0.046	0.000	0.303	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	0.191	200.871	low Link Crov	3.135	0 - 08:47 hrs	0.018	0.155	0.142	1.300	1.327	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

5-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.317	193.585	low Link Crov	6.415	0 - 10:10 hrs	0.000	11.785	0.000	173.151	258.575	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	1.360	193.757	low Link Crov	6.243	0 - 10:10 hrs	0.000	11.773	0.000	172.920	189.143	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	1.386	194.182	low Link Crov	6.818	0 - 10:07 hrs	0.009	11.096	0.026	160.609	512.128	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	1.385	194.546	low Link Crov	6.454	0 - 10:04 hrs	0.000	11.098	0.000	159.789	471.912	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	1.655	195.197	low Link Crov	4.008	0 - 10:00 hrs	0.014	11.809	0.041	161.583	2,161.572	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	1.986	197.384	low Link Crov	3.677	0 - 09:30 hrs	0.336	10.938	5.669	160.725	683.335	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	1.868	197.407	low Link Crov	2.593	0 - 09:30 hrs	0.000	8.603	0.000	131.391	969.882	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	1.151	197.631	low Link Crov	3.369	0 - 09:29 hrs	0.010	6.364	0.038	85.149	185.356	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	1.481	197.465	low Link Crov	4.535	0 - 09:30 hrs	0.000	5.926	0.000	86.781	297.372	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	1.393	197.492	low Link Crov	3.508	0 - 09:30 hrs	0.043	6.163	0.490	85.700	274.922	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	1.396	198.048	low Link Crov	2.952	0 - 09:17 hrs	0.009	6.362	0.115	84.023	66.784	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	1.324	198.078	low Link Crov	2.002	0 - 09:15 hrs	0.000	6.473	0.000	82.251	263.723	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.160	193.246	low Link Crov	5.367	0 - 10:10 hrs	0.000	12.155	0.000	180.322	215.036	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.112	197.686	low Link Crov	5.213	0 - 09:27 hrs	0.000	6.346	0.000	84.501	51.263	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	1.410	198.043	low Link Crov	3.817	0 - 09:17 hrs	0.000	6.322	0.000	83.953	33.469	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	1.382	193.888	low Link Crov	7.732	0 - 10:08 hrs	0.004	11.767	0.012	172.551	323.210	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	1.337	198.072	low Link Crov	1.989	0 - 09:17 hrs	0.000	6.235	0.000	82.979	57.171	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	0.636	198.076	low Link Crov	2.924	0 - 09:17 hrs	0.008	0.065	0.078	1.045	1.051	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.628	200.268	low Link Crov	2.698	0 - 08:56 hrs	0.035	6.463	1.061	76.717	84.224	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.067	199.798	low Link Crov	3.259	0 - 08:57 hrs	0.000	0.037	0.000	0.586	2.276	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.202	200.097	low Link Crov	2.949	0 - 08:41 hrs	0.000	0.076	0.000	0.662	0.384	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	0.167	200.077	low Link Crov	2.859	0 - 08:44 hrs	0.021	0.039	0.138	0.244	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	0.182	201.812	low Link Crov	1.823	0 - 08:45 hrs	0.039	0.092	0.877	1.342	0.503	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
24	☐	07M193	1.256	199.646	w Maximum D	2.064	0 - 08:59 hrs	0.000	2.978	0.000	44.940	9.125	0.930	0.131	2.064	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	0.979	198.219	low Link Crov	3.594	0 - 08:55 hrs	0.000	3.175	0.000	24.719	15.918	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.165	199.435	low Link Crov	7.881	0 - 08:44 hrs	0.000	0.254	0.000	1.418	0.123	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	1.244	200.514	w Maximum D	1.340	0 - 08:37 hrs	0.144	0.191	1.000	1.275	0.358	0.974	0.839	1.340	0.000	0.000	0.000	0 - 00:00 hrs
28	☐	JCT-68	0.513	200.174	low Link Crov	2.813	0 - 09:07 hrs	0.000	1.297	0.000	12.498	49.835	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.153	199.503	low Link Crov	2.541	0 - 08:36 hrs	0.018	0.121	0.101	0.690	0.129	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.155	198.975	low Link Crov	1.233	0 - 08:40 hrs	0.036	0.056	0.286	0.421	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.151	198.617	low Link Crov	3.911	0 - 08:56 hrs	0.000	0.840	0.001	7.437	8.165	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.075	204.425	low Link Crov	1.876	0 - 08:34 hrs	0.000	0.072	0.000	0.366	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	0.348	201.028	low Link Crov	2.978	0 - 08:56 hrs	0.028	0.241	0.173	1.581	1.245	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

100-Year

		ID	Maximum Depth (m)	Maximum HGL (m)	Maximum HGL Head Class	Freeboard (m)	Max.Depth Day-Time (day-time)	Maximum Lateral Inflow (m3/s)	Maximum Total Inflow (m3/s)	Lateral Inflow Volume (ML)	Total Inflow Volume (ML)	Flow Volume Difference (m3)	Total Surcharge Time (hrs)	Max.Surcharge Height Above Crown	Min.Surcharge Depth Below Rim (m)	Total Flood Volume (ML)	Total Flood Time (hrs)	Maximum Flood Rate (m3/s)	Max.Flood Day-Time (day-time)
1	☐	01M014OF	1.965	194.233	low Link Crov	5.767	0 - 09:59 hrs	0.000	28.196	0.000	425.751	437.435	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
2	☐	01M015OF	2.048	194.445	low Link Crov	5.555	0 - 09:57 hrs	0.000	28.135	0.000	424.624	324.098	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
3	☐	03M006OF	2.120	194.916	low Link Crov	6.084	0 - 09:56 hrs	0.023	25.854	0.646	386.359	864.336	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
4	☐	04M014OF	2.131	195.292	low Link Crov	5.708	0 - 09:56 hrs	0.000	25.674	0.000	378.895	799.333	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
5	☐	05M038OF	2.403	195.945	low Link Crov	3.260	0 - 09:52 hrs	0.031	26.953	0.969	381.910	4,278.860	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
6	☐	06M222OF	2.582	197.980	low Link Crov	3.081	0 - 09:22 hrs	0.880	25.378	19.064	376.794	528.122	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
7	☐	07M194OF	2.476	198.015	low Link Crov	1.985	0 - 09:22 hrs	0.000	18.321	0.000	285.029	1,380.033	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
8	☐	07M207OF	1.835	198.315	low Link Crov	2.685	0 - 09:25 hrs	0.022	14.188	0.099	192.446	257.420	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
9	☐	08M004OF	2.131	198.115	low Link Crov	3.885	0 - 09:23 hrs	0.000	14.579	0.000	197.519	614.937	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
10	☐	09M006OF	2.054	198.153	low Link Crov	2.847	0 - 09:23 hrs	0.109	14.338	1.268	194.445	468.894	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
11	☐	10M079OF	2.278	198.930	low Link Crov	2.070	0 - 09:22 hrs	0.024	14.062	0.337	189.757	103.090	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
12	☐	10M093OF	2.199	198.953	low Link Crov	1.127	0 - 09:22 hrs	0.000	14.235	0.000	185.035	437.008	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
13	☐	JCT-194	1.671	193.757	low Link Crov	4.856	0 - 09:57 hrs	0.000	29.371	0.000	447.461	342.275	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
14	☐	JCT-200	1.793	198.367	low Link Crov	4.532	0 - 09:23 hrs	0.000	14.067	0.000	190.753	72.065	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
15	☐	JCT-58	2.293	198.926	low Link Crov	2.934	0 - 09:22 hrs	0.001	14.038	0.013	189.674	49.704	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
16	☐	JCT-62	2.093	194.599	low Link Crov	7.021	0 - 09:57 hrs	0.009	28.044	0.123	422.993	546.156	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
17	☐	10M044OF	2.213	198.948	low Link Crov	1.113	0 - 09:22 hrs	0.000	13.879	0.000	186.477	87.856	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
18	☐	10M043	1.525	198.965	w Maximum D	2.035	0 - 09:21 hrs	0.019	0.166	0.183	1.942	1.209	1.624	0.475	2.035	0.000	0.000	0.000	0 - 00:00 hrs
19	☐	11M001OF	0.945	200.585	low Link Crov	2.381	0 - 09:04 hrs	0.098	15.197	2.536	175.386	54.562	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
20	☐	JCT-64	0.076	199.807	low Link Crov	3.250	0 - 09:32 hrs	0.001	0.057	0.014	1.143	3.516	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
21	☐	07M206	0.346	200.241	low Link Crov	2.805	0 - 08:45 hrs	0.000	0.182	0.000	1.658	0.506	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
22	☐	09M007	1.464	201.374	w Maximum D	1.561	0 - 08:34 hrs	0.051	0.152	0.384	1.001	0.218	1.157	1.089	1.561	0.000	0.000	0.000	0 - 00:00 hrs
23	☐	08M003	2.005	203.635	Surcharged	0.000	0 - 08:45 hrs	0.104	0.231	1.999	3.206	0.754	1.722	1.705	0.000	0.000	0.020	0.000	0 - 08:49 hrs
24	☐	07M193	1.676	200.066	w Maximum D	1.643	0 - 08:45 hrs	0.000	4.319	0.000	88.277	17.020	2.925	0.551	1.643	0.000	0.000	0.000	0 - 00:00 hrs
25	☐	06M221	1.530	198.770	low Link Crov	3.043	0 - 08:47 hrs	0.000	6.741	0.000	74.107	22.494	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
26	☐	05M037	0.249	199.519	low Link Crov	7.797	0 - 08:41 hrs	0.000	0.522	0.000	5.053	1.331	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
27	☐	03M005	2.583	201.853	Surcharged	0.000	0 - 08:27 hrs	0.346	0.441	7.007	7.924	6.525	9.955	2.178	0.000	0.101	0.573	0.081	0 - 08:34 hrs
28	☐	JCT-68	0.830	200.491	low Link Crov	2.496	0 - 09:03 hrs	0.000	2.784	0.000	37.528	102.910	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
29	☐	01M011	0.258	199.608	low Link Crov	2.435	0 - 08:34 hrs	0.042	0.283	0.349	2.158	0.282	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
30	☐	01M013	0.267	199.087	low Link Crov	1.121	0 - 08:34 hrs	0.086	0.136	0.960	1.453	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
31	☐	JCT-192	0.230	198.696	low Link Crov	3.832	0 - 08:57 hrs	0.002	2.069	0.022	22.164	17.055	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
32	☐	04M013	0.115	204.465	low Link Crov	1.836	0 - 08:34 hrs	0.000	0.169	0.000	1.261	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs
33	☐	10M075	1.761	202.441	low Link Crov	1.565	0 - 09:33 hrs	0.067	0.573	0.432	4.188	-1.224	0.000	0.000	0.000	0.000	0.000	0.000	0 - 00:00 hrs

Appendix C – Hydraulic Model Results

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	4599	2 year	4.96	196.33	198.84		198.85	0.000024	0.20	24.98	15.87	0.05
MohawkE-DS-0-0	4599	5 year	6.27	196.33	199.02		199.03	0.000027	0.23	28.13	19.03	0.05
MohawkE-DS-0-0	4599	10 year	8.03	196.33	199.24		199.25	0.000031	0.26	32.49	20.61	0.06
MohawkE-DS-0-0	4599	25 year	10.27	196.33	199.54		199.54	0.000032	0.29	38.90	22.72	0.06
MohawkE-DS-0-0	4599	50 year	12.27	196.33	199.79		199.79	0.000032	0.31	44.76	24.49	0.06
MohawkE-DS-0-0	4599	100 year	13.99	196.33	200.00		200.01	0.000032	0.32	50.34	49.61	0.06
MohawkE-DS-0-0	4599	Hazel	17.43	196.33	200.50		200.50	0.000024	0.31	75.67	53.62	0.05
MohawkE-DS-0-0	4567	2 year	4.96	196.95	198.83	197.71	198.84	0.000280	0.54	9.26	7.55	0.15
MohawkE-DS-0-0	4567	5 year	6.27	196.95	199.01	197.79	199.02	0.000307	0.59	10.63	7.99	0.16
MohawkE-DS-0-0	4567	10 year	8.03	196.95	199.22	197.89	199.24	0.000323	0.65	12.43	8.63	0.17
MohawkE-DS-0-0	4567	25 year	10.27	196.95	199.52	198.01	199.54	0.000305	0.69	15.10	9.60	0.17
MohawkE-DS-0-0	4567	50 year	12.27	196.95	199.76	198.11	199.79	0.000288	0.71	17.58	10.51	0.17
MohawkE-DS-0-0	4567	100 year	13.99	196.95	199.98	198.19	200.01	0.000268	0.72	19.96	11.46	0.16
MohawkE-DS-0-0	4567	Hazel	17.43	196.95	200.47	198.33	200.50	0.000193	0.70	27.46	20.05	0.14
MohawkE-DS-0-0	4547	2 year	4.96	196.56	198.84	197.17	198.84	0.000039	0.23	21.48	15.40	0.06
MohawkE-DS-0-0	4547	5 year	6.27	196.56	199.01	197.23	199.02	0.000045	0.26	24.31	16.40	0.07
MohawkE-DS-0-0	4547	10 year	8.03	196.56	199.23	197.32	199.24	0.000047	0.29	28.02	17.65	0.07
MohawkE-DS-0-0	4547	25 year	10.27	196.56	199.53	197.41	199.53	0.000045	0.31	33.48	19.33	0.07
MohawkE-DS-0-0	4547	50 year	12.27	196.56	199.77	197.49	199.78	0.000043	0.33	38.44	20.74	0.07
MohawkE-DS-0-0	4547	100 year	13.99	196.56	199.99	197.54	200.00	0.000040	0.34	43.07	21.98	0.07
MohawkE-DS-0-0	4547	Hazel	17.43	196.56	200.48	197.65	200.49	0.000033	0.35	54.53	24.63	0.06
MohawkE-DS-0-0	4532	2 year	4.96	196.58	198.83		198.84	0.000048	0.27	19.04	15.30	0.07
MohawkE-DS-0-0	4532	5 year	6.27	196.58	199.01		199.02	0.000052	0.30	21.85	16.26	0.07
MohawkE-DS-0-0	4532	10 year	8.03	196.58	199.23		199.24	0.000055	0.34	25.52	17.39	0.08
MohawkE-DS-0-0	4532	25 year	10.27	196.58	199.52		199.53	0.000054	0.37	30.97	19.82	0.08
MohawkE-DS-0-0	4532	50 year	12.27	196.58	199.77		199.78	0.000052	0.39	36.17	22.26	0.08
MohawkE-DS-0-0	4532	100 year	13.99	196.58	199.99		200.00	0.000049	0.40	41.27	24.78	0.08
MohawkE-DS-0-0	4532	Hazel	17.43	196.58	200.48		200.49	0.000039	0.40	54.51	28.66	0.07
MohawkE-DS-0-0	4500	2 year	4.96	196.60	198.83	197.34	198.84	0.000072	0.30	16.71	13.28	0.08
MohawkE-DS-0-0	4500	5 year	6.27	196.60	199.01	197.44	199.02	0.000079	0.33	19.16	16.09	0.09
MohawkE-DS-0-0	4500	10 year	8.03	196.60	199.23	197.54	199.23	0.000082	0.36	22.82	17.47	0.09
MohawkE-DS-0-0	4500	25 year	10.27	196.60	199.52	197.65	199.53	0.000076	0.38	28.25	19.33	0.09
MohawkE-DS-0-0	4500	50 year	12.27	196.60	199.77	197.73	199.78	0.000071	0.39	33.24	20.89	0.09
MohawkE-DS-0-0	4500	100 year	13.99	196.60	199.99	197.79	200.00	0.000066	0.40	37.92	22.25	0.09
MohawkE-DS-0-0	4500	Hazel	17.43	196.60	200.48	197.91	200.49	0.000048	0.39	49.92	26.49	0.08
MohawkE-DS-0-0	4491		Culvert									
MohawkE-DS-0-0	4481	2 year	4.96	197.11	198.79	197.75	198.80	0.000209	0.45	10.93	9.89	0.14
MohawkE-DS-0-0	4481	5 year	6.27	197.11	198.96	197.82	198.97	0.000227	0.50	12.56	10.45	0.15
MohawkE-DS-0-0	4481	10 year	8.03	197.11	199.14	197.91	199.15	0.000234	0.55	15.13	15.81	0.15
MohawkE-DS-0-0	4481	25 year	10.27	197.11	199.37	198.01	199.39	0.000217	0.59	18.98	17.27	0.15
MohawkE-DS-0-0	4481	50 year	12.27	197.11	199.55	198.09	199.57	0.000208	0.62	22.19	18.40	0.15
MohawkE-DS-0-0	4481	100 year	13.99	197.11	199.70	198.16	199.72	0.000200	0.64	24.99	19.34	0.15
MohawkE-DS-0-0	4481	Hazel	17.43	197.11	200.02	198.27	200.04	0.000170	0.66	31.65	21.43	0.14
MohawkE-DS-0-0	4450	2 year	4.96	195.93	198.79		198.80	0.000053	0.26	19.23	14.62	0.07
MohawkE-DS-0-0	4450	5 year	6.27	195.93	198.96		198.96	0.000060	0.29	21.64	15.39	0.08
MohawkE-DS-0-0	4450	10 year	8.03	195.93	199.14		199.14	0.000068	0.33	24.72	17.81	0.08
MohawkE-DS-0-0	4450	25 year	10.27	195.93	199.37		199.38	0.000070	0.37	28.99	18.77	0.09
MohawkE-DS-0-0	4450	50 year	12.27	195.93	199.55		199.56	0.000073	0.40	32.43	19.52	0.09
MohawkE-DS-0-0	4450	100 year	13.99	195.93	199.70		199.71	0.000074	0.42	35.37	20.13	0.09
MohawkE-DS-0-0	4450	Hazel	17.43	195.93	200.02		200.03	0.000071	0.45	42.18	21.50	0.09
MohawkE-DS-0-0	4389	2 year	4.96	196.86	198.79	197.36	198.79	0.000044	0.25	20.37	15.43	0.07
MohawkE-DS-0-0	4389	5 year	6.27	196.86	198.95	197.42	198.96	0.000050	0.28	22.90	16.17	0.07
MohawkE-DS-0-0	4389	10 year	8.03	196.86	199.13	197.48	199.14	0.000056	0.31	25.92	17.21	0.08
MohawkE-DS-0-0	4389	25 year	10.27	196.86	199.37	197.56	199.37	0.000059	0.35	30.08	18.45	0.08
MohawkE-DS-0-0	4389	50 year	12.27	196.86	199.54	197.62	199.55	0.000061	0.38	33.47	19.40	0.08
MohawkE-DS-0-0	4389	100 year	13.99	196.86	199.69	197.67	199.70	0.000062	0.40	36.41	20.19	0.09
MohawkE-DS-0-0	4389	Hazel	17.43	196.86	200.02	197.76	200.03	0.000060	0.43	43.30	21.92	0.09
MohawkE-DS-0-0	4341	2 year	4.96	196.50	198.79		198.79	0.000038	0.23	21.60	15.22	0.06
MohawkE-DS-0-0	4341	5 year	6.27	196.50	198.95		198.95	0.000045	0.26	24.10	15.96	0.07
MohawkE-DS-0-0	4341	10 year	8.03	196.50	199.13		199.13	0.000053	0.30	27.05	16.78	0.07
MohawkE-DS-0-0	4341	25 year	10.27	196.50	199.36		199.37	0.000059	0.33	31.08	17.85	0.08
MohawkE-DS-0-0	4341	50 year	12.27	196.50	199.54		199.55	0.000065	0.36	34.36	18.68	0.08
MohawkE-DS-0-0	4341	100 year	13.99	196.50	199.69		199.70	0.000068	0.38	37.18	19.36	0.09
MohawkE-DS-0-0	4341	Hazel	17.43	196.50	200.02		200.03	0.000067	0.40	43.77	20.88	0.09
MohawkE-DS-0-0	4300	2 year	4.96	197.77	198.78	198.10	198.79	0.000231	0.41	12.13	14.58	0.14
MohawkE-DS-0-0	4300	5 year	6.27	197.77	198.94	198.14	198.95	0.000216	0.43	14.50	15.13	0.14
MohawkE-DS-0-0	4300	10 year	8.03	197.77	199.12	198.20	199.13	0.000208	0.46	17.29	16.10	0.14
MohawkE-DS-0-0	4300	25 year	10.27	197.77	199.35	198.27	199.36	0.000187	0.49	21.21	17.58	0.14
MohawkE-DS-0-0	4300	50 year	12.27	197.77	199.53	198.33	199.54	0.000178	0.51	24.46	18.72	0.14
MohawkE-DS-0-0	4300	100 year	13.99	197.77	199.68	198.37	199.69	0.000166	0.52	27.31	19.57	0.13
MohawkE-DS-0-0	4300	Hazel	17.43	197.77	200.01	198.45	200.02	0.000133	0.53	34.03	21.38	0.12

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	4232	2 year	4.96	197.70	198.77		198.78	0.000238	0.43	11.54	13.27	0.15
MohawkE-DS-0-0	4232	5 year	6.27	197.70	198.93		198.94	0.000229	0.46	13.72	13.93	0.15
MohawkE-DS-0-0	4232	10 year	8.03	197.70	199.11		199.12	0.000224	0.49	16.32	15.07	0.15
MohawkE-DS-0-0	4232	25 year	10.27	197.70	199.34		199.36	0.000201	0.52	19.99	16.38	0.14
MohawkE-DS-0-0	4232	50 year	12.27	197.70	199.52		199.54	0.000191	0.54	23.02	17.42	0.14
MohawkE-DS-0-0	4232	100 year	13.99	197.70	199.67		199.69	0.000179	0.56	25.68	18.40	0.14
MohawkE-DS-0-0	4232	Hazel	17.43	197.70	200.00		200.02	0.000147	0.58	32.10	20.58	0.13
MohawkE-DS-0-0	4192	2 year	4.96	197.70	198.77	198.00	198.77	0.000125	0.33	15.21	15.94	0.11
MohawkE-DS-0-0	4192	5 year	6.27	197.70	198.93	198.04	198.93	0.000122	0.35	17.78	16.12	0.11
MohawkE-DS-0-0	4192	10 year	8.03	197.70	199.11	198.08	199.11	0.000122	0.39	20.71	16.64	0.11
MohawkE-DS-0-0	4192	25 year	10.27	197.70	199.34	198.14	199.35	0.000114	0.42	24.72	17.63	0.11
MohawkE-DS-0-0	4192	50 year	12.27	197.70	199.52	198.19	199.53	0.000111	0.45	27.95	18.38	0.11
MohawkE-DS-0-0	4192	100 year	13.99	197.70	199.67	198.23	199.68	0.000109	0.47	30.74	19.01	0.11
MohawkE-DS-0-0	4192	Hazel	17.43	197.70	200.00	198.30	200.01	0.000096	0.49	37.24	20.39	0.11
MohawkE-DS-0-0	4150	2 year	4.96	197.78	198.75	198.20	198.76	0.000394	0.50	9.96	13.23	0.18
MohawkE-DS-0-0	4150	5 year	6.27	197.78	198.91	198.25	198.92	0.000358	0.52	12.17	14.67	0.18
MohawkE-DS-0-0	4150	10 year	8.03	197.78	199.09	198.30	199.10	0.000319	0.54	15.09	17.49	0.17
MohawkE-DS-0-0	4150	25 year	10.27	197.78	199.33	198.37	199.34	0.000263	0.55	19.37	18.77	0.16
MohawkE-DS-0-0	4150	50 year	12.27	197.78	199.51	198.42	199.52	0.000231	0.57	22.85	19.75	0.15
MohawkE-DS-0-0	4150	100 year	13.99	197.78	199.66	198.46	199.67	0.000209	0.58	25.86	20.57	0.15
MohawkE-DS-0-0	4150	Hazel	17.43	197.78	199.99	198.54	200.00	0.000160	0.58	33.00	22.38	0.14
MohawkE-DS-0-0	4118	2 year	4.96	197.83	198.74	198.10	198.75	0.000106	0.27	18.54	23.75	0.10
MohawkE-DS-0-0	4118	5 year	6.27	197.83	198.91	198.12	198.91	0.000092	0.28	22.44	24.19	0.09
MohawkE-DS-0-0	4118	10 year	8.03	197.83	199.09	198.16	199.09	0.000085	0.30	26.88	24.99	0.09
MohawkE-DS-0-0	4118	25 year	10.27	197.83	199.32	198.21	199.33	0.000072	0.31	32.99	26.46	0.09
MohawkE-DS-0-0	4118	50 year	12.27	197.83	199.51	198.24	199.51	0.000067	0.33	37.90	27.59	0.09
MohawkE-DS-0-0	4118	100 year	13.99	197.83	199.66	198.28	199.66	0.000063	0.34	42.11	28.52	0.08
MohawkE-DS-0-0	4118	Hazel	17.43	197.83	199.99	198.32	200.00	0.000052	0.35	51.97	30.59	0.08
MohawkE-DS-0-0	4084	2 year	4.96	195.98	198.74	196.61	198.74	0.000035	0.21	23.79	17.60	0.06
MohawkE-DS-0-0	4084	5 year	6.27	195.98	198.90	196.69	198.91	0.000043	0.23	26.78	19.26	0.06
MohawkE-DS-0-0	4084	10 year	8.03	195.98	199.09	196.78	199.09	0.000051	0.26	30.44	21.11	0.07
MohawkE-DS-0-0	4084	25 year	10.27	195.98	199.32	196.88	199.33	0.000056	0.29	35.74	23.54	0.07
MohawkE-DS-0-0	4084	50 year	12.27	195.98	199.50	196.98	199.51	0.000059	0.31	40.18	25.40	0.08
MohawkE-DS-0-0	4084	100 year	13.99	195.98	199.65	197.04	199.66	0.000060	0.32	44.10	26.94	0.08
MohawkE-DS-0-0	4084	Hazel	17.43	195.98	199.99	197.17	199.99	0.000050	0.33	53.02	30.35	0.07
MohawkE-DS-0-0	4059	2 year	4.96	197.58	198.74	197.88	198.74	0.000089	0.29	17.09	17.33	0.09
MohawkE-DS-0-0	4059	5 year	6.27	197.58	198.90	197.92	198.91	0.000087	0.32	19.91	17.49	0.09
MohawkE-DS-0-0	4059	10 year	8.03	197.58	199.08	197.97	199.09	0.000088	0.35	23.09	17.66	0.10
MohawkE-DS-0-0	4059	25 year	10.27	197.58	199.32	198.03	199.33	0.000083	0.38	27.30	17.89	0.10
MohawkE-DS-0-0	4059	50 year	12.27	197.58	199.50	198.07	199.51	0.000083	0.41	30.54	18.06	0.10
MohawkE-DS-0-0	4059	100 year	13.99	197.58	199.65	198.11	199.66	0.000082	0.43	33.24	18.21	0.10
MohawkE-DS-0-0	4059	Hazel	17.43	197.58	199.98	198.18	199.99	0.000074	0.45	39.23	18.53	0.10
MohawkE-DS-0-0	4051		Bridge									
MohawkE-DS-0-0	4043	2 year	4.96	197.78	198.73	198.09	198.74	0.000227	0.40	12.45	14.42	0.14
MohawkE-DS-0-0	4043	5 year	6.27	197.78	198.89	198.14	198.90	0.000210	0.42	14.78	14.44	0.13
MohawkE-DS-0-0	4043	10 year	8.03	197.78	199.07	198.18	199.08	0.000206	0.46	17.38	14.46	0.13
MohawkE-DS-0-0	4043	25 year	10.27	197.78	199.31	198.24	199.32	0.000193	0.49	20.81	14.48	0.13
MohawkE-DS-0-0	4043	50 year	12.27	197.78	199.49	198.29	199.50	0.000191	0.52	23.42	14.50	0.13
MohawkE-DS-0-0	4043	100 year	13.99	197.78	199.64	198.32	199.65	0.000189	0.55	25.58	14.52	0.13
MohawkE-DS-0-0	4043	Hazel	17.43	197.78	199.97	198.39	199.99	0.000173	0.57	30.42	14.55	0.13
MohawkE-DS-0-0	4026	2 year	4.96	196.53	198.73		198.73	0.000063	0.25	20.06	17.71	0.07
MohawkE-DS-0-0	4026	5 year	6.27	196.53	198.89		198.90	0.000068	0.27	23.00	18.52	0.08
MohawkE-DS-0-0	4026	10 year	8.03	196.53	199.07		199.08	0.000075	0.30	26.41	19.41	0.08
MohawkE-DS-0-0	4026	25 year	10.27	196.53	199.31		199.32	0.000076	0.33	31.15	20.59	0.09
MohawkE-DS-0-0	4026	50 year	12.27	196.53	199.49		199.50	0.000078	0.35	34.95	21.48	0.09
MohawkE-DS-0-0	4026	100 year	13.99	196.53	199.64		199.65	0.000079	0.37	38.22	22.23	0.09
MohawkE-DS-0-0	4026	Hazel	17.43	196.53	199.97		199.98	0.000073	0.38	45.91	23.88	0.09
MohawkE-DS-0-0	4000	2 year	4.96	196.45	198.73		198.73	0.000019	0.18	27.84	17.35	0.04
MohawkE-DS-0-0	4000	5 year	6.27	196.45	198.89		198.90	0.000023	0.20	30.70	17.98	0.05
MohawkE-DS-0-0	4000	10 year	8.03	196.45	199.07		199.08	0.000028	0.24	34.01	18.69	0.06
MohawkE-DS-0-0	4000	25 year	10.27	196.45	199.31		199.31	0.000032	0.27	38.57	20.60	0.06
MohawkE-DS-0-0	4000	50 year	12.27	196.45	199.49		199.49	0.000034	0.29	42.41	21.72	0.06
MohawkE-DS-0-0	4000	100 year	13.99	196.45	199.64		199.64	0.000035	0.31	45.71	22.39	0.06
MohawkE-DS-0-0	4000	Hazel	17.43	196.45	199.97		199.98	0.000035	0.34	53.43	23.87	0.07
MohawkE-DS-0-0	3976	2 year	4.96	196.42	198.73		198.73	0.000031	0.21	23.59	15.28	0.05
MohawkE-DS-0-0	3976	5 year	6.27	196.42	198.89		198.89	0.000037	0.24	26.09	15.77	0.06
MohawkE-DS-0-0	3976	10 year	8.03	196.42	199.07		199.08	0.000046	0.28	28.98	16.32	0.07
MohawkE-DS-0-0	3976	25 year	10.27	196.42	199.31		199.31	0.000052	0.31	32.92	17.05	0.07
MohawkE-DS-0-0	3976	50 year	12.27	196.42	199.49		199.49	0.000058	0.34	36.05	17.61	0.08
MohawkE-DS-0-0	3976	100 year	13.99	196.42	199.64		199.64	0.000062	0.36	38.71	18.08	0.08
MohawkE-DS-0-0	3976	Hazel	17.43	196.42	199.97		199.98	0.000064	0.39	44.91	19.12	0.08

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	3927	2 year	4.96	196.63	198.73		198.73	0.000028	0.21	23.31	14.73	0.05
MohawkE-DS-0-0	3927	5 year	6.27	196.63	198.89		198.89	0.000034	0.24	25.71	15.08	0.06
MohawkE-DS-0-0	3927	10 year	8.03	196.63	199.07		199.07	0.000041	0.28	28.60	17.73	0.07
MohawkE-DS-0-0	3927	25 year	10.27	196.63	199.31		199.31	0.000046	0.32	32.88	18.52	0.07
MohawkE-DS-0-0	3927	50 year	12.27	196.63	199.49		199.49	0.000050	0.35	36.27	19.13	0.07
MohawkE-DS-0-0	3927	100 year	13.99	196.63	199.63		199.64	0.000052	0.37	39.16	19.63	0.08
MohawkE-DS-0-0	3927	Hazel	17.43	196.63	199.97		199.98	0.000052	0.40	46.06	21.95	0.08
MohawkE-DS-0-0	3887	2 year	4.96	196.33	198.73		198.73	0.000016	0.16	30.27	18.10	0.04
MohawkE-DS-0-0	3887	5 year	6.27	196.33	198.89		198.89	0.000019	0.19	33.26	18.95	0.05
MohawkE-DS-0-0	3887	10 year	8.03	196.33	199.07		199.07	0.000024	0.22	36.74	19.90	0.05
MohawkE-DS-0-0	3887	25 year	10.27	196.33	199.31		199.31	0.000028	0.25	41.59	21.22	0.06
MohawkE-DS-0-0	3887	50 year	12.27	196.33	199.49		199.49	0.000032	0.27	45.51	22.28	0.06
MohawkE-DS-0-0	3887	100 year	13.99	196.33	199.63		199.64	0.000034	0.29	48.90	23.15	0.06
MohawkE-DS-0-0	3887	Hazel	17.43	196.33	199.97		199.97	0.000036	0.31	56.94	25.10	0.06
MohawkE-DS-0-0	3850	2 year	4.96	197.65	198.72	198.02	198.73	0.000312	0.48	10.41	12.37	0.17
MohawkE-DS-0-0	3850	5 year	6.27	197.65	198.88	198.08	198.89	0.000298	0.50	12.45	13.05	0.16
MohawkE-DS-0-0	3850	10 year	8.03	197.65	199.05	198.14	199.07	0.000361	0.54	14.98	16.62	0.18
MohawkE-DS-0-0	3850	25 year	10.27	197.65	199.29	198.21	199.30	0.000295	0.54	19.09	18.13	0.17
MohawkE-DS-0-0	3850	50 year	12.27	197.65	199.47	198.29	199.49	0.000263	0.55	22.46	19.28	0.16
MohawkE-DS-0-0	3850	100 year	13.99	197.65	199.62	198.33	199.63	0.000230	0.55	25.41	20.26	0.15
MohawkE-DS-0-0	3850	Hazel	17.43	197.65	199.95	198.43	199.97	0.000166	0.55	32.56	22.42	0.14
MohawkE-DS-0-0	3782	2 year	4.96	197.70	198.70		198.71	0.000349	0.48	10.33	13.45	0.17
MohawkE-DS-0-0	3782	5 year	6.27	197.70	198.86		198.87	0.000315	0.50	12.57	14.28	0.17
MohawkE-DS-0-0	3782	10 year	8.03	197.70	199.03		199.05	0.000300	0.53	15.17	15.16	0.17
MohawkE-DS-0-0	3782	25 year	10.27	197.70	199.27		199.29	0.000259	0.54	18.92	16.22	0.16
MohawkE-DS-0-0	3782	50 year	12.27	197.70	199.45		199.47	0.000242	0.56	21.93	17.02	0.16
MohawkE-DS-0-0	3782	100 year	13.99	197.70	199.60		199.62	0.000228	0.57	24.54	17.68	0.15
MohawkE-DS-0-0	3782	Hazel	17.43	197.70	199.94		199.96	0.000187	0.57	30.76	19.17	0.14
MohawkE-DS-0-0	3737	2 year	4.96	197.62	198.68	197.97	198.69	0.000350	0.49	10.12	12.02	0.17
MohawkE-DS-0-0	3737	5 year	6.27	197.62	198.84	198.02	198.86	0.000326	0.52	12.11	12.50	0.17
MohawkE-DS-0-0	3737	10 year	8.03	197.62	199.02	198.08	199.03	0.000319	0.56	14.71	32.02	0.17
MohawkE-DS-0-0	3737	25 year	10.27	197.62	199.26	198.16	199.28	0.000227	0.54	25.09	52.82	0.15
MohawkE-DS-0-0	3737	50 year	12.27	197.62	199.45	198.22	199.46	0.000172	0.51	36.33	68.55	0.13
MohawkE-DS-0-0	3737	100 year	13.99	197.62	199.60	198.27	199.61	0.000134	0.48	47.87	81.61	0.12
MohawkE-DS-0-0	3737	Hazel	17.43	197.62	199.95	198.36	199.95	0.000072	0.40	80.87	110.97	0.09
MohawkE-DS-0-0	3700	2 year	4.96	197.59	198.67	197.94	198.68	0.000243	0.43	11.43	13.15	0.15
MohawkE-DS-0-0	3700	5 year	6.27	197.59	198.83	197.99	198.84	0.000232	0.46	13.63	13.84	0.15
MohawkE-DS-0-0	3700	10 year	8.03	197.59	199.01	198.06	199.02	0.000233	0.50	16.14	14.60	0.15
MohawkE-DS-0-0	3700	25 year	10.27	197.59	199.26	198.12	199.27	0.000195	0.52	19.90	16.10	0.14
MohawkE-DS-0-0	3700	50 year	12.27	197.59	199.44	198.18	199.45	0.000182	0.55	22.93	17.21	0.14
MohawkE-DS-0-0	3700	100 year	13.99	197.59	199.59	198.23	199.60	0.000171	0.56	25.61	18.13	0.14
MohawkE-DS-0-0	3700	Hazel	17.43	197.59	199.93	198.32	199.95	0.000140	0.58	32.13	20.19	0.13
MohawkE-DS-0-0	3683	2 year	4.96	197.76	198.66	198.06	198.67	0.000284	0.44	11.17	13.31	0.15
MohawkE-DS-0-0	3683	5 year	6.27	197.76	198.83	198.09	198.84	0.000258	0.47	13.36	13.38	0.15
MohawkE-DS-0-0	3683	10 year	8.03	197.76	199.00	198.15	199.02	0.000266	0.51	15.72	14.01	0.15
MohawkE-DS-0-0	3683	25 year	10.27	197.76	199.25	198.21	199.26	0.000226	0.54	19.27	14.97	0.15
MohawkE-DS-0-0	3683	50 year	12.27	197.76	199.43	198.26	199.45	0.000212	0.56	22.08	15.80	0.14
MohawkE-DS-0-0	3683	100 year	13.99	197.76	199.58	198.30	199.60	0.000200	0.58	24.52	16.49	0.14
MohawkE-DS-0-0	3683	Hazel	17.43	197.76	199.92	198.38	199.94	0.000166	0.60	30.41	18.04	0.13
MohawkE-DS-0-0	3653	2 year	4.96	197.62	198.66	197.89	198.67	0.000102	0.30	16.60	17.95	0.10
MohawkE-DS-0-0	3653	5 year	6.27	197.62	198.83	197.93	198.83	0.000095	0.32	19.58	18.37	0.10
MohawkE-DS-0-0	3653	10 year	8.03	197.62	199.00	197.97	199.01	0.000095	0.36	22.87	18.81	0.10
MohawkE-DS-0-0	3653	25 year	10.27	197.62	199.25	198.02	199.26	0.000086	0.38	27.59	19.43	0.10
MohawkE-DS-0-0	3653	50 year	12.27	197.62	199.43	198.07	199.44	0.000084	0.41	31.18	19.89	0.10
MohawkE-DS-0-0	3653	100 year	13.99	197.62	199.58	198.10	199.59	0.000082	0.42	34.23	20.28	0.10
MohawkE-DS-0-0	3653	Hazel	17.43	197.62	199.93	198.17	199.94	0.000072	0.44	41.30	21.13	0.10
MohawkE-DS-0-0	3616	2 year	4.96	197.34	198.66	197.78	198.66	0.000102	0.31	16.11	15.44	0.10
MohawkE-DS-0-0	3616	5 year	6.27	197.34	198.82	197.83	198.83	0.000107	0.34	18.69	15.99	0.10
MohawkE-DS-0-0	3616	10 year	8.03	197.34	199.00	197.88	199.01	0.000115	0.37	21.55	16.41	0.10
MohawkE-DS-0-0	3616	25 year	10.27	197.34	199.25	197.94	199.25	0.000108	0.40	25.70	17.24	0.10
MohawkE-DS-0-0	3616	50 year	12.27	197.34	199.43	198.00	199.44	0.000108	0.43	28.91	17.86	0.10
MohawkE-DS-0-0	3616	100 year	13.99	197.34	199.58	198.04	199.59	0.000107	0.45	31.66	18.38	0.10
MohawkE-DS-0-0	3616	Hazel	17.43	197.34	199.92	198.10	199.93	0.000096	0.47	38.14	19.54	0.10
MohawkE-DS-0-0	3550	2 year	9.01	197.70	198.54	198.26	198.62	0.003042	1.28	7.06	10.26	0.49
MohawkE-DS-0-0	3550	5 year	11.58	197.70	198.70	198.34	198.79	0.002670	1.33	8.70	10.62	0.47
MohawkE-DS-0-0	3550	10 year	14.58	197.70	198.87	198.43	198.96	0.002389	1.38	10.54	11.02	0.45
MohawkE-DS-0-0	3550	25 year	18.40	197.70	199.12	198.54	199.22	0.001853	1.36	13.61	13.33	0.41
MohawkE-DS-0-0	3550	50 year	22.04	197.70	199.30	198.63	199.40	0.001614	1.40	16.08	14.20	0.39
MohawkE-DS-0-0	3550	100 year	25.37	197.70	199.45	198.71	199.55	0.001482	1.44	18.23	14.91	0.38
MohawkE-DS-0-0	3550	Hazel	33.52	197.70	199.78	198.89	199.90	0.001263	1.53	23.47	16.53	0.36
MohawkE-DS-0-0	3491	2 year	9.01	197.50	198.43		198.49	0.001861	1.12	8.05	10.07	0.40
MohawkE-DS-0-0	3491	5 year	11.58	197.50	198.60		198.67	0.001699	1.18	9.79	10.41	0.39

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	3491	10 year	14.58	197.50	198.77		198.85	0.001587	1.25	11.69	10.78	0.38
MohawkE-DS-0-0	3491	25 year	18.40	197.50	199.05		199.13	0.001278	1.25	14.72	11.34	0.35
MohawkE-DS-0-0	3491	50 year	22.04	197.50	199.23		199.32	0.001236	1.31	16.85	11.72	0.35
MohawkE-DS-0-0	3491	100 year	25.37	197.50	199.38		199.48	0.001224	1.36	18.63	12.03	0.35
MohawkE-DS-0-0	3491	Hazel	33.52	197.50	199.72		199.83	0.001198	1.47	22.78	12.72	0.35
MohawkE-DS-0-0	3455	2 year	9.01	196.84	198.41		198.44	0.000672	0.75	12.06	12.65	0.24
MohawkE-DS-0-0	3455	5 year	11.58	196.84	198.58		198.62	0.000678	0.81	14.31	13.39	0.25
MohawkE-DS-0-0	3455	10 year	14.58	196.84	198.77		198.80	0.000677	0.87	16.81	14.16	0.25
MohawkE-DS-0-0	3455	25 year	18.40	196.84	199.05		199.09	0.000579	0.88	20.94	15.34	0.24
MohawkE-DS-0-0	3455	50 year	22.04	196.84	199.23		199.28	0.000574	0.92	23.89	16.14	0.24
MohawkE-DS-0-0	3455	100 year	25.37	196.84	199.39		199.43	0.000574	0.96	26.40	16.75	0.24
MohawkE-DS-0-0	3455	Hazel	33.52	196.84	199.73		199.78	0.000563	1.04	32.34	18.01	0.25
MohawkE-DS-0-0	3400	2 year	9.01	196.33	198.36		198.40	0.000804	0.90	9.98	8.57	0.27
MohawkE-DS-0-0	3400	5 year	11.58	196.33	198.52		198.58	0.000912	1.01	11.42	8.98	0.29
MohawkE-DS-0-0	3400	10 year	14.58	196.33	198.70		198.76	0.001007	1.12	13.01	9.42	0.30
MohawkE-DS-0-0	3400	25 year	18.40	196.33	198.98		199.05	0.000950	1.17	15.74	10.12	0.30
MohawkE-DS-0-0	3400	50 year	22.04	196.33	199.16		199.24	0.001003	1.25	17.60	10.57	0.31
MohawkE-DS-0-0	3400	100 year	25.37	196.33	199.30		199.39	0.001053	1.32	19.16	10.94	0.32
MohawkE-DS-0-0	3400	Hazel	33.52	196.33	199.63		199.74	0.001135	1.47	22.88	11.77	0.34
MohawkE-DS-0-0	3328	2 year	9.01	195.88	198.34	197.15	198.36	0.000330	0.66	13.71	9.42	0.17
MohawkE-DS-0-0	3328	5 year	11.58	195.88	198.50	197.28	198.53	0.000401	0.76	15.23	9.59	0.19
MohawkE-DS-0-0	3328	10 year	14.58	195.88	198.66	197.40	198.70	0.000474	0.86	16.86	9.77	0.21
MohawkE-DS-0-0	3328	25 year	18.40	195.88	198.94	197.54	198.99	0.000488	0.94	19.62	10.07	0.21
MohawkE-DS-0-0	3328	50 year	22.04	195.88	199.12	197.65	199.17	0.000547	1.03	21.41	10.26	0.23
MohawkE-DS-0-0	3328	100 year	25.37	195.88	199.26	197.74	199.32	0.000601	1.11	22.87	10.41	0.24
MohawkE-DS-0-0	3328	Hazel	33.52	195.88	199.58	197.95	199.66	0.000714	1.28	26.25	10.82	0.26
MohawkE-DS-0-0	3250	2 year	9.01	196.12	198.34	196.88	198.34	0.000079	0.32	27.93	21.50	0.09
MohawkE-DS-0-0	3250	5 year	11.58	196.12	198.50	196.97	198.50	0.000095	0.37	31.49	22.68	0.10
MohawkE-DS-0-0	3250	10 year	14.58	196.12	198.67	197.05	198.68	0.000108	0.41	35.47	23.93	0.11
MohawkE-DS-0-0	3250	25 year	18.40	196.12	198.95	197.15	198.96	0.000096	0.43	42.95	29.40	0.10
MohawkE-DS-0-0	3250	50 year	22.04	196.12	199.13	197.23	199.14	0.000099	0.47	48.61	33.31	0.11
MohawkE-DS-0-0	3250	100 year	25.37	196.12	199.28	197.31	199.29	0.000101	0.50	53.70	36.47	0.11
MohawkE-DS-0-0	3250	Hazel	33.52	196.12	199.61	197.46	199.62	0.000104	0.56	66.26	39.54	0.11
MohawkE-DS-0-0	3184	2 year	9.01	196.18	198.33	196.77	198.34	0.000081	0.36	24.74	15.49	0.09
MohawkE-DS-0-0	3184	5 year	11.58	196.18	198.49	196.85	198.50	0.000102	0.43	27.24	15.97	0.10
MohawkE-DS-0-0	3184	10 year	14.58	196.18	198.66	196.94	198.67	0.000124	0.49	29.97	16.48	0.12
MohawkE-DS-0-0	3184	25 year	18.40	196.18	198.94	197.05	198.95	0.000133	0.53	34.79	19.28	0.12
MohawkE-DS-0-0	3184	50 year	22.04	196.18	199.12	197.13	199.13	0.000147	0.58	39.96	34.45	0.13
MohawkE-DS-0-0	3184	100 year	25.37	196.18	199.26	197.20	199.28	0.000153	0.61	45.25	37.81	0.13
MohawkE-DS-0-0	3184	Hazel	33.52	196.18	199.59	197.38	199.61	0.000158	0.67	58.44	42.13	0.14
MohawkE-DS-0-0	3100	2 year	9.01	195.92	198.32		198.33	0.000116	0.43	20.86	12.91	0.11
MohawkE-DS-0-0	3100	5 year	11.58	195.92	198.47		198.49	0.000148	0.51	22.91	13.45	0.12
MohawkE-DS-0-0	3100	10 year	14.58	195.92	198.64		198.65	0.000182	0.58	25.17	14.03	0.14
MohawkE-DS-0-0	3100	25 year	18.40	195.92	198.92		198.94	0.000193	0.63	29.24	15.01	0.14
MohawkE-DS-0-0	3100	50 year	22.04	195.92	199.09		199.12	0.000213	0.69	32.07	18.57	0.15
MohawkE-DS-0-0	3100	100 year	25.37	195.92	199.24		199.26	0.000225	0.74	35.07	23.53	0.16
MohawkE-DS-0-0	3100	Hazel	33.52	195.92	199.56		199.60	0.000239	0.84	44.38	32.98	0.17
MohawkE-DS-0-0	3047	2 year	9.01	196.15	198.32	196.73	198.32	0.000068	0.34	26.38	16.19	0.09
MohawkE-DS-0-0	3047	5 year	11.58	196.15	198.47	196.82	198.48	0.000085	0.40	28.97	17.19	0.10
MohawkE-DS-0-0	3047	10 year	14.58	196.15	198.64	196.90	198.65	0.000102	0.46	31.82	17.45	0.11
MohawkE-DS-0-0	3047	25 year	18.40	196.15	198.92	196.99	198.93	0.000105	0.50	36.79	17.90	0.11
MohawkE-DS-0-0	3047	50 year	22.04	196.15	199.09	197.07	199.11	0.000116	0.56	40.47	24.52	0.12
MohawkE-DS-0-0	3047	100 year	25.37	196.15	199.24	197.15	199.25	0.000125	0.60	44.20	27.82	0.12
MohawkE-DS-0-0	3047	Hazel	33.52	196.15	199.56	197.30	199.59	0.000137	0.69	54.49	35.36	0.13
MohawkE-DS-0-0	2966	2 year	9.01	195.73	198.31	196.41	198.32	0.000053	0.30	29.98	17.97	0.07
MohawkE-DS-0-0	2966	5 year	11.58	195.73	198.47	196.49	198.47	0.000068	0.35	32.80	18.59	0.08
MohawkE-DS-0-0	2966	10 year	14.58	195.73	198.63	196.58	198.64	0.000083	0.41	35.91	19.54	0.09
MohawkE-DS-0-0	2966	25 year	18.40	195.73	198.91	196.68	198.92	0.000085	0.44	41.78	22.23	0.10
MohawkE-DS-0-0	2966	50 year	22.04	195.73	199.09	196.76	199.10	0.000095	0.49	45.82	23.68	0.10
MohawkE-DS-0-0	2966	100 year	25.37	195.73	199.23	196.84	199.24	0.000104	0.53	49.70	33.73	0.11
MohawkE-DS-0-0	2966	Hazel	33.52	195.73	199.56	197.00	199.57	0.000116	0.60	62.24	40.48	0.12
MohawkE-DS-0-0	2817	2 year	9.01	195.56	198.31	195.93	198.31	0.000006	0.12	77.88	40.85	0.03
MohawkE-DS-0-0	2817	5 year	11.58	195.56	198.47	195.98	198.47	0.000008	0.14	84.23	41.20	0.03
MohawkE-DS-0-0	2817	10 year	14.58	195.56	198.63	196.04	198.63	0.000010	0.16	91.03	41.56	0.03
MohawkE-DS-0-0	2817	25 year	18.40	195.56	198.91	196.11	198.92	0.000011	0.18	102.84	42.38	0.04
MohawkE-DS-0-0	2817	50 year	22.04	195.56	199.09	196.16	199.09	0.000012	0.20	110.37	42.95	0.04
MohawkE-DS-0-0	2817	100 year	25.37	195.56	199.23	196.22	199.24	0.000014	0.22	116.64	45.42	0.04
MohawkE-DS-0-0	2817	Hazel	33.52	195.56	199.56	196.33	199.56	0.000018	0.25	132.63	51.42	0.05
MohawkE-DS-0-0	2710	2 year	9.01	195.05	198.31	195.36	198.31	0.000001	0.06	157.62	65.47	0.01
MohawkE-DS-0-0	2710	5 year	11.58	195.05	198.47	195.41	198.47	0.000001	0.07	167.84	66.37	0.01
MohawkE-DS-0-0	2710	10 year	14.58	195.05	198.63	195.45	198.63	0.000002	0.08	178.83	67.33	0.02
MohawkE-DS-0-0	2710	25 year	18.40	195.05	198.91	195.52	198.92	0.000002	0.09	198.05	69.23	0.02

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	2710	50 year	22.04	195.05	199.09	195.56	199.09	0.000003	0.10	210.40	70.67	0.02
MohawkE-DS-0-0	2710	100 year	25.37	195.05	199.23	195.61	199.24	0.000003	0.12	220.59	71.84	0.02
MohawkE-DS-0-0	2710	Hazel	33.52	195.05	199.56	195.70	199.56	0.000004	0.14	245.54	82.51	0.02
MohawkE-DS-0-0	2605	2 year	9.01	195.08	198.31	195.35	198.31	0.000001	0.05	190.13	78.32	0.01
MohawkE-DS-0-0	2605	5 year	11.58	195.08	198.47	195.39	198.47	0.000001	0.06	202.38	79.63	0.01
MohawkE-DS-0-0	2605	10 year	14.58	195.08	198.63	195.42	198.63	0.000001	0.07	215.56	80.67	0.01
MohawkE-DS-0-0	2605	25 year	18.40	195.08	198.91	195.46	198.92	0.000001	0.08	238.55	82.45	0.01
MohawkE-DS-0-0	2605	50 year	22.04	195.08	199.09	195.49	199.09	0.000002	0.09	253.25	84.07	0.02
MohawkE-DS-0-0	2605	100 year	25.37	195.08	199.23	195.52	199.23	0.000002	0.10	265.37	85.43	0.02
MohawkE-DS-0-0	2605	Hazel	33.52	195.08	199.56	195.59	199.56	0.000003	0.11	293.78	88.52	0.02
MohawkE-DS-0-0	2551	2 year	9.01	194.50	198.31	194.64	198.31	0.000000	0.02	438.03	123.88	0.00
MohawkE-DS-0-0	2551	5 year	11.58	194.50	198.47	194.66	198.47	0.000000	0.03	457.25	124.08	0.00
MohawkE-DS-0-0	2551	10 year	14.58	194.50	198.63	194.67	198.63	0.000000	0.03	477.67	124.29	0.00
MohawkE-DS-0-0	2551	25 year	18.40	194.50	198.92	194.70	198.92	0.000000	0.04	512.77	124.64	0.01
MohawkE-DS-0-0	2551	50 year	22.04	194.50	199.09	194.72	199.09	0.000000	0.04	534.79	124.87	0.01
MohawkE-DS-0-0	2551	100 year	25.37	194.50	199.23	194.75	199.23	0.000000	0.05	552.67	125.05	0.01
MohawkE-DS-0-0	2551	Hazel	33.52	194.50	199.56	194.78	199.56	0.000000	0.06	593.59	125.43	0.01
MohawkE-DS-0-0	2432	2 year	9.01	193.94	198.31	194.12	198.31	0.000005	0.01	615.11	165.34	0.00
MohawkE-DS-0-0	2432	5 year	11.58	193.94	198.47	194.15	198.47	0.000007	0.02	640.77	165.94	0.00
MohawkE-DS-0-0	2432	10 year	14.58	193.94	198.63	194.18	198.63	0.000009	0.02	668.12	166.58	0.00
MohawkE-DS-0-0	2432	25 year	18.40	193.94	198.91	194.20	198.91	0.000012	0.03	715.24	167.68	0.00
MohawkE-DS-0-0	2432	50 year	22.04	193.94	199.09	194.22	199.09	0.000014	0.03	744.90	168.37	0.00
MohawkE-DS-0-0	2432	100 year	25.37	193.94	199.23	194.25	199.23	0.000017	0.03	769.04	168.92	0.00
MohawkE-DS-0-0	2432	Hazel	33.52	193.94	199.56	194.29	199.56	0.000024	0.04	824.43	170.20	0.01
MohawkE-DS-0-0	2281	2 year	9.01	194.16	198.31	194.35	198.31	0.000000	0.01	792.53	242.57	0.00
MohawkE-DS-0-0	2281	5 year	11.58	194.16	198.47	194.36	198.47	0.000000	0.01	830.33	244.57	0.00
MohawkE-DS-0-0	2281	10 year	14.58	194.16	198.63	194.39	198.63	0.000000	0.02	870.63	245.56	0.00
MohawkE-DS-0-0	2281	25 year	18.40	194.16	198.91	194.41	198.91	0.000000	0.02	940.11	247.26	0.00
MohawkE-DS-0-0	2281	50 year	22.04	194.16	199.09	194.43	199.09	0.000000	0.02	983.85	248.32	0.00
MohawkE-DS-0-0	2281	100 year	25.37	194.16	199.23	194.45	199.23	0.000000	0.03	1019.45	249.19	0.00
MohawkE-DS-0-0	2281	Hazel	33.52	194.16	199.56	194.49	199.56	0.000000	0.03	1101.93	256.53	0.00
MohawkE-DS-0-0	2200	2 year	9.01	194.26	198.31	194.66	198.31	0.000000	0.01	675.03	218.78	0.00
MohawkE-DS-0-0	2200	5 year	11.58	194.26	198.47	194.68	198.47	0.000000	0.02	709.09	220.96	0.00
MohawkE-DS-0-0	2200	10 year	14.58	194.26	198.63	194.71	198.63	0.000000	0.02	745.62	223.28	0.00
MohawkE-DS-0-0	2200	25 year	18.40	194.26	198.91	194.74	198.91	0.000000	0.02	809.14	227.25	0.00
MohawkE-DS-0-0	2200	50 year	22.04	194.26	199.09	194.76	199.09	0.000000	0.03	849.43	228.94	0.00
MohawkE-DS-0-0	2200	100 year	25.37	194.26	199.23	194.78	199.23	0.000000	0.03	882.25	229.71	0.00
MohawkE-DS-0-0	2200	Hazel	33.52	194.26	199.56	194.82	199.56	0.000000	0.04	957.58	231.46	0.01
MohawkE-DS-0-0	2109	2 year	9.01	193.76	198.31	193.97	198.31	0.000000	0.01	699.22	214.95	0.00
MohawkE-DS-0-0	2109	5 year	11.58	193.76	198.47	194.00	198.47	0.000000	0.02	732.65	216.71	0.00
MohawkE-DS-0-0	2109	10 year	14.58	193.76	198.63	194.02	198.63	0.000000	0.02	768.38	217.67	0.00
MohawkE-DS-0-0	2109	25 year	18.40	193.76	198.91	194.04	198.91	0.000000	0.02	829.97	219.21	0.00
MohawkE-DS-0-0	2109	50 year	22.04	193.76	199.09	194.07	199.09	0.000000	0.03	868.73	220.09	0.00
MohawkE-DS-0-0	2109	100 year	25.37	193.76	199.23	194.09	199.23	0.000000	0.03	900.29	220.87	0.00
MohawkE-DS-0-0	2109	Hazel	33.52	193.76	199.56	194.14	199.56	0.000000	0.03	972.73	222.65	0.01
MohawkE-DS-0-0	2108	2 year	9.01	193.02	198.31	193.28	198.31	0.000000	0.01	756.42	205.52	0.00
MohawkE-DS-0-0	2108	5 year	11.58	193.02	198.47	193.31	198.47	0.000000	0.01	788.38	207.06	0.00
MohawkE-DS-0-0	2108	10 year	14.58	193.02	198.63	193.35	198.63	0.000000	0.02	822.56	208.51	0.00
MohawkE-DS-0-0	2108	25 year	18.40	193.02	198.91	193.37	198.91	0.000000	0.02	881.66	210.90	0.00
MohawkE-DS-0-0	2108	50 year	22.04	193.02	199.09	193.40	199.09	0.000000	0.02	919.02	212.10	0.00
MohawkE-DS-0-0	2108	100 year	25.37	193.02	199.23	193.42	199.23	0.000000	0.03	949.43	212.82	0.00
MohawkE-DS-0-0	2108	Hazel	33.52	193.02	199.56	193.46	199.56	0.000000	0.03	1019.24	214.52	0.00
MohawkE-DS-0-0	2007	2 year	9.01	193.61	198.31	194.02	198.31	0.000000	0.01	661.34	188.00	0.00
MohawkE-DS-0-0	2007	5 year	11.58	193.61	198.47	194.07	198.47	0.000000	0.02	690.57	189.35	0.00
MohawkE-DS-0-0	2007	10 year	14.58	193.61	198.63	194.12	198.63	0.000000	0.02	721.84	190.76	0.00
MohawkE-DS-0-0	2007	25 year	18.40	193.61	198.91	194.14	198.91	0.000000	0.02	775.95	193.81	0.00
MohawkE-DS-0-0	2007	50 year	22.04	193.61	199.09	194.18	199.09	0.000000	0.03	810.27	195.06	0.00
MohawkE-DS-0-0	2007	100 year	25.37	193.61	199.23	194.21	199.23	0.000000	0.03	838.27	196.10	0.00
MohawkE-DS-0-0	2007	Hazel	33.52	193.61	199.56	194.27	199.56	0.000000	0.04	902.54	197.49	0.01
MohawkE-DS-0-0	2006	2 year	9.01	193.71	198.31	193.99	198.31	0.000000	0.02	538.54	141.04	0.00
MohawkE-DS-0-0	2006	5 year	11.58	193.71	198.47	194.00	198.47	0.000000	0.02	560.43	141.62	0.00
MohawkE-DS-0-0	2006	10 year	14.58	193.71	198.63	194.04	198.63	0.000000	0.03	583.77	142.24	0.00
MohawkE-DS-0-0	2006	25 year	18.40	193.71	198.91	194.06	198.91	0.000000	0.03	624.02	143.29	0.00
MohawkE-DS-0-0	2006	50 year	22.04	193.71	199.09	194.09	199.09	0.000000	0.03	649.37	143.96	0.01
MohawkE-DS-0-0	2006	100 year	25.37	193.71	199.23	194.12	199.23	0.000000	0.04	670.01	144.49	0.01
MohawkE-DS-0-0	2006	Hazel	33.52	193.71	199.56	194.17	199.56	0.000000	0.05	717.86	147.88	0.01
MohawkE-DS-0-0	1914	2 year	8.82	193.65	198.31	194.35	198.31	0.000001	0.06	140.19	42.70	0.01
MohawkE-DS-0-0	1914	5 year	11.39	193.65	198.47	194.42	198.47	0.000001	0.08	146.81	42.88	0.01
MohawkE-DS-0-0	1914	10 year	14.31	193.65	198.63	194.50	198.63	0.000002	0.09	153.87	43.06	0.02
MohawkE-DS-0-0	1914	25 year	18.16	193.65	198.91	194.58	198.91	0.000002	0.11	166.05	43.38	0.02
MohawkE-DS-0-0	1914	50 year	21.91	193.65	199.09	194.66	199.09	0.000003	0.13	173.81	44.72	0.02
MohawkE-DS-0-0	1914	100 year	25.33	193.65	199.23	194.72	199.23	0.000003	0.14	180.27	45.84	0.02

HEC-RAS Plan: Default Scen River: Mohawk Reach: MohawkE-DS-0-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
MohawkE-DS-0-0	1914	Hazel	34.48	193.65	199.56	194.86	199.56	0.000005	0.18	196.12	51.10	0.03
MohawkE-DS-0-0	1841	2 year	8.82	195.52	198.31	196.25	198.31	0.000020	0.22	40.75	18.91	0.05
MohawkE-DS-0-0	1841	5 year	11.39	195.52	198.46	196.33	198.47	0.000027	0.26	43.67	19.08	0.06
MohawkE-DS-0-0	1841	10 year	14.31	195.52	198.63	196.41	198.63	0.000035	0.31	46.80	19.26	0.06
MohawkE-DS-0-0	1841	25 year	18.16	195.52	198.91	196.50	198.91	0.000040	0.35	52.94	24.83	0.07
MohawkE-DS-0-0	1841	50 year	21.91	195.52	199.08	196.56	199.09	0.000047	0.39	57.45	26.84	0.07
MohawkE-DS-0-0	1841	100 year	25.33	195.52	199.22	196.62	199.23	0.000053	0.43	61.36	28.46	0.08
MohawkE-DS-0-0	1841	Hazel	34.48	195.52	199.55	196.76	199.56	0.000068	0.52	71.00	31.47	0.09
MohawkE-DS-0-0	1797	2 year	8.82	196.50	198.31	196.85	198.31	0.000045	0.26	33.44	23.18	0.07
MohawkE-DS-0-0	1797	5 year	11.39	196.50	198.46	196.91	198.47	0.000054	0.31	37.00	23.39	0.08
MohawkE-DS-0-0	1797	10 year	14.31	196.50	198.62	196.97	198.63	0.000062	0.35	40.82	23.61	0.08
MohawkE-DS-0-0	1797	25 year	18.16	196.50	198.90	197.05	198.91	0.000061	0.38	47.49	24.00	0.09
MohawkE-DS-0-0	1797	50 year	21.91	196.50	199.08	197.12	199.09	0.000068	0.43	51.70	24.47	0.09
MohawkE-DS-0-0	1797	100 year	25.33	196.50	199.22	197.19	199.23	0.000073	0.46	55.20	25.10	0.10
MohawkE-DS-0-0	1797	Hazel	34.48	196.50	199.54	197.34	199.56	0.000088	0.55	63.48	26.63	0.11
MohawkE-DS-0-0	1750	2 year	8.82	196.66	198.30	197.08	198.31	0.000093	0.35	25.54	20.55	0.10
MohawkE-DS-0-0	1750	5 year	11.39	196.66	198.45	197.14	198.46	0.000111	0.40	28.85	23.01	0.11
MohawkE-DS-0-0	1750	10 year	14.31	196.66	198.62	197.22	198.63	0.000126	0.44	32.74	25.31	0.12
MohawkE-DS-0-0	1750	25 year	18.16	196.66	198.90	197.30	198.91	0.000118	0.47	40.94	34.35	0.12
MohawkE-DS-0-0	1750	50 year	21.91	196.66	199.07	197.37	199.08	0.000124	0.50	48.45	52.52	0.12
MohawkE-DS-0-0	1750	100 year	25.33	196.66	199.21	197.44	199.23	0.000124	0.53	56.06	55.02	0.12
MohawkE-DS-0-0	1750	Hazel	34.48	196.66	199.54	197.60	199.55	0.000125	0.57	74.75	60.34	0.12
MohawkE-DS-0-0	1645	2 year	8.82	197.10	198.28	197.64	198.30	0.000387	0.53	16.74	20.72	0.19
MohawkE-DS-0-0	1645	5 year	11.39	197.10	198.43	197.72	198.45	0.000379	0.57	19.88	21.28	0.19
MohawkE-DS-0-0	1645	10 year	14.31	197.10	198.59	197.78	198.61	0.000366	0.61	23.33	21.89	0.19
MohawkE-DS-0-0	1645	25 year	18.16	197.10	198.87	197.87	198.89	0.000283	0.61	29.70	22.97	0.17
MohawkE-DS-0-0	1645	50 year	21.91	197.10	199.05	197.94	199.07	0.000279	0.65	33.82	25.72	0.17
MohawkE-DS-0-0	1645	100 year	25.33	197.10	199.19	197.99	199.21	0.000275	0.68	37.52	27.07	0.17
MohawkE-DS-0-0	1645	Hazel	34.48	197.10	199.51	198.13	199.54	0.000276	0.76	47.00	34.77	0.18
MohawkE-DS-0-0	1580	2 year	8.82	197.09	198.26	197.48	198.27	0.000228	0.45	19.54	20.44	0.15
MohawkE-DS-0-0	1580	5 year	11.39	197.09	198.41	197.54	198.42	0.000244	0.50	22.64	21.18	0.16
MohawkE-DS-0-0	1580	10 year	14.31	197.09	198.57	197.60	198.58	0.000253	0.55	26.08	21.97	0.16
MohawkE-DS-0-0	1580	25 year	18.16	197.09	198.86	197.68	198.87	0.000211	0.56	32.62	23.39	0.15
MohawkE-DS-0-0	1580	50 year	21.91	197.09	199.03	197.74	199.05	0.000228	0.60	36.80	26.80	0.16
MohawkE-DS-0-0	1580	100 year	25.33	197.09	199.17	197.79	199.19	0.000230	0.63	40.67	28.33	0.16
MohawkE-DS-0-0	1580	Hazel	34.48	197.09	199.49	197.94	199.51	0.000239	0.70	50.25	31.78	0.17
MohawkE-DS-0-0	1485	2 year	8.82	197.08	198.22	197.59	198.24	0.000539	0.61	14.43	18.29	0.22
MohawkE-DS-0-0	1485	5 year	11.39	197.08	198.36	197.67	198.39	0.000539	0.66	17.17	19.11	0.22
MohawkE-DS-0-0	1485	10 year	14.31	197.08	198.52	197.75	198.55	0.000524	0.71	20.27	19.99	0.22
MohawkE-DS-0-0	1485	25 year	18.16	197.08	198.82	197.83	198.84	0.000393	0.69	26.46	21.66	0.20
MohawkE-DS-0-0	1485	50 year	21.91	197.08	198.99	197.92	199.02	0.000391	0.72	30.24	22.61	0.20
MohawkE-DS-0-0	1485	100 year	25.33	197.08	199.13	197.98	199.16	0.000387	0.76	34.01	27.70	0.20
MohawkE-DS-0-0	1485	Hazel	34.48	197.08	199.45	198.14	199.48	0.000361	0.83	43.12	29.68	0.20
MohawkE-DS-0-0	1354	2 year	8.82	197.33	198.10	197.77	198.14	0.001475	0.88	10.12	16.39	0.35
MohawkE-DS-0-0	1354	5 year	11.39	197.33	198.26	197.83	198.30	0.001190	0.91	12.70	16.75	0.33
MohawkE-DS-0-0	1354	10 year	14.31	197.33	198.42	197.90	198.47	0.001003	0.94	15.48	16.85	0.31
MohawkE-DS-0-0	1354	25 year	18.16	197.33	198.75	197.98	198.79	0.000616	0.88	21.00	17.06	0.25
MohawkE-DS-0-0	1354	50 year	21.91	197.33	198.92	198.05	198.96	0.000599	0.94	23.89	17.17	0.25
MohawkE-DS-0-0	1354	100 year	25.33	197.33	199.06	198.11	199.10	0.000596	0.99	26.26	17.26	0.25
MohawkE-DS-0-0	1354	Hazel	34.48	197.33	199.37	198.25	199.43	0.000618	1.12	31.65	17.46	0.26
MohawkE-DS-0-0	1341		Bridge									
MohawkE-DS-0-0	1332	2 year	8.82	197.24	198.05		198.10	0.002255	1.05	8.42	13.80	0.43
MohawkE-DS-0-0	1332	5 year	11.39	197.24	198.21		198.27	0.001817	1.06	10.78	14.78	0.40
MohawkE-DS-0-0	1332	10 year	14.31	197.24	198.38		198.44	0.001520	1.07	13.41	15.80	0.37
MohawkE-DS-0-0	1332	25 year	18.16	197.24	198.73		198.77	0.000877	0.95	19.20	17.83	0.29
MohawkE-DS-0-0	1332	50 year	21.91	197.24	198.90		198.95	0.000816	0.98	22.34	18.85	0.29
MohawkE-DS-0-0	1332	100 year	25.33	197.24	199.04		199.09	0.000765	1.02	25.03	19.67	0.28
MohawkE-DS-0-0	1332	Hazel	34.48	197.24	199.35		199.41	0.000712	1.11	31.51	21.54	0.28
MohawkE-DS-0-0	1240	2 year	8.82	196.93	197.98	197.34	198.01	0.000485	0.69	12.71	12.91	0.22
MohawkE-DS-0-0	1240	5 year	11.39	196.93	198.15	197.41	198.18	0.000486	0.77	14.82	12.96	0.23
MohawkE-DS-0-0	1240	10 year	14.31	196.93	198.32	197.48	198.36	0.000485	0.84	17.00	13.00	0.23
MohawkE-DS-0-0	1240	25 year	18.16	196.93	198.68	197.57	198.71	0.000485	0.81	22.58	18.55	0.21
MohawkE-DS-0-0	1240	50 year	21.91	196.93	198.85	197.65	198.89	0.000485	0.88	26.12	22.64	0.22
MohawkE-DS-0-0	1240	100 year	25.33	196.93	198.99	197.71	199.03	0.000485	0.92	29.56	26.18	0.22
MohawkE-DS-0-0	1240	Hazel	34.48	196.93	199.31	197.88	199.36	0.000486	1.03	39.17	34.24	0.22

Appendix D-1 – Channel Classifications

12 Naturalization of Headwater Streams in Illinois: Challenges and Possibilities

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Aquafor Beech Limited

Type 1 Channel

- Straight or smoothly curving trapezoidal channel with uniform bed
- Result of recent channelization or maintenance

Type 2 Channel

- Straight or smoothly curving trapezoidal channel with unvegetated, migrating alternate bars
- Seems to develop as the result of a high sediment flux into recently channelized reach with adequate transport capacity
- Some may achieve stable forms without migrating bars due to the overwhelming effects of dense vegetation.

Type 3 Channel

- Straight or smoothly curving trapezoidal channel with stable pool-riffle sequences
- Appears to represent a relatively stable morphology that develops in low-energy, gravel-bed channels

Type 4 Channel

- Straight or smoothly curving trapezoidal channel with stable, vegetated alternate bars
- Origin of bars is unclear. Bars clearly depositional features, not the result of bank slumping, but can deflect flow laterally into bank. May be a transitional form leading to a Type 6 channel

Type 5 Channel

- Straight or smoothly curving trapezoidal channel containing a meandering low-flow stream flanked by continuous floodplain
- Appears to be a relatively stable morphology that develops in the smallest headwater streams. May represent containment of meander belt of an underfit stream within the ditch bottom

Type 6 Channel

- Straight or smoothly curving trapezoidal channel containing a meandering stream that impinges upon and erodes the ditch banks
- Appears to be a transitional form leading to destruction of the ditch by a meandering stream as it re-establishes its sinuosity

Type 7 Channel

- Straight or smoothly curving channel with natural cross section that may or may not contain vegetated alternate bars
- Represents straightened sections that were not deepened substantially and that have recovered their geometric, but not their planform properties

Type 8 Channel

- Mildly sinuous meandering channel
- May represent an evolutionary stage subsequent to Type 7 channels, or to Type 6 channels where the ditch has been destroyed. May be an equilibrium state for low-energy meandering channels

Type 9 Channel

- Highly sinuous meandering channel
- May represent an evolutionary stage subsequent to Type 7 channels. Probably an equilibrium state for the largest headwater channels

12 Naturalization of Headwater Streams in Illinois: Challenges and Possibilities

BRUCE L. RHOADS[1] AND EDWIN E. HERRICKS[2]

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Types of channels

Despite the widespread impact of ditching, channelization, and channel maintenance on the streams of east central Illinois, a large variety of channel types is found in this region. At least nine different categories of channels can be identified on the basis of differences in channel pattern and cross-section geometry (Table 12.3, Figure 12.4). Not all of these channel types are equally prevalent; the categories that include various types of trapezoidal or straightened channels (Types 1–7) are far more common than those that encompass relatively unmodified channels (Types 8 and 9). Highly meandering headwater stream segments are especially rare in east central Illinois.

The relationship of the channel types to controlling environmental conditions such as hydrologic regime, stream power, boundary materials, and valley gradient has yet to be determined. Moreover, the genetic connection (or lack thereof) among the types is incompletely understood. Type 1 obviously is the result of direct human modification of streams; however, the pattern of evolution following such modification appears to vary spatially. Welford (1993a) documented the development of migrating alternate bars in the Embarras River following ditching (Type 2 channel). One might suspect that these migrating bars eventually stabilize and evolve into the fixed, vegetated alternate bars found in Type 3 channels. However, seven years after channelization the reach studied by Welford (1993a) still did not contain vegetated bars; moreover, migrating bars no longer develop in this reach because the high flux of sediment into the stream from the initially bare channel banks, which provided the sediment necessary for bar formation, has been severely curtailed by the dense cover of vegetation on these banks. Other categories, such as Types 4 and 5 may represent relatively stable forms that develop under certain conditions (Table 12.3). Field observations and historical aerial photography indicate that in many cases no detectable change has occurred in these types of channels for several decades, indicating that they are not evolving at a timescale relevant to human concerns. Types 8 and 9 appear to be forms that are adjusted or nearly adjusted to prevailing environmental conditions, but the relationship of these types to the morphology and dynamics of streams in the region prior to European settlement is unknown because of a lack of historical scientific data. The best available information, GLO records, documents the position and direction of streams only at section lines; the plat maps with these records do not accurately portray the planform of the river between section-line crossings. Further geomorphological research is needed to determine the percentage of total stream length in each category, the specific conditions under which these different channel types develop, and the evolutionary connections among the types. Such information would serve a useful role in efforts to develop naturalized strategies for stream management and to assess the potential success of applying a particular strategy in a specific context.

12.3 Types of channels found in east central Illinois. Also see Figure 12.4

	Description	Comments
1	Straight or smoothly curving trapezoidal channel with uniform bed	Result of recent channelization or maintenance
2	Straight or smoothly curving trapezoidal channel with unvegetated, migrating alternate bars	Seems to develop as the result of a high sediment flux into recently channelized reach with adequate transport capacity
Type 3	Straight or smoothly curving trapezoidal channel with stable, vegetated alternate bars	Origin of bars is unclear. Bars clearly depositional features, not the result of bank slumping, but can deflect flow laterally into bank. May be a transitional form leading to a Type 6 channel
Type 4	Straight or smoothly curving trapezoidal channel with stable pool-riffle sequences	Appears to represent a relatively stable morphology that develops in low-energy, gravel-bed channels
Type 5	Straight or smoothly curving trapezoidal channel containing a meandering low-flow stream flanked by continuous floodplain	Appears to be a relatively stable morphology that develops in the smallest headwater streams. May represent containment of meander belt of an underfit stream within the ditch bottom
Type 6	Straight or smoothly curving trapezoidal channel containing a meandering stream that impinges upon and erodes the ditch banks	Appears to be a transitional form leading to destruction of the ditch by a meandering stream as it re-establishes its sinuousity
Type 7	Straight or smoothly curving channel with natural cross section that may or may not contain vegetated alternate bars	Represents straightened sections that were not deepened substantially and that have recovered their geometric, but not their planform properties
Type 8	Mildly sinuous meandering channel	May represent an evolutionary stage subsequent to Type 7 channels, or to Type 6 channels where the ditch has been destroyed. May be an equilibrium state for low-energy meandering channels
Type 9	Highly sinuous meandering channel	May represent an evolutionary stage subsequent to Type 7 channels. Probably an equilibrium state for the largest headwater channels

Hydrologic characteristics of headwater channels

Previous research has shown that the implementation of drainage improvements for agriculture usually increases rates of runoff from fields and peak flows in streams (Skaggs et al. 1994). These increases are the combined result of additions of subsurface tiles and open ditches to farm-field drainage systems and channelization of streams, both of which tend to move a given volume of water off of the landscape more rapidly than occurred prior to drainage improvements. The effects of land drainage on watershed hydrology tend to be cumulative with the magnitude of the effect increasing in the downstream direction (Spaling and Smit 1995), although the unavailability of adequate historical hydrologic data often precludes conclusive analysis of this problem (Spaling 1995). Such is the case for east central Illinois where little or no data are available on hydrologic conditions prior to the implementation of drainage improvements. Moreover, because no public records are maintained on the installation of field tile drains by individual landowners, the full extent of subsurface tiling in the region is unknown. This situation severely limits attempts to model the watershed-scale effects of tile drainage on streamflow. In addition, no scientific effort has been devoted to estimating the effects of channelization on streamflow in Illinois (Illinois Department of Energy and Natural Resources 1994b) and attempts to isolate the impact of the loss of natural wetlands on runoff rates have proven difficult (Demissie and Khan 1993). A recent study of change in streamflow along the Des Plaines River in northeastern Illinois, using data for a gaging station operated at Riverside, Illinois from 1886 to 1904, and from 1943 to the present, indicates that the median discharge in the 1990s, with approximately 70 to 80% of the watershed in urban development or in agricultural production, is about 400 times greater than it was in the late 1800s, when only 40% of the watershed was developed or used for agriculture (Apfelbaum 1995). Although this study was conducted in a watershed that includes a considerable amount of urban development, it suggests that agricultural drainage certainly has contributed to dramatic change in the hydrologic conditions of streams in Illinois.

Stream gaging data for headwater streams in east central Illinois are limited. A stream gage with one of the longest records is the Kaskaskia River at Bondville, Illinois (US Geological Survey Gaging Station 05590000), which operated between December 1948 and September 1990. The drainage area upstream of this gaging station is only 30 km^2. Mean monthly data for the Kaskaskia River illustrate the characteristic annual hydrologic regime for headwater streams in the region. On average, the greatest amount of runoff occurs in the spring and the least amount of flow occurs in the fall (Figure 12.5a); however, the annual pattern of flow varies considerably from year to year (Figure 12.5b). The hydrologic response of these headwater streams is rather flashy with discrete storm events superimposed upon seasonal variations in baseflow (Figure 12.5b). The hydrographs of storm events are characterized by steep rising limbs, more gently sloping falling limbs, and gradual baseflow recession curves (Figure 12.5c). Flow depth can change by one to two meters within a period of hours following storm events, especially where flow is confined within drainage ditches (Figure 12.5c). In some cases the ditches are large enough to contain infrequent events. The large runoff event in May 1990 for the Kaskaskia River (Figure 12.5b) had the second largest peak discharge recorded over the 42-year period of record for this station (40 $m^3 s^{-1}$), yet this peak flow was completely contained within the drainage ditch comprising the channel of this stream (Figure 12.6). Although confinement of flow within drainage ditches increases values of stream power, the low gradients of the channels (<0.0005) severely constrain the magnitude of energy expenditure of the flow, an issue that will be examined in detail in a subsequent section of this chapter.

Rhoads, B.L. and Herricks, E.E. (1996). Naturalization of headwater streams in Illinois: Challenges and possibilities. In A. Brookes and F.D. Shields Jr. (eds.), River Channel Restoration. Toronto: J. Wiley & Sons: 331-367.

Appendix D-2 – Photo Inventory of Geomorphology Reaches

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-1 Photo 1.JPG

Reach MLC-1 Photo 2.JPG

Reach MLC-1 Photo 3.JPG

Reach MLC-1 Photo 4.JPG

Reach MLC-1 Photo 5.JPG

Reach MLC-1 Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-2 Photo 1.JPG

Reach MLC-2 Photo 2.JPG

Reach MLC-2 Photo 3.jpg

Reach MLC-2 Photo 4.jpg

Reach MLC-2 Photo 5.jpg

Reach MLC-2 Photo 6.jpg

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-3 Photo 1.jpg

Reach MLC-3 Photo 2.jpg

Reach MLC-3 Photo 3.jpg

Reach MLC-3 Photo 4.jpg

Reach MLC-3 Photo 5.JPG

Reach MLC-3 Photo 6.jpg

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-4 Photo 1.JPG

Reach MLC-4 Photo 2.JPG

Reach MLC-4 Photo 3.JPG

Reach MLC-5 Photo 1.JPG

Reach MLC-5 Photo 2.JPG

Reach MLC-5 Photo 3.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-6 Photo 1.jpg

Reach MLC-6 Photo 2.JPG

Reach MLC-6 Photo 3.JPG

Reach MLC-6 Photo 4.JPG

Reach MLC-7 Photo 1.JPG

Reach MLC-7 Photo 2.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach MLC-8 Photo 1.JPG

Reach MLC-8 Photo 2.JPG

Reach MLC-8 Photo 3.JPG

Reach MLC-8 Photo 4.JPG

Reach MLC-8 Photo 5.JPG

Reach MLC-8 Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach OF-1 Photo 1.JPG

Reach OF-1 Photo 2.JPG

Reach OF-1 Photo 3.JPG

Reach OF-1 Photo 4.JPG

Reach OF-1 Photo 5.JPG

Reach OF-1 Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach SC-1 Photo 1.JPG

Reach SC-1 Photo 2.JPG

Reach SC-1 Photo 3.JPG

Reach SC-1 Photo 4.JPG

Reach SC-1 Photo 5.JPG

Reach SC-1 Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach T1a Photo 1.JPG

Reach T1a Photo 2.JPG

Reach T1a Photo 3.JPG

Reach T1a Photo 4.JPG

Reach T1a Photo 5.JPG

Reach T1a Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach T1b Photo 1.JPG

Reach T1b Photo 2.JPG

Reach T1b Photo 3.JPG

Reach T1b Photo 4.JPG

Reach T1b Photo 5.JPG

Reach T1b Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach T1c Photo 1.JPG

Reach T1c Photo 2.JPG

Reach T1c Photo 3.JPG

Reach T1c Photo 4.JPG

Reach T1c Photo 5.JPG

Reach T1c Photo 6.JPG

Appendix: Mohawk Lake Geomorphology Reach Photos

Reach T1d Photo 1.JPG

Reach T1d Photo 2.JPG

Reach T1d Photo 3.JPG

Reach T1d Photo 4.JPG

Reach T1d Photo 5.JPG

Reach T1d Photo 6.JPG

Appendix D-3 – Photo Inventory of Erosion Sites

Appendix: Mohawk Lake Erosion Site Photos

Erosion Site 1 Photo 1.JPG

Erosion Site 1 Photo 2.JPG

Erosion Site 1 Photo 3.JPG

Erosion Site 1 Photo 4.JPG

Erosion Site 1 Photo 5.JPG

Erosion Site 1 Photo 6.JPG

Appendix: Mohawk Lake Erosion Site Photos

Erosion Site 2 Photo 1.JPG

Erosion Site 2 Photo 2.JPG

Erosion Site 2 Photo 3.JPG

Erosion Site 2 Photo 4.JPG

Erosion Site 2 Photo 5.JPG

Erosion Site 2 Photo 6.JPG

Appendix: Mohawk Lake Erosion Site Photos

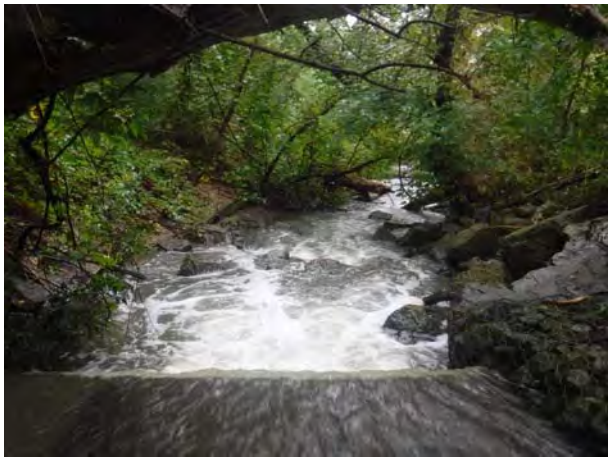
Erosion Site 3 Photo 1.JPG

Erosion Site 3 Photo 2.JPG

Erosion Site 3 Photo 3.JPG

Erosion Site 3 Photo 4.JPG

Erosion Site 3 Photo 5.JPG



Erosion Site 3 Photo 6.JPG

Appendix E-1 – Aquatic Habitat Surveys

Site Identification

Stream Name: MOHAWK LAKE | Stream Code: U/S | Date (yyyy-mm-dd): 2018-09-13

Site Code: MH1 | Alternate Site Code: | Sample: 01 | Site Length (m): 40.0

... Record using NAD83 datum

	Zone	Easting	Northing	
Uncorr. UTM	1			OR → Lat. DD MM SS.sss:
Corr. UTM	1			Long. DD MM SS.sss:

Source of Uncorrected UTM Coord.: GPS/DGPS ☐ GIS ☒ OBM ☐ Other

Source of CorrectedUTM Coordinates: FWIS ☐ Ortho-photos ☐ GIS ☒ Other

Name of Layer Used for Correction:

Access Route

EAST ON 403 SOUTH ON WAYNE GRETZKY PKWY, WEST ON COLBORNE ST E, SOUTH ON DRUMMOND ST, JUMP CURB ONTO WALKWAY, WEST TO END OF PATH

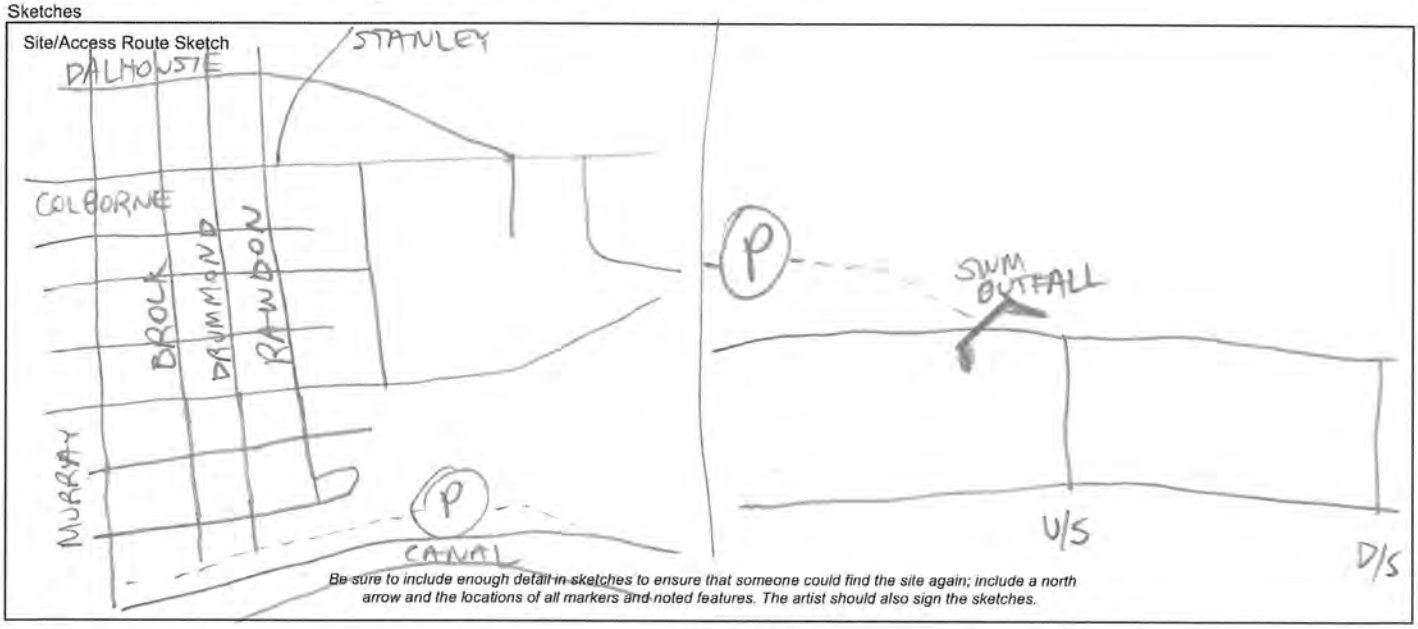
Site Description

PARK @ END OF PATH, TAKE TRAIL WEST TO SW OUTFALL, D/S STARTS ~45 M D/S

☐ **Site Was Unsampleable** - *add reason on reverse*

Sketches

Site/Access Route Sketch



Be sure to include enough detail in sketches to ensure that someone could find the site again; include a north arrow and the locations of all markers and noted features. The artist should also sign the sketches.

Photo No. | Photo Name | Photo Description

Comments

Crew Leader (init. & last name): GEBY

Crew	Recorder	Entered	Verified	Corrected
MBORDI	MB	CE		

Site Marker Details

SITE MARKER DESCRIPTION

Upstream Marker (measure from stake to site) — Bearing (D): 60 — Distance (m): 4.7 — Photo No. (Upstream): — Photo No. (Downstream): — Photo Name:

Upstream Description: Flagged Walnut, Right Bank

Downstream Marker (measure from stake to site) — Bearing (D): 300 — Distance (m): 10.2 — Photo No. (Upstream): — Photo No. (Downstream): — Photo Name:

Downstream Description: Flagged Walnut, Right Bank

Site is Unsampleable

- ☐ Stream dry
- ☐ Insufficient water to sample effectively
- ☐ Stream is no longer present at location (tiled or relocated, etc)
- ☐ Naturally unwadeable (i.e. > 1.5 m deep)
- ☐ Unwadeable due to ponding from a permanent barrier — What is the permanent barrier?
- ☐ Unwadeable due to ponding from temporary barrier (eg. beaver dam) — What is the temporary barrier?
- ☐ Landowner could not be contacted
- ☐ Landowner refused access
- ☐ Inaccessible for safety reasons *(add details in comments below)*
- ☐ Stream is wadeable but not appropriate for the intended sampling

Modules to have been used (e.g. S2.M1, S3.M1):

Comments

Site Features

Mandatory Fields In Grey
Must be filled out for processing

Stream Code: | | | | | | | | | | |

Site Code: M H 1 | | | | | |

Sample: 0 1

Date (mm-dd): 2 0 1 8 0 9 - 1 3

Stream Name: MOHAWK LAKE CANAL U/S

For each landuse, check box that applies. Be sure to include comments explaining the particulars, including names and numbers of contacts

Site Features	Ongoing & Active	Historical Evidence	No Evidence but Reported	No Evidence	Unknown	Comments
Potential Point or Non-point Source Contaminant Sources	☒	☐	☐	☐	☐	MULTIPLE OUTFALLS, INDUSTRY, ROADS
Major Nutrient Sources Upstream	☒	☐	☐	☐	☐	〃
Channel Hardening or Straightening	☒	☐	☐	☐	☐	CANAL
Adjacent Landuses that Destabilize Banks	☒	☐	☐	☐	☐	ROADWAY, PATH
Sediment Loading or Deprivation	☐	☐	☐	☒	☐	
Instream Habitat Modifications	☒	☐	☐	☐	☐	WEIR U/S, CONCRETE BANK U/S
Barriers and/or Dams in the Vicinity of the Site	☒	☐	☐	☐	☐	WEIR U/S
High Fishing Pressure	☒	☐	☐	☐	☐	
Log Jam Deflectors	☒	☐	☐	☐	☐	
Springs or Seeps at the Site	☐	☐	☐	☒	☐	
Impervious Substrate Limiting Burrowing Depth of Fish	☐	☐	☐	☒	☐	
Fish Stocked Near Sample Site	☐	☐	☐	☒	☐	
Other Activities that Could Influence Biota or Habitat	☐	☐	☐	☒	☐	
Intensive Logging Activitties within the Riparian Zone	☐	☐	☐	☒	☐	

Sources of Information
Visual Immediate ☒ Visual Extended ☒ Interview ☐ Maps & Photos ☒

Temperatures
Time (24hr): | | : | | | Air Temp (°C): | | | | |
Water Temp (°C): | | | | | Max Air Temp (°C): | | | | |
Max. Water Temp (°C): | | | | | Source of Max. Air Temp: | | | | | | | | | |

Riparian Vegetation Community
Only check one box for each bank and zone.

	Dominant Vegetation Type													
	Left Bank							Right Bank						
Riparian Zone	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands
1.5-10m	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐
10-30m	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐
30-100m	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐

Comments

Crew Leader (initial & last name): G L B T | | | | | | | | | | | | |

Crew Initials	Recorder	Ent/Scanned	Verified	Corrected
MB	MB			

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Date (mm-dd): 2018-09-13

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 01 of 10

Bearing (D):

Min. Width (m): >3.0

Site Length (m): 40.0

Active Channel Width (m): 12.5

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.08

Points per Transect: 6

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No. Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Size Point (mm)	Particle Size Max. in Ring (mm)	Cover: Unmeasurable	Cover: Quality	Cover: Wood	Cover: Round Rock	Cover: Flat Rock	Cover: Macrophyte	Cover: Bank	Cover: Other	Aquatic Vegetation Types Present: FL	AL	SS	MC	WC	GR	TR
1	1.04	290	0	0.1	15		0										X			
2	3.12	310	0	0.1	8		0													
3	5.2	325	0	0.1	10		0										X			
4	7.28	270	0	0.1	8		0										X			
5	9.36	330	0	0.1	0.1		0													
6	11.44	450	0	0.05	0.1		2	X												

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height ☐	890	500	310	0	0	3
	Substrate Diameters	110	0.05	0.05	0.05		
Right Bank	Height ☐	810	710	570	0	0	4
	Substrate Diameters	0.65	0.05	0.05	0.05		

Dominant Vegetation Type

(Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	X	☐	☐	☐
Right Bank	☐	☐	☐	☐	☐	X	☐

Table Codes

Particle Sizes: *Measure all particles between 2.00mm and 1000mm*

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments:

Crew Leader (initial & last name): GEBY

Crew	Recorder	Ent/Scanned	Verified	Corrected
MBORDI	MB			

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Date (mm-dd): 2011 - -

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 2 of 10

Bearing (D):

Min. Width (m): 73.6

Site Length (m): 46.0

Active Channel Width (m): 12.9

No. of Transects: 10

Transect Spacing (m): 4.49

Point Spacing (m): 2.87

Points per Transect: 6

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Size Point	Particle Size Max. in Ring
1	1.08	305	0	0.10	43
2	3.23	340	0	0.10	12
3	5.38	340	0	0.10	0.10
4	7.53	330	0	0.10	235
5	9.68	320	0	0.10	0.10
6	11.83	370	0	0.05	0.10

Measure depth & hydraulic head to nearest 5 mm

Particle Sizes (mm)

Point No.	Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	FL	AL	SS	MC	WC	GR	TR
1		0													
2		0													
3		0													
4		1		X											
5		0													
6		0													

Cover

Aquatic Vegetation Types Present

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height ☐	765	405	240	0	0	2
	Substrate Diameters	0.1	0.05	0.05	0.05		
Right Bank	Height ☐	795	680	405	0	0	8
	Substrate Diameters	1.20	0.05	0.05	0.05		

Dominant Vegetation Type

(Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	☒	☐	☐	☐
Right Bank	☒	☐	☐	☐	☐	☐	☐

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 3 of 10

Bearing (D):

Min. Width (m): >3.0

Site Length (m): 40.6

Active Channel Width (m): 12.9

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.15

Points per Transect: 6

Date (mm-dd): 201 - -

Transect & Point Layout		
Use this table to determine the number of transects & points required, given the minimum stream width.		
Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Measure depth & hydraulic head to nearest 5 mm: Depth (mm)	Hydraulic Head (mm)	Particle Sizes (mm): Point	Max. in Ring
1	1.68	240	0	0.05	0.1
2	3.23	320	0	0.10	8
3	5.38	350	0	0.05	0.10
4	7.53	320	0	0.05	0.10
5	9.68	330	0	0.05	0.10
6	11.83	250	0	0.05	0.10

Point No.	Cover: Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	Aquatic Vegetation Types Present: FL	AL	SS	MC	WC	GR	TR
1		0													
2		0													
3		0													
4		0													
5		0													
6		2	X												

Bank Angle & Particle Median Diameters
(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height ☐	660	345	280	0	0	2
	Substrate Diameters	0.05	0.05	0.05	0.05		
Right Bank	Height ☐	465	330	230	0	0	3
	Substrate Diameters	300	0.05	0.05	0.05		

Dominant Vegetation Type (Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	☐	X	☐	☐
Right Bank	☐	☐	☐	☐	X	☐	☐

Table Codes

Particle Sizes: *Measure all particles between 2.00mm and 1000mm*

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01 Transect No.: 4 of 10 Bearing (D):

Min. Width (m): >3.0 Site Length (m): 40.0 Active Channel Width (m): 12.7

No. of Transects: 10 Transect Spacing (m): 4.44 Point Spacing (m): 2.12

Points per Transect: 6

Date (mm-dd): 201 - - -

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Measure depth & hydraulic head to nearest 5 mm: Depth (mm)	Hydraulic Head (mm)	Particle Sizes (mm): Point	Max. in Ring	Cover: Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	Aquatic Vegetation Types Present: FL	AL	SS	MC	WC	GR	TR
1	1.06	300	0	0.05	0.10		2				X									X
2	3.18	390	0	0.10	6		6													
3	5.30	410	0	0.05	0.10		0													
4	7.42	320	0	0.05	0.10		0													
5	9.54	280	0	0.05	0.10		0													
6	11.66	250	0	32	225		2		X							X				

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height ☐	840	310	315	0	0	0
	Substrate Diameters	0.05	0.05	0.05	0.05		
Right Bank	Height ☐	520	435	340	0	0	6
	Substrate Diameters	0.05	0.05	0.05	0.05		

Dominant Vegetation Type (Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	☐	☒	☐	☐
Right Bank	☒	☐	☐	☐	☐	☐	☐

Table Codes

Particle Sizes: *Measure all particles between 2.00mm and 1000mm*

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01 Transect No.: 5 of 10 Bearing (D):

Min. Width (m): >3.0 Site Length (m): 40.0 Active Channel Width (m): 13.6

No. of Transects: 10 Transect Spacing (m): 4.44 Point Spacing (m): 2.27

Points per Transect: 6

Date (mm-dd): 201 - -

Transect & Point Layout Use this table to determine the number of transects & points required, given the minimum stream width.		
Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm) (Measure depth & hydraulic head to nearest 5 mm)	Hydraulic Head (mm)	Particle Sizes (mm): Point	Particle Sizes (mm): Max. in Ring
1	1.14	300	0	0.05	0.10
2	3.41	420	0	0.10	14
3	5.68	430	0	0.10	8
4	7.95	290	0	0.05	0.10
5	10.22	215	0	0.05	0.10
6	12.49	265	0	0.05	0.10

Cover

Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other
	2				X		
	0						
	0						
	0						
	0						
	2	X					

Aquatic Vegetation Types Present

FL	AL	SS	MC	WC	GR	TR
						X
		X				

Bank Angle & Particle Median Diameters
(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	Height	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank			985	560	444	0	0	1
	Substrate Diameters		0.05	0.05	0.05	0.05		
Right Bank			1110	750	480	0	0	3
	Substrate Diameters		0.05	0.05	0.05	0.05		

Dominant Vegetation Type (Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank					X		
Right Bank						X	

Table Codes Particle Sizes: *Measure all particles between 2.00mm and 1000mm*	
Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: HAWK LAKE CANAL

Date (mm-dd): 201 - -

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 6 of 10

Bearing (D):

Min. Width (m): >3.0

Site Length (m): 40.0

Active Channel Width (m): 12.5

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.08

Points per Transect: 6

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Size (mm) Point	Particle Size (mm) Max. in Ring
1	1.04	370	0	0.10	80
2	3.12	395	0	0.05	0.10
3	5.20	360	0	0.05	0.10
4	7.28	210	0	0.10	17
5	9.36	180	0	0.05	0.10
6	11.44	230	0	0.05	0.10

Measure depth & hydraulic head to nearest 5 mm

Particle Sizes (mm)

Point No.	Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	FL	AL	SS	MC	WC	GR	TR
1	☐	0	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐
2	☐	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	2	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐

Cover

Aquatic Vegetation Types Present

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

		> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height	☐	1050	740	395	0	0	0
	Substrate Diameters		95	0.05	0.05	0.05		
Right Bank	Height	☐	1575	1210	240	0	80	0
	Substrate Diameters		20	0.10	0.10	0.10		

Dominant Vegetation Type (Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	☐	☐	☒	☐
Right Bank	☐	☐	☐	☐	☐	☒	☐

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Date (mm-dd): 201 - -

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 7 of 10

Bearing (D):

Min. Width (m): >3.0

Site Length (m): 40.0

Active Channel Width (m): 13.2

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.2

Points per Transect: 6

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Size Point	Particle Size Max. in Ring
1	1.1	390	0	0.1	110
2	3.3	270	0	15	60
3	5.5	165	0	20	40
4	7.7	180	0	5	35
5	9.9	185	0	0.05	0.10
6	12.1	230	0	0.05	0.10

Measure depth & hydraulic head to nearest 5 mm

Particle Sizes (mm)

Point No.	Cover: Unmeasurable	Cover: Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	Aquatic Vegetation Types Present: FL	AL	SS	MC	WC	GR	TR
1		2		X							X				
2		0									X				
3		0									X				
4		0									X				
5		0													
6		0													

Cover

Aquatic Vegetation Types Present

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

		> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height	☐	1320	1090	775	0	0	0
	Substrate Diameters		15	145	8	0.10		
Right Bank	Height	☐	1285	1160	630	0	0	0
	Substrate Diameters		35	0.10	25	0.05		

Dominant Vegetation Type

(Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	X						
Right Bank	X						

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHNK01

Site Code: MHNK01

Sample: D1

Transect No.: 8 of 10

Bearing (D):

Min. Width (m): 13.0

Site Length (m): 46.0

Active Channel Width (m): 13.2

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.2

Points per Transect: 6

Date (mm-dd): 201 - - -

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No. Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Size (mm) Point	Particle Size (mm) Max. in Ring
1	1.1	320	0	0.10	110
2	3.3	240	0	12	300
3	5.5	145	0	25	50
4	7.7	220	0	10	35
5	9.9	250	0	0.05	0.10
6	12.1	250	0	0.05	0.10

Measure depth & hydraulic head to nearest 5 mm

Particle Sizes (mm)

Point No.	Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	FL	AL	SS	MC	WC	GR	TR
1		1		X											
2		2			X						X				
3		0									X	X			
4		0									X	X			
5		0													
6		0													

Cover

Aquatic Vegetation Types Present

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height	X				320	0
	Substrate Diameters						
Right Bank	Height		495	450	210	0	3
	Substrate Diameters		0.05	0.05	0.05	0.05	

Dominant Vegetation Type
(Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Meadow	Scrub-land	Forest	Wet-land
Left Bank						X	
Right Bank	X						

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHWK01

Site Code: MHWK01

Sample: 01

Transect No.: 9 of 10

Bearing (D):

Min. Width (m): >3.0

Site Length (m): 40.0

Active Channel Width (m): 13.5

No. of Transects: 10

Transect Spacing (m): 4.44

Point Spacing (m): 2.25

Points per Transect: 6

Date (mm-dd): 201 - -

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No. Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Measure depth & hydraulic head to nearest 5 mm

Point No.	Location (m)	Depth (mm)	Hydraulic Head (mm)	Particle Sizes (mm) Point	Particle Sizes (mm) Max. in Ring
1	1.13	440	0	0.05	0.10
2	3.38	250	0	50	75
3	5.63	245	0	15	40
4	7.88	305	0	10	25
5	10.13	360	0	0.05	0.10
6	12.38	275	0	0.05	0.10

Cover

Point No.	Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other
1		0						
2		0						
3		0						
4		0						
5		0						
6		0						

Aquatic Vegetation Types Present

Point No.	FL	AL	SS	MC	WC	GR	TR
1							
2			X				
3			X				
4			X				
5							
6			X				

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

	> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height: X					590	0
	Substrate Diameters						
Right Bank	Height:	490	435	280	0	0	0
	Substrate Diameters	0.05	0.05	0.05	0.05		

Dominant Vegetation Type (Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Meadow	Scrub-land	Forest	Wet-land
Left Bank					X		
Right Bank	X						

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Channel Morphology

Mandatory Fields In Grey
Must be filled out for processing

Stream Name: MOHAWK LAKE CANAL

Stream Code: MHNK01

Site Code: MHNK01

Sample: 01

Transect No.: 10 of 10

Bearing (D): 290

Min. Width (m): >3.0

No. of Transects: 10

Points per Transect: 6

Site Length (m): 40.0

Transect Spacing (m): 4.44

Active Channel Width (m): 13.9

Point Spacing (m): 2.32

Date (mm-dd): 201 - -

Transect & Point Layout

Use this table to determine the number of transects & points required, given the minimum stream width.

Minimum Width (m)	No.Transects at Site	Points per Transect
> 3.0	10	6
1.5 - 3.0	12	5
1.0 - 1.49	15	3
< 1.0	20	2

Calculations:

Transect Spacing = Site Length / (No. of Transects - 1)

Point Spacing = Active Channel Width / Points per Transect

1st Point = Point Spacing / 2 (from left bank)

Point No.	Location (m)	Measure depth & hydraulic head to nearest 5 mm: Depth (mm)	Hydraulic Head (mm)	Particle Sizes (mm): Point	Max. in Ring
1	1.16	340	0	0.05	0.10
2	3.48	490	0	0.05	0.10
3	5.80	690	0	0.05	0.10
4	8.12	620	0	0.18	15
5	10.44	570	0	0.10	20
6	12.76	320	0	0.10	40

Point No.	Cover: Unmeasurable	Quality	Wood	Round Rock	Flat Rock	Macrophyte	Bank	Other	Aquatic Vegetation Types Present: FL	AL	SS	MC	WC	GR	TR
1		2	☒												
2		0													
3		0													
4		0													
5		0													
6		0													

Bank Angle & Particle Median Diameters

(Bank to tape height; if a height is >2m use check box, else enter values in proper observation points)

		> 2 m	0 mm	250 mm	750 mm	1500 mm	Amount of Undercut (mm)	No. of Veg. Squares on Bank
Left Bank	Height	☒					720	0
	Substrate Diameters							
Right Bank	Height	☐	735	545	230		0	5
	Substrate Diameters		0.05	0.05	0.05			

Dominant Vegetation Type
(Check box of the dominant type within the 1 x 2 m area)

	None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-land
Left Bank	☐	☐	☐	☐	☐	☒	☐
Right Bank	☒	☐	☐	☐	☐	☐	☐

Table Codes

Particle Sizes:
Measure all particles between 2.00mm and 1000mm

Material	Size
Unconsolidated Clay	0.01
Consolidated Clay	0.011
Silt	0.05
Sand	0.10
Large Boulders	1001
Bedrock	1111

Cover Quality:
0 = No Cover
1 = Embedded Cover
2 = Unembedded Cover

Aquatic Vegetation Types:
FL = Filamentous Algae
AL = Non-Filamentous
SS = Moss
MC = Macrophytes
WC = Watercress
GR = Grass
TR = Terrestrial Plants

Comments

Crew Leader (initial & last name)

Crew	Recorder	Ent/Scanned	Verified	Corrected

Benthic Survey Sheet

Mandatory Fields In Grey
Must be filled out for processing

Stream Code: MHWK01 | Site Code: MHWK01 | Sample: 01

Date (mm-dd): 2018 07 13

Stream Name: MOHAWK LAKE

Time (24hr): 14:00

NOTE:
For all measurements, right and left banks defined facing upstream.

Water Quality

Water Temp (°C): | Conductivity (uS/cm): | pH:

DO (mg/L): | Alkalinity (mg/L as CaCO3):

Substrate

Enter dominant substrate class and second dominant class for each sub-sample.

	Collect. Area 1	Collect. Area 2	Collect. Area 3
Dominant	2	5	5
2nd Dominant	6	6	6

Class	Description
1	Clay (hard pan)
2	Silt (floury, <0.06 mm particle diameter)
3	Sand (grainy, 0.06 - 2mm)
4	Gravel (2 - 65 mm)
5	Cobble (65 - 250 mm)
6	Boulder (>250 mm)
7	Bed Rock

Aquatic Macrophytes & Algae

Enter appropriate abundance class for each type and sub-sample.

Macrophytes	Collect. Area 1	Collect. Area 2	Collect. Area 3
Emergent	2	1	1
Rooted Floating	2	1	1
Submergent	2	1	1
Free Floating	2	2	2

Algae	Collect. Area 1	Collect. Area 2	Collect. Area 3
Floating Algae	2	2	2
Filamentous	1	1	1
Attached Algae	0	0	1

Class	Descr
0	Abser
1	Prese
2	Abunc

Riparian Vegetation Community

Only check one box for each bank and zone.

Dominant Vegetation Type

Riparian Zone	Left Bank: None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands	Right Bank: None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands
1.5-10m	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐
10-30m	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐
30-100m	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐

Bankfull Width (m):

Gear Type
- ☐ Poled Seine ☐ Ponar
- ☒ D-Net ☐ Ekman
- ☐ Surber ☐ Other :

Collection Method
- ☐ Rapid Survey
- ☐ Stationary Kick Survey
- ☒ Transect Kick & Sweep
- ☐ Grab

MeshSize (microns)
- ☐ 250 ☐ 600
- ☒ 500 ☐ 1000

(Select the box that most closely represents the mesh size used.)

	Pool or Riffle (P/R)	Sampling Dist.(m)	Sampling Time (min : sec)	Max. Depth (mm)	Hydraulic Head (mm)	Wetted Width (m)	Grabs/ Area
Collection Area 1:	P	3.0	3:00	>1m	0	0.	
Collection Area 2:	P	4.0	3:00	>1m	0	0.	
Collection Area 3:	P	5.0	3:00	>1m	0	0.	

Enter a P or an R to indicate whether the collection was a riffle or pool.

1, 2, or 3 grabs can be collected within each collection area.

% Canopy Cover
- ☒ 0 - 24 ☐ 50 - 74
- ☐ 25 - 49 ☐ 75 - 100

If instrument used, record type:

River Characterization
- ☒ Perennial
- ☐ Intermittent
- ☐ Unknown

Candidate Reference Site? (ie. minimally impacted)
- ☐ Yes
- ☒ No

Pebble sizes (mm) use sizes from table 2

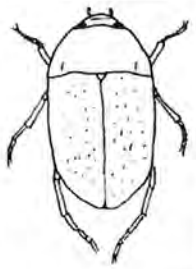
Comments: LAKE PROTOCOL USED

Crew Leader (initial & last name): G EBY

Crew Names: M BORDI

Recorder Init. Entered	Verified	Corrected
MB GE		

Ontario Benthos Biomonitoring Network Field Sheet-LAKES



Date: 09/13/18
Time 14.00
Agency:
Investigators: CE + MB

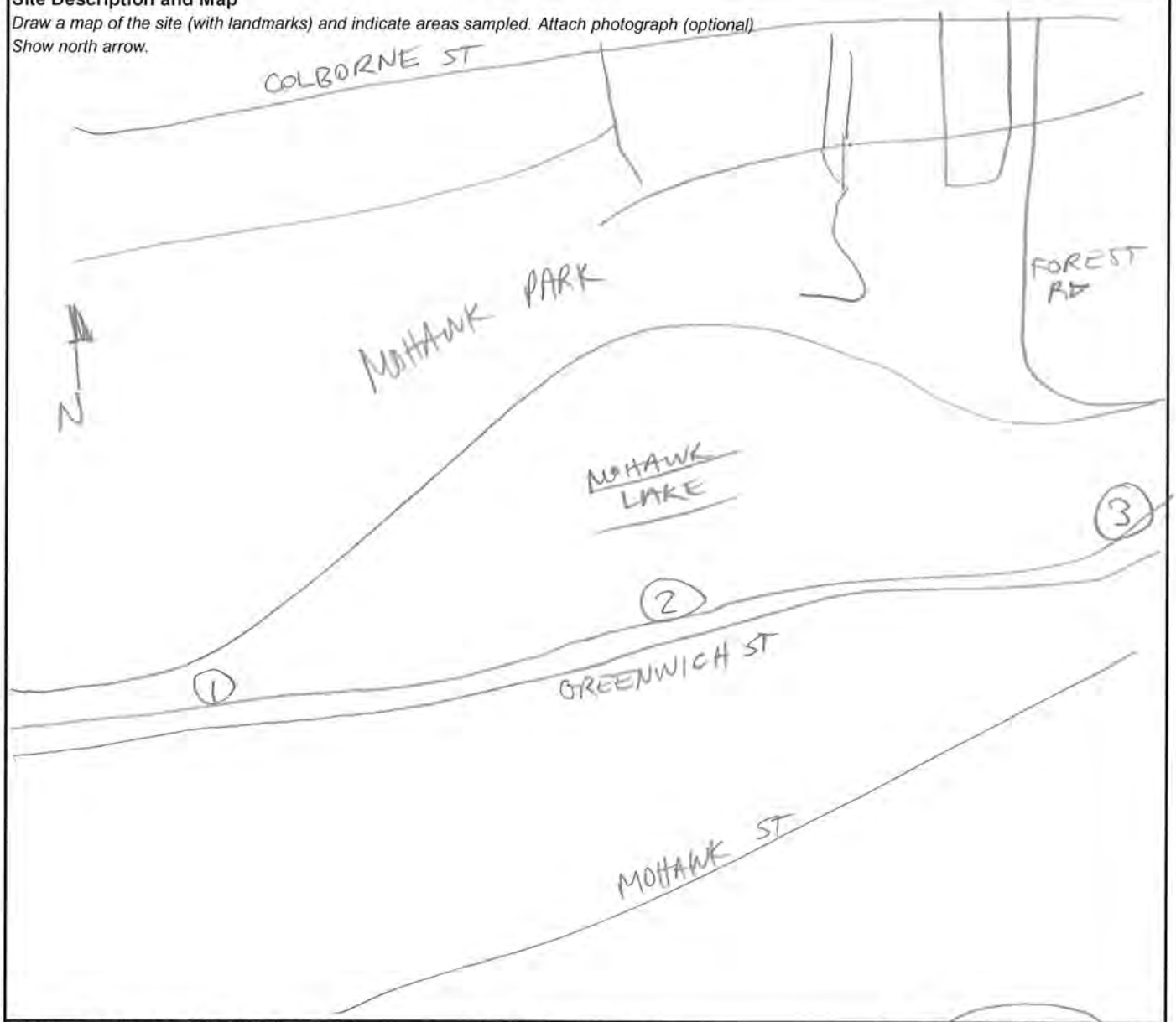
Lake Name: MOHAWK
Site #: 1
Location (centroid of 3 replicates, use deg./min./sec. or specify other)
Latitude: Elevation (m asl):
Longitude:

Water Quality

Water Temperature (°C): Conductivity (uS/cm): pH:
DO (mg/l): Alkalinity (mg/l as $CaCO_3$):

Site Description and Map

Draw a map of the site (with landmarks) and indicate areas sampled. Attach photograph (optional).
Show north arrow.



Benthos Collection Method (circle one):
• Traveling Kick & Sweep • Other (specify):

Gear Type (circle one)
• D-net • Other (*specify*):

Mesh Size: 500 micron (or specify)

Replicates	Sampling distance covered (m)	Time (min.)	Max. Depth (m)	Replicate locations (Degrees/Minutes/Decimal seconds or specify): Latitude	Longitude
Sample 1	3.0	3	7/m		
Sample 2	4.0	3	7/m		
Sample 3	5.0	3	7/m		

Appendix E-2 – Vegetation Communities Table

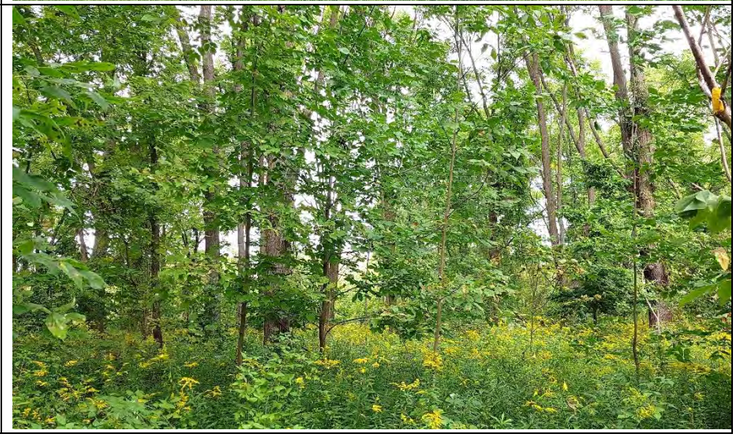
Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
1	SWD3-3 / SWD1	Swamp Maple Mineral Deciduous Swamp / Oak Mineral Deciduous Swamp Complex	GNR	S5	Located at the north end of Mohawk Park, this is a mature treed swamp community dominated by a mix of shagbark hickory (*Carya ovata*), Freeman's maple (*Acer x freemanii*), red maple (*A. rubra*), and black oak (*Quercus velutina*). Common buckthorn (*Rhamnus cathartica*) dominates the understory. Ground cover is patchy but diverse, including abundant fowl manna grass (*Glyceria striata*) and occasional Canada enchanter's nightshade (*Circaea lutetiana ssp. canadensis*), yellow avens (*Geum aleppicum*), field horsetail (*Equisetum arvense*), starry Solomon's seal (*Maianthemum stellatum*), one-sided aster (*Aster lateriflorus var. lateriflorus*), spotted crane's-bill (*Geranium maculatum*) and fowl blue grass (*Poa palustris*). The soil is comprised of sandy loam in the top 10 cm (A layer), below which lies a sandy clay layer (B) to 50 cm, then transitioning to medium sand (C). Mottles occurred in the top 10 cm (A) and gley started at 50 cm (C). The water table was reached at 70 cm.	
2	FOD2-2	Dry - Fresh Oak - Hickory Deciduous Forest	G4?	S3S4	Located throughout undeveloped portions of Mohawk Park, including at the north end and along Mohawk Lake, this mature deciduous forest includes a mix of white oak (*Quercus alba*), red oak (*Q. rubra*), black oak, and pignut hickory (*Carya glabra*). The understory is characterized by dense common buckthorn, choke cherry (*Prunus virginiana*), and western poison-ivy. The ground cover is fairly dense and comprised of a diverse mix of species including abundant jumpseed (*Polygonum virginianum*) and occasional pointed-leaved tick-trefoil (*Desmodium glutinosum*), spotted crane's-bill, starry Solomon's seal, zig-zag goldenrod (*Solidago flexicaulis*), large-leaved aster (*Aster macrophyllus*), arrow-leaved aster (*A. urophyllum*). The soil consists of sandy loam in the top 10 cm (A), below which lies medium sand (B). Mottles were encountered at 70 cm (B). Neither the water table nor gley was not encountered.	
3	OAO	Open Aquatic	-	-	This community characterizes Mohawk Lake and the canal. Primarily open water, species associated with shallow aquatic and riparian edge habitats near the shoreline were inventoried. Overhanging tree species provide some shade to this aquatic habitat; however, canopy cover associated with Community 3 is limited to overhanging shoreline trees and shrubs. Shallow water vegetation includes, narrow-leaved cattail (*Typha angustifolia*), common arrowhead (*Sagittaria latifolia*) and pondweed (*Potamogeton sp.*). The riparian edge includes a range of common wetland and edge grasses and forbs, including patches of common reed (*Phragmites australis*), sedges (*Carex spp.*), rushes (*Juncus spp.*), fowl blue grass, spotted touch-me-not (*Impatiens capensis*), spotted joe-pye-weed (*Eupatorium maculatum ssp. maculatum*), common boneset (*E. perfoliatum*), panicled aster (*Aster lanceolatus ssp. lanceolatus*), and one-sided aster.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
4	CGL_2 (2008)	Parkland	-	-	Community 4 represents the managed portions of Mohawk Park. It is comprised mainly of open grown mature trees and manicured lawn. The tree species present include many of the species present in the adjacent forested areas (Communities 1 and 2), including a variety of oaks, hickories, and maples, as well as eastern white pine (*Pinus strobus*), Scots pine (*P. sylvestris*), hackberry (*Celtis occidentalis*), eastern cottonwood (*Populus deltoides ssp. deltoides*), small-leaved linden (*Tilia cordata*), eastern white cedar (*Thuja occidentalis*), and eastern hemlock (*Tsuga canadensis*).	
5	FOD6-5	Fresh - Moist Sugar Maple - Hardwood Deciduous Forest	GNR	S5	This small pocket of lowland forest is associated with a minor drainage feature in the eastern portion of Mohawk Park. The canopy is characterized by abundant sugar maple (*Acer saccharum* ssp. *saccharum*) and Freeman's maple, with occasional green ash, crack willow (*Salix fragilis*), and Manitoba maple (*Acer negundo*). The understory contains abundant common buckthorn and red-osier dogwood (*Cornus stolonifera)*. Ground cover is fairly limited, with abundant garlic mustard (*Alliaria petiolata*) and common species tolerant of disturbance such as yellow avens, one-sided aster, common strawberry (*Fragaria virginiana ssp. virginiana*), periwinkle (*Vinca minor*), and ground ivy (*Glechoma hederacea*). The soil consists of sandy clay loam in the top 15 cm (A), below which lies medium sand (B). Mottles were encountered at 30 cm (B). At the time of surveys in summer 2018, no surface water was present. Neither the water table nor gley was not encountered.	
6	FOD7-4	Black Walnut Lowland Deciduous Forest	G4?	S2S3	Situated along the moisture gradient associated with the valley slope between Forest Road and Mohawk Lake. The canopy is dominated by black walnut (*Juglans nigra*), with occasional eastern cottonwood, and Manitoba maple. Vines such as riverbank grape, thicket creeper, western poison ivy, and virgin's bower (*Clematis virginiana*), and sprawling black raspberry (*Rubus occidentalis*) are prevalent throughout this community. The understory contains abundant common buckthorn and red-osier dogwood, with occasional riverbank grape, thicket creeper, and western poison ivy. Ground cover includes abundant Canada goldenrod (*Solidago canadensis*), garlic mustard, and yellow avens, with occasional enchanter's nightshade, Virginia false dragonhead (*Physostegia virginiana*), and smooth bedstraw (*Galium mollugo*). The soil consists of loam in the top 20 cm (A), below which lies silty loam (B) to a depth of 80 cm. A third horizon (C) consists of silt. Mottles were encountered at 35 cm (B). Neither the water table nor gley was encountered.	

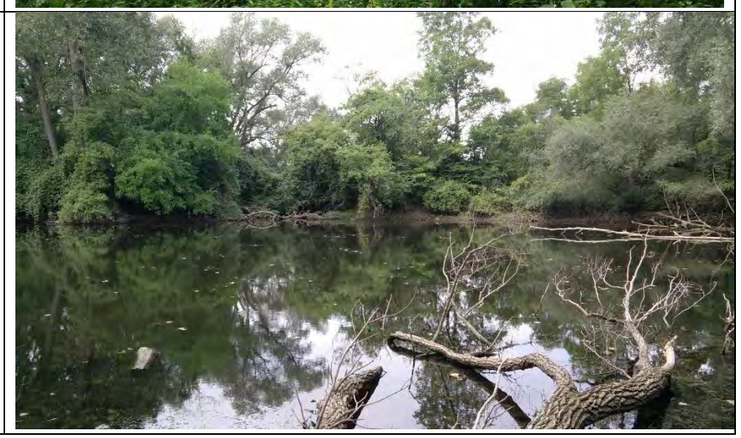
Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
7	CUW1	Mineral Cultural Woodland	-	-	Located along the highly disturbed embankment slope between Forest Road and the canal. This cultural woodland area is characterized by a very young canopy dominated by black walnut, with abundant staghorn sumac (*Rhus typhina*). Manitoba maple, eastern cottonwood, black locust (*Robinia pseudo-acacia*), white mulberry (*Morus alba*), common buckthorn, and planted redbud (*Cercis canadensis*) are also present. The ground layer is dominated by Kentucky blue grass (*Poa pratensis ssp. pratensis*), with abundant smooth bedstraw and Canada goldenrod.	
8	FOD2-4	Dry - Fresh Oak - Hardwood Deciduous Forest	G?	S5	This community comprises the bulk of the vegetation present throughout the valley system between Mohawk Park and Locks Road. The canopy is dominated by red and white oak, while some areas include prominent stands of sugar maple. The understory is fairly open, with abundant common buckthorn and scattered multiflora rose (*Rosa multiflora*), Tartarian honeysuckle (*Lonicera tatarica*), choke cherry, witch-hazel (*Hamamelis virginiana*), hawthorn (*Crataegus sp.*) and red raspberry (*Rubus idaeus ssp. idaeus*). The ground cover is characterized by abundant garlic mustard (*Alliaria petiolata*) with occasional enchanter's nightshade, western poison ivy, and patches of common forest species such as lopseed (*Phryma leptostachya*), Virginia stickseed (*Hackelia virginiana*), zig-zag goldenrod, jack-in-the-pulpit (*Arisaema triphyllum ssp. triphyllum*), and spinulose wood fern (*Dryopteris carthusiana*). The soil is comprised of thick clay in the upper layer. No mottles, gley, nor water table were encountered.	
9	FOD7	Fresh - Moist Deciduous Lowland Forest	-	-	This community characterizes the floodplain and lowland portions of the valley system between Mohawk Park and Locks Road. The canopy includes abundant black walnut, with occasional hybrid white willow (*Salix x rubens*), eastern cottonwood, and sugar maple. Riverbank grape, thicket creeper, and common buckthorn are prevalent in the understory. Ground cover includes abundant spotted touch-me-not and creeping bentgrass (*Agrostis stolonifera*) along the creek, with garlic mustard, western poison ivy, and a variety of common wetland and forest species on the banks. The soil is comprised of thick clay in the upper layer. Coarse fragments were encountered at 20 cm. No mottles, gley, nor water table were encountered.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
10	CUM1-1	Dry - Moist Old Field Meadow	-	-	Located north and west of Mohawk park, this community previous used for agricultural activities, and is now naturalizing with a suite of common old field and edge species. Common ragweed (*Ambrosia artemisiifolia*) and bristly foxtail (*Setaria verticillata*) are abundant throughout the fields. Other species present include Canada goldenrod, common dandelion (*Taraxacum officinale*), large crabgrass (*Digitaria sanguinalis*), horseweed (*Conyza canadensis*), and common mullein (*Verbascum thapsus*).	
11	CUW1 / CUT1 / CUM1-1 Complex	Mineral Cultural Woodland / Mineral Cultural Thicket / Dry - Moist Old Field Meadow Complex Inclusion: FOD7-3 Fresh - Moist Willow Lowland Deciduous Forest	- Incl: GNR	- Incl: S4S5	Community 11 is located in the northwest corner of the study area and encompasses a large complex of cultural community types varying in assemblage from very open to treed. This area is highly disturbed, with numerous informal trails, including signs of ATV usage, earth movement, and dumping. Canopy cover includes occasional trembling aspen (*Populus tremuloides*), black walnut, basswood (*Tilia americana*), with a suite of other common species scattered throughout. The understory includes abundant grey dogwood (*Cornus foemina ssp. racemosa*), common buckthorn, and riverbank grape. The ground cover is very diverse, with the most abundant species being Canada goldenrod, garlic mustard, and common ragweed.	
12	SWD4-1	Willow Mineral Deciduous Swamp	GNR	S4	Located in pockets within Community 11, this swamp community is dominated by hybrid white willow with trembling aspen, Manitoba maple, and red ash (*Fraxinus pennsylvanica*) also present. Understory species include slender willow (*Salix petiolaris*), sandbar willow (*Salix exigua*), common buckthorn, and red-osier dogwood. Ground cover includes obligate wetland plants purple loosestrife (*Lythrum salicaria*) and northern water-horehound (*Lycopus uniflorus*). The top 5 cm of soil consists of organic material, underlain by coarse sand. No gley or mottles were encountered.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
13	MAMM1-12 (2008)	Common Reed Graminoid Mineral Meadow Marsh	-	-	Located along the northwest shore of Mohawk Lake, this riparian wetland is dominated by invasive common reed. Other noted species include rare-to-occasional reed canary grass (*Phalaris arundinacea*), wild cucumber (*Echinocystis lobata*), common buckthorn, riverbank grape (*Vitis riparia*), and black locust.	
14	CUW1	Mineral Cultural Woodland	-	-	Community 14 is located in a narrow strip along the south side of the canal, north of Greenwich Street. The canopy includes abundant Norway maple (*Acer platanoides*) and black walnut; other canopy and sub-canopy species present include Manitoba maple, red ash, white mulberry, tree-of-heaven (*Ailanthus altissima*), and hybrid white willow. Ground cover includes abundant Kentucky blue grass but also a variety of other grasses and forbs. Overall, the community is highly disturbed and includes a large number of non-native plant species.	
15	CUW1	Mineral Cultural Woodland	-	-	This community type is found on the south side of Mohawk Lake south of Greenwich Street, on either side of the hydro cut, and in a narrow strip along Mohawk Street in the southern part of the study area. Canopy species include abundant eastern cottonwood with some red ash, Manitoba maple, black walnut, tree-of-heaven, and eastern white pine. Common buckthorn and staghorn sumac are abundant in the shrub layer, and ground cover species include abundant Canada goldenrod, panicled aster, bird's-foot trefoil (*Lotus corniculatus*), quack grass (Elymus repens), and garlic mustard. Evidence of dumping was documented in this unit.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
16	FODM7-7 (2008)	Fresh - Moist Manitoba Maple Lowland Deciduous Forest	-	-	This lowland forest unit is located south of Mohawk Lake next to the rail trail and roads. Manitoba maple dominates the canopy and sub-canopy with tree-of-heaven, red ash, black walnut, Freeman's maple, white mulberry, and eastern red cedar also present. Ground cover included abundant common hop (*Humulus lupulus*) and garlic mustard, with a variety of occasional-to-rare associates such as giant ragweed (*Ambrosia trifida*), common burdock (*Arctium minus* ssp. *minus*), one-seeded bur cucumber (*Sicyos angulatus*), dame's rocket (*Hesperis matronalis*), and yellow avens. Invasive Japanese knotweed (*Polygonum cuspidatum*) was documented as a rare occurrence next to Mohawk Road. Evidence of dumping was noted along the edges of this unit, near parking lots. Surficial soil texture was sandy loam; no evidence of mottles, gley, or water table was encountered.	
17	CUM1-1 (2008)	Dry - Moist Old Field Meadow	-	-	Typical of old-field meadows in southern Ontario, this community is dominated by common and/or non-native grasses and forbs such as quack grass, grass-leaved goldenrod (*Euthamia graminifolia*), bird's-foot trefoil, and Canada goldenrod. Invasive common reed is a rare occurrence in this unit.	
18	FOD7-4	Black Walnut Lowland Deciduous Forest	G4?	S2S3	Site access was not permitted for this unit, so community assessment was completed using observations obtained from the edges. Black walnut was almost completely dominant in the canopy and sub-canopy, with occasional red ash and rare occurrences of silver maple (*Acer saccharinum*) and eastern cottonwood. Canada goldenrod dominated the understory.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
19	MAS2-1	Cattail Mineral Shallow Marsh	G5	S5	Community 19 is essentially a monoculture of broad-leaved cattail (*Typha latifolia*) with occurrences of common reed and bittersweet nightshade (*Solanum dulcamara*).	
20	FOD7-3 / FOD 7-4 Inclusion of: FOD2-4 Dry - Fresh Oak - Hardwood Deciduous Forest	Willow Lowland Deciduous Forest / Black Walnut Lowland Deciduous Forest Complex	GNR / G4? Incl: G?	S4S5 / S2S3 Incl: S5	Community 20 occurs in the valley of a restored creek at the eastern project limits. Dominant canopy species include black walnut and hybrid white willow, with eastern cottonwood, red ash, and Manitoba maple. Hackberry and Ohio buckeye (Aesculus glabra) are rare inclusions in this unit; Ohio buckeye is an S1 species in Ontario. The oak-hardwood deciduous forest inclusion was noted to include white oak, red oak, shagbark hickory, sugar maple, alternate-leaved dogwood (*Cornus alternifolia*), and black cherry (*Prunus serotina*).	
21	SAF1-3	Duckweed Shallow Aquatic	G5Q	S5	This community consists of a small pond south of the canal, near the confluence with the Grand River. The edges of the pond include black walnut, Manitoba maple, common buckthorn, and gray dogwood. Lesser duckweed (*Lemna minor*), Columbia water meal (*Wolffia columbiana*), rice cut grass (*Leersia oryzoides*), and cut-leaved water horehound (*Lycopus americanus*) are abundant in the community.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
22	CUW1 / CUS1	Mineral Cultural Woodland / Mineral Cultural Savannah Complex	-	-	Community 22 is found adjacent to the rail line and includes the remnants of past structures (i.e., old foundations, paved areas). The cultural origin of this community is evident in the predominance of common early-succession and/or non-native plant species. Canopy species include black walnut, eastern cottonwood, Manitoba maple, and black locust. Other species present include Canada goldenrod, Kentucky blue grass, reed canary grass, wild carrot (*Daucus carota*), trailing crown-vetch (*Coronilla varia*), and Japanese knotweed.	
23	FODM8-3 (2008)	Fresh - Moist Cottonwood Deciduous Forest	-	-	The canopy and subcanopy of Community 23 consist primarily of eastern cottonwood, black walnut, common buckthorn, and Freeman's maple. Other species observed include: white avens (*Geum canadense*), yellow avens, Canada goldenrod, dame's rocket, garlic mustard, giant ragweed, Virginia stickseed, and spotted touch-me-not. A high level of disturbance was observed in this community (e.g., dumping, unofficial trails).	
24	SAS1	Submerged Shallow Aquatic	-	-	This community consists of a dug pond with a berm around the perimeter. An oily sheen was observed on the water, and there was some evidence of groundwater inputs. Fallen logs and large woody debris provided wildlife habitat. Vegetation around the edge of the pond included crack willow, Manitoba maple, eastern cottonwood, red-osier dogwood, Tartarian honeysuckle, soft rush (*Juncus effuses* ssp. *solutus*), common reed, and northern water-horehound. In-water vegetation was dominated by bladderwort (*Utricularia* sp.) with lesser duckweed also present.	

Polygon	Vegetation Community		Ranking		Vegetation Community Description	Representative Photo
	Code	Name	Global	Provincial		
25	MAM3-2	Reed Canary Grass Organic Meadow Marsh	GNR	S5	Community 25 is located along a seasonally-dry creek bed. Reed canary grass is dominant, with spotted touch-me-not, bittersweet nightshade, and devil's beggar-ticks (*Bidens frondosa*) also abundant. Other species present include common buckthorn, grey dogwood, wild cucumber, riverbank grape, purple-stem aster (*Aster puniceus* var. *puniceus*), Manitoba maple, and cut-leaved water-horehound. Organic soil was observed up to 1 m depth in this community.	
26	CUT1 / CUM1-1	Mineral Cultural Thicket / Dry - Moist Old Field Meadow Inclusion of A: MAS2-1 - Cattail Mineral Shallow Marsh B: MAM2-10 - Forb Mineral Meadow Marsh	- Incl A: G5 B: G?	- Incl A: S5 B: S4S5	Community 26 is a cultural meadow site succeeding to thicket, with small localized wet inclusions. The majority of the unit is dominated by Kentucky blue grass, with associates including Canada goldenrod, smooth bedstraw, New England aster (*Aster novae-angliae*), black walnut, Manitoba maple, grey dogwood, common buckthorn, Siberian elm (*Ulmus pumila*), white clover (*Trifolium repens*), one-sided aster, wild carrot, and arrow-leaved aster. The cattail shallow marsh inclusion is dominated by narrow-leaved cattail with occasional spotted touch-me-not, northern water-horehound, and slender willow. The forb meadow marsh inclusion contained abundant devil's beggar-ticks with purple loosestrife, field horsetail, blue vervain (*Verbena hastata*), Manitoba maple, and sedges also documented.	

Appendix E-3 – Ecological Land Classification (ELC) Field Data Forms

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Highhawk Lake		POLYGON: 1	
SURVEYOR(S): Ash + Nick	DATE: 22 Aug '16	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL ● WETLAND G AQUATIC	G ORGANIC ● MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE ● BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	● NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD G GRAMINOID G FORB G LICHEN G BRYOPHYTE ● DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH ● SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER ● SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB ● TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	CARO VAT = ACER NEG GIL > ACER RUBR = QUERUBR
2	SUB-CANOPY	2	2	ULMAMER
3	UNDERSTOREY	3	4	
4	GRD. LAYER	6	2	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	X	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:		
COMMUNITY SERIES:		
ECOSITE:		
VEGETATION TYPE:	"OAK - MAPLE SWAMP SILVER MAPLE SWAMP	FOD9-2? SWD?
INCLUSION		
COMPLEX		

Notes:

- Dumping by Park adj to trails
- earth works

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

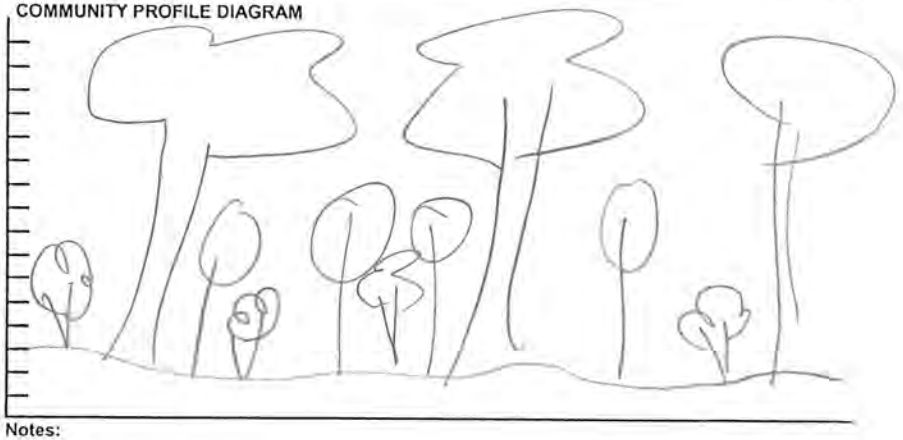
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			5		—	—	—			
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 0-10cm B 10-17 C 17-50 D 50-100				
A TEXTURE	SL				
COURSE FRAGMENTS	none				
B TEXTURE	SC				
COURSE FRAGMENTS	None				
C TEXTURE	mS				
COURSE FRAGMENTS	none				
EFFECTIVE TEXTURE					
SURFACE STONINESS	none				
SURFACE ROCKINESS	None				
DEPTH TO / OF					
MOTTLES	10 cm				
GLEY	50 cm				
BEDROCK	>100				
WATER TABLE	70cm				
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

D: clay

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 1
DATE: 22 Aug 2018
SURVEYOR(S): Ashanie

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
CARUVAT	D				
ULMAMER		O			
ACENEGU	O	O			
FRAPENN		O	O		
ACERFRE	A	O			
ACERUBR	O	O			
CATSPEC	R				
QUERUBR	O	O			
CARGLAB		O			
TILAME	R	R			
QUEVELU	O	O			
RHACATH			D		
PRUVIRG			O		
RUBALE			R		
SORAUCU		R	O		
CORRACE			O		
PRUSERO			R		
QUEBICO	O	O			
CORAMER			R		
CARCARO			R		
HAMVIRG			R		
AMEARBO			R		
ZANAMER			R		
VITRIPA			O		
RHURYDB			O		
dewberry RUBHISP			R		
PARINSE			D		

SPECIES CODE	LAYER 1	2	3	4	COL.
LOPSEED				A	
bittersweet nightshade				O	
ACHALEP				O	
RHURAME				O	
TOXVIRG				O	
VIOL-SP				R	
EQUARVE				O	
GLYSTRI				O	
CAR-SP				O	
CARROSE				R	
[illegible]				O	
[illegible]				R	
FRAVESC				O	
SOLCANA				R	
LYCUNIF				O	
ASTLAL A				O	
LOBSIPH				R	
GERMACU				O	
POAPALU				O	
PODROLE				O	
ONOSENS				R	
CARLURI				O	
skunk cabbage				R	
horse nettle				R	
CALCANA				R	
SPIALBA				R	
THADIOI				R	
ARITRI				R	
APOANDR				R	
TRIEREC				O	
BIDFRON				R	
PIL-SP				R	

marsh fern R

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 1
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

X	VERNAL POOLS	X	SNAGS
	HIBERNACULA	X	FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
B	EAWO	OB,VO		1					
B	Robin	VO		-					
B	Chipmunk	OB		1					
B	Woodpecker	VO		-					
B	Great Horned	VO		1					
	Owl	OB							

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: MOHAWK LAKE		POLYGON: 2	
SURVEYOR(S):	DATE:	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(•) TERRESTRIAL	G ORGANIC	G LACUSTRINE	(•) NATURAL	G PLANKTON	G LAKE
G WETLAND	(•) MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
	G BASIC BEDRK.	G VALLEY SLOPE		G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
		(•) ROLL. UPLAND		G BRYOPHYTE	G FEN
		G CLIFF		(•) DECIDUOUS	G BOG
		G TALUS		G CONIFEROUS	G BARREN
		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			(•) FOREST
					G PLANTATION

SITE	COVER
G OPEN WATER	G OPEN
G SHALLOW WATER	G SHRUB
(•) SURFICIAL DEP	(•) TREED
G BEDROCK	

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	
2	SUB-CANOPY	2	3	
3	UNDERSTOREY	3	4	
4	GRD. LAYER	6	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT≤0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	X	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:		
COMMUNITY SERIES:		
ECOSITE:		
VEGETATION TYPE:	DRY-FRESH OAK-HICKORY DEC. FOREST	FOD2-2
INCLUSION		
COMPLEX		

Notes:

ELC
STAND CHARACTERISTICS

SITE:
POLYGON:
DATE:
SURVEYOR(S):

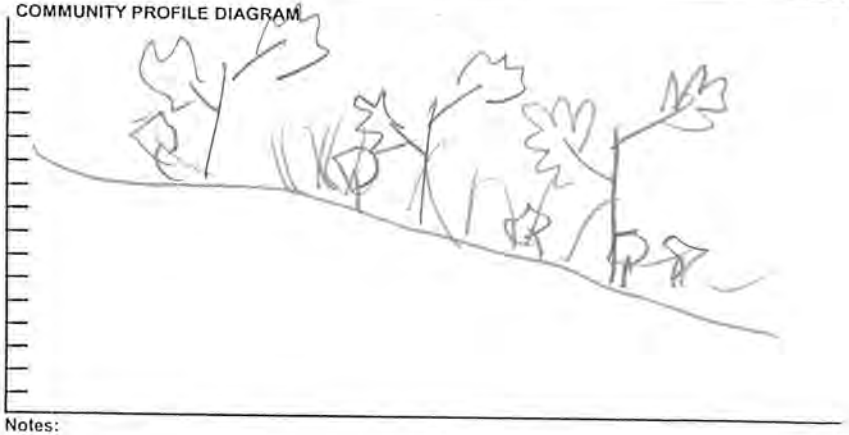
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1				3					17	562180	4776232
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 0-10 / B 10-				
A TEXTURE	SL				
COURSE FRAGMENTS	none				
B TEXTURE	MS				
COURSE FRAGMENTS	none				
C TEXTURE	/				
COURSE FRAGMENTS	/				
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES	70				
GLEY	no				
BEDROCK	>120				
WATER TABLE	>120				
CARBONATES	/				
DEPTH OF ORGANICS	/				
PORE SIZE DISC #1	/				
PORE SIZE DISC #2	/				
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

Spring @ 562216, 4776219 ±3-4m

ELC PLANT SPECIES LIST

SITE: Mohawk

POLYGON: 2

DATE: 22 Aug 2018

SURVEYOR(S): ARTNS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
QUEALBA	O				
PRUSERO		O	O		
FRAPENN			O		
ACERUBR		O			
QUERUBR	O				
QUEVELU	O			R	
ACESACA				R	
CARGLAB	R				
TILAMER		R	R		
JUGNIGR	R		R		
CELOCCI		R	R		
PRUVIRG			A		
CORFOEM			R		
RHACATH			A		
RUBALLE			R		
VIBACER			O		
HAMVIRG			R		
CRAMACR		R			
RIBODID			R		
VITRIPA			R		
PARINSE			O		
CEL-			R		
RHURYDB			A		

SPECIES CODE	LAYER 1	2	3	4	COL.
DESGLUT				O	
POLPUBE				O	
GERMACC				O	
CARPENS				R	
SOLFLEX				O	
MAISTEL				O	
ASTMACR				O	
POTANSE				R	
VIO-SP				R	
EVOOBOV				R	
ALLPET1				O	
Mangopple				R	
ARITRIP				R	
ACT-SP				R	
GEUCANA				R	
Jumpseed POLVIR M				A	
CONARVE				O	
GEUALEP				O	
ASTUROP				O	
Jerusalem Artichoke				R	
thistle weed				R	
rattlesnake root				R	
SOLARGU				R	
ASTCORD				R	
SOLCANA				R	
DACGLOM				R	
MAIRACE				R	
OXASTRI				R	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 8
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
B	RWBL	OB	VO	1					
B	NOFLICK	DP		1					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 3	
SURVEYOR(S): Ash + Nick	DATE: 22 Aug '18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	● LACUSTRINE	G NATURAL	G PLANKTON	● LAKE
G WETLAND	● MINERAL SOIL	G RIVERINE	● CULTURAL	G SUBMERGED	G POND
● AQUATIC	G PARENT MIN.	G BOTTOMLAND		● FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
	G BASIC BEDRK.	G VALLEY SLOPE		G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
		G ROLL. UPLAND		G BRYOPHYTE	G FEN
		G CLIFF		G DECIDUOUS	G BOG
		G TALUS		G CONIFEROUS	G BARREN
		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION
SITE			COVER		
● OPEN WATER			● OPEN		
G SHALLOW WATER			G SHRUB		
G SURFICIAL DEP.			G TREED		
G BEDROCK					

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	1	
2	SUB-CANOPY	3	1	
3	UNDERSTOREY	4	1	
4	GRD. LAYER	6	1	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	x	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Open Aquatic	OA
COMMUNITY SERIES:	Open Aquatic	OAO
ECOSITE:		
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes: Mohawk Lake + Northern riparian fringe

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

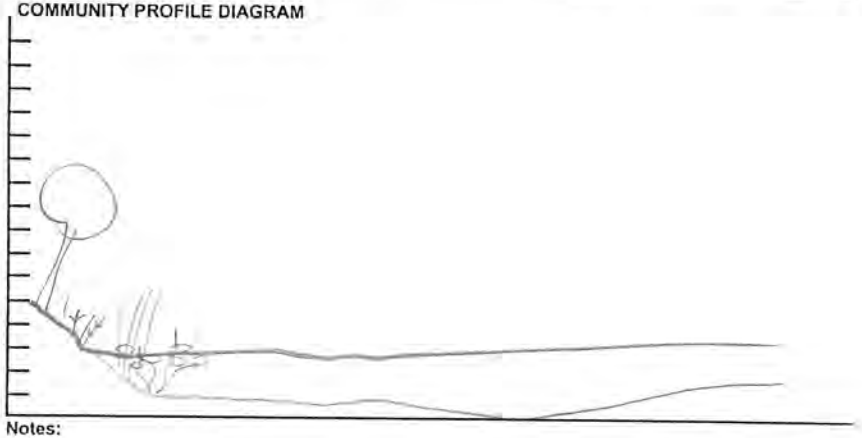
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 3
DATE: 22 Aug 2018
SURVEYOR(S): Ash + Nick

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
SALRUBE	D	D			
ROBPSEU		R	R	R	
RHACATH		O	O		
silky dogwood			O		
grey dogwood			O		
PHYOPUL			O		
wildcane				R	
RIBAMER				O	
PHAARUN				O	
yellow vine				R	

SPECIES CODE	LAYER 1	2	3	4	COL.
carpenter's square				R	
ASTLANC				O	
CONARVE				O	
POL_				O	X
PRUNUVU				O	
CAR_SP1				O	
CAR_SP2				O	
JUN_SP1				O	
LOBSIPH				R	
SOLARGU				R	
LYTSALI				R	
CHEGLAB				IR	
LYCUNIF				IR	
CALCANA				R	
tall meadow rue				R	
spotted H2O hemlock				R	
JUNTENU				O	
POAPALU				O	
PLAMAJO				O	
ASTLACA				O	
TYPANGU				O	
IMPCAPE				O	
soft stemmed bulrush				O	
PHRAUST			A	A	
EUPMACU				O	
EUPPERF				O	
JUNTORR				O	
CARVULP				O	
EUTGRAM				O	
VITRIPA				O	
PILFONT				R	

no fruit

SAG LATI
POT SP

ELC

MANAGEMENT / DISTURBANCE

SITE: Mohawk Lake
POLYGON: 3
DATE: 22 Aug 2018
SURVEYOR(S): AVBO NS

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE:
POLYGON:
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
B	Bald Eagle	OB							

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 4	
SURVEYOR(S): Nick + Kristina	DATE: Sept 5/18	TIME: start 10:00 / finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK G BASIC BEDRK G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

Parkland

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	
2	SUB-CANOPY	2	1	
3	UNDERSTOREY	3	1	
4	GRD. LAYER	7	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR < 10% 2= 10 < CVR < 25% 3= 25 < CVR < 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	✓	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:		
COMMUNITY SERIES:		
ECOSITE:		
VEGETATION TYPE:	PARKLAND	
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS

SITE:	Mohawk Lake
POLYGON:	4
DATE:	Sept. 5 /18
SURVEYOR(S):	Nick + Kristina

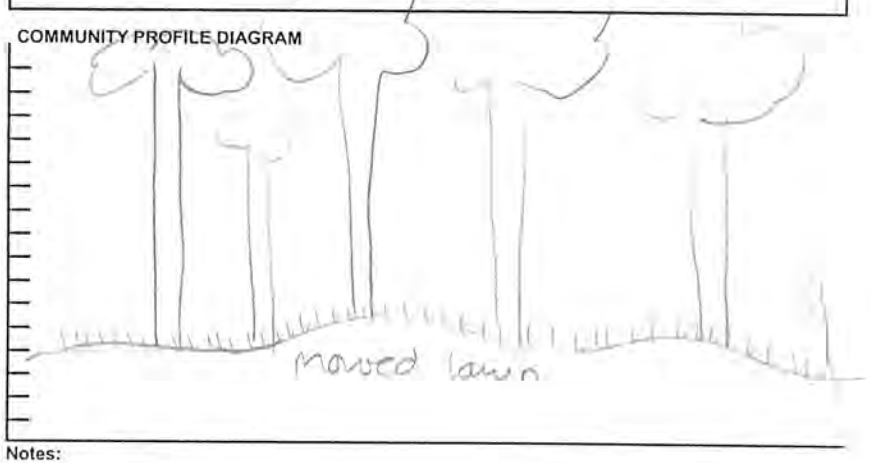
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 4
DATE: Sept 5/18
SURVEYOR(S): Nick + Kristina

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 4
DATE: Sept. 5/18
SURVEYOR(S): Nick + Kristina

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
QUEALBA	O	R			
QUERUBR	O				
QUEVELU	O				
ACERUB	O				
ACESASA	O				
ACEPLAT		R			
ACEFREE	O				
PINSTRO	R	R			
CARGLAB	O				
QUEMACR		R			
CELOCCI		R			
ACESACC	O				
POPDELT	R				
CAROVAT	O				
TILCORD		R			
PINSYLV	R				
ABIBALS			R		
THUOCCI			R		
TSUCANA	R				

SPECIES CODE	LAYER 1	2	3	4	COL.

ELC
MANAGEMENT / DISTURBANCE

SITE: Mohawk Lake
POLYGON: 4
DATE: Sept. 5/18
SURVEYOR(S): Nick + Kristina

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	(> 30 YRS)	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	(NONE)	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	(NONE)	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	(WELL MARKED)	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	(EXTENSIVE)	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	(HEAVY)	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	(EXTENSIVE)	
NOISE	NONE	SLIGHT	(MODERATE)	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	(WIDESPREAD)	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER GYPSY MOTH	NONE	LIGHT	MODERATE	HEAVY	
EXTENT PREDATION	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC
WILDLIFE

SITE: Mohawk Lake
POLYGON: 4
DATE: Sept 5/18
SURVEYOR(S): Nick + Kristina
START TIME:
END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS – rare
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
B	SAWO	10		2					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 5	
SURVEYOR(S): Nick & Kristina	DATE: Sept 5/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	G LACUSTRINE	G NATURAL	G PLANKTON	G LAKE
G WETLAND	G MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL. UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	G DECIDUOUS	G BOG
G SURFICIAL DEP.		G TALUS	G TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	4	
2	SUB-CANOPY	3	3	
3	UNDERSTOREY	4-5	2	
4	GRD. LAYER	6-7	3	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh moist Sugar Maple	FOD6
VEGETATION TYPE:	Fresh-Moist Sugar Maple Hardwood Deciduous	FOD6-5
INCLUSION		
COMPLEX		

Notes: lowland forest with minor drainage
Feature - no surface water present, pockets of wetland plants

ELC STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

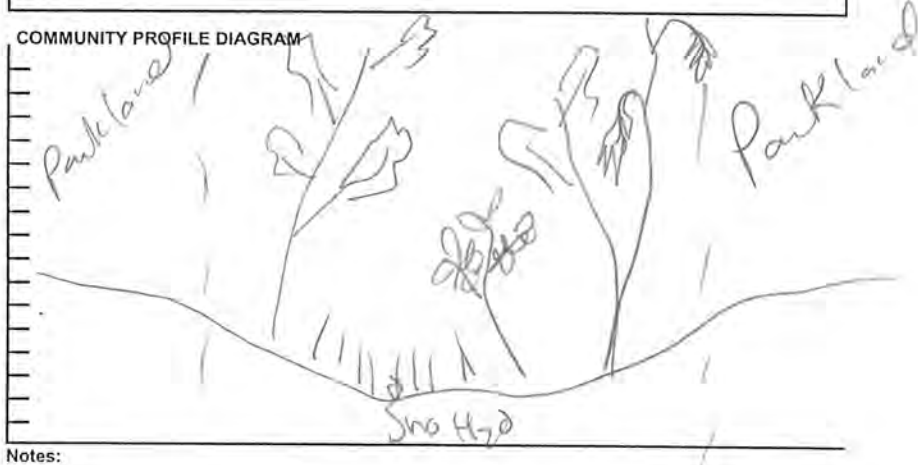
TREE TALLY BY SPECIES:

PRISM FACTOR [ ]

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC
SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 5
DATE: Sept. 5/18
SURVEYOR(S): Nick & Kristina

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			4	/	/	/	/	17	562438	4776422
2											
3											
4											
5											

+/- 4.5

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A SCL 15cm B mS 120+				
A TEXTURE	SCL				
COURSE FRAGMENTS	10				
B TEXTURE	mS				
COURSE FRAGMENTS	999				
C TEXTURE	/				
COURSE FRAGMENTS	/				
EFFECTIVE TEXTURE	mS				
SURFACE STONINESS	0				
SURFACE ROCKINESS	0				
DEPTH TO / OF					
MOTTLES	30				
GLEY	/				
BEDROCK	/				
WATER TABLE	/				
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME	4				
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 5
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
ACENEGU		O	O		
ACEPLAT	D				
ACESASA	R				
ACE XFRE	A				
FRAAME		R	R		
PRUSERO			O		
ACESACC	A				
TILAMER	R				
FRAPENN	O	O	A	O	
QUERUBR	R				
TILCORD		R	R		
PRUPUM		R			
JUGNIGR		R	R		
CARGLAB				R	
SALFRAG	D				
Catalpa		R	R		
QUEALBA	R				
POPDELT	R				
SORAUCU			R		
LONTATA			R		
CORFOEM			R		
RUBIDID			R		
VITRIPA			O	O	
PARINSE				O	
RHURYDB				O	
RHACATH			A		
CORSTOL			A		

SPECIES CODE	LAYER 1	2	3	4	COL.
ALLPETI				A	
ASTLALA				O	
PHRLEPT				R	
GLEHEDE				R	
SOLDULC				A	
EPICIL				R	
BIDFRON				R	
AGRSTOL				O	
SYMFOET				R	
GEUALEP				O	
SOLCANA				R	
FRAVIRG				O	
VINMINO				O	
SCIRATRO				R	
CONMAJA				R	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 5
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS	✓	SNAGS - dead ash
	HIBERNACULA	✓	FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
M	EACH	OB							

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 6	
SURVEYOR(S): NS & KD	DATE: Sept 5/18	TIME: start	finish
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
● TERRESTRIAL	G ORGANIC	G LACUSTRINE	● NATURAL	G PLANKTON	G LAKE
G WETLAND	● MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	● VALLEY SLOPE	COVER	G FORB	G MARSH
G OPEN WATER	G CARB. BEDRK.	G TABLELAND	G OPEN	G LICHEN	G SWAMP
G SHALLOW WATER		G ROLL. UPLAND	G SHRUB	G BRYOPHYTE	G FEN
● SURFICIAL DEP.		G CLIFF	● TREED	● DECIDUOUS	G BOG
G BEDROCK		G TALUS		G CONIFEROUS	G BARREN
		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			● FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	
2	SUB-CANOPY	3	2	
3	UNDERSTOREY	3	2	
4	GRD. LAYER	5-4	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG	X	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	FOREST	FO
COMMUNITY SERIES:	DECIDUOUS	FOD
ECOSITE:	LOWLAND	FOD7
VEGETATION TYPE:	Riparian Lowland dec. Forest	FOD7-4
INCLUSION		
COMPLEX		

Notes:

Black walnut dominated slope & rubus, goldenrod's, vines edge sp. indicative of plantings / manicured.

ELC — STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

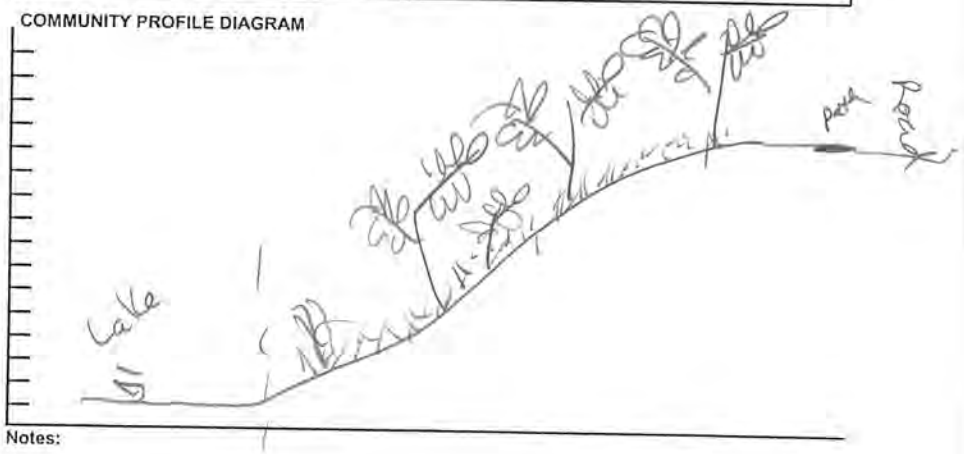
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC
SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 6
DATE: Sept 5/18
SURVEYOR(S): Nick + Kristina

Slope — UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			3	/	—	—	—	17	5628866	4776113
2											
3											
4											
5											

+/- 4.5m
* obedient plant not to soil sample

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A / 20cm / B / 80cm / C				
A TEXTURE	L				
COURSE FRAGMENTS	999				
B TEXTURE	SiL				
COURSE FRAGMENTS	999				
C TEXTURE	Si				
COURSE FRAGMENTS	999				
EFFECTIVE TEXTURE					
SURFACE STONINESS	0				
SURFACE ROCKINESS	0				
DEPTH TO / OF					
MOTTLES	35				
GLEY	/				
BEDROCK	/				
WATER TABLE	/				
CARBONATES	~				
DEPTH OF ORGANICS	~				
PORE SIZE DISC #1	~				
PORE SIZE DISC #2	~				
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
JUGNIGR	D	D			
MORALBA		R	R		
ACENEGU		O	~~O~~		
FRAPENN	R	R	R		
POPDELT	O				
PRUNAVIR		R			
ASPLAT		R	R		
TILCORD		R			
CELOCCI		R	R		
PRUVIRG					
RHACATH			R		
RHUTYPH			R		
ROSNULT			R		
RUBIDID					
VITRIPA				A	
PARTNSE				A	

SPECIES CODE	LAYER 1	2	3	4	COL.	
SOLCANA				A		
DAUCARO				R		
DACGLOM				O		
SOLDULC				R		
RUBOCCI				A		
ALLPET				A		
GERALEP				A		
enchanter's nightshade				O		
VITRIPA				O		
canada thistle				R		
RHUKAMS				O		
GALMOLL				R		
PARINSE				A		
Solomon's seal				R		- Not hairy edge
CLEVIRG				O		
PHYVIRG				O		- false dragonhead (keyed out)
ELYHYST				R		
ASTLAEA				R		
CIRLUTE				R		
THAPUBE				R		

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 6
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 7	
SURVEYOR(S): Kristina + Nick	DATE: Sept 5/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	2	JUGNIGR
2	SUB-CANOPY	3	3	JUGNIGR >> RHMTYPH
3	UNDERSTOREY	4,5	2	JUGNIGR = RHMTYPH
4	GRD. LAYER	5,6,7	4	POA PRAT

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER	✓	YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Woodland	CUW
ECOSITE:	Cultural woodland	CUW1
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS

SITE:	Mohawk Lake
POLYGON:	7
DATE:	Sept. 5/18
SURVEYOR(S):	Kristina

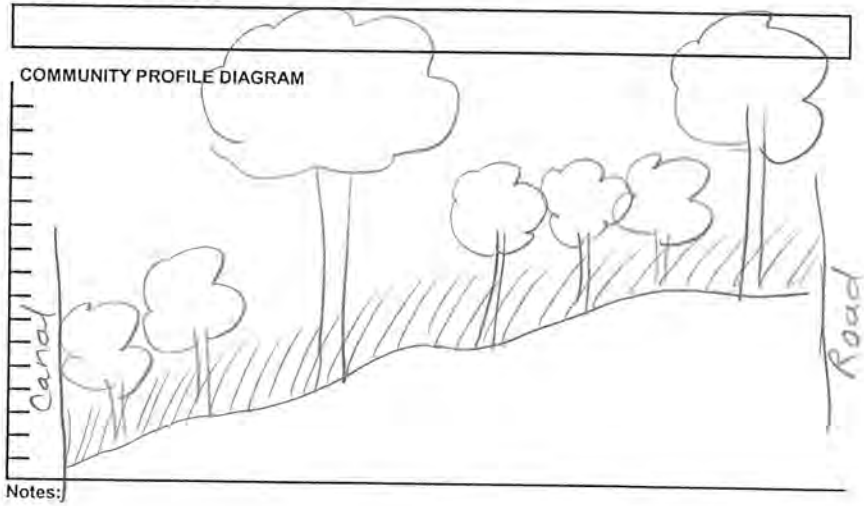
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Class	Z	UTM EASTING	UTM NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 7

DATE: Sept. 5/18

SURVEYOR(S): Kristina + NICK

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.
JUG NIGR	O	A	A	O	
PIN STRO			R		
MOR ALBA		R			
ACE NEGU	R				
redbud		O			
PIC GLAU			R		
POP DELT	R				
ROBPSEU	R	O			
CEL OCCI			R		
RHU TYPH		O	A		
RHA CATH			O		
COR FOEM			R	R	
autumn olive			R		
THU OCCI			R		
VIT RIPA				O	
PAR INSE				O	

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.
POA PRAT				D	
SOL CANA				O	
GAL MOLL				A	
PHL PRA				R	
CAL SEPI				R	
BRO INER				O	
HYP PERF				R	
DAU CARO				R	
AST NOVA				R	
TRI PRAT				R	
AST LANC				R	

Page .... of ....

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 7
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake	POLYGON: 8	
	SURVEYOR(S): NS & KD	DATE: Sept 5/18	TIME: start / finish
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(●) TERRESTRIAL ( ) WETLAND ( ) AQUATIC	( ) ORGANIC (●) MINERAL SOIL ( ) PARENT MIN. ( ) ACIDIC BEDRK. ( ) BASIC BEDRK. ( ) CARB. BEDRK.	( ) LACUSTRINE ( ) RIVERINE ( ) BOTTOMLAND ( ) TERRACE (●) VALLEY SLOPE ( ) TABLELAND ( ) ROLL. UPLAND ( ) CLIFF ( ) TALUS ( ) CREVICE / CAVE ( ) ALVAR ( ) ROCKLAND ( ) BEACH / BAR ( ) SAND DUNE ( ) BLUFF	(●) NATURAL ( ) CULTURAL	( ) PLANKTON ( ) SUBMERGED ( ) FLOATING-LVD. ( ) GRAMINOID ( ) FORB ( ) LICHEN ( ) BRYOPHYTE (●) DECIDUOUS ( ) CONIFEROUS ( ) MIXED	( ) LAKE ( ) POND ( ) RIVER ( ) STREAM ( ) MARSH ( ) SWAMP ( ) FEN ( ) BOG ( ) BARREN ( ) MEADOW ( ) PRAIRIE ( ) THICKET ( ) SAVANNAH ( ) WOODLAND (●) FOREST ( ) PLANTATION
SITE			**COVER**		
( ) OPEN WATER ( ) SHALLOW WATER (●) SURFICIAL DEP. ( ) BEDROCK			( ) OPEN ( ) SHRUB (●) TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	3	
2	SUB-CANOPY	2	4	
3	UNDERSTOREY	3	3	
4	GRD. LAYER	6	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	X	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Dry Fresh	FOD2
VEGETATION TYPE:	Oak - Hardwood	FOD2-4
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS	SITE: Mohawk Lake
	POLYGON: 8
	DATE: Sept. 5/18
	SURVEYOR(S): Nick & Kristina

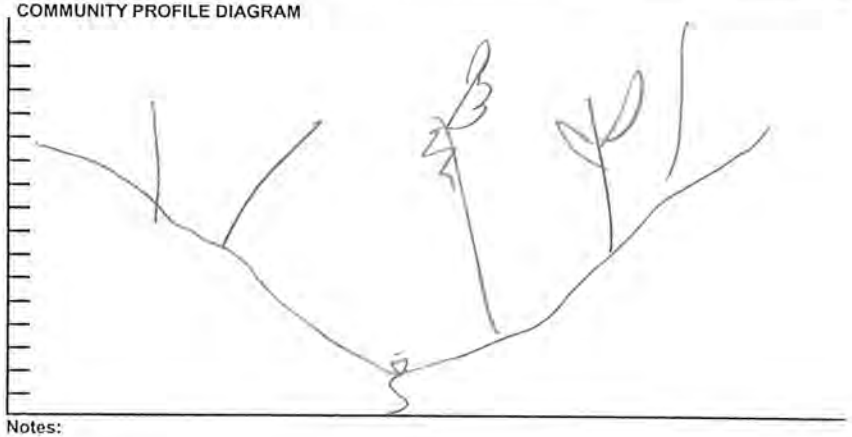
TREE TALLY BY SPECIES:

PRISM FACTOR [ ]

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 8
DATE: Sept. 5/18
SURVEYOR(S): Nick

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			3	—	—	—	—	17	563097	4776615
2											
3											
4											
5											

+/- 3.9m

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A				
	120				
A TEXTURE	C				
COURSE FRAGMENTS	999				
B TEXTURE	999				
COURSE FRAGMENTS	999				
C TEXTURE	999				
COURSE FRAGMENTS	999				
EFFECTIVE TEXTURE	C				
SURFACE STONINESS	0				
SURFACE ROCKINESS	0				
DEPTH TO / OF					
MOTTLES	—				
GLEY	—				
BEDROCK	—				
WATER TABLE	—				
CARBONATES	—				
DEPTH OF ORGANICS	0.5cm				
PORE SIZE DISC #1	—				
PORE SIZE DISC #2	—				
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 8
DATE: Sept. 5/18
SURVEYOR(S): Nick & Kristina

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
PINSTRO	O				
CAROVAT		R			
PRUSERO	O	A	O		
FRAPENN		O	O	O	
ACERUBR	R	O			
QUEALBA	O	O			
TILNIGR	R	R			
QUERUBR	O	R			
MORALBA		R			
ACESASA	O			O	
CAR GLAB					
OST VIRG					
QUE VELU					
TIL AMER					
PRUAVIU	R				
FAG GRAN		R			
RHACATH			A		
ROSMULT			R		
LONTATA			R		
PRUVIRG			RR		
CRA SP.					
RUB ID ID					
HAM VIRG					
PIC GLA	R				
CAR CORD	R				
VITRIPP			O		
PARINSS			O		

SPECIES CODE	LAYER 1	2	3	4	COL.
ALIPET				A	
GERMACH				R	
GEUMSP				R	
FRAVIRG				R	
LOPSEED				R	
DRYCARD				R	
SOLCANA				R	
SORREL				R	
ARI TRIP				R	
RUBOCCI				R	
PIL PUMI				R	
IMP CAPE				R	
GEUCANA				R	
anchantus	sight			O	
RHAMRAT2				O	
HAC VIRG				R	
VIO SP.				R	
SOL FLEX				R	
CIR LUTE				R	

*composition shifts throughout QUER vs ACER dominant

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

old fence post - grazing history?

† INTENSITY x EXTENT = SCORE

possible infection w PRUSERO - jelly-like sap all over

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 8
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS	✓	SNAGS
	HIBERNACULA	✓	FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#
B	Ruby-thr. hummingbird	OB		2

TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake		POLYGON: 9	
	SURVEYOR(S): Kristina + Nick	DATE: Sept. 5/18	TIME: start	
			finish	
	UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	JUG NIGR
2	SUB-CANOPY	2	3	
3	UNDERSTOREY	3,4	1	
4	GRD. LAYER	5,6,7	4	IMPCAPE

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR < 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh-Moist Lowland	FOD7
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS	SITE: Mohawk Lake
	POLYGON: 9
	DATE: Sept. 5/18
	SURVEYOR(S): Kristina + Nick

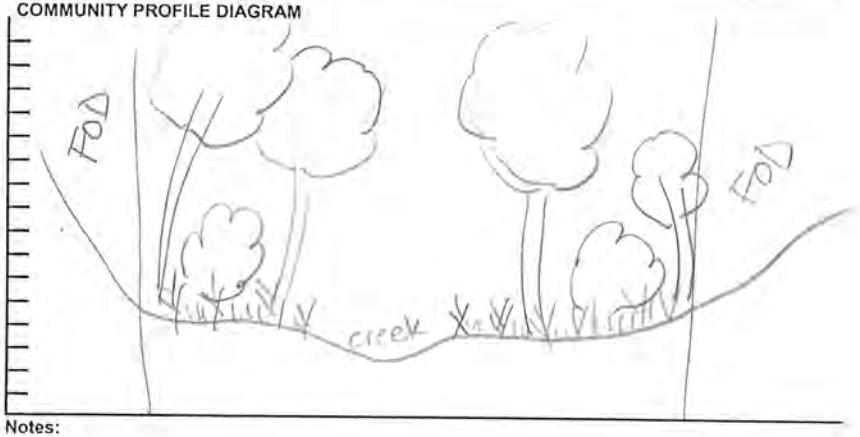
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 9
DATE: Sept 5/18
SURVEYOR(S): Kristina & Nick

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A								17	563198	4776467
2											
3											
4											
5											

+/- 2.6m

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A				
20					
A TEXTURE	CL				
COURSE FRAGMENTS	20 cm				
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

*tried 3 locations, kept hitting rock at 20cm

ELC PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 9
DATE: Sept. 5/18
SURVEYOR(S): Kristina & Nick

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
JUG NIGR	A	O	R		
SALIX RUB	O				
POP DELT	O				
FRA PENN		O	F	O	
ACE NEGU		O	O		
ROBPSEU			R		
ACE SASA		O			
RHA CATH			O	O	
RUB IDID				R	
RIB CYNO				R	
ROS MULT			R		
LONTATA			R		
VIT RIPA				O	
PAR INSE				O	
RHU RYDB				A	

SPECIES CODE	LAYER 1	2	3	4	COL.
IMP CAPE				D	
IMP PALL				O	
PIL PUMI				O	
EQU ARVE				O	
CAR sp.				R	
GEU ALEP				O	
GLY STRI				O	
RUMOBTU				R	
PHR LEPT				O	
AMP BRAC				O	
AGR STOL				A	
SOL CANA				R	
ALLPETI				O	
TIS FARF				R	
SYM FOET				R	
ARI TRIP				R	
VER URTI				R	
VIOL sp.				R	
ASTALA				R	
HES MATR				R	
GEU CANA				R	
PHRAUST				R	

ELC

MANAGEMENT / DISTURBANCE

SITE: Mohawk Lake
POLYGON: 9
DATE: Sept 5/18
SURVEYOR(S): Kristina + Nick

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	historical?
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	past creek rehab/alignment
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE:
POLYGON:
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake		POLYGON: 10	
	SURVEYOR(S): Kristina	DATE: Sept. 6/18	TIME: start	
	UTMZ:	UTME:	UTMN:	finish

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	G LACUSTRINE	G NATURAL	G PLANKTON	G LAKE
G WETLAND	G MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL. UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	G DECIDUOUS	G BOG
G SURFICIAL DEP.		G TALUS	G TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY	4,5	1	
4	GRD. LAYER	6,7	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH
	✓									

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Meadow	CUM
ECOSITE:	Mineral	CUM1
VEGETATION TYPE:	old-field Cultural meadow	CUM1-1
INCLUSION		
COMPLEX		

Notes:

Fairly recent agri. use — pioneer CUM1.

ELC STAND CHARACTERISTICS	SITE: Mohawk Lake
	POLYGON: 10
	DATE: Sept 6/18
	SURVEYOR(S): Kristina

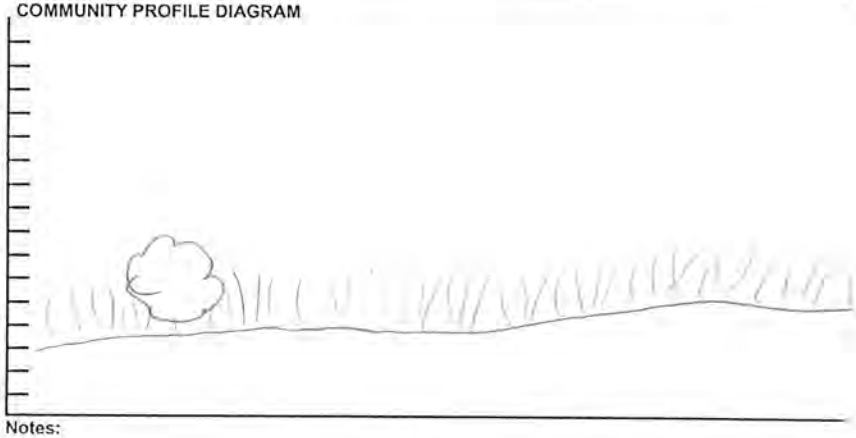
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 10
DATE: Sept 6/18
SURVEYOR(S): Kristina

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 10
DATE: Sept 6/18
SURVEYOR(S): Kristina

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
AMBARTE				D	
SET VERT				A	
POT RECT				O	
SOL CANA				O	
TAR OFFI				O	
LAC SERR				O	
AST LAEA				R	
AST NOVA				R	
ERIG ANN				R	
VER THAP				O	
RUM CRIS				O	
ASC SYRI				R	
TRI REPE				O	
DAU CARO				R	
ACH MIMI				R	
MEL ALBA				R	
ART VULG				R	
DIG SANG				O	
horsetail				O	
CIR VULG				R	
CAR NUTA				[illegible]	
TAN VULG				R	
TRI PRAT				R	
CICH INTY				R	
PLA MAJO				R	
HEL STRU					

SPECIES CODE	LAYER 1	2	3	4	COL.
ACENEG				R	
JUG CINE				R	
VIT RIPA					

- pot hybrid photos UTM: 562084 4775992 +/- 2.5m

Page ..... of .....

ELC

MANAGEMENT / DISTURBANCE

SITE: Mohawk Lake
POLYGON: 10
DATE: Sept 6/18
SURVEYOR(S): Kristina

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE:
POLYGON:
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: MOHAWK LAKE		POLYGON: 11	
SURVEYOR(S): NS & KD	DATE: SEPT 6/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	G LACUSTRINE	G NATURAL	G PLANKTON	G LAKE
G WETLAND	G MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL. UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	G DECIDUOUS	G BOG
G SURFICIAL DEP.		G TALUS	G TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	2	3	
3	UNDERSTOREY	3	4	
4	GRD. LAYER	4	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Woodland	CUW
ECOSITE:	Mineral Cultural Woodland	CUW1
VEGETATION TYPE:		
INCLUSION	willow lowland dec. Forest	FOD7-3
COMPLEX	Comp.	CUM1-1

Notes:

Comp. CUT1

* very disturbed; informal trails, earth movement, ATV trails; dumping

* Complex of cultural communities; assemblages change b/w more open & closed communities

ELC — STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

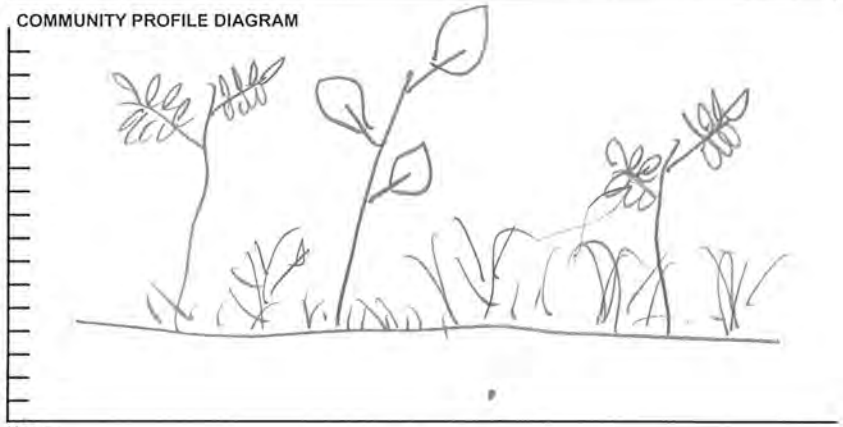
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 11
DATE: Sept. 16/18
SURVEYOR(S): NS + KD

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
PORTREN	D				
QUEMACR	R				
POPDELT	R	R			
TSUNIGR	O	A			
ACENEGU		O	O		
TILAMER	O	O			
QUERUBR	R				
QUEVELU	R				
CELOCCI		R	R		
Cohelpa	R				
FRAPENN		O	O		
SALAMY			R		
QUEALBA	R				
tree of heaven	R	R			
CORFOEM			A		
RHACATH			A		
RHUTYPH			O		
MOCARBA		R	R		
ROBNEUT			R		
Sal X mb	R	O	O		
ELAUMBE					
SAL-SP		O	O		
VITRIPA			A		
cikory				R	
ASCSPP				R	
Black medic				O	
ROBPSEU	R	R	R		
EUPALTI				R	
EUPPERF				R	
JUNTORR				R	
EQUFLUV				R	
JUNTENU				R	

SPECIES CODE	LAYER 1	2	3	4	COL.
SOLCANA				A	
tansy				O	
Daisy fleab				R	
POA PRAT				A	
teasel				O	
ASTLAEA				O	
EUTGRAM				O	
Purple lance				R	
ASTNOVA				R	
PARINSE				O	
Spreading dogbane				R	
Tuckahoe				R	
GEUMALE				R	
Mayapple				R	
Sweet William				R	
SOLGIGA				O	
RHURANE				O	
ACUPET1				A	
SOLPSE1				R	
IMPCAPE				R	
TOPSECR				R	
Pinweed				O	
RUBOCC1				R	
foxtail grass				O	
ragweed				A	
Hidden snapdragon				R	
PHAARUN				R	
PHRAUST				R	
red clover				O	
DANGLOM				O	
SOLNEMO				O	
Bugloss				R	
AMBTRIF				R	
CIRARVN				R	

Page ..... of .....

* 561765 4977500 ± 3.1m

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 11
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake		POLYGON: 12	
	SURVEYOR(S): Kristina + Nick	DATE: Sept 6/18	TIME: start	finish
	UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC ● MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE ● BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	● NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE ● DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH ● SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB ● TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	
2	SUB-CANOPY	3	1	
3	UNDERSTOREY	4	2	
4	GRD. LAYER	5	2	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE	✓	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Swamp	SW
COMMUNITY SERIES:	Deciduous	SWD
ECOSITE:	Mineral	SWD4
VEGETATION TYPE:	willow mineral dec. swamp	SWD4-1
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM

Notes:

ELC
SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 12
DATE: Sept. 6/18
SURVEYOR(S): Kristina

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A								17	561811	4775986
2											
3											
4											
5											

+/- 4cm

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
5cm	A				
	B				
20cm	- - - - - -				
A TEXTURE	Org.				
COURSE FRAGMENTS	999				
B TEXTURE	coarse Sand				
COURSE FRAGMENTS	10cm				
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES	—				
GLEY	—				
BEDROCK	—				
WATER TABLE	—				
CARBONATES					
DEPTH OF ORGANICS	5cm				
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

wetland

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 12
DATE: Sept. 6/18
SURVEYOR(S): Kristina

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
POPTREM					
SALXRUBE					
ACE NEG					
FRA PENN					
RHUTYPH					
SAL PETI					
SAL EXIG					
RUB IDAID					
RHA CATH					
CORSTOL					
VIT RIPA					

SPECIES CODE	LAYER 1	2	3	4	COL.
SOL CANA					
EUT GRAM					
AGR STOL					
LYT SALI					
AST LAEV					
PHR AUST					
PHA ARU					
LYC UNI					

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 12
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 13	
SURVEYOR(S): Nick	DATE: Sept. 6/18	TIME: start	
UTMZ:	UTME:	UTMN:	finish

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	G LACUSTRINE	G NATURAL	G PLANKTON	G LAKE
G WETLAND	G MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
G OPEN WATER	G CARB. BEDRK.	G TABLELAND	G OPEN	G LICHEN	G SWAMP
G SHALLOW WATER		G ROLL. UPLAND	G SHRUB	G BRYOPHYTE	G FEN
G SURFICIAL DEP.		G CLIFF	G TREED	G DECIDUOUS	G BOG
G BEDROCK		G TALUS		G CONIFEROUS	G BARREN
		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	4	Phragmites
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER			

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :	X	PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Marsh	MA
COMMUNITY SERIES:	Shallow	MAS
ECOSITE:	Mineral	MAS2
VEGETATION TYPE:	Phragmites shallow marsh	MAS2
INCLUSION		
COMPLEX	Phrag. meadow marsh	MAM2

Notes:

*no desc for Phrag communities

ELC STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

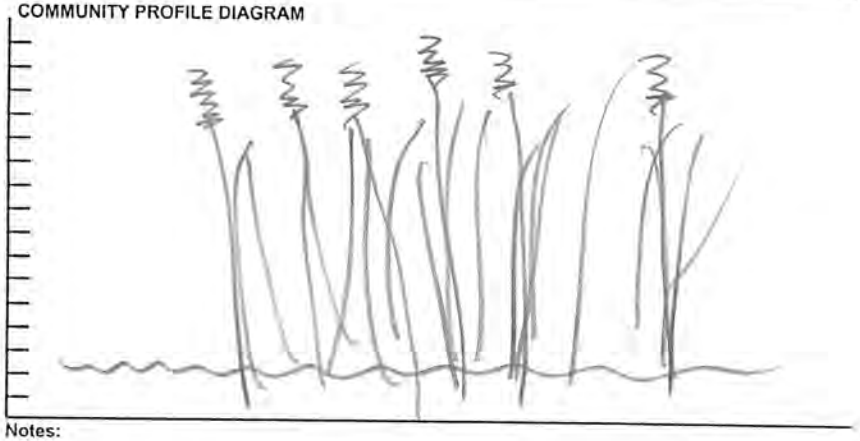
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 13

DATE: Sept 6/18

SURVEYOR(S): NS + RD

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
THRAST	D	D	D	D	
wldcuc		R			
PHAARUN		O	O		
RHACATH		O			
VITRIPA		O	O		
MORALBA	R				
Bindweed	R				
ACENEGU	O				
ROBPSEU	R				
SALXRUB	O	O			
TYPLAT	R	R			

SPECIES CODE	LAYER 1	2	3	4	COL.

ELC
MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC
WILDLIFE

SITE: Mohawk Lake
POLYGON: 13
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake	POLYGON: 14	
	SURVEYOR(S): Kristina + Nick	DATE: Sept 6/18	TIME: start / finish
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	
2	SUB-CANOPY	3	3	
3	UNDERSTOREY	3	2	
4	GRD. LAYER	5	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH
		✓			

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Woodland	CUW
ECOSITE:	Mineral Cultural Woodland	CUW1
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes:

- narrow strip along south side of canal

ELC STAND CHARACTERISTICS	SITE: Mohawk Lake
	POLYGON: 14
	DATE: Sept. 6/18
	SURVEYOR(S): Kristina + Nick

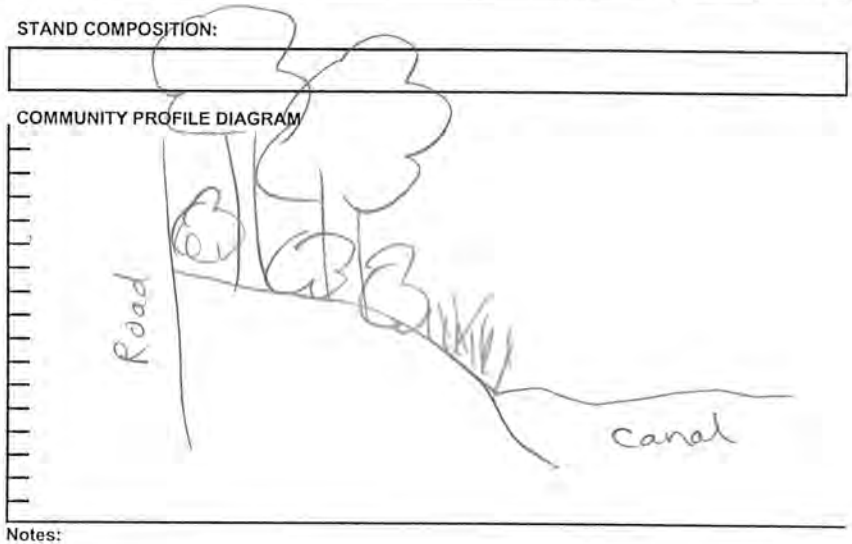
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 14

DATE: Sept. 6/18

SURVEYOR(S): Kristina & Nick

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
ACE NEGU	O	D			
ACE PLAT	A	A			
JUGNIGR	A	O			
FRA PENN	O	O	O		
ULM AMER		R	O	O	
MOR ALB	R	R	R		
AIL ALTI		R	R		
Catalpa			.	R	
CELOCCI			R		
SALIRUBE	O				
ACE GINN			R		
RHA CATH					
LONTATA					
RUB IDID					
PRUVIRG					
RHUTYPH					
COR STOL					
PAR INSE					
VIT RIPA					

SPECIES CODE	LAYER 1	2	3	4	COL.
SOL CANA				O	
POA PRAT				A	
GALMOLL				O	
ERI ANNU				R	
SAP OFFI				R	
DAU CARO				R	
CHR LEUC					
LOT CORN					
CHR LEUC					
ASC SYRI					
TAN VULG					
AST NOVA					
LIN VULG					
AMB ARTE					
PLA LANC					
SOL DULC					
IRI cf PSEU					
PHR AUST					
BIDIFRON					
IMP CAPE					
VER THAP					
LYC UNIF					
POT RECT					
ACH MIMI					
PHL PRAT					
BRO INN					
GLE HEDE					
AMB TRIF					

ELC

MANAGEMENT / DISTURBANCE

SITE: Mohawk Lake
POLYGON: 14
DATE: Sept. 6/18
SURVEYOR(S): Kristina + Nick

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	(LIGHT)	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	(WIDESPREAD)	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	(MODERATE)	HEAVY	Fishing
EXTENT OF RECR. USE	NONE	(LOCAL)	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE:
POLYGON:
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk lake		POLYGON: 15	
SURVEYOR(S): NS, KD	DATE: Sept 6/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(G) TERRESTRIAL	G ORGANIC	G LACUSTRINE	(G) NATURAL	G PLANKTON	G LAKE
G WETLAND	(G) MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	(G) BOTTOMLAND		G FLOATING-LVD	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	(G) DECIDUOUS	G BOG
(G) SURFICIAL DEP.		G TALUS	(G) TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			(G) WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	3	3	
3	UNDERSTOREY	3	4	
4	GRD. LAYER	5	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG	X	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Woodland	CUW
ECOSITE:	Mineral Cultural Woodland	CUW1
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes:

Cultral woodland South of Greenwich Rd.
- dumping

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

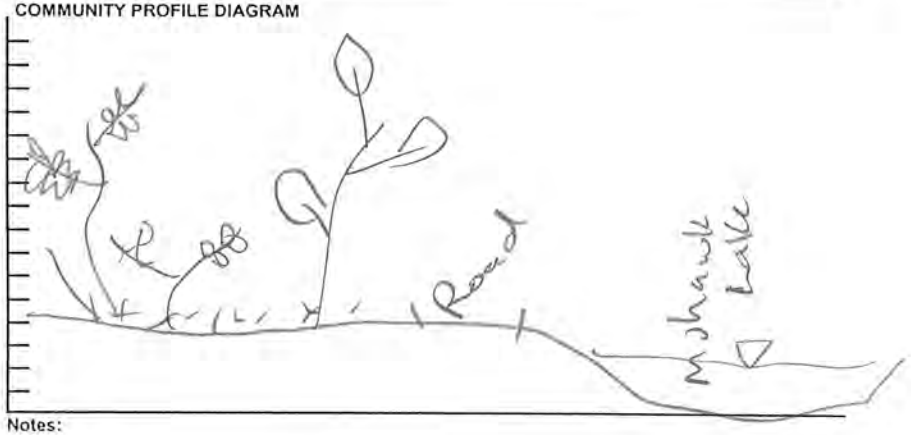
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 15
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
POPDELT	A	R			
FRAPENN	O	A	A		
ACENEGU		A	A		
ROBPSEU		A	O		
JUGNIGR	O	A			
LONMAXX		O	O		
ALIARTI	R	R	R		
PINSTRO	R	R			
RHACATH			A		
RHUTYPH			A		
VITRIPA			A		

SPECIES CODE	LAYER 1	2	3	4	COL.
Nanny pot				D	
SOLCANA				A	
ASTLANC				A	
Tansy				O	
Birdsfoot tre				A	
butter/eggs				D	
ELYTGRAM				A	
Burdock				O	
PHRAUST				O	
teasel				O	
[illegible]				R	
timothy				O	
ELYREPE				A	
BROINN				O	
ALOPETI				A	
SAPOFFI				R	
mullein				R	
Sowthistle				R	
wild cucumb				O	
giant ragweed				O	
giant burdock				D	
Icelandica				D	
RUBOCCI				R	

ELC
MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC
WILDLIFE

SITE: Mohawk Lake
POLYGON: 15
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: MOHAWK LAKE		POLYGON: 16	
SURVEYOR(S): NS & KD	DATE: SEPT 6/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(●) TERRESTRIAL	( ) ORGANIC	( ) LACUSTRINE	(●) NATURAL	( ) PLANKTON	( ) LAKE
( ) WETLAND	(●) MINERAL SOIL	( ) RIVERINE	( ) CULTURAL	( ) SUBMERGED	( ) POND
( ) AQUATIC	( ) PARENT MIN.	(●) BOTTOMLAND		( ) FLOATING-LVD	( ) RIVER
	( ) ACIDIC BEDRK.	( ) TERRACE		( ) GRAMINOID	( ) STREAM
SITE	( ) BASIC BEDRK.	( ) VALLEY SLOPE	COVER	( ) FORB	( ) MARSH
( ) OPEN WATER	( ) CARB. BEDRK.	( ) TABLELAND	( ) OPEN	( ) LICHEN	( ) SWAMP
( ) SHALLOW WATER		( ) ROLL. UPLAND	( ) SHRUB	( ) BRYOPHYTE	( ) FEN
(●) SURFICIAL DEP.		( ) CLIFF	(●) TREED	(●) DECIDUOUS	( ) BOG
( ) BEDROCK		( ) TALUS		( ) CONIFEROUS	( ) BARREN
		( ) CREVICE / CAVE		( ) MIXED	( ) MEADOW
		( ) ALVAR			( ) PRAIRIE
		( ) ROCKLAND			( ) THICKET
		( ) BEACH / BAR			( ) SAVANNAH
		( ) SAND DUNE			( ) WOODLAND
		( ) BLUFF			(●) FOREST
					( ) PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	
2	SUB-CANOPY	3	2	
3	UNDERSTOREY	3	2	
4	GRD. LAYER	4	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG	X	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh-Moist Lowland	FOD7
VEGETATION TYPE:	Manitoba maple lowland forest	FOD7 (FOOM7-7 2008)
INCLUSION		
COMPLEX		

Notes:

lowland forest next to rail trail; Roads -

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

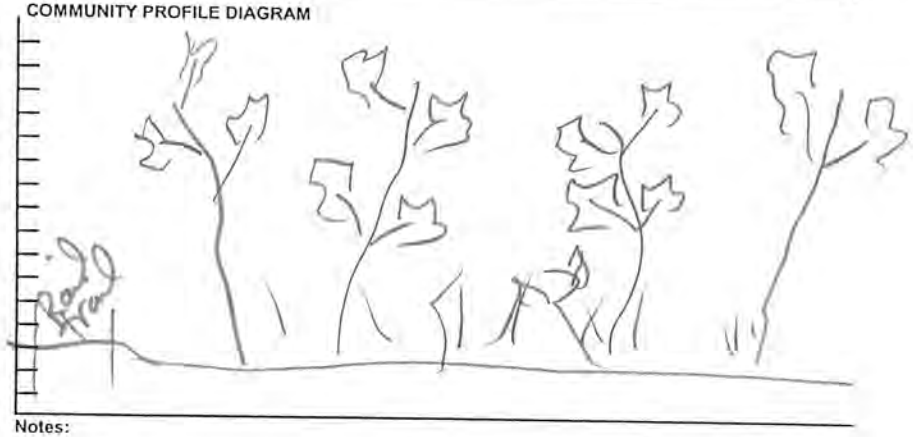
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope / UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			5	~	-	—	~	A		
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 30 Course fragments				
A TEXTURE	MSL				
COURSE FRAGMENTS					
B TEXTURE	—				
COURSE FRAGMENTS	—				
C TEXTURE	—				
COURSE FRAGMENTS	—				
EFFECTIVE TEXTURE					
SURFACE STONINESS	0				
SURFACE ROCKINESS	0				
DEPTH TO / OF					
MOTTLES	—				
GLEY	—				
BEDROCK	—				
WATER TABLE	—				
CARBONATES	—				
DEPTH OF ORGANICS	—				
PORE SIZE DISC #1	—				
PORE SIZE DISC #2	—				
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 16
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
ACENEGU	A	A			
ALLALT1	R	R			
FRAPENN	O	O	A		
MOXALBA		O	O		
JUGNIGR	O	O			
ACESACFRE	O				
JUNVIRG		R	R		
CERCCI			R		
RHIACATH			O		
VITRIPA			A		
SIC ANGU			O		
POL SCAN			R		

SPECIES CODE	LAYER 1	2	3	4	COL.
giant ragweed			C	O	
HESMATR				R	
SOLDULC				O	
Burdock				O	
RUBOCCI				R	
Plantain				O	
TAROFFI				O	
GEUALEP				O	
RUBIDID				C	
SOLCANA				C	
ARCMINO				O	
PATRANSE				O	
VIO_SP				R	
RHURANE				C	
wild cuc				R	
IMPCAPS				R	
GALMOLL				R	
URTDIOI				O	
* pokeweed?				R	
POL SCAN				R	
HUM LUPU				A	
SIC ANGU				D	
dock				O	
Celendine				R	
ALLPETI				A	
HESMATR				O	
POACSP				R	
Xanchin				R	
POLLARA				R	
PHY AMER				R	

climbing false Buckwheat

ragweed nap

one-seeded bur Cucumber

largest to

Page ..... of .....

* Dumping along edges by parking lots

ELC
MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC
WILDLIFE

SITE: Mohawk Lake
POLYGON: 16
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk lake	POLYGON: 17	
	SURVEYOR(S): N. Schmetz	DATE: Sept 7/18	TIME: start / finish
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			COVER G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	4	4	
2	SUB-CANOPY	5	4	
3	UNDERSTOREY	6	4	
4	GRD. LAYER			

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT<0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :	PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Meadow	CUM
ECOSITE:	Mineral	CUM1
VEGETATION TYPE:	DRY-FRESH OLD FIELD CULTURAL MEADOW	CUM1-1
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

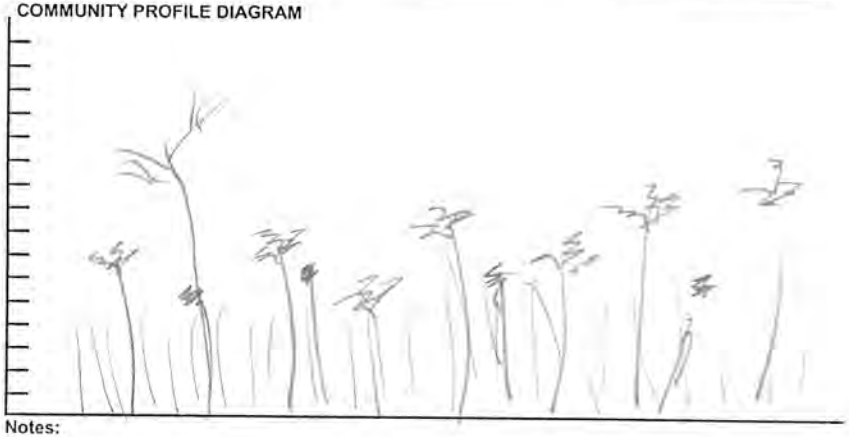
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Slope Class	Z	UTM EASTING	UTM NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 17

DATE: Sept. 7/18

SURVEYOR(S): N. Schwetz

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.
ACENEGU	R				
Horsechest	R				
ACEXFRE	R				

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.
PHRAAUST	R				
SUMREPE			D		
SOLCANA		A	O		
EUTGRAM			A		
Tansey		O	O		
Birdsfoot			A		
ASCSYRI		R			
chickory		R			
mullen		R			
daisy flea			R		
ragweed			R		
bladder camp			R		
buttercup			R		
RHUHIRT		R			
Ev. Primrose		R			
CYPESCU					

Page .... of ....

ELC

MANAGEMENT / DISTURBANCE

SITE:

POLYGON:

DATE:

SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake

POLYGON: 17

DATE:

SURVEYOR(S):

START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
L	MONA	OB							

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
- SH = SUITABLE HABITAT
- SM = SINGING MALE

BREEDING BIRD - PROBABLE:
- T = TERRITORY
- A = ANXIETY BEHAVIOUR
- D = DISPLAY
- N = NEST BUILDING
- P = PAIR
- V = VISITING NEST

BREEDING BIRD - CONFIRMED:
- DD = DISTRACTION
- NE = EGGS
- AE = NEST ENTRY
- NU = USED NEST
- NY = YOUNG
- FY = FLEDGED YOUNG
- FS = FOOD/FAECAL SACK

OTHER WILDLIFE EVIDENCE:
- OB = OBSERVED
- DP = DISTINCTIVE PARTS
- TK = TRACKS
- SI = OTHER SIGNS (specify)
- VO = VOCALIZATION
- HO = HOUSE/DEN
- FE = FEEDING EVIDENCE
- CA = CARCASS
- FY = EGGS OR YOUNG
- SC = SCAT

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: MOHAWK LAKE	POLYGON: 18	
	SURVEYOR(S): N. Schmatz	DATE:	TIME: start / finish
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(G) TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC (G) MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE (G) BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL (G) CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE (G) DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND (G) FOREST G PLANTATION

SITE
G OPEN WATER G SHALLOW WATER (G) SURFICIAL DEP. G BEDROCK

COVER
G OPEN G SHRUB (G) TREED

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	
2	SUB-CANOPY	2	2	
3	UNDERSTOREY	3	3	
4	GRD. LAYER	4	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh-Moist Lowland	FOD7
VEGETATION TYPE:	Black Walnut lowland deciduous forest	FOD7-4
INCLUSION		
COMPLEX		

Notes:

NO ACCESS

ELC STAND CHARACTERISTICS	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

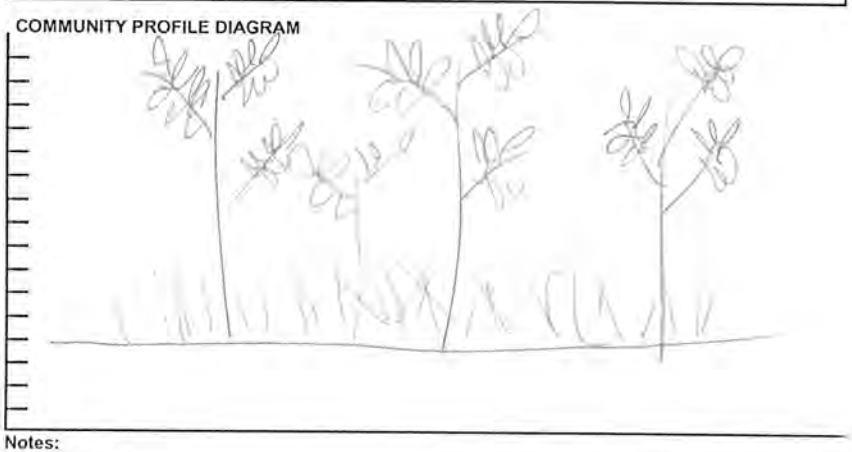
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON		ND organics			
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 18
DATE:
SURVEYOR(S): NS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
THUIGIR	D	D			
FRAPENN		O	A		
ACESACC	R	R			
ACENEGU			O		
CELOCCI			R		
POPDELT	R	R			
RHACATH			R		
VITRIPA	O	O	O		
PARINSE	O	O	O		

SPECIES CODE	LAYER 1	2	3	4	COL.
RUBIDID				R	
SOLCANA				D	
GEUMLEP				O	
Dandelion				O	
AZURED				O	
HESMATR				R	
RUBOCCI				O	
GEUMACR				R	
lily-sp					

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 18
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: MOHAWK LAKE	POLYGON: 99	
	SURVEYOR(S): NS	DATE: SEPT 1/16	TIME: start / finish
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE			**COVER**		
G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	3	4	
2	SUB-CANOPY	4	2	
3	UNDERSTOREY	—		
4	GRD. LAYER	—		

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Marsh	MA
COMMUNITY SERIES:	Shallow	MAS
ECOSITE:	Mineral	MAS2
VEGETATION TYPE:	CATTAIL SHALLOW MARSH	MAS2-1
INCLUSION		
COMPLEX		

Notes:

ELC STAND CHARACTERISTICS	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

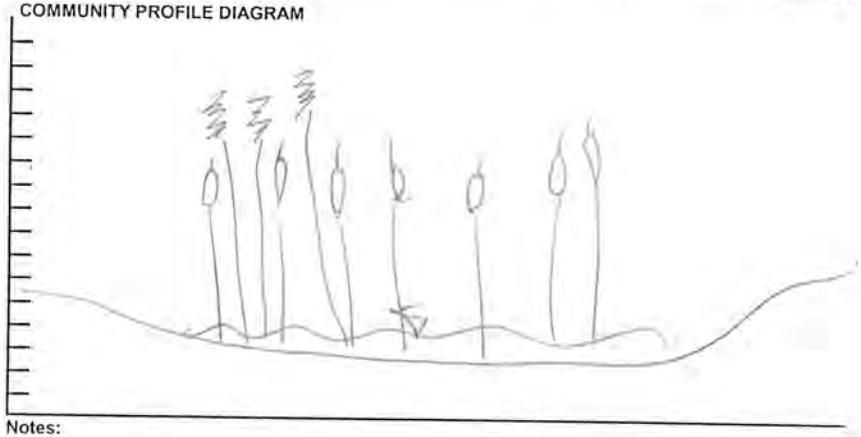
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 19
DATE:
SURVEYOR(S): NS & KD

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
TYPHLAT	D	D			
PHRAUST	O	O			
SOLDULC		R			

SPECIES CODE	LAYER 1	2	3	4	COL.

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Monarch Lake
POLYGON: 19
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT
SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY
A = ANXIETY BEHAVIOUR
D = DISPLAY
N = NEST BUILDING
P = PAIR
V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION
NE = EGGS
AE = NEST ENTRY
NU = USED NEST
NY = YOUNG
FY = FLEDGED YOUNG
FS = FOOD/FAECAL SACK

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED
DP = DISTINCTIVE PARTS
TK = TRACKS
SI = OTHER SIGNS (specify)
VO = VOCALIZATION
HO = HOUSE/DEN
FE = FEEDING EVIDENCE
CA = CARCASS
FY = EGGS OR YOUNG
SC = SCAT

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: MOHAWK LAKE		POLYGON: 20	
SURVEYOR(S): PS	DATE: Sept 7/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(●) TERRESTRIAL	G ORGANIC	G LACUSTRINE	(●) NATURAL	G PLANKTON	G LAKE
G WETLAND	(●) MINERAL SOIL	G RIVERINE	(●) CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	(●) VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	(●) DECIDUOUS	G BOG
(●) SURFICIAL DEP.		G TALUS	(●) TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			(●) FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	
2	SUB-CANOPY	2	3	
3	UNDERSTOREY	3	3	
4	GRD. LAYER	5	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh - Moist Lowland	FOD7
VEGETATION TYPE:	willow lowland dec forest	FOD7-3
// INCLUSION	OAK HICKORY MAPLE	FOD2-4
// COMPLEX	BLACK WALNUT lowland dec forest	FOD7-9

Notes:

Willows adjacent to restored creek - by walnut alone on higher slopes

Don one valley slope point

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

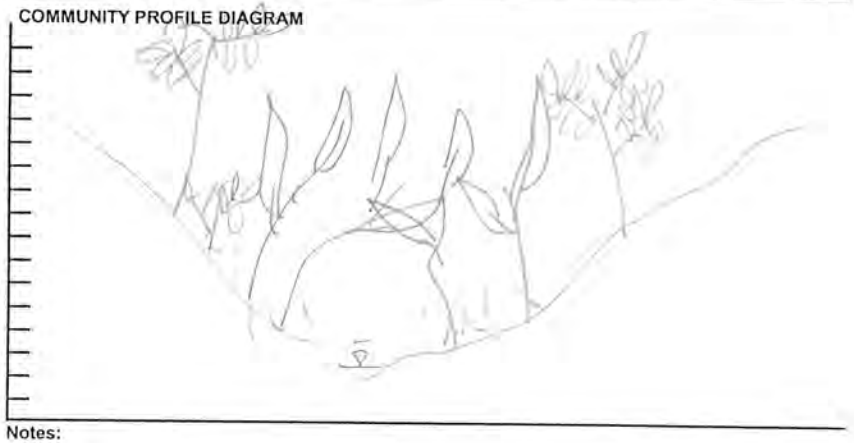
TREE TALLY BY SPECIES:

PRISM FACTOR [ ]

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE: Mohawk Lake
POLYGON: 20
DATE: Sept. 7/18
SURVEYOR(S): NS

Slope | UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A			3	—	—	—	—	17	563507	4776349
2	A			4							
3											
4											
5				✓							

+/- 4.7m

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 42 B 120	A 60 120			
A TEXTURE	SiC	C L			
COURSE FRAGMENTS	999	40			
B TEXTURE	C	SiS			
COURSE FRAGMENTS	999				
C TEXTURE	—				
COURSE FRAGMENTS	—				
EFFECTIVE TEXTURE	C				
SURFACE STONINESS	O				
SURFACE ROCKINESS	O				
DEPTH TO / OF					
MOTTLES	60	35			
GLEY	999	999			
BEDROCK	999	999			
WATER TABLE	999	999			
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

In valley N. of canal

In lowland along Grand R.

Inclusion

ELC PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 20
DATE: Sept. 20/18
SURVEYOR(S): NS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
Salxvub	A	A			
Thaarv	A	O			
Popdel	O	O			
FRAPSNN		O	O		
TILCORD			R		
ACENEGU		O	O		
ACE PLAT		R	R		
CELOCCI			R		
POPTREM		R	R		
Ohio Buckeye	R		R		
LONTATA			R		
RHACATH			S		
PRUVIRG			O		
CORSTOL			O		
ROSMULT			R		
CORSERI			O		
False chms. Buckwheat			O		
PART INSE			A		
Quecalba	R				
ACESAC	R	R			
Prunvir	R				
Carcord	R	R			
Coralte			R		
Querubr	R				
Tsucan		R	R		
Physti				R	
PRUSERO			R		
CAREX SP			R		
white bowmoss			R		

SPECIES CODE	LAYER 1	2	3	4	COL.
GEUALSP				O	
UTRIPA			O	O	
SOLRAT				O	
AZLPET				A	
TROFFI				O	
HESMATR				O	
Sorrel				R	
PARINSE				O	
PHRAUST				O	
RUBOCCI				A	
URTDIO				O	
ERI_SP				O	
Lopseed				R	
GERMACU				R	
SOLDULC				R	
Great blue lobe				R	
Turtle head				R	
HYPCAPE				R	
H. obovata				R	
APIAMER				R	
Jack-in-the-pulpit				R	
EUPMACU				O	
DOC				O	
ASTUROR				O	
Coltsfoot				O	
Vio_sp				R	
SOLCANA				A	
ONOSENS				R	
SYMEQST				R	
VIBOPUL			R	R	
DACGLOM				R	

INTENSIVE

Page ..... of .....

ELY RIPA
SMI HERB
BID FRON

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 20
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#
D	Bluewinged	OB		1
B	Redpoll	OB		2
M	Beaver	OB		1
B	Hooded	OB		1

TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

Ohio Buckeye in lowland along Grand River

(1) Canopy tree at east edge of Duckweed pond
DBH = 40 cm
17T 563502E +/- 2.9m
4776365 N

(2) near #1 on other side of adhoc trail; slightly uphill.
DBH = 9.5 cm
17T 563501 E
4776360 N +/- 5.9m

Plant List for Unit 20 contd

BOE CYLI - R
RUB IDB - O
AST LAZA - O
HAC VIRG - R
IMP PALL - R
ROS BLAN - R
white snakeroot - R
ARC MINU - R
PLA MAJO - R

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 2	
SURVEYOR(S): KD, NS	DATE: Sept 12/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	1	JUG. NIGR
2	SUB-CANOPY	2	1	ACE NEGU
3	UNDERSTOREY	3,4	2	RHA CATH > COR RACE
4	GRD. LAYER	5,6,7	4	LEM MINO

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER	✓	YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Shallow aquatic	SA
COMMUNITY SERIES:	Floating-Leaved	SAF
ECOSITE:	Floating-leaved shallow aquatic	SAF1
VEGETATION TYPE:	Duckweed Shallow Aquatic	SAF1-3
INCLUSION		
COMPLEX		

Notes: small pond south of canal near confluence with Grand River

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

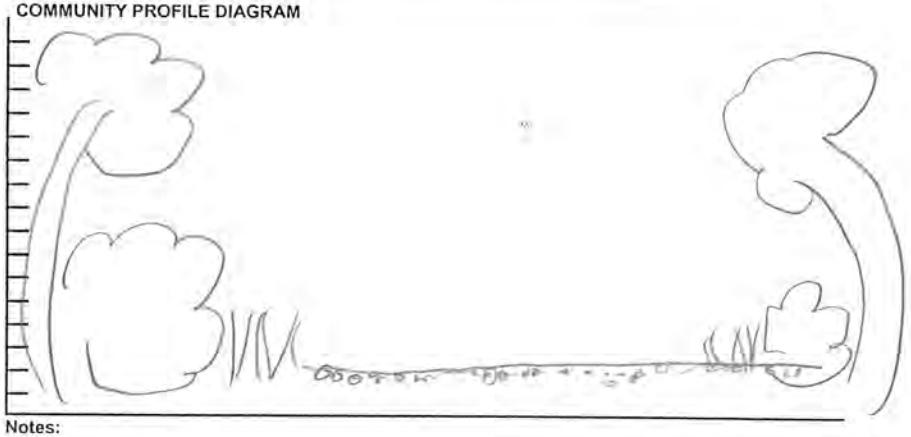
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 21
DATE: Sept. 12/18
SURVEYOR(S): KD/NS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
ACE NEGU		R	R		
JUG NIGR	R				
RHA CATH			R		
COR FOEM			R		
VIT RIPA					

SPECIES CODE	LAYER 1	2	3	4	COL.
BID FRON				O	
PIL FONT				O	
IMP CAPE				O	
SOL NIGR ssp nitens				O	
LEM MIN				A	
WOL COLU				A	
LEE ORYZ				A	
PHA ARUN				O	
ECH CRUS				O	
LYC AMER				A	
One seed bur cuc.				O	
SOL DULC				O	
GLY STRI				O	
LYT SALI				R	
URT DIO				R	
CLIM. Fab.				O	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 21
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
	AMTO								
	GRFR								

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: MOHAWK LAKE		POLYGON: 22	
SURVEYOR(S): NS. KD	DATE: SEPT 12/18	TIME: start	finish
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
(G) TERRESTRIAL	G ORGANIC	G LACUSTRINE	(G) NATURAL	G PLANKTON	G LAKE
G WETLAND	(G) MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	(G) BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
	G BASIC BEDRK.	G VALLEY SLOPE		G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
		G ROLL. UPLAND		G BRYOPHYTE	G FEN
		G CLIFF		(G) DECIDUOUS	G BOG
		G TALUS		G CONIFEROUS	G BARREN
		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			(G) SAVANNAH
		G SAND DUNE			(G) WOODLAND
		G BLUFF			G FOREST
					G PLANTATION
SITE			COVER		
G OPEN WATER			G OPEN		
G SHALLOW WATER			G SHRUB		
(G) SURFICIAL DEP.			(G) TREED		
G BEDROCK					

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	1	POBAL T = TSUGNIGR
2	SUB-CANOPY	2	3	TSUGNIGR > ACERNEGM ? ALESACC = THUOCCI
3	UNDERSTOREY	3	3	RHUTYPH > CELOCCI = ACERNEGM ? VITRIPA
4	GRD. LAYER	5	4	SOLCANA = VITRIPA = PARINSE = POA - SP.

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:	< 10	10 - 24	25 - 50	> 50
STANDING SNAGS:	< 10	10 - 24	25 - 50	> 50
DEADFALL / LOGS:	< 10	10 - 24	25 - 50	> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :	PIONEER	YOUNG	MID-AGE	MATURE	OLD GROWTH
		(X)			

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	CULTURAL	CU
COMMUNITY SERIES:	WOODLAND	CUW
ECOSITE:	Cultural Woodland	CUW1
VEGETATION TYPE:		
INCLUSION		
(X) COMPLEX	Cultral Savannah	CUS1

Notes:

Cultral community adj to pipeline / utilities = old foundations / paved areas

ELC — STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

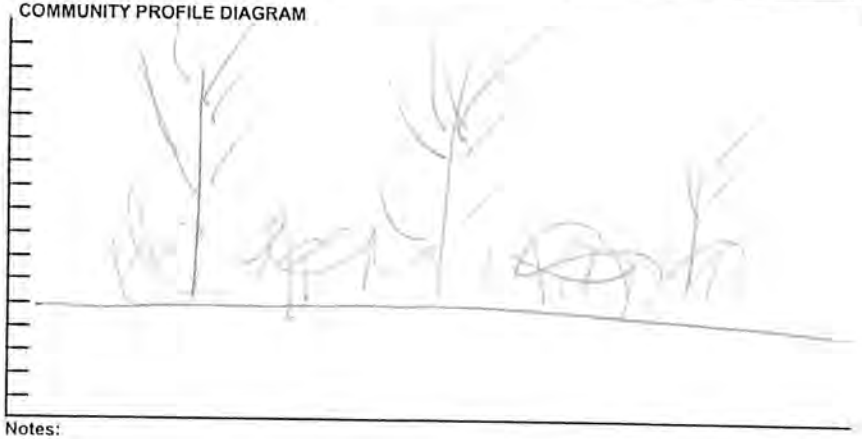
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 22

DATE:

SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
JUGNIGR	A	A			
ACENEGU		A	O		
PICGLAN					
POPDELT	A				
CELOCCI		R	O		
GINBILO			R		
ROBPSEU	R			O	
THUOCCI		R	R		
PIC blue sp.		R			
ACESACC	R	R			
yew Canada		R			
MORALBA			R		
QUEMACR			R		
RHUTYPH			A		
CORFOEM			O		
RHACATH			O		
VITRIPA			A	A	
PARINSE			A	A	

SPECIES CODE	LAYER 1	2	3	4	COL.
SOLCANA				A	
PHAARUN				O	
WHOVOIL				R	
DAUCARO				O	
Canada thistle				O	
Cow vetch				O	
Chicory				R	
Yarrow				C	
ASTNOVA				R	
DACGLOM				R	
Hawk				S	
Mullein				R	
POA PRAT				A	
Ragweed				R	
RUBOCCI				R	
OENBIEN				R	
POTSIMP				R	
VIBERSBUGLOSS				R	
Bladder sedge				R	
CORSTOL				R	
PARQUI				R	
ASCSYRI				R	
AMBROSIA ARTE				R	
Knapweed				R	
Japanese knotweed				O	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 22
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 23	
SURVEYOR(S): NS, KD	DATE: Sept. 12/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	POP DELT
2	SUB-CANOPY	2	3	JUG NIGR
3	UNDERSTOREY	3,4	2	RHAT CATH
4	GRD. LAYER	5,6,7	4	GEUspp = ALLPETI

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Forest	FO
COMMUNITY SERIES:	Deciduous	FOD
ECOSITE:	Fresh-Moist	FOD8
VEGETATION TYPE:	Fresh-Moist Cottonwood Deciduous Forest	FODM8-3 (2008 list)
INCLUSION		
COMPLEX		

Notes: very hilly topography - possible old [illegible] glacial till ridge
highly disturbed - sp comp, trails, berms, dumping

ELC STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

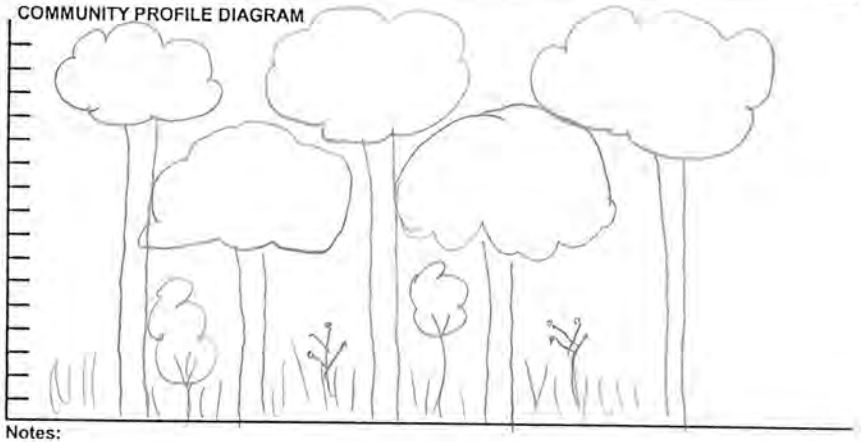
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 20 / B 50				
A TEXTURE	SC (fine)				
COURSE FRAGMENTS	10				
B TEXTURE	SCL (course)				
COURSE FRAGMENTS	999				
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS	-				
DEPTH TO / OF					
MOTTLES	/				
GLEY	/				
BEDROCK	/				
WATER TABLE	/				
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 23

DATE: Sept. 12/18

SURVEYOR(S): KD, NS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
POP DELT	*				
JUG NIGR		*			
CEL OCCI			*		
MOR ALB			*		
ACE NEGU			*		
ACE PLAT			*	*	
ACE x FREE		R			
RHA CATH		O	O	A	
RUB OCCI			O		
ROS MULT			R		
RIB CYNO				R	
PRU VIRG			O		
RHU TYPH			R		
SAL PETI			R		
VIT RIPA			O		
RHU RYDB				A	
PAR INSE			A		

SPECIES CODE	LAYER 1	2	3	4	COL.
GEU CANA				O	
GEU ALEP				O	
SOL CANA				O	
HES MATR				O	
PLA MAJO				R	
spread dogbane				R	
ALL PETI				O	
OXA STRI				R	
AMB TRIF				O	
climb false buck				O	
one-seed bur cuc				O	
HAC VIRG				O	
IMP CAPE				O	
EQU ARVE				R	
SAN CANA				R	
ARI TRIP				R	
ACA VIRG				R	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lodge
POLYGON: 23
DATE: Sept 12/18
SURVEYOR(S): KD NR
START TIME: END TIME:

TEMP (°C): CLOUD (10th): WIND: PRECIPITATION:
CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
	AMTD			100+					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 24	
SURVEYOR(S): KD, NS	DATE: Sept 12/18	TIME: start	
		finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL	G ORGANIC	G LACUSTRINE	G NATURAL	G PLANKTON	G LAKE
G WETLAND	G MINERAL SOIL	G RIVERINE	G CULTURAL	G SUBMERGED	G POND
G AQUATIC	G PARENT MIN.	G BOTTOMLAND		G FLOATING-LVD.	G RIVER
	G ACIDIC BEDRK.	G TERRACE		G GRAMINOID	G STREAM
SITE	G BASIC BEDRK.	G VALLEY SLOPE	COVER	G FORB	G MARSH
	G CARB. BEDRK.	G TABLELAND		G LICHEN	G SWAMP
G OPEN WATER		G ROLL. UPLAND	G OPEN	G BRYOPHYTE	G FEN
G SHALLOW WATER		G CLIFF	G SHRUB	G DECIDUOUS	G BOG
G SURFICIAL DEP.		G TALUS	G TREED	G CONIFEROUS	G BARREN
G BEDROCK		G CREVICE / CAVE		G MIXED	G MEADOW
		G ALVAR			G PRAIRIE
		G ROCKLAND			G THICKET
		G BEACH / BAR			G SAVANNAH
		G SAND DUNE			G WOODLAND
		G BLUFF			G FOREST
					G PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	1	
2	SUB-CANOPY	2	1	
3	UNDERSTOREY	3,4,5	1	
4	GRD. LAYER	6,7	4	

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Shallow Aquatic	SA
COMMUNITY SERIES:	Submerged SA	SAS
ECOSITE:	Submerged SA	SAS1
VEGETATION TYPE:		
INCLUSION		
COMPLEX		

Notes:
- dug pond - berm around edge
- oily sheen - groundwater inputs
- several pond weed species but no turtle obs.

ELC
STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

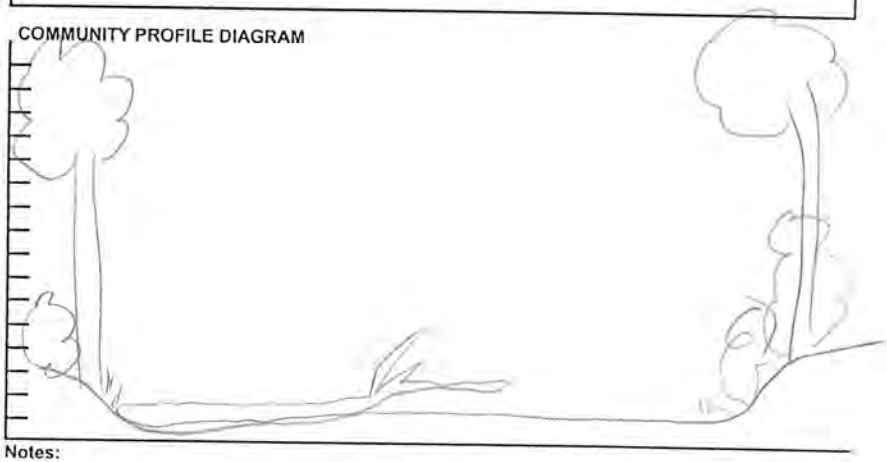
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 24

DATE:

SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
POPDELT	R				
SALFRAG	A	O			
ACENEGU	A	O			
RHACATH		R			
CORSTOL		O			
LONTATA		O			

SPECIES CODE	LAYER 1	2	3	4	COL.
UTR bladd				D	
LEMMINO				O	
BIDFRON				O	
LYC UNIF				R	
PHR AUST				R	
JUN EFFU				R	

ELC
MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC
WILDLIFE

SITE: Mohawk Lake
POLYGON: 29
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS	✓	SNAGS
	HIBERNACULA	✓	FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
H	GRFR	OB	many!	204					
H	AMTO	OB	many!	204					
B	GBHE	OB	at wetland	1					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

SITE: Mohawk Lake		POLYGON: 25	
SURVEYOR(S): NS & KD	DATE: SEPT 12/18	TIME: start / finish	
UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN G ACIDIC BEDRK G BASIC BEDRK G CARB BEDRK	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP G BEDROCK			COVER G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	SALXRUB = FRAGNIGR
2	SUB-CANOPY	3	2	ACENEGU
3	UNDERSTOREY	4	4	RHACATH = CORRAC > VIBOPU = RUBIDI
4	GRD. LAYER	5	4	PHAARU > IMPCAPE = SOLCAN > BIDFRON

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	MARSH	MA
COMMUNITY SERIES:	MEADOW MARSH	MAM
ECOSITE:	ORGANIC	MAM3
VEGETATION TYPE:	Reed-canary grass organic meadow marsh	MAM3-2
INCLUSION		
COMPLEX		

Notes:

Dry creek bed with reed-canary grass in and adjacent to creek.

ELC — STAND CHARACTERISTICS

SITE:	
POLYGON:	
DATE:	
SURVEYOR(S):	

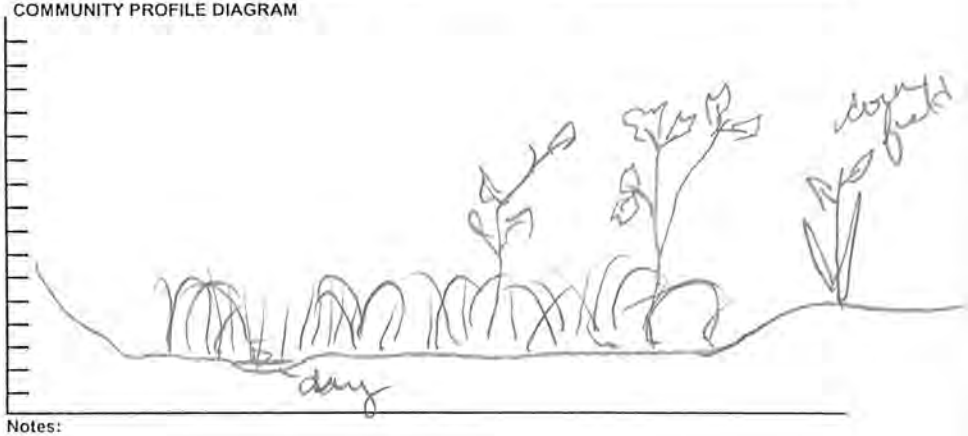
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:
POLYGON:
DATE:
SURVEYOR(S):

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Slope Class	UTM Z	UTM EASTING	UTM NORTHING
1	A			5	—	—	—	—	17	562212	4775325
2											
3											
4											
5											

+/- 3.4m

SOIL	1	2	3	4	5
TEXTURE x HORIZON	A 10 / B / 100 / C				
A TEXTURE	fibric org.				
COURSE FRAGMENTS	999				
B TEXTURE	OA org.				
COURSE FRAGMENTS	999				
C TEXTURE	S course				
COURSE FRAGMENTS	100				
EFFECTIVE TEXTURE					
SURFACE STONINESS	0				
SURFACE ROCKINESS	0				
DEPTH TO / OF					
MOTTLES	20				
GLEY	999				
BEDROCK	999				
WATER TABLE	30				
CARBONATES	—				
DEPTH OF ORGANICS	100				
PORE SIZE DISC #1	—				
PORE SIZE DISC #2	—				
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE: Mohawk Lake
POLYGON: 25
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
ACE NEGU.		O	O		
JUG NIGR	R				
SAL RUBE	R				
RHA CATH			A		
RUB IDID			R		
VIB OPUL			R		
COR FOEM			A		
ECM LOBA				O	
UT RIPA				O	

SPECIES CODE	LAYER 1	2	3	4	COL.
PHA ARUN				D	
IMP CAPE				A	
SOL DULC				A	
BID FRON				A	
AST PURU				O	
4* POL AMPH				R	
SOL ALTI				R	
5* EPI HIRS				R	
EQU ARV				R	
LYC AMER				O	
BOE CYLI				R	
ARC MIMI				R	
PIL PUMI				R	
LYT SALI				R	
LYS creeping Jenny				R	
CIR ARVE				R	
TYP LATI				R	
SOL CANA				R	
URT DIOI				R	
CAR SP.				R	
AMB TRIF					
ASCLSYRI					

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 25
DATE:
SURVEYOR(S):
START TIME: END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:

CONDITIONS:

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
L	MONA	DD		1					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE: Mohawk Lake		POLYGON: 26	
	SURVEYOR(S): KD, NS	DATE: Sept. 12/18	TIME: start	finish
	UTMZ:	UTME:	UTMN:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
G TERRESTRIAL G WETLAND G AQUATIC	G ORGANIC G MINERAL SOIL G PARENT MIN. G ACIDIC BEDRK. G BASIC BEDRK. G CARB. BEDRK.	G LACUSTRINE G RIVERINE G BOTTOMLAND G TERRACE G VALLEY SLOPE G TABLELAND G ROLL. UPLAND G CLIFF G TALUS G CREVICE / CAVE G ALVAR G ROCKLAND G BEACH / BAR G SAND DUNE G BLUFF	G NATURAL G CULTURAL	G PLANKTON G SUBMERGED G FLOATING-LVD. G GRAMINOID G FORB G LICHEN G BRYOPHYTE G DECIDUOUS G CONIFEROUS G MIXED	G LAKE G POND G RIVER G STREAM G MARSH G SWAMP G FEN G BOG G BARREN G MEADOW G PRAIRIE G THICKET G SAVANNAH G WOODLAND G FOREST G PLANTATION
SITE G OPEN WATER G SHALLOW WATER G SURFICIAL DEP. G BEDROCK			**COVER** G OPEN G SHRUB G TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (up to 4 sp) (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1,2	1	
2	SUB-CANOPY	3	1	
3	UNDERSTOREY	4,5	3	CORN SPP. = RHA CATH > RHU TYPH
4	GRD. LAYER	6,7	4	POA > SOL > AST

HT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m

CVR CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:		< 10		10 - 24		25 - 50		> 50
STANDING SNAGS:		< 10		10 - 24		25 - 50		> 50
DEADFALL / LOGS:		< 10		10 - 24		25 - 50		> 50

ABUNDANCE CODES: N = NONE R = RARE O = OCCASIONAL A = ABUNDANT

COMM. AGE :		PIONEER	✓	YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES / GLEY	g =	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

		ELC CODE
COMMUNITY CLASS:	Cultural	CU
COMMUNITY SERIES:	Cultural Thicket	CUT
ECOSITE:	Mineral	CUT1
VEGETATION TYPE:	Mineral Cultural thicket	CUT1
INCLUSION	cattail shallow marsh + forb meadow marsh	MAS2-1 & MAM2-10
COMPLEX	Cultural meadow.	CUM1-1

Notes:

ELC STAND CHARACTERISTICS	SITE:	
	POLYGON:	
	DATE:	
	SURVEYOR(S):	

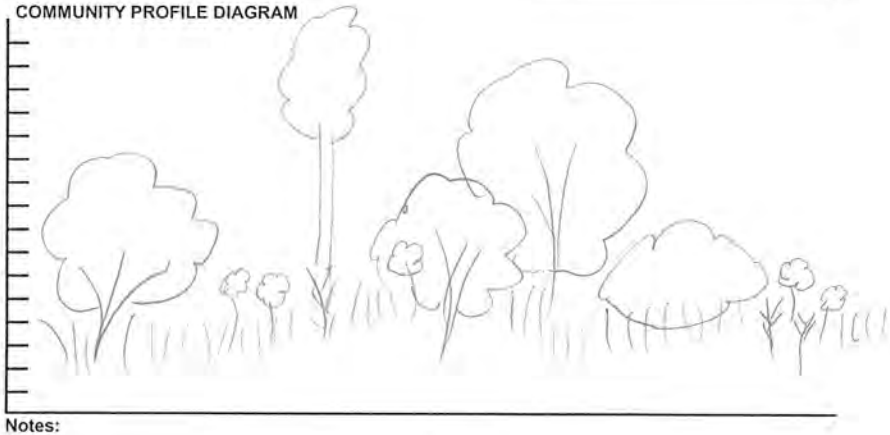
TREE TALLY BY SPECIES:

PRISM FACTOR

SPECIES	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AVG
TOTAL							100
BASAL AREA (BA)							
DEAD							

STAND COMPOSITION:

COMMUNITY PROFILE DIAGRAM



Notes:

ELC

SOILS ONTARIO

SITE:

POLYGON:

DATE:

SURVEYOR(S):

Slope UTM

	P/A	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1											
2											
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE x HORIZON					
A TEXTURE					
COURSE FRAGMENTS					
B TEXTURE					
COURSE FRAGMENTS					
C TEXTURE					
COURSE FRAGMENTS					
EFFECTIVE TEXTURE					
SURFACE STONINESS					
SURFACE ROCKINESS					
DEPTH TO / OF					
MOTTLES					
GLEY					
BEDROCK					
WATER TABLE					
CARBONATES					
DEPTH OF ORGANICS					
PORE SIZE DISC #1					
PORE SIZE DISC #2					
MOISTURE REGIME					
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE: Mohawk Lake

POLYGON: 26

DATE: Sept 12/18

SURVEYOR(S): KD NS

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.
JUGNIGR		O			
ACENEG		O			
COR EDEM			A		
COR STOL			O	O	
RHU TYPH			O		
RHA CATH			A		
ULM PUMI			O		
ACE GINN			R		
ELA UMBE			R		
RUB OCCI				O	
PAR INSE					
VIT RIPA					

SPECIES CODE	LAYER 1	2	3	4	COL.
SOL CANA				A	
AST NOVA				O	
TRIF REPE				O	
AST LAEA				O	
GAL MOLL				A	
DAU CARO				O	
AST UROP				O	
POA PRAT				D	
TAN VULG				R	
EUT GRAM				R	
ASC SYRI				R	
PHA ARUN				R	
AMB ARTE				R	
DIP FULL				R	
BRO INN				R	
VER THAP				R	
EQU ARVE				R	
PLA MAJO				R	
Cattail inclusion					
TYP ANGU				D	
IMP CAPE				O	
LYC UNIF				O	
SAL PETI			O		
MAM 2-10					
BID FRON				A	
LYT SALI				O	
ACE NEGU				O	
CARE sp.				R	
EQU ARVE				O	
VER HAST				R	

ELC

MANAGEMENT / DISTURBANCE

SITE:
POLYGON:
DATE:
SURVEYOR(S):

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

ELC

WILDLIFE

SITE: Mohawk Lake
POLYGON: 26
DATE: Sept. 12/18
SURVEYOR(S): KD, NS
START TIME:
END TIME:

TEMP (°C):	CLOUD (10th):	WIND:	PRECIPITATION:
CONDITIONS:			

POTENTIAL WILDLIFE HABITAT:

	VERNAL POOLS		SNAGS
	HIBERNACULA		FALLEN LOGS

SPECIES LIST:

TY	SP. CODE	EV	NOTES	#	TY	SP. CODE	EV	NOTES	#
L	MONA	OB		1					

FAUNAL TYPE CODES (TY):
B = BIRD M = MAMMAL H = HERPETOFAUNA L = LEPIDOPTERA F = FISH O = OTHER

EVIDENCE CODES (EV):

BREEDING BIRD - POSSIBLE:
SH = SUITABLE HABITAT SM = SINGING MALE

BREEDING BIRD - PROBABLE:
T = TERRITORY D = DISPLAY P = PAIR
A = ANXIETY BEHAVIOUR N = NEST BUILDING V = VISITING NEST

BREEDING BIRD - CONFIRMED:
DD = DISTRACTION NU = USED NEST FY = FLEDGED YOUNG
NE = EGGS NY = YOUNG FS = FOOD/FAECAL SACK
AE = NEST ENTRY

OTHER WILDLIFE EVIDENCE:
OB = OBSERVED VO = VOCALIZATION CA = CARCASS
DP = DISTINCTIVE PARTS HO = HOUSE/DEN FY = EGGS OR YOUNG
TK = TRACKS FE = FEEDING EVIDENCE SC = SCAT
SI = OTHER SIGNS (specify)

Appendix E-4 – Vascular Plant List

Scientific Name	Common Name	G-Rank	COSEWIC	COSSARO	S-Rank	CC	CW	Introduced 0=n 1=y	7E Rankings[1]	Vegetation Community																								
										1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Abies balsamea	Balsam Fir	G5			S5	5	-3	0	?				x																					
Acalypha virginica var. rhomboidea	Three-seeded Mercury	G5			S5	0	3	0	x																						x			
Acer ginnala	Amur Maple	G?			SE1	0	5	I															x											x
Acer negundo	Manitoba Maple	G5			S5	0	-2	0	C	x				x	x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Acer platanoides	Norway Maple	G?			SE5	0	5	I	IX				x	x	x								x					x			x			
Acer rubrum	Red Maple	G5			S5	4	0	0	C	x	x		x				x												x					
Acer saccharinum	Silver Maple	G5			S5	5	-3	0	C				x	x													x			x				
Acer saccharum ssp. saccharum	Sugar Maple	G5			S5	4	3	0	C		x		x	x			x	x										x						
Acer X freemanii	Freeman's Maple	G?			S5			0	HYB	x			x	x										x	x					x				
Achillea millefolium ssp. millefolium	Common Yarrow	G5			SE	0	3	I											x				x							x				
Actaea pachypoda	White Baneberry	G5			S5	6	5	0	C																			x						
Actaea sp	Baneberry Species							0			x																							
Aesculus glabra	Ohio Buckeye	G5			S1	10	-1	0	IR																			x						
Aesculus hippocastanum	Horse Chestnut	G?			SE2	0	5	I	IX																	x								
Agrimonia sp	Agrimony Species							0																				x						
Agrostis stolonifera	Creeping Bent Grass	G5			S5	0	-3	0	IX					x				x			x													
Ailanthus altissima	Tree-of-heaven	G?			SE5	0	5	I												x			x	x	x									
Alliaria petiolata	Garlic Mustard	G?			SE5	0	0	I	IX		x			x	x		x	x		x				x	x		x		x		x			
Alopecurus pratensis	Meadow Foxtail	G?			SE5	0	-3	I	IX											x														
Ambrosia artemisiifolia	Common Ragweed	G5			S5	0	3	0	C										x	x			x			x				x				x
Ambrosia trifida	Giant Ragweed	G5			S5	0	-1	0	C											x			x	x	x			x			x		x	
Amelanchier arborea	Downy Serviceberry	G5			S5	5	3	0	X	x																								
Amphicarpaea bracteata	Hog Peanut	G5			S5	4	0	0	C									x																
Anemone virginiana var. virginiana	Thimbleweed	G5			S5	4	5	0	C		x																							
Apios americana	Groundnut	G5			S5	6	-3	0	C																			x						
Apocynum androsaemifolium ssp. androsaemifolium	Spreading Dogbane	G5			S5	3	5	0	C	x										x											x			
Arctium minus ssp. minus	Common Burdock	G?			SE5	0	5	I	IX															x	x			x				x		
Arisaema triphyllum ssp. triphyllum	Jack-in-the-pulpit	G5			S5	5	-2	0	C	x	x							x	x		x							x			x			
Artemisia vulgaris	Common Mugwort	G?			SE5	0	5	I	IX										x					x										
Asclepias syriaca	Common Milkweed	G5			S5	0	5	0	C										x	x			x			x				x			x	x
Aster cordifolius	Heart-leaved Aster	G5			S5	5	5	0	C		x																x							
Aster lanceolatus ssp. lanceolatus	Panicled Aster	G5			S5	3	-3	0	C			x				x								x										
Aster lateriflorus var. lateriflorus	One-sided Aster	G5			S5	3	-2	0	C	x		x		x	x			x	x	x	x								x						x
Aster macrophyllus	Large-leaved Aster	G5			S5	5	5	0	C		x					x			x	x			x							x				x
Aster novae-angliae	New England Aster	G5			S5	2	-3	0	C							x																		
Aster puniceus var. puniceus	Purple-stem Aster	G5			S5	6	-5	0	C																								x	
Aster urophyllus	Arrow-leaved Aster	G4			S4	6	5	0	C		x																	x						x
Bidens frondosa	Devil's Beggar-ticks	G5			S5	3	-3	0	C	x				x						x			x					x	x			x	x	x
Boehmeria cylindrica	False Nettle	G5			S5	4	-5	0	C																			x					x	
Bromus ciliatus	Fringed Brome	G5			S5	6	-3	0	C																			x						
Bromus inermis ssp. inermis	Smooth Brome	G4G5			SE5	0	5	I	IX							x							x	x										x
Calamagrostis canadensis	Canada Blue-joint	G5			S5	4	-5	0	C	x		x																						
Calystegia sepium ssp. angulata	Hedge Bindweed	G5			S5	2	0	0	C							x						x											
Carduus nutans ssp. leiophyllus	Nodding Thistle	G?			SE5	0	5	I	IX										x														
Carex lupulina	Common Hop Sedge	G5			S5	6	-5	0	C	x																								
Carex pensylvanica	Pennsylvania Sedge	G5			S5	5	5	0	C		x																							
Carex rosea	Stellate Sedge	G5			S5	5	5	0	C	x																								
Carex sp	Sedge Species							0		x		x						x											x				x	x
Carex vulpinoidea	Fox Sedge	G5			S5	3	-5	0	C			x																						
Carpinus caroliniana	Blue Beech	G5			S5	6	0	0	C	x																								

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										1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Carya cordiformis	Bitternut Hickory	G5			S5	6	0	0	C								x												x						
Carya glabra	Pignut Hickory	G5			S3	9	3	0	**C**	x	x		x	x			x																		
Carya ovata	Shagbark Hickory	G5			S5	6	3	0	C	x			x				x												x						
Catalpa speciosa	Northern Catalpa	G2G4			SE1	0	3	I		x				x						x			x												
Celastrus scandens	Climbing Bittersweet	G5			S5	3	3	0	C		x																								
Celtis occidentalis	Hackberry	G5			S4	8	1	0	U		x		x		x	x				x			x		x		x		x	x				
Centaurea sp	Knapweed Species							0																						x					
Cercis canadensis	Redbud	G5			SX	8	3	0	IR							x																			
Chelidonium majus	Celandine	G?			SE5	0	5	I	IX															x	x										
Chelone glabra	Turtlehead	G5			S5	7	-5	0	C			x																	x						
Chrysanthemum leucanthemum	Ox-eye Daisy	G?			SE5	0	5	I	IX														x												
Cichorium intybus	Chicory	G?			SE5	0	5	I	IX										x	x						x				x					
Cicuta maculata	Spotted Water-hemlock	G5			S5	6	-5	0	C			x																							
Circaea lutetiana ssp. canadensis	Canada Enchanter's Nightshade	G5			S5	3	3	0	C	x					x		x																		
Cirsium arvense	Canada Thistle	G?			SE5	0	3	I	IX						x															x			x		
Cirsium vulgare	Bull Thistle	G5			SE5	0	4	I	IX										x																
Clematis virginiana	Virgin's Bower	G5			S5	3	0	0	C						x																				
Clinopodium vulgare	Wild Basil	G?			S5	4	5	0	C																					x					
Convallaria majalis	Lily-of-the-valley	G5			SE5	0	5	I	IX					x																					
Convolvulus arvensis	Field Bindweed	G?			SE5	0	5	I	IX		x	x																								
Conyza canadensis	Horseweed	G5			S5	0	1	0	C										x																
Cornus alternifolia	Alternate-leaved Dogwood	G5			S5	6	5	0	C																				x						
Cornus amomum ssp. obliqua	Silky Dogwood	G5			S5	5	-4	0	C			x																	x						
Cornus foemina ssp. racemosa	Grey Dogwood	G5			S5	2	-2	0	C	x	x	x		x		x				x										x	x			x	x
Cornus stolonifera	Red-osier Dogwood	G5			S5	2	-3	0	C					x							x		x						x		x		x		x
Coronilla varia	Trailing Crown-vetch	G?			SE5	0	5	I	IX																					x					
Corylus americana	American Hazelnut	G5			S5	5	4	0	C	x																										
Crataegus macracantha	Long-spined Hawthorn	G?			S5	4	5	0			x																								
Crataegus sp	Hawthorn Species							0									x																		
Cyperus esculentus	Field Nut Sedge	G5			S5	1	-3	0	U																	x									
Dactylis glomerata	Orchard Grass	G?			SE5	0	3	I	IX		x				x					x								x		x					
Daucus carota	Wild Carrot	G?			SE5	0	5	I	IX						x	x			x				x							x					x
Desmodium glutinosum	Pointed-leaved Tick-trefoil	G5			S4	6	5	0	C		x																								
Digitaria sanguinalis	Large Crabgrass	G5			SE5	0	3	I	IX										x																
Dipsacus fullonum ssp. sylvestris	Common Teasel	G?			SE5	0	5	I	IX											x										x					x
Dryopteris carthusiana	Spinulose Wood Fern	G5			S5	5	-2	0	C								x																		
Echinochloa crusgalli	Barnyard Grass	G?			SE5	0	-3	I	IX																					x					
Echinocystis lobata	Wild Cucumber	G5			S5	3	-2	0	C			x										x		x	x								x		
Echium vulgare	Viper's Bugloss	G?			SE5	0	5	I	IX											x										x					
Elaeagnus umbellata	Autumn Olive	G?			SE3	0	3	I	IX							x				x															x
Elymus hystrix	Bottlebrush Grass	G5			S5	5	5	0	C						x																				
Elymus repens	Quack Grass	G5			SE5	0	3	I	IX															x		x									
Elymus riparius	Riverbank Wild Rye	G5			S4?	7	-3	0	U																				x						
Epilobium ciliatum ssp. ciliatum	American Willow-herb	G5			S5	3	3	0	C					x																					
Epilobium hirsutum	Hairy Willow-herb	G?			SE5	0	-4	I	IX																									x	
Equisetum arvense	Field Horsetail	G5			S5	0	0	0	C	x								x																x	x
Equisetum fluviatile	Water Horsetail	G5			S5	7	-5	0	C											x															
Erigeron annuus	Daisy Fleabane	G5			S5	0	1	0	C										x	x			x			x									
Erigeron sp	Fleabane Species							0																					x						
Euonymus obovata	Running Strawberry-bush	G5			S5	6	5	0	C		x																								

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Eupatorium altissimum	Tall Boneset	G5			S1	3	3	0												x															
Eupatorium maculatum ssp. maculatum	Spotted Joe-pye-weed	G5			S5	3	-5	0	C			x																x						
Eupatorium perfoliatum	Common Boneset	G5			S5	2	-4	0	C			x								x														
Eupatorium rugosum	White Snakeroot	G5			S5	5	3	0	C																			x						
Euthamia graminifolia	Grass-leaved Goldenrod	G5			S5	2	-2	0	C			x								x	x					x								x
Fagus grandifolia	American Beech	G5			S5	6	3	0	C								x																	
Fragaria vesca ssp. americana	Woodland Strawberry	G5			S5	4	4	0	U	x																								
Fragaria virginiana ssp. virginiana	Common Strawberry	G5			S5	2	1	0	C					x			x																
Fraxinus americana	White Ash	G5			S5	4	3	0	C					x																				
Fraxinus pennsylvanica	Red Ash	G5			S5	3	-3	0	C	x	x			x	x		x	x		x	x		x	x	x		x		x					
Galium mollugo	Smooth Bedstraw	G?			SE5	0	5	I	IX						x	x								x		x								x
Geranium maculatum	Spotted Crane's-bill	G5			S5	6	3	0	C	x	x						x											x						
Geum aleppicum	Yellow Avens	G5			S5	2	-1	0	C	x	x			x	x		x	x		x					x		x		x			x		
Geum canadense	White Avens	G5			S5	3	0	0	C		x						x	x													x			
Geum macrophyllum	Large-leaved Avens	G5			S5	9	-4	0	?																		x							
Glechoma hederacea	Ground Ivy	G?			SE5	0	3	I	IX					x									x											
Glyceria striata	Fowl Manna Grass	G5			S5	3	-5	0	C	x								x										x	x					
Hackelia virginiana	Virginia Stickseed	G5			S5	5	1	0	U								x											x			x			
Hamamelis virginiana	Witch-hazel	G5			S5	6	3	0	C	x	x						x																	
Helianthus strumosus	Pale-leaved Wood Sunflower	G5			S5	7	5	0	**R**										x															
Helianthus tuberosus	Jerusalem Artichoke	G5			SE5	0	0	I	IX		x													x										
Hesperis matronalis	Dame's Rocket	G4G5			SE5	0	5	I	IX									x							x		x		x			x		
Humulus lupulus	Common Hop	G5			S?	0	3	I	IX																x									
Hypericum perforatum	Common St. John's-wort	G?			SE5	0	5	I	IX							x																		
Impatiens capensis	Spotted Touch-me-not	G5			S5	4	-3	0	C			x					x	x		x			x		x				x	x		x		x	x
Impatiens pallida	Pale Touch-me-not	G5			S5	7	-3	0	U									x											x						
Iris pseudacorus	Yellow Iris	G?			SE3	0	-5	I	IX			x											x												
Juglans nigra	Black Walnut	G5			S4	5	3	0	C		x			x	x	x	x	x		x			x	x	x		x		x	x	x	x		x	x
Juglans sp	Walnut Species							0											x																
Juncus torreyi	Torrey's Rush	G5			S5	3	-3	0	U			x																						
Juncus effusus ssp. solutus	Soft Rush	G5			S5	4	-5	0	C																						x			
Juncus sp	Rush Species							0				x																						
Juncus tenuis	Path Rush	G5			S5	0	0	0	C			x								x								x						
Juncus torreyi	Torrey's Rush	G5			S5	3	-3	0	U											x														
Juniperus virginiana	Eastern Red Cedar	G5			S5	4	3	0	C																x									
Lactuca serriola	Prickly Lettuce	G?			SE5	0	0	I	IX										x															
Leersia oryzoides	Rice Cut Grass	G5			S5	3	-5	0	C																				x					
Lemna minor	Lesser Duckweed	G5			S5	2	-5	0	X																				x			x		
Lilium sp	Lily Species							0																			x							
Linaria vulgaris	Butter-and-eggs	G?			SE5	0	5	I	IX														x			x				x				
Lobelia siphilitica	Great Blue Lobelia	G5			S5	6	-4	0	C	x		x																x						
Lonicera tatarica	Tartarian Honeysuckle	G?			SE5	0	3	I	IX					x			x	x					x					x				x		
Lotus corniculatus	Bird's-foot Trefoil	G?				0	1	I															x	x		x								
Lycopus americanus	Cut-leaved Water-horehound	G5			S5	4	-5	0	C																				x				x	
Lycopus uniflorus	Northern Water-horehound	G5			S5	5	-5	0	C	x		x									x		x						x			x		x
Lysimachia nummularia	Moneywort	G?			SE5	0	-4	I	IX																								x	
Lysimachia thyrsiflora	Tufted Loosestrife	G5			S5	7	-5	0	U	x																								
Lythrum salicaria	Purple Loosestrife	G5			SE5	0	-5	I	IX			x								x	x									x			x	x
Maianthemum racemosum ssp. racemosum	False Solomon's Seal	G5			S5	4	3	0	C		x																	x						
Maianthemum stellatum	Starry False Solomon's Seal	G5			S5	6	1	0	C	x	x																							

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Medicago lupulina	Black Medick	G?			SE5	0	1	I	IX											x														
Melilotus alba	White Sweet-clover	G5			SE5	0	3	I	IX										x	x														
Morus alba	White Mulberry	G?			SE5	0	0	I	IX						x	x	x			x		x	x		x					x	x			
Oenothera biennis	Common Evening-primrose	G5			S5	0	3	0	X																	x					x			
Onoclea sensibilis	Sensitive Fern	G5			S5	4	-3	0	C	x																			x					
Ostrya virginiana	Hop Hornbeam	G5			S5	4	4	0	C								x																
Oxalis stricta	Upright Yellow Wood-sorrel	G5			S5	0	3	0	C		x						x			x									x		x		
Parthenocissus inserta	Thicket Creeper	G5			S5	3	3	0	C	x	x			x	x	x	x	x		x			x		x		x		x	x			x
Phalaris arundinacea	Reed Canary Grass	G5			S5	0	-4	0	C			x								x	x	x								x	x		x	x
Phleum pratense	Timothy	G?			SE5	0	3	I	IX							x							x	x										
Phragmites australis	Common Reed	G5			S5	0	-4	0	IC			x						x		x		x	x			x		x	x		x		x	
Phryma leptostachya	Lopseed	G5			S4S5	6	5	0	C					x			x	x		x									x					
Physocarpus opulifolius	Ninebark	G5			S5	5	-2	0	C			x																						
Physostegia virginiana	Virginia False Dragonhead	G5			S4	8	-3	0							x																			
Phytolacca americana	Pokeweed	G5			S4	3	1	0	C																x									
Picea glauca	White Spruce	G5			S5	6	3	0	X							x	x													x				
Picea pungens	Blue Spruce	G5			SNA		3	1																						x				
Pilea fontana	Spring Clearweed	G5			S4	5	-3	0	C			x																	x					
Pilea pumila	Common Clearweed	G5			S5	5	-3	0	U								x	x															x	
Pilea sp	Clearweed Species							0		x																								
Pinus strobus	Eastern White Pine	G5			S5	4	3	0	C				x			x	x							x									
Pinus sylvestris	Scots Pine	G?			SE5	0	5	I	IX				x																					
Plantago lanceolata	Ribgrass	G5			SE5	0	0	I	IX														x											
Plantago major	Common Plantain	G5			SE5	0	-1	I	IX			x							x	x					x				x			x		x
Poa palustris	Fowl Blue Grass	G5			S5	5	-4	0	C	x		x																						
Poa pratensis ssp. pratensis	Kentucky Blue Grass	G?			S5	0	1	0	IX							x				x			x								x			x
Podophyllum peltatum	Mayapple	G5			S5	5	3	0	C		x									x														
Polygonatum biflorum	Smooth Solomon's Seal	G5			S4	8	3	0	U						x																			
Polygonatum pubescens	Hairy Solomon's Seal	G5			S5	5	5	0	C		x																							
Polygonum amphibium	Water Smartweed	G5			S5	5	-5	0	X																								x	
Polygonum cuspidatum	Japanese Knotweed	G?			SE4	0	3	I	IX																x					x				
Polygonum lapathifolium	Pale Smartweed	G5			S5	2	-4	0	C																x									
Polygonum scandens	Climbing False Buckwheat	G5			S4S5	3	0	0	X																x				x	x		x		
Polygonum sp	Smartweed Species							0				x																						
Polygonum virginianum	Jumpseed	G5			S4	6	0	0	X		x																							
Populus deltoides ssp. deltoides	Eastern Cottonwood	G5			S5	4	-1	0	C				x	x	x	x		x		x				x			x		x		x	x	x	
Populus tremuloides	Trembling Aspen	G5			S5	2	0	0	C											x	x							x						
Potamogeton sp	Pondweed Species							0				x																						
Potentilla anserina ssp. anserina	Silverweed	G5			S5	5	-4	0	IX		x																							
Potentilla recta	Rough-fruited Cinquefoil	G?			SE5	0	5	I	IX										x				x							x				
Prenanthes trifoliata	Tall Rattlesnake Root	G5			S5			0			x																							
Prunella vulgaris ssp. vulgaris	Selfheal	G5			SE3	0	0	I				x																						
Prunus avium	Sweet Cherry	G?			SE4	0	5	I	IX					x	x		x																	
Prunus serotina	Black Cherry	G5			S5	3	3	0	C	x	x			x			x												x					
Prunus virginiana ssp. virginiana	Choke Cherry	G5			S5	2	1	0	C	x	x				x		x						x						x			x		
Quercus alba	White Oak	G5			S5	6	3	0	C		x		x	x			x			x									x					
Quercus bicolor	Swamp White Oak	G5			S4	8	-4	0	U	x																								
Quercus macrocarpa	Bur Oak	G5			S5	5	1	0	C				x							x										x				
Quercus rubra	Red Oak	G5			S5	6	3	0	C	x	x		x	x			x			x									x					
Quercus velutina	Black Oak	G5			S4	8	5	0	C	x	x		x				x			x														

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Rhamnus cathartica	Common Buckthorn	G?			SE5	0	3	I	IX	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x		x	x	x	x	x	x
Rhus radicans ssp. rydbergii	Western Poison-ivy	G5			S5	0	0	0	X	x	x			x	x		x	x		x					x						x			
Rhus typhina	Staghorn Sumac	G5			S5	1	5	0	C						x	x				x	x		x	x						x	x			x
Ribes americanum	Wild Black Currant	G5			S5	4	-3	0	C			x																							
Ribes cynosbati	Prickly Gooseberry	G5			S5	4	5	0	C									x													x			
Robinia pseudo-acacia	Black Locust	G5			SE5	0	4	I	IX			x				x		x		x		x		x					x				
Rosa blanda	Smooth Wild Rose	G5			S5	3	3	0	C																			x						
Rosa multiflora	Multiflora Rose	G?			SE4	0	3	I	IX						x		x	x		x								x			x			
Rubus allegheniensis	Common Blackberry	G5			S5	2	2	0	X	x	x																							
Rubus hispidus	Swamp Dewberry	G5			S4	6	-3	0	X	x																								
Rubus idaeus ssp. idaeus	Red Raspberry	G5			SE1	0	5	I			x			x	x		x	x			x		x		x		x		x			x		
Rubus occidentalis	Black Raspberry	G5			S5	2	5	0	X						x		x			x				x	x		x		x	x			x
Rudbeckia hirta	Black-eyed Susan	G5			S5	0	3	0	C																	x								
Rumex crispus	Curly Dock	G?			SE5	0	-1	I	IX										x						x									
Rumex obtusifolius ssp. obtusifolius	Bitter Dock	G?			SE5	0	-3	I	IX									x																
Sagittaria latifolia	Common Arrowhead	G5			S5	4	-5	0	C			x																						
Salix amygdaloides	Peach-leaved Willow	G5			S5	6	-3	0	X											x														
Salix exigua	Sandbar Willow	G5			S5	3	-5	0	C												x													
Salix fragilis	Crack Willow	G?			SE5	0	-1	I						x																		x		
Salix petiolaris	Slender Willow	G5			S5	3	-4	0	C												x										x			x
Salix sp	Willow Species							0												x														
Salix X rubens	Hybrid White Willow	G?			SE4	0	-4	I	HYB			x						x		x	x	x	x					x					x	
Sanguinaria canadensis	Bloodroot	G5			S5	5	4	0	C																						x			
Saponaria officinalis	Bouncing Bet	G?			SE5	0	3	I	IX														x	x										
Scirpus atrovirens	Black Bulrush	G5?			S5	3	-5	0	C					x																				
Scirpus validus	Softstem Bulrush	G?			S5	5	-5	0	X			x																						
Scrophularia marilandica	Carpenter's Square	G5			S4	7	4	0	**R**			x																						
Setaria verticillata	Bristly Foxtail	G?			SE4	0	0	I	IX										x															
Sicyos angulatus	One-seeded Bur Cucumber	G5			S5	5	-2	0	U																x				x		x			
Silene latifolia	Bladder Campion	G?			SE5	0	5	I												x						x								
Smilax herbacea	Herbaceous Carrion Flower	G5			S4	5	0	0	C																			x						
Solanum carolinense	Horse Nettle	G5			SE3	0	4	I		x																								
Solanum dulcamara	Bittersweet Nightshade	G?			SE5	0	0	I	IX					x									x		x			x	x	x			x	
Solanum nigrum	Black Nightshade	G?			SE1	0	0	I																						x				
Solidago altissima var. altissima	Tall Goldenrod	G?			S5	1	3	0	C																								x	
Solidago arguta var. arguta	Sharp-leaved Goldenrod	G5			S3	8	3	0			x	x																						
Solidago canadensis var. canadensis	Canada Goldenrod	G5			S5	1	3	0	C	x	x			x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x		x	x
Solidago flexicaulis	Zig-zag Goldenrod	G5			S5	6	3	0	C		x						x																	
Solidago gigantea	Giant Goldenrod	G5			S5	4	-3	0	C											x														
Solidago nemoralis ssp. nemoralis	Gray Goldenrod	G5			S5	2	5	0	C											x														
Solidago patula	Rough-leaved Goldenrod	G5			S5	8	-5	0	C																			x						
Sonchus arvensis ssp. arvensis	Field Sow-thistle	G?			SE5	0	1	I	IX															x										
Sorbus aucuparia	European Mountain-ash	G5			SE4	0	5	I	IX	x				x																				
Spiraea alba	Narrow-leaved Meadowsweet	G5			S5	3	-4	0	C	x																								
Symplocarpus foetidus	Skunk Cabbage	G5			S5	7	-5	0	C	x				x				x											x					
Tanacetum vulgare	Tansy	G?			SE5	0	5	I	IX										x	x			x	x		x								x
Taraxacum officinale	Common Dandelion	G5			SE5	0	3	I	IX										x						x				x		x			
Thalictrum dioicum	Early Meadow-rue	G5			S5	5	2	0	C	x																								
Thalictrum pubescens	Tall Meadow-rue	G5			S5	5	-2	0	C			x			x																			
Thelypteris palustris var. pubescens	Marsh Fern	G5			S5	5	-4	0	C	x																								

Scientific Name	Common Name	G-Rank	COSEWIC	COSSARO	S-Rank	CC	CW	Introduced 0=n 1=y	7E Rankings[1]	Vegetation Community																								
										1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Thuja occidentalis	Eastern White Cedar	G5			S5	4	-3	0	C				x			x														x				
Tilia americana	Basswood	G5			S5	4	3	0	C	x	x			x			x				x													
Tilia cordata	Little-leaf Linden	GNR			SNA			1					x	x	x															x				
Trifolium pratense	Red Clover	G?			SE5	0	2	I	IX							x			x	x														
Trifolium repens	White Clover	G?			SE5	0	2	I	IX										x																x
Trillium erectum	Red Trillium	G5			S5	6	1	0	C	x																								
Tsuga canadensis	Eastern Hemlock	G5			S5	7	3	0	C				x																					
Tussilago farfara	Coltsfoot	G?			SE5	0	3	I	IX									x											x					
Typha angustifolia	Narrow-leaved Cattail	G5			S5	3	-5	0	IX			x																						x
Typha latifolia	Broad-leaved Cattail	G5			S5	3	-5	0	C													x					x						x	
Ulmus americana	White Elm	G5?			S5	3	-2	0	C	x													x	x										
Ulmus pumila	Siberian Elm	G?			SE3	0	5	I	IX																									x
Urtica dioica ssp. dioica	European Stinging Nettle	G5T?			SE2	0	-1	I	IX																x				x	x			x	
Utricularia sp	Bladderwort Species							0																								x		
Verbascum thapsus	Common Mullein	G?			SE5	0	5	I	IX										x				x	x		x				x				x
Verbena hastata	Blue Vervain	G5			S5	4	-4	0	C																									x
Verbena urticifolia	White Vervain	G5			S5	4	-1	0	C									x																
Viburnum acerifolium	Maple-leaved Viburnum	G5			S5	6	5	0	C		x																							
Viburnum opulus	European Highbush Cranberry	G5			SE4	0	0	I	IX																				x				x	
Vinca minor	Periwinkle	G?			SE5	0	5	I	IX					x																				
Viola sp	Violet Species							0		x	x						x	x							x				x					
Vitis riparia	Riverbank Grape	G5			S5	0	-2	0	C	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x
Wolffia columbiana	Columbia Water Meal	G5			S4S5	4	-5	0	**R**																					x				
Xanthium strumarium	Cocklebur	G?			S5	2	0	0	C																x									
Zanthoxylum americanum	Prickly-ash	G5			S5	3	5	0	C	x																								

1. Oldham, Michael J. 2017. List of the Vascular Plants of Ontario's Carolinian Zone (Ecoregion 7E). Carolinian Canada and Ontario Ministry of Natural Resources and Forestry. Peterborough, ON. 132 pp.

Legend:

bold font	*rare; either of provincial conservation concern in Ontario (NHIC tracked) or rare at CZ or area level (R or H)*
I	*introduced; thought to have been present in the Carolinian Zone or individual CZ area prior to European settlement; believed to be deliberately or inadvertently introduced to the CZ by humans*
C	*common*
U	*uncommon*
R	*rare*
H	*historic records only (generally >30 years)*
X	*present; status unknown or not specified in source lists*
?	*unconfirmed report*
hyb	*hybrid*

Appendix E-5 – Terrastory Breeding Bird Report (2018)

October 18, 2018
Project No.: 1821

TERRASTORY
environmental consulting inc.

Ash Baron
Ecology Lead
Aquafor Beech Ltd.
55 Regal Road, Unit 3
Guelph, ON N1K 1B6
Sent via email to: *baron.a@aquaforbeech.com*

SUBJECT: Breeding Bird Surveys
Mohawk Lake Study Area, City of Brantford

BACKGROUND

Terrastory Environmental Consulting Inc. (hereinafter "Terrastory") was retained to undertake breeding bird surveys in the vicinity of Mohawk Lake (hereinafter "Study Area") in the City of Brantford. The results of these surveys are described below.

APPROACH AND METHODS

Two (2) rounds of breeding bird surveys were conducted in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al. 2001). Surveys occurred within the appropriate season (May 24–July 10), time of day (between dawn and approximately 5 hours after dawn), and weather conditions (no rain, wind speed ≤3 on the Beaufort Wind Scale). The two (2) rounds of surveys were spaced at least (10) days apart to better ascertain breeding status.

A total of twenty-eight (28) point count survey stations were established and situated systematically to cover the variety of bird habitats occurring within the Study Area (where permission to enter had been granted). Survey stations were positioned with greater emphasis in habitats that posses a higher potential to support significant bird species (i.e., Species at Risk), and in portions of the Study Area that may occur within or adjacent to future areas of disturbance. The stations were generally situated at a distance that minimized the potential for double counting individuals (i.e., minimum of 300 m apart) but were established somewhat closer where warranted (i.e., areas of greater noise pollution, potentially significant habitats, etc.). Birds were also recorded on transit between survey stations, but such records are not reported herein unless they involved a significant species or species that had not been recorded elsewhere in the Study Area. Each station was surveyed for a minimum duration of ten (10) minutes. The locations of all stations and significant bird species/habitats were recorded in the field with a high-accuracy global positioning system (Mesa II).

Signs of breeding activity were scrutinized for each individual bird recorded (e.g., singing male, probable pair, agitation, carrying nest material, etc.). The OBBA provides four (4) possible breeding categories to accompany each record:

Observed: Species observed during its breeding season (no evidence of breeding).

Possible Breeding: Includes any of the following observation types: 1) species observed in its breeding season in suitable nesting habitat, and 2) singing male present, or breeding calls heard, in its breeding season in suitable nesting habitat.

Probable Breeding: Includes any of the following observation types: 1) pair observed in their breeding season in suitable nesting habitat, 2) permanent territory presumed through registration of territorial song on at least 2 days, a week or more apart, at the same place, 3) courtship or display between a male and a female or 2 males, including courtship feeding or copulation, 4) visiting probable nest site, 5) agitated behaviour or anxiety calls of an adult, 6) brood patch on adult female or cloacal protuberance on adult male, and 7) nest-building or excavation of nest hole.

Confirmed Breeding: Includes any of the following observation types: 1) distraction display or injury feigning, 2) used nest or egg shell found (occupied or laid within the period of the study), 3) recently fledged young or downy young, including young incapable of sustained flight, 4) adults leaving or entering nest site in circumstances indicating occupied nest, 5) adult carrying faecal sac, 6) adult carrying food for young, 7) nest containing eggs, and 8) nest with young seen or heard.

Table 1 below summarizes the date, weather conditions, and time on-site during each breeding bird survey.

Table 1. Breeding Bird Survey Characteristics.

Date of Site Assessment	Primary Task(s)	Weather Conditions	Time of Site Assessment
June 9, 2018	Breeding bird survey #1 (stations #1-14)	air temperature 11-14°C; Beaufort wind 0; cloud cover 50-100%; no precipitation.	5:30-10:30
June 11, 2018	Breeding bird survey #1 (stations #15-28)	air temperature 15-18°C; Beaufort wind 0-2; cloud cover 0-10%; no precipitation.	5:30-10:15
June 20, 2018	Breeding bird survey #2 (stations #1-5)	air temperature 18-19°C; Beaufort wind 0-1; cloud cover 100%; precipitation at 7:15 forced cancellation of further surveying.	5:45-7:15
June 21, 2018	Breeding bird survey #2 (stations #6-16, 26-28)	air temperature 15-21°C; Beaufort wind 0-3; cloud cover 0%; no precipitation.	5:45-9:30
June 22, 2018	Breeding bird survey #2 (stations #17-25)	air temperature 12-16°C; Beaufort wind 0-2; cloud cover 20-70%; no precipitation.	6:00-9:15

RESULTS

A total of sixty-two (62) bird species were recorded during the breeding bird surveys. The assemblage and abundance of birds recorded generally reflects the prevailing structure and composition of on-site vegetation communities (particularly small deciduous woodlands) and the predominantly suburban landscape of the Study Area. The full breeding bird survey results indicating each species' breeding status by survey station can be found in **Appendix 1**, with representative photographs of the Study Area and key habitats provided in **Appendix 2**. The locations of significant birds and bird habitats recorded are shown in **Figure 1**.

Survey stations situated in small deciduous woodlands and along their edges represent the preponderance of habitats surveyed within the Study Area. Bird species frequently recorded within this habitat type included American Goldfinch (*Spinus tristis*), American Robin (*Turdus migratorius*), Baltimore Oriole (*Icterus galbula*), Blue Jay (*Cyanocitta cristata*), Brown-headed Cowbird (*Molothrus ater*), Common Grackle (*Quiscalus quiscula*), Downy Woodpecker (*Picoides pubescens*), Eastern Wood-pewee (*Contopus virens*), Gray Catbird (*Dumetella carolinensis*), House Wren (*Troglodytes aedon*), Mourning Dove (*Zenaida macroura*), Northern Cardinal (*Cardinalis cardinalis*), Song Sparrow (*Melospiza melodia*), and White-breasted Nuthatch (*Sitta carolinensis*). Most of the above species were recorded at greater than 50% of the stations surveyed within the Study Area. Where coverage by shrubs and/or regenerating trees was greater, Indigo Bunting (*Passerina cyanea*), American Redstart (*Setophaga ruticilla*), Carolina Wren (*Thryothorus ludovicianus*), and Yellow Warbler (*Setophaga petechia*) became more prevalent. In deeper parts of the woodlands further from edge effects, Great Crested Flycatcher (*Myrarchus crinitus*), Northern Flicker (*Colaptes auratus*), and Red-eyed Vireo (*Vireo olivaceus*) vocalized with greater frequency.

Interior forest conditions – often described as being at least 200 m from the nearest edge – are limited within the Study Area and restricted to the west side of Mohawk Park (and contiguous areas further west). This portion of the Study Area is the only location where Wood Thrush (*Hylocichla mustelina*) and Pileated Woodpecker (*Hylatomus pileatus*) were documented.

A small number of waterbirds were recorded at the survey stations adjacent to Mohawk Lake and its associated inlet and outlet channels. Double-crested Cormorant (*Phalacrocorax auritus*), Hooded Merganser (*Lophodytes cucullatus*), and a Wood Duck (*Aix sponsa*) duckling were recorded swimming, while Caspian Tern (*Hydroprogne caspia*), Osprey (*Pandion haliaetus*), Great Blue Heron (*Ardea herodias*), and Northern Rough-winged Swallows (*Stelgidopteryx serripennis*) were recorded foraging within/above Mohawk Lake. Red-winged Blackbirds (*Agelaius phoeniceus*) breed along the margins of Mohawk Lake and inlet/outlet channels in relatively high numbers.

Four (4) birds designated as Species at Risk in Ontario were recorded during the breeding bird surveys: Barn Swallow (*Hirundo rustica*), Chimney Swift (*Chaetura pelagica*), Eastern Wood-pewee, and Wood Thrush. Each record of these species within the Study Area is described further below along with other locally significant bird habitats identified.

Barn Swallow

Barn Swallow is designated Threatened in Ontario per O. Reg. 230/08 pursuant to the *Endangered Species Act* (ESA) and is federally designated Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Prior to European settlement Barn Swallow nested in or on natural features (e.g., caves, cliff faces, etc.); today most nesting is associated with built structures such as barns, bridge/culvert undersides, and awnings/overhangs on the sides of buildings (COSEWIC 2011). Foraging habitat includes a variety of open areas such as agricultural lands, old fields, and waterbodies. Foraging distances from nest sites depend on habitat quality and social characteristics, but have been found to extend greater than one (1) kilometre (Brown and Brown 1999) though may only average a few hundred metres for most forays (Turner 1981).

Two (2) active Barn Swallow nests were documented beneath Mohawk Street bridge where it spans the Mohawk Lake outlet channel (BI-26). Several apparently inactive nests were also documented beneath the bridge. This species was also recorded foraging over Mohawk Lake (BI-4) and

downstream of the bridge (BI-27), which may represent individuals from the colony breeding beneath the bridge.

Chimney Swift

Chimney Swift is designated Threatened in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Threatened by COSEWIC. Pre-settlement this species nested and roosted in large hollow trees as well as along cave and rock walls, given its requirement for vertical surfaces to grip during roosting and to attach nests. Today, nesting and roosting has mostly shifted from natural to artificial sites, particularly chimneys (COSEWIC 2007). Chimney Swifts are regularly encountered foraging above urban areas (including both large cities and small rural towns) across southern Ontario where older buildings (particularly schools and churches) with traditional chimneys that lack a metal lining still exist.

Chimney Swift was documented as "observed" at four (4) stations (BI-1, BI-9, BI-18, BI-19). No artificial structures that may be suitable for nesting and roosting were documented within the portions of the Study Area surveyed. At least one (1) known nesting/roosting site has been documented in Brantford (Bird Studies Canada 2017), but the whereabouts of this site are not publicly available.

Eastern Wood-pewee

Eastern Wood-pewee is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. This species is most commonly associated with relatively open, deciduous and mixed forests of various sizes, as well as forest edges and other areas with relatively continuous canopy cover (e.g., parks, cemeteries, etc.). This species' preference for open forests and forest edges may be attributed to its aerial foraging behaviour (COSEWIC 2012). Territory sizes were shown to average approximately 1.75 ha (representing a circle with a radius of 75 m) in a study in southern Ontario (as cited in COSEWIC 2012).

Eastern Wood-pewee occurs at a relatively high level of abundance in the Study Area and was documented at seventeen (17) stations (see **Appendix 1** and **Figure 1**). At five (5) stations this species was recorded as a "possible" breeder based on one (1) record (visual or auditory) and no further evidence of breeding. At twelve (12) stations this species was recorded as a "probable" breeder largely based on records (visual or auditory) on two (2) separate occasions (i.e., the first and second round of breeding bird surveys) in approximately the same location. At station BI-9 a presumed pair was observed which strengthens the likelihood of breeding at this location.

Wood Thrush

Wood Thrush is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. Wood Thrush is predominantly found in deciduous and mixed forests with a well-developed understorey of regenerating trees and shrubs. This species is more often found in larger forest blocks but is also documented (and will successfully breed within) smaller forest fragments (Cadman et al. 2007). In a study in Pennsylvania, Wood Thrush territory sizes were shown to be 2.5 ha on average with a range of 1.5-4 ha (Evans et al. 2008).

Wood Thrush was documented as a "probable" breeder at one (1) station (BI-1) based on auditory records during the first and second round of breeding bird surveys (See **Figure 1**). On both

occasions the individual recorded (i.e., singing male) vocalized from west of Mohawk Park where access had not been granted at the time of the surveys, and therefore additional evidence of breeding (i.e., interacting with a mate, etc.) could not be ascertained.

Locally Significant Birds and Bird Habitats

In addition to the significant bird species noted above, the following locally significant birds and bird habitats were documented during the breeding bird surveys:

- A Turkey Vulture (*Cathartes aura*) roost consisting of approximately sixty (60) individuals was observed on several occasions and at various times of day including early morning (see **Figure 1**). Per ebird, the location identified on **Figure 1** as a Turkey Vulture roost was also noted by other observers in previous years (i.e., 2013) and may be occupied annually.
- One (1) active Osprey nest was documented on a telecommunications tower south of Mohawk Lake (see **Figure 1**). An Osprey was observed adding sticks to this nest on June 11/2018 and was observed near the nest (i.e., perched on the telecommunications tower, etc.) on several dates. Mohawk Lake and the Grand River provide suitable foraging opportunities for this species, which feeds almost exclusively on captured live fish.
- A Broad-winged Hawk (*Buteo platypterus*) was recorded being chased by Red-winged Blackbirds high above the woodland between Forest Road and Marvin Avenue. This species is a rare breeder in the area (Curry 2006) and (per ebird) June records of this species are quite limited in the City of Brantford and Brant County over the past twenty (20) years. The individual did not exhibit evidence of breeding, and it is unknown if this species bred within the Study Area in 2018.

STUDY LIMITATIONS

The survey methods performed herein to characterize the 2018 breeding bird community of the Study Area are best suited to recording certain taxonomic groups, particularly Passeriformes (i.e., "perching birds" or "songbirds"). While no Owls or Rails (i.e., "marsh birds") were recorded, potentially suitable breeding habitat for both such groups is present within the Study Area. Surveys for Owls and Rails typically make use of recorded vocalizations to elicit a response. The Study Area may also provide important habitats for non-breeding birds during migration (e.g., Passerines migrating along the Grand River valley corridor, Duck stopover/staging, etc.) and overwintering (e.g., Gulls, etc.). Such use could not be ascertained based on the survey methods performed in this study. Last, it is noted that portions of the Study Area could not be surveyed due to lack of permissions to enter at the time the surveys took place, and it is unknown if any additional bird species breed within these non-surveyed areas.

CLOSURE

Please contact the undersigned if there are any questions regarding the report, or if further information is requested.

Regards,

Terrastory Environmental Consulting Inc.

_____

Tristan Knight, M.E.S., M.Sc.
Senior Ecologist / President

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Legend

Study Area

Study Area

Site Assessments

Breeding Bird Survey Stations

Significant Natural Features - Terrastory

Significant Birds and Bird Habitats

- Barn Swallow - Confirmed Breeding (Active Nests)
- Eastern Wood-pewee - Possible Breeding
- Eastern Wood-pewee - Probable Breeding
- Wood Thrush - Probable Breeding
- Osprey - Confirmed Breeding (Active Nest)
- Turkey Vulture Roost

Note:
Breeding bird locations are depicted on this figure as points, which represent the approximate centre of their breeding territory as suggested by vocalizations and/or observations during breeding bird surveys on June 9, 11, 20, 21, and 22/2018. The "true" centre of the depicted breeding territories may differ somewhat from the locations on this figure, and may change interannually.

TERRASTORY
environmental consulting inc.

1:9,000	0 125 250 375 m

N	Project No.: 1821	By: TK	Date: June 2018

Orthophotograph Date: April 2016

Location: Mohawk Lake, City of Brantford

Figure 1. Significant Birds and Bird Habitats documented by Terrastory.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
-Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

Appendix 1. Breeding Bird Surveys

Common Name[1]	Scientific Name	Breeding Bird Stations[2] and Breeding Status[3]																
		BI-1	**BI-2**	**BI-3**	**BI-4**	**BI-5**	**BI-6**	**BI-7**	**BI-8**	**BI-9**	**BI-10**	**BI-11**	**BI-12**	**BI-13**	**BI-14**	**BI-15**	**BI-16**	**BI-17**
American Crow	*Corvus brachyrhynchos*	O				O	O	O	O		O							
American Goldfinch	*Spinus tristis*								Pr		Po	Po	Po	Po				Pr
American Redstart	*Setophaga ruticilla*																	Pr
American Robin	*Turdus migratorius*	Pr	Co	Po		Pr	Co	Po	Pr	Pr	Pr	Po	Pr	Pr	Po	Co	Pr	Pr
Baltimore Oriole	*Icterus galbula*		Po	Po	Po		Pr	Pr		Pr	Pr	Co	Pr	Po	Pr	Po	Po	
Barn Swallow	***Hirundo rustica***				**O**													
Black-capped Chickadee	*Poecile atricapillus*				Po	Po				Pr	Po			Po				
Blue-gray Gnatcatcher	*Polioptila caerulea*									Po								
Blue Jay	*Cyanocitta cristata*	Po	Pr	Po	Po	Po	Po	Po		Pr	Po		Po			Pr	Pr	
Broad-winged Hawk	*Buteo platypterus*																	
Brown-headed Cowbird	*Molothrus ater*		Pr	Po			Po	Po	Po	Po		Po		Po				Po
Canada Goose	*Branta canadensis*				O													
Carolina Wren	*Thryothorus ludovicianus*		Po				Pr			Pr	Po			Pr			Pr	
Caspian Tern	*Hydroprogne caspia*			O	O										O			
Cedar Waxwing	*Bombycilla cedrorum*																	Po
Chimney Swift	***Chaetura pelagica***	**O**								**O**								
Chipping Sparrow	*Spizella passerina*		Po			Po				Pr						Co		
Cliff Swallow	*Petrochelidon pyrrhonota*																	
Common Grackle	*Quiscalus quiscula*					Po	Po	Pr	Pr	Pr			Po	Po	Po		Pr	Po
Common Yellowthroat	*Geothlypis trichas*																	
Double-crested Cormorant	*Phalacrocorax auritus*																	
Downy Woodpecker	*Picoides pubescens*		Pr		Po	Po	Pr	Pr		Po	Po	Po	Po	Pr			Po	Po
Eastern Kingbird	*Tyrannus tyrannus*		Po												Po			
Eastern Phoebe	*Sayornis phoebe*					Co												
Eastern Wood-pewee	***Contopus virens***	**Pr**	**Pr**		**Pr**	**Pr**	**Pr**			**Pr**	**Po**	**Pr**	**Pr**					
European Starling	*Sturnus vulgaris*		Pr	Co	Po	Po	Po	Po		Po	Po	Po		Po	Po			Po
Gray Catbird	*Dumetella carolinensis*		Pr	Po				Pr		Po	Po	Po	Po	Po	Po		Po	Pr
Great Blue Heron	*Ardea herodias*			O														
Great Crested Flycatcher	*Myrarchus crinitus*	Po	Po	Po								Po	Po			Po		
Green Heron	*Butorides virescens*																	
Hairy Woodpecker	*Leuconotopicus villosus*	Po	Po									Po	Po					
Herring Gull	*Larus argentatus*		O															
Hooded Merganser	*Lophodytes cucullatus*			O														
House Sparrow	*Passer domesticus*						Po		Pr		Po					Pr	Po	
House Wren	*Troglodytes aedon*			Po	Po		Pr		Po	Po	Pr	Po		Po	Po	Pr	Po	Po
Indigo Bunting	*Passerina cyanea*											Po		Po				

Common Name[1]	Scientific Name	Breeding Bird Stations[2] and Breeding Status[3]																
		BI-1	**BI-2**	**BI-3**	**BI-4**	**BI-5**	**BI-6**	**BI-7**	**BI-8**	**BI-9**	**BI-10**	**BI-11**	**BI-12**	**BI-13**	**BI-14**	**BI-15**	**BI-16**	**BI-17**
Least Flycatcher	*Empidonax minimus*																	
Mourning Dove	*Zenaida macroura*	Po	Pr		Po		Po		Po	Po	Pr	Po	Po	Po		Po	Po	Po
Northern Cardinal	*Cardinalis cardinalis*	Pr	Pr		Po	Pr	Pr	Pr	Po	Pr	Pr	Po	Po	Pr		Pr		Pr
Northern Flicker	*Colaptes auratus*						Po			Po		Po						
Nor. Rough-winged Swallow	*Stelgidopteryx serripennis*				Pr										Po			O
Orchard Oriole	*Icterus spurius*																	
Osprey	*Pandion haliaetus*																	
Pileated Woodpecker	*Hylatomus pileatus*			Po														
Red-bellied Woodpecker	*Melanerpes carolinus*	Po	Po	Po		Pr		Po			Po		Po	Pr		Po		
Red-eyed Vireo	*Vireo olivaceus*	Pr		Po		Pr		Pr			Po				Po	Po		
Red-tailed Hawk	*Buteo jamaicensis*																	
Red-winged Blackbird	*Agelaius phoeniceus*		Po	Pr	Po		Po								Pr	Po	Po	
Ring-billed Gull	*Larus delawarensis*		O										O		O	O		O
Rock Pigeon	*Columba livia*										O							
Rose-breasted Grosbeak	*Pheucticus ludovicianus*		Po	Pr			Pr			Co		Po						
Song Sparrow	*Melospiza melodia*		Pr		Po				Pr	Pr		Co	Pr	Pr	Pr			Pr
Tree Swallow	*Tachycineta bicolor*														Po			
Tufted Titmouse	*Baeolophus bicolor*									Po				Po		Po		
Turkey Vulture	*Cathartes aura*									O					O		O	
Warbling Vireo	*Vireo gilvus*		Po	Po	Po													
White-breasted Nuthatch	*Sitta carolinensis*	Pr	Po			Po				Po	Pr	O	Po	Po		Po		
Willow Flycatcher	*Empidonax traillii*																	Po
Wood Duck	*Aix sponsa*																	
Wood Thrush	***Hylocichla mustelina***	**Pr**																
Yellow-billed Cuckoo	*Coccyzus americanus*	Po	Po											Po				
Yellow Warbler	*Setophaga petechia*		Po	Pr	Po									Pr	Po	Po		Pr

[1] **Bolded** species are listed as Endangered, Threatened, or Special Concern per O. Reg. 242/08 under the *Endangered Species Act*.
[2] Locations of breeding bird survey stations are indicated on **Figure 1**.
[3] **Co** = Confirmed Breeder; **Pr** = Probable Breeder; **Po** = Possible Breeder; **O** = Observed (no evidence of breeding).

Common Name[1]	Scientific Name	Breeding Bird Stations[2] and Breeding Status[3]										
		BI-18	**BI-19**	**BI-20**	**BI-21**	**BI-22**	**BI-23**	**BI-24**	**BI-25**	**BI-26**	**BI-27**	**BI-28**
American Crow	*Corvus brachyrhynchos*	O	O									
American Goldfinch	*Spinus tristis*	Pr		Po	Pr	Pr	Pr	Pr	Pr	Pr	Po	Pr
American Redstart	*Setophaga ruticilla*			Po	Pr	Po						Po
American Robin	*Turdus migratorius*	Po		Po	Pr	Pr	Pr	Pr	Pr	Po	Co	Po
Baltimore Oriole	*Icterus galbula*	Po	Co		Pr		Po	Pr	Po	Pr	Co	Po
Barn Swallow	***Hirundo rustica***									**Co**	**O**	
Black-capped Chickadee	*Poecile atricapillus*			Po	Po			Po				Po
Blue-gray Gnatcatcher	*Polioptila caerulea*					Po						
Blue Jay	*Cyanocitta cristata*		Pr	Po			Po				Po	Pr
Broad-winged Hawk	*Buteo platypterus*									O		
Brown-headed Cowbird	*Molothrus ater*	Po	Po		Pr	Pr	Po	Po			Po	Po
Canada Goose	*Branta canadensis*			Po								
Carolina Wren	*Thryothorus ludovicianus*	Pr		Po					Pr			Pr
Caspian Tern	*Hydroprogne caspia*											
Cedar Waxwing	*Bombycilla cedrorum*		Po		Po		Po			O		
Chimney Swift	***Chaetura pelagica***	**O**	**O**									
Chipping Sparrow	*Spizella passerina*										Po	
Cliff Swallow	*Petrochelidon pyrrhonota*									Po		
Common Grackle	*Quiscalus quiscula*	Pr	Po	Co			Po	Po	Co	Pr	Po	Po
Common Yellowthroat	*Geothlypis trichas*					Po		Po				
Double-crested Cormorant	*Phalacrocorax auritus*								O			
Downy Woodpecker	*Picoides pubescens*	Po					Po	Po	Po			
Eastern Kingbird	*Tyrannus tyrannus*		Po			Pr			Po		Po	
Eastern Phoebe	*Sayornis phoebe*									Pr	Po	
Eastern Wood-pewee	***Contopus virens***	**Pr**	**Po**	**Pr**	**Po**	**Pr**	**Po**	**Pr**			**Po**	
European Starling	*Sturnus vulgaris*	Pr	Po	Po	Po		Pr		Pr			
Gray Catbird	*Dumetella carolinensis*	Pr	Po	Po	Pr		Pr	Pr	Po		Po	
Great Blue Heron	*Ardea herodias*								O			
Great Crested Flycatcher	*Myrarchus crinitus*					Po			Po		Po	Po
Green Heron	*Butorides virescens*								O			
Hairy Woodpecker	*Leuconotopicus villosus*											
Herring Gull	*Larus argentatus*											
Hooded Merganser	*Lophodytes cucullatus*											
House Sparrow	*Passer domesticus*		Po	Po						Po		
House Wren	*Troglodytes aedon*	Po	Po		Po		Pr	Pr	Po			
Indigo Bunting	*Passerina cyanea*				Po	Pr		Pr			Po	Pr

Common Name[1]	Scientific Name	Breeding Bird Stations[2] and Breeding Status[3]										
		BI-18	**BI-19**	**BI-20**	**BI-21**	**BI-22**	**BI-23**	**BI-24**	**BI-25**	**BI-26**	**BI-27**	**BI-28**
Least Flycatcher	*Empidonax minimus*				Co							
Mourning Dove	*Zenaida macroura*	Po					Po		Po	Po	Po	
Northern Cardinal	*Cardinalis cardinalis*	Pr	Po	Po	Pr	Po	Pr	Po			Po	Po
Northern Flicker	*Colaptes auratus*			Po				Po	Po		Po	
Nor. Rough-winged Swallow	*Stelgidopteryx serripennis*			Pr		Pr			Pr	Pr		Po
Orchard Oriole	*Icterus spurius*							Pr				
Osprey	*Pandion haliaetus*			Co								
Pileated Woodpecker	*Hylatomus pileatus*											
Red-bellied Woodpecker	*Melanerpes carolinus*										Po	
Red-eyed Vireo	*Vireo olivaceus*											
Red-tailed Hawk	*Buteo jamaicensis*					O				O		
Red-winged Blackbird	*Agelaius phoeniceus*		Po	Pr	Pr	Pr			Pr	Co	Po	
Ring-billed Gull	*Larus delawarensis*		O	O		O	O		O			O
Rock Pigeon	*Columba livia*											
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				Po	Po		Pr		Co	Pr	Co
Song Sparrow	*Melospiza melodia*	Po	Po	Co		Pr	Pr	Po	Po	Po	Pr	Po
Tree Swallow	*Tachycineta bicolor*			Po								Po
Tufted Titmouse	*Baeolophus bicolor*									Po		
Turkey Vulture	*Cathartes aura*	O				O	O	O	O		O	
Warbling Vireo	*Vireo gilvus*			Po	Pr	Pr	Pr	Po	Pr		Po	Po
White-breasted Nuthatch	*Sitta carolinensis*					Po		Po				Po
Willow Flycatcher	*Empidonax traillii*					Pr						
Wood Duck	*Aix sponsa*											
Wood Thrush	***Hylocichla mustelina***											
Yellow-billed Cuckoo	*Coccyzus americanus*							Po				
Yellow Warbler	*Setophaga petechia*		Po	Pr	Pr	Pr	Pr	Pr	Pr	Po	Pr	Pr

[1] **Bolded** species are listed as Endangered, Threatened, or Special Concern per O. Reg. 242/08 under the *Endangered Species Act*.
[2] Locations of breeding bird survey stations are indicated on **Figure 1**.
[3] **O** = Observed (no evidence of breeding), **Po** = Possible Breeder; **Pr** = Probable Breeder; **Co** = Confirmed Breeder;

Appendix 2. Representative Photographs

Photo 1. Conditions at BI-1 where Wood Thrush was recorded (June 9, 2018).

Photo 2. Conditions at BI-9 where Eastern Wood-pewee was recorded (June 9, 2018).

Photo 3. Conditions at BI-26 where Barn Swallow are nesting beneath the Mohawk Street bridge (June 11, 2018).

Photo 4. Telecommunications tower which contains an active Osprey nest (June 11, 2018).

Photo 5. Turkey Vulture roost on Forest Road (June 9, 2018).

Photo 6. Mohawk Lake as observed from BI-3 (June 9, 2018).

Photo 7. Mohawk Lake as observed from BI-25 (June 22, 2018).

Photo 8. Conditions at BI-22 (June 22, 2018).

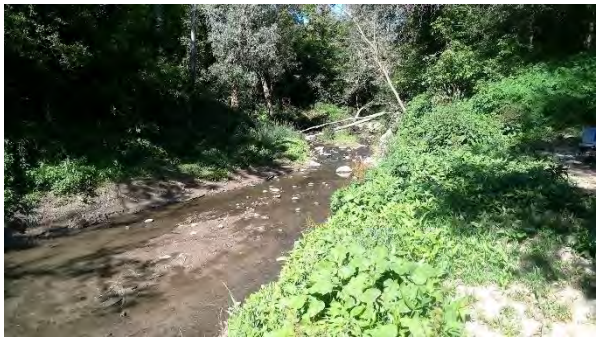


Photo 9. Conditions at BI-28 where the Mohawk Lake outlet channel enters the Grand River (June 11, 2018).

Photo 10. Conditions at BI-7 (June 9, 2018).

Appendix E-6 – Amphibian Call Field Data Forms

AMPHIBIAN DATA FORM

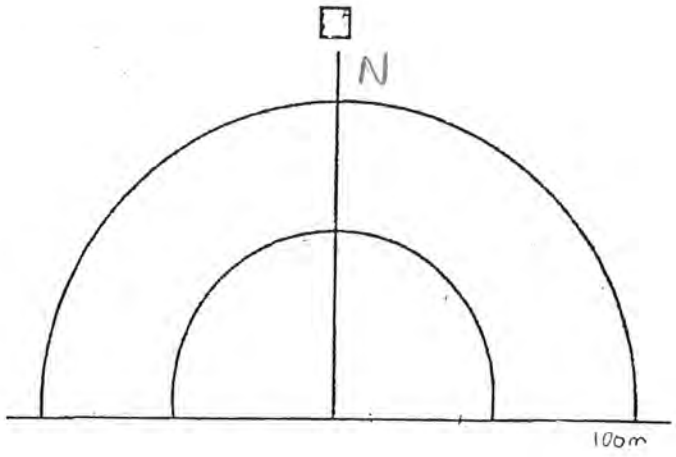
Please write legibly.

Observer: AB & GE	Route Name: Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): I	Survey #: 1	Start time (e.g. 2127 h): 21:55
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 7°C
Water Temp. (°C or °F): [redacted]	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers Y 3-minute & 5-minute surveys Y	
Remarks: 40KM SIGN, FACTORY NOISE, NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
[redacted]	FOTO				
Gray Treefrog	GRTF				
[redacted]	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
[redacted]	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

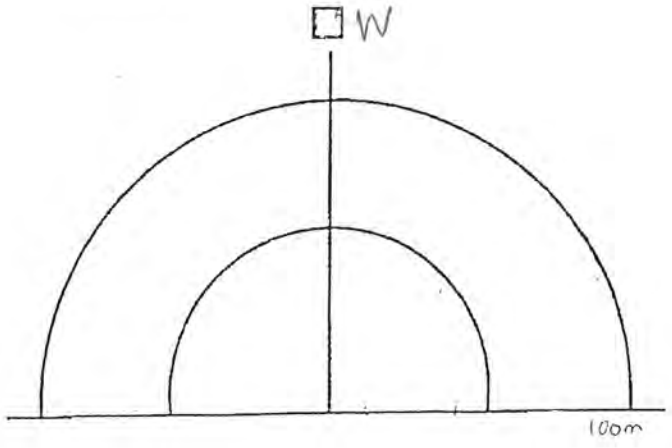
Please write legibly.

Observer: AB + GE	Route Name: Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): 2	Survey #: 1	Start time (e.g. 2127 h): 21:00
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 9°C
[redacted]	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers X 3-minute & 5-minute surveys X	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
[redacted]	FOTO				
Gray Treefrog	GRTF	0	0	0	0
[redacted]	CGTF				
Spring Peeper	SPPE	0	0	0	0
Chorus Frog	CHFR	0	0	0	0
[redacted]	BCFR				
Wood Frog	WOFR	0	0	0	0
N. Leopard Frog	NLFR	0	0	0	0
Pickerel Frog	PIFR	0	0	0	0
Green Frog	GRFR	0	0	0	0
Mink Frog	MIFR	0	0	0	0
Bullfrog	BULL	0	0	0	0

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

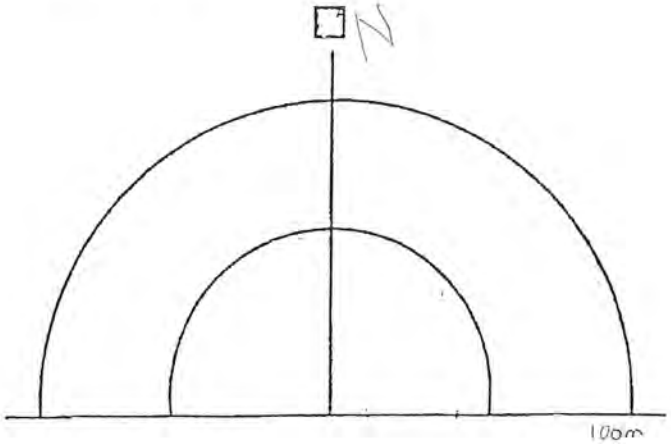
Please write legibly.

Observer: AB + GE	Route Name: Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): 3	Survey #: 1	Start time (e.g. 2127 h): 2115
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 8°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers X 3-minute & 5-minute surveys X	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	COTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

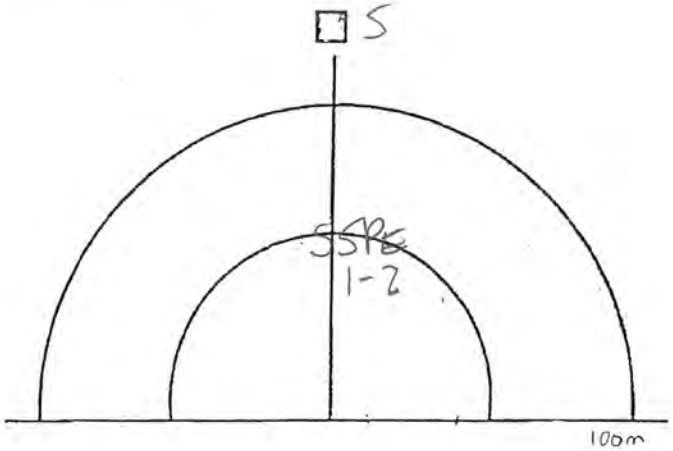
Please write legibly.

Observer: AB + GE	Route Name:. Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): 4	Survey #: 1	Start time (e.g. 2127 h): . 21:20
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 8°
[redacted]	Precip: None/dry X Damp ___ *Haze ___ Fog ___ Drizzle ___ Rain*___	
Validation studies you are participating in:	None ___ Two observers X 3-minute & 5-minute surveys X	
Remarks: WALKED PAST GATE TO WILLOWS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
[redacted]	FOTO				
Gray Treefrog	GRTF	0	0	0	0
[redacted]	COTF				
Spring Peeper	SPPE	1	2	1	2
Chorus Frog	CHFR	0	0	0	0
[redacted]	BCFR				
Wood Frog	WOFR	0	0	0	0
N. Leopard Frog	NLFR	0	0	0	0
Pickerel Frog	PIFR	0	0	0	0
Green Frog	GRFR	0	0	0	0
Mink Frog	MIFR	0	0	0	0
Bullfrog	BULL	0	0	0	0

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

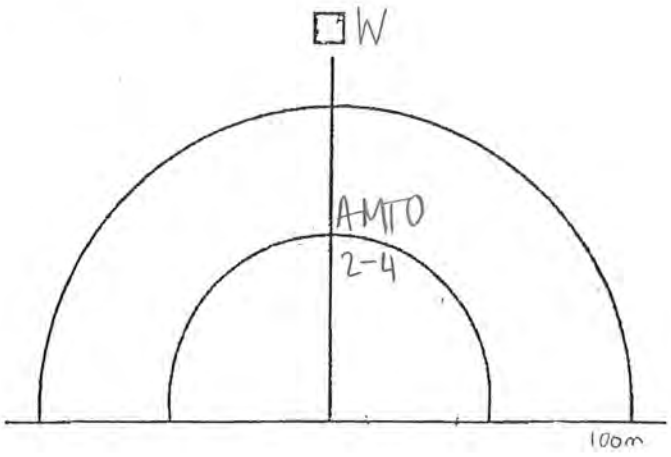
Please write legibly.

Observer: AB+GE	Route Name: Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): 5	Survey #: 1	Start time (e.g. 2127 h): 21:31
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 7°C
[redacted]	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers X 3-minute & 5-minute surveys X	
Remarks: HYDRO CUT		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	2	4	2	4
[redacted]	[redacted]				
Gray Treefrog	GRTF	0	0	0	0
[redacted]	[redacted]				
Spring Peeper	SPPE	0	0	0	0
Chorus Frog	CHFR	0	0	0	0
[redacted]	[redacted]				
Wood Frog	WOFR	0	0	0	0
N. Leopard Frog	NLFR	0	0	0	0
Pickerel Frog	PIFR	0	0	0	0
Green Frog	GRFR	0	0	0	0
Mink Frog	MIFR	0	0	0	0
Bullfrog	BULL	0	0	0	0

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

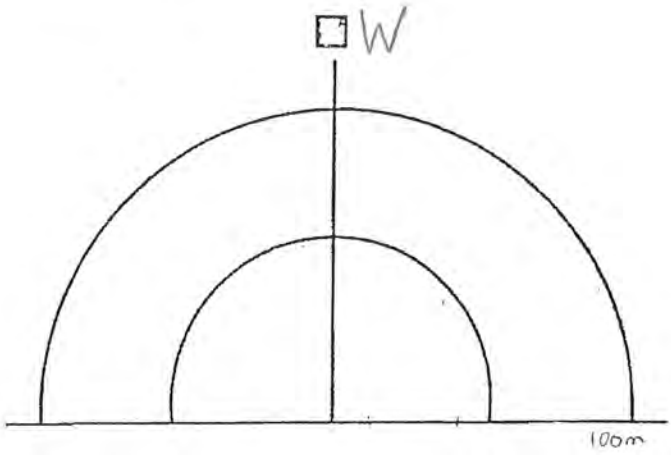
Please write legibly.

Observer: AB+GE	Route Name: Mohawk Lake	Date (yr-mm-dd): 18-04-26
Station #: (A-H): 6	Survey #: 1	Start time (e.g. 2127 h): 21:40
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 7°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers X 3-minute & 5-minute surveys X	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

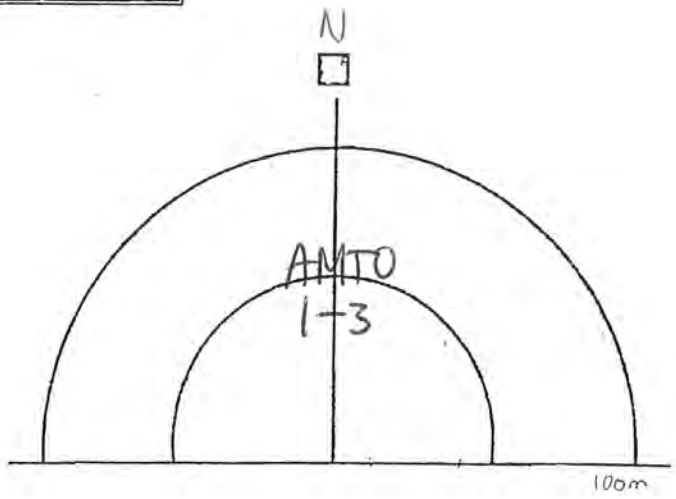
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): 1 NORTH	Survey #: 2	Start time (e.g. 2127 h): 10:04
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 21 °C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys ___	
Remarks: FACTORY NOISE, MOVED EAST ON GREENWICH		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	1	3		
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

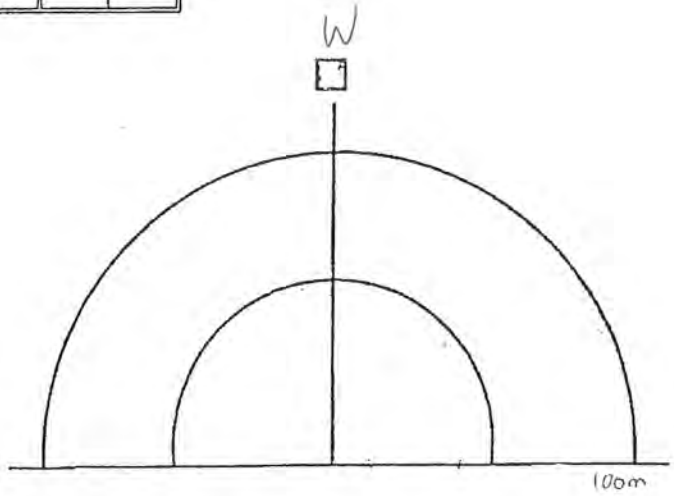
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): 2 WEST	Survey #: 2	Start time (e.g. 2127 h): 9:23
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 21°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in: None ___ Two observers ___ 3-minute & 5-minute surveys ___		
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO				
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

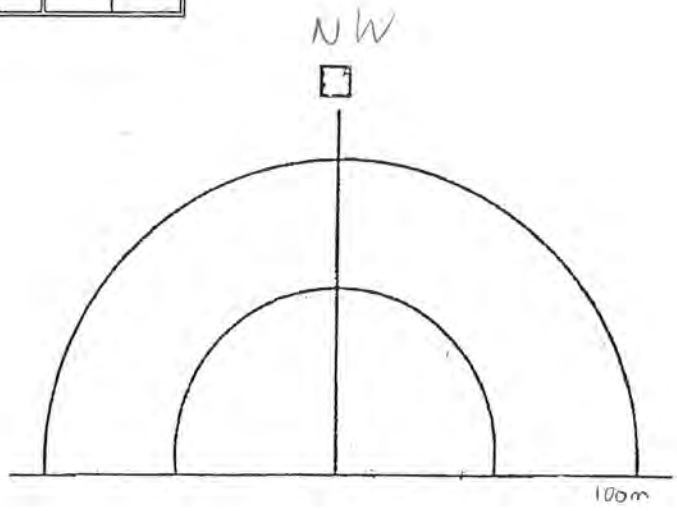
Please write legibly.

Observer: GE	Route Name:. MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): 3 NORTH	Survey #: 2	Start time (e.g. 2127 h): 9:32
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 21°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys ___	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO				
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

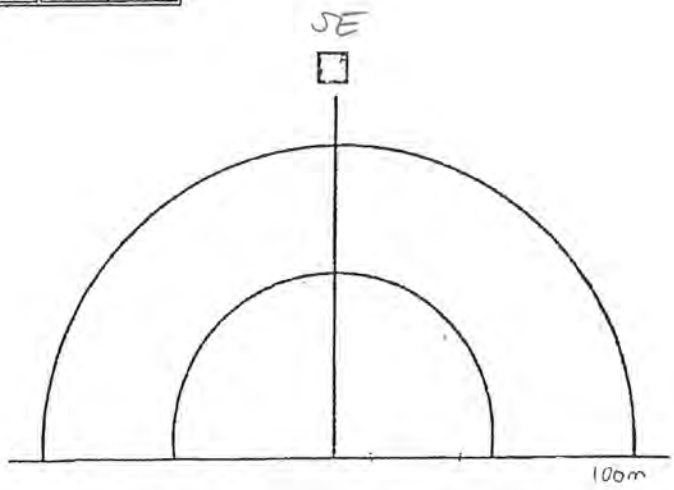
Please write legibly.

Observer: GE	Route Name:. MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): 4 SOUTH	Survey #: 2	Start time (e.g. 2127 h): 9:38
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys ___	
Remarks: WATERFALL / DAM NOISE, NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO				
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

Please write legibly.

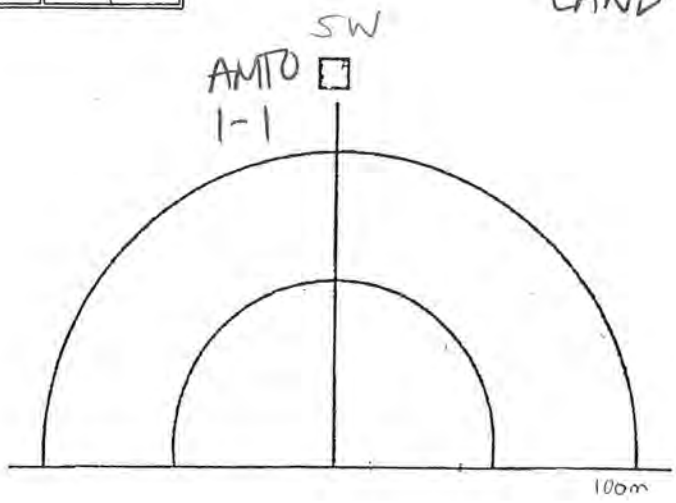
Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): S WEST	Survey #: 2	Start time (e.g. 2127 h): 9:55
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 21°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks: SOME HIGHWAY NOISE, HYDRO BUZZING		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	1	1	1	1
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers

COYOTES HEARD ON RESERVE LAND



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

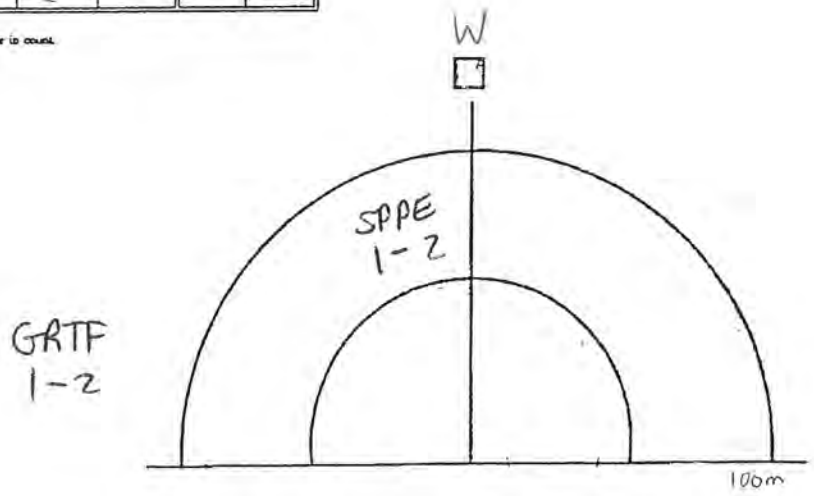
Please write legibly.

Observer: GE	Route Name:. MOHAWK LAKE	Date (yr-mm-dd): 18-05-23
Station #: (A-H): 6 WEST	Survey #: 2	Start time (e.g. 2127 h): . 9:46
Beaufort Wind Scale: 0	Cloud Cover (10ths): 0	Air Temp. (°C or °F): 21°C
Water Temp. (°C or °F):	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys ___	
Remarks:		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO				
Fowler's Toad	FOTO				
Gray Treefrog	GRTF	1	2		
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE	1	2		
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

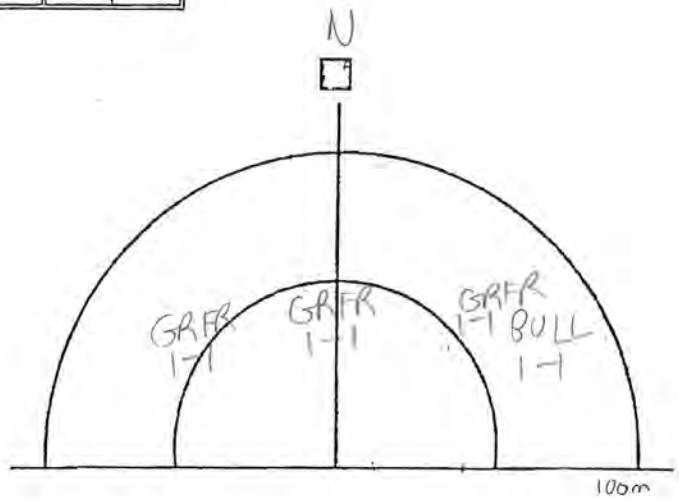
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 1 (NORTH)	Survey #: 3	Start time (e.g. 2127 h): 10:16
Beaufort Wind Scale: 0	Cloud Cover (10ths): 3	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): NA	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks:		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0		
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR	1	3		
Mink Frog	MIFR	0	0		
Bullfrog	BULL	1	1		

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

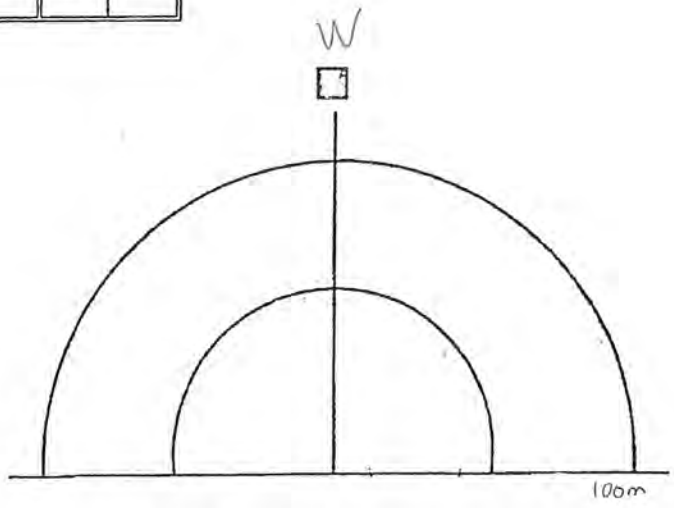
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 2 (WEST)	Survey #: 3	Start time (e.g. 2127 h): 9:35
Beaufort Wind Scale: 0	Cloud Cover (10ths): 1	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): NA	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

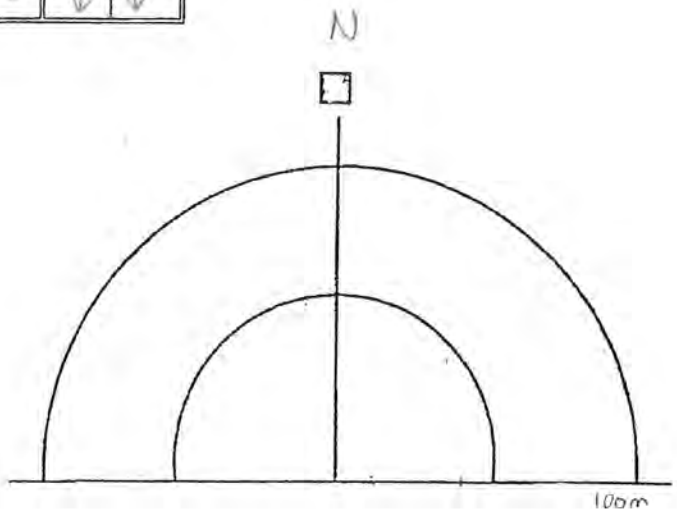
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 3 (NORTH)	Survey #: 3	Start time (e.g. 2127 h): 9:43
Beaufort Wind Scale: 0	Cloud Cover (10ths): 1	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): NA	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks: NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL	↓		↓	↓

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

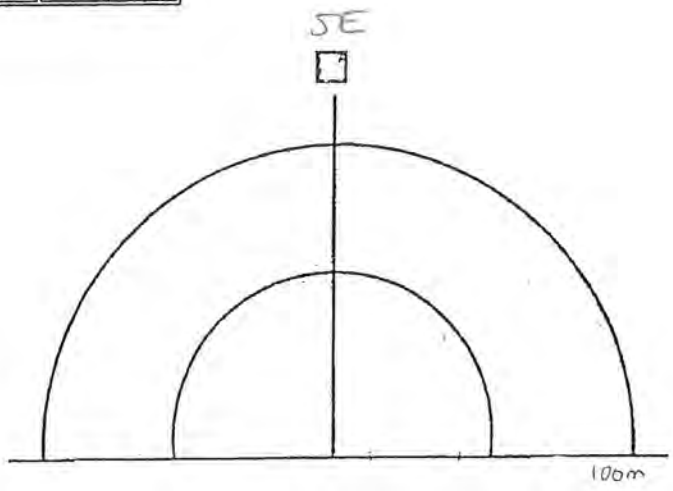
Please write legibly.

Observer: OE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 4 (SOUTH)	Survey #: 3	Start time (e.g. 2127 h): 9:50
Beaufort Wind Scale: 0	Cloud Cover (10ths): 1	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): N/A	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks: VERY LOUD RUNNING WATER NO CALLS		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

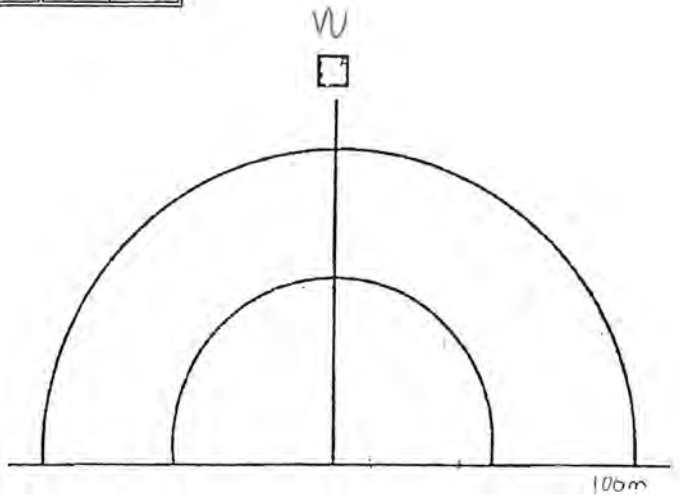
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 5 (WEST)	Survey #: 3	Start time (e.g. 2127 h): 9:58
Beaufort Wind Scale: 0	Cloud Cover (10ths): 3	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): NA	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks:		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO				
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR				
Mink Frog	MIFR				
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

AMPHIBIAN DATA FORM

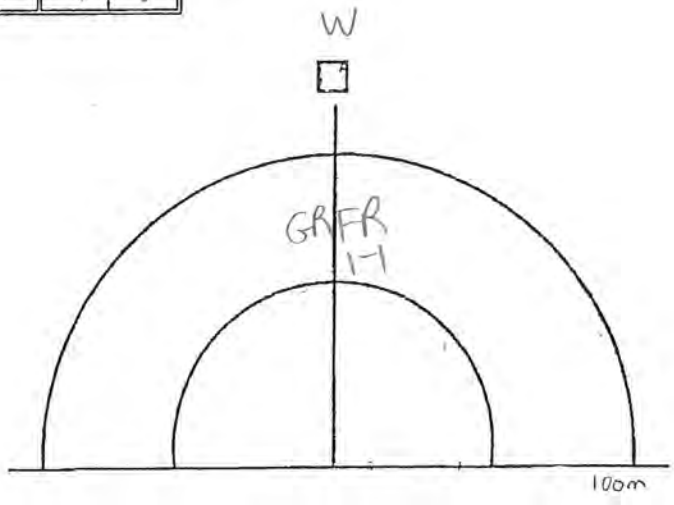
Please write legibly.

Observer: GE	Route Name: MOHAWK LAKE	Date (yr-mm-dd): 18-06-20
Station #: (A-H): 6 (WEST)	Survey #: 3	Start time (e.g. 2127 h): 10:07
Beaufort Wind Scale: 0	Cloud Cover (10ths): 3	Air Temp. (°C or °F): 20°C
Water Temp. (°C or °F): NA	Precip: None/dry X Damp ___ Haze ___ Fog ___ Drizzle ___ Rain ___	
Validation studies you are participating in:	None ___ Two observers ___ 3-minute & 5-minute surveys X	
Remarks:		

Species Name	Code	First 3 minutes		Next 2 minutes*	
		Code	Count	Code	Count
American Toad	AMTO	0	0	0	0
Fowler's Toad	FOTO				
Gray Treefrog	GRTF				
Cope's Gray Treefrog	CGTF				
Spring Peeper	SPPE				
Chorus Frog	CHFR				
Blanchard's Cricket Frog	BCFR				
Wood Frog	WOFR				
N. Leopard Frog	NLFR				
Pickerel Frog	PIFR				
Green Frog	GRFR	1	1		
Mink Frog	MIFR	0	0		
Bullfrog	BULL				

* Only record new species, change in code or change in count.

CALL LEVEL CODES	
0 =	None heard (record zeroes, not blanks)
1 =	Males can be counted individually without error
2 =	Calls overlap each other, but numbers can be reliably estimated
3 =	Calls overlap each other too much to estimate numbers



Marsh Monitoring Program Amphibian Data Form.

Appendix E-7 – Species-at-Risk and Species of Conservation Concern Screening Table

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	**Common Name**							
BIRDS								
Empidonax virescens	Acadian Flycatcher	END	END	G5	S2, S3B	Brantford SAR List (MNRF 2018)	Generally requires large areas of mature, undisturbed forest; avoids the forest edge; found in well wooded swamps and ravines.	**Not Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). The study area does not contain any large areas of undisturbed forest habitat.
Haliaeetus leucocephalus	Bald Eagle	NAR	SC	G5	S2N, S4B	eBird (2017); Brantford SAR List (MNRF 2018)	Prefers deciduous and mixed deciduous forest; and habitat close to water bodies such as lakes and rivers.	**Potentially Present:** Not documented in the study area during breeding bird surveys (Terrastory, 2018); however, this species has been documented at Mohawk Lake and on surrounding lands via eBird database on multiple occasions. Suitable perching and foraging habitat is present along Mohawk Lake and the canal; potential nesting habitat is present along the nearby Grand River.
Riparia riparia	Bank Swallow	THR	THR	G5	S4B	Brantford SAR List (MNRF 2018)	Sand, clay or gravel riverbanks or steep riverbank cliffs; lakeshore bluffs or easily crumbled sand or gravel; gravel pits, road cuts, grassland or cultivated fields that are close to water. Nesting sites are limiting factor for species presence.	**Not Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018) and no suitable nesting habitat is present in the study area.
Hirundo rustica	Barn Swallow	THR	THR	G5	S4B	**Aquafor Beech (2018); Terrastory (2018);** Brantford SAR List (MNRF 2018)	Prefers farmland, lake/river shorelines, wooded clearings, urban populated areas, rocky cliffs and wetlands. They nest inside or outside buildings, under bridges and in road culverts, or on rock faces and caves.	**Present:** Two (2) active Barn Swallow nests were documented beneath Mohawk Street bridge where it spans the Mohawk Lake outlet channel (BI-26). Several apparently inactive nests were also documented beneath the bridge. This species was also recorded foraging over Mohawk Lake (BI-4) and downstream of the bridge (BI-27), which may represent individuals from the colony breeding beneath the bridge (Terrastory 2018).
Dolichonyx oryzivorus	Bobolink	THR	THR	G5	S4B	Brantford SAR List (MNRF 2018)	COSEWIC (2010, p. iv) defines bobolink habitat as follows: "Since the conversion of the prairie to cropland and the clearing of the eastern forests, the Bobolink has nested in forage crops…The bobolink also occurs in various grassland habitats including wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses, remnants of uncultivated virgin prairie (tall-grass prairie), no-till cropland, small-grain fields, restored surface mining sites and irrigated fields in arid regions." Requires large tracts of grassland habitat (>50 ha).	**Unlikely Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). Some agricultural fields and cultural meadows are present in the study area but these are generally small in area and not contiguous, unlikely to provide the total area of habitat required for this species.
Cardellina canadensis	Canada Warbler	THR	SC	G5	S4B	Brantford SAR List (MNRF 2018)	An interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha.	**Unlikely Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). The forest/swamp communities north of Mohawk Lake potentially provide a suitable area of habitat for this species; however, the majority of this habitat is disturbed and the shrub layer has been partially cleared in places. Interior forest is not present in the study area.
Setophaga cerulean	Cerulean Warbler	END	THR	G4	S3B	Brantford SAR List (MNRF 2018)	Prefers mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha).	**Not Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018), and no suitable nesting habitat meeting area requirements is present in the study area.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	Common Name							
Chaetura pelagica	Chimney Swift	THR	THR	G5	S4B, S4N	**Terrastory (2018);** Brantford SAR List (MNRF 2018)	Historically found in deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer. Now, most are found in urban areas in large, uncapped chimneys.	**Present:** Documented as "observed" during breeding bird surveys (Terrastory 2018) at four (4) stations (BI-1, BI-9, BI-18, BI-19). No artificial structures suitable for nesting and roosting were documented within the portions of the study area surveyed; it is possible that nesting could occur in chimneys on industrial buildings located within portions of the study area south of Mohawk Lake for which site access was not granted.
Chordeiles minor	Common Nighthawk	THR	SC	G5	S4B	Brantford SAR List (MNRF 2018) eBird.org	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs.	**Unlikely Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018) and no suitable nesting habitat present. eBird records include one observation of this species in the study area in late August 2014 (i.e., likely encountered as a migrant).
Sturnella magna	Eastern Meadowlark	THR	THR	G5	S4B	Brantford SAR List (MNRF 2018)	Open grasslands with dense ground cover, hay fields, meadows, fallow fields. Generally requires large tracts of grassland (>50 ha) but has been observed to use mosaics of smaller grassland areas, pastures, and similar. The MNRF defines general habitat as the nest and suitable habitat within 300 metres of a nest or centre of defended territory (MNRF 2013).	**Unlikely Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). Some agricultural fields and cultural meadows are present in the study area but these are generally disturbed, small in area, and not contiguous, unlikely to provide the total area of habitat required for this species.
Contopus virens	Eastern Wood-Pewee	SC	SC	G5	S4B	**Terrastory (2018);** Wetland Evaluation (Ross, 2000); Plan B, Natural Heritage; NHIC (no date); Brantford SAR List (MNRF 2018)	Associated with deciduous and mixed forests. Within mature and intermediate age stands it prefers areas with little understory vegetation as well as forest clearings and edges.	**Present:** Eastern Wood-pewee occurs at a relatively high level of abundance in the study area and was documented at seventeen (17) stations during breeding bird surveys (Terrastory 2018). At five (5) stations this species was recorded as a "possible" breeder based on one (1) record (visual or auditory) and no further evidence of breeding. At twelve (12) stations this species was recorded as a "probable" breeder largely based on records (visual or auditory) on two (2) separate occasions (i.e., the first and second round of breeding bird surveys) in approximately the same location. At station BI-9 a presumed pair was observed which strengthens the likelihood of breeding at this location.
Vermivora chrysoptera	Golden-winged Warbler	THR	SC	G4	S4B	Brantford SAR List (MNRF 2018)	Generally prefer early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubbery clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha of habitat	**Potentially Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). Potentially suitable early successional habitat is associated with Community 11 west of Mohawk Lake and in the utility corridor and adjacent disturbed woodlands south of Mohawk Lake.
Larus marinus	Great Black-backed Gull	-	-	G5	S2B	eBird.org	Breeding habitat includes rocky islands; rarely on beaches. Wintering habitat includes landfills and open water on large lakes and rivers (Bezener, 2000).	**Not applicable:** Breeding habitat is not present within the study area. Although potentially suitable overwintering habitat is present within the study area, the "S2B" status for this species signifies that only the breeding habitat is considered provincially rare. According to the NHIC, this species has been slowing increasing and spreading its range in Ontario.
Seirus motacilla	Louisiana Waterthrush	THR	SC	G5	S3B	Brantford SAR List (MNRF 2018)	Generally inhabits large tracts of mature forests along steeply sloped ravines adjacent to running water. It prefers clear, cold streams and densely wooded swamps.	**Unlikely Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). The wooded valleys northeast of Mohawk Lake are unlikely to provide ideal quality and quantity of habitat for this species due to the level of disturbance on the site.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	**Common Name**							
Colinus virginianus	Northern Bobwhite	END	END	G4G5	S1	Brantford SAR List (MNRF 2018)	Generally inhabits a variety of edge and grassland type habitats including non-intensively farmed agricultural lands	**Potentially Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018). Potentially suitable habitat is present in Communities 10 and 11 west of Mohawk Lake.
Podiceps auratus	Horned Grebe	SC	SC	G5	S1B S4N	eBird (1992)	Deep water marshes or sloughs with a mix of open water, emergent vegetation; small freshwater ponds or protected bays of larger lakes with emergent vegetation; territories are about 1 ha.	**Unlikely Present:** Breeds in central to northwestern Canada so will not occur as a breeding bird in the study area. Only one occurrence of this species was documented at Mohawk Lake via eBird database in 1992; it could continue to be encountered as a rare migrant but is unlikely to occur.
Melanerpes erythrocephalus	Red-Headed Woodpecker	THR	SC	G5	S4B	eBird (2017) Brantford SAR List (MNRF 2018)	COSEWIC (2007c, p. iv) defines red-headed woodpecker habitat as follows: "The Red-headed Woodpecker is found in a variety of habitats, including oak and beech forests, grasslands, forest edges, orchards, pastures, riparian forests, roadsides, urban parks, golf courses, cemeteries, beaver ponds and burns." Requires cavity trees with at least 40 cm dbh; requires about 4 ha for a territory.	**Potentially Present:** Not documented in the study area during breeding bird surveys (Terrastory 2018); however, was documented at Mohawk Lake via eBird database as recently as 2017 (breeding status was not provided). Potentially suitable habitat is present in natural areas throughout the site.
Hylocichla mustelina	Wood Thrush	THR	SC	G5	S4B	**Terrastory (2018);** Brantford SAR List (MNRF 2018)	Nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics, but may also nest in small forest fragments.	**Present:** Wood Thrush was documented as a "probable" breeder at one (1) station (BI-1) based on auditory records during the first and second round of breeding bird surveys (Terrastory 2018). Suitable habitat is present in forested areas throughout the study area.
Icteria virens	Yellow-breasted Chat	END	END	G5	S2B	Brantford SAR List (MNRF 2018)	Thickets, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc.	**Potentially Present:** Not documented in the study area during breeding bird surveys (Terrastory, 2018) and not documented in the vicinity via eBird. However, potentially suitable habitat is located in Communities 10 and 11 west of Mohawk Lake, and this species could feasibly be encountered on the site in future.
INSECTS								
Danaus plexippus	Monarch	END	SC	G5	S2N, S4B	**Aquafor Beech (2018)**; Brantford SAR List (MNRF 2018)	Exist primarily where milkweed (*Asclepias spp.*) (obligate larval host plant) and other wildflowers exist. This includes abandoned farmland, roadsides and other open spaces.	**Present:** Adult monarchs observed in Communities 17, 25, and 26 during field surveys in 2018. Common milkweed (*Asclepias syriaca*) was recorded in Communities 10, 11, 14, 17, 22, 25, and 26.
Gomphus quadricolor	Rapids Clubtail	END	END	G3G4	S1	Brantford SAR List (MNRF 2018)	Clear, cool, medium to large rivers with wooded shorelines, gravel shallows and muddy pools. Adult females inhabit shoreline forests, moving to the rapids when ready to mate. The nymphs live in these quiet, muddy, downstream pools where they spend most of their time buried just below the surface of the sediment in the bottom of the pool.	**Potentially Present:** Not observed in the study area during field surveys in 2018. Marginally suitable habitat is located along watercourses and the edges of Mohawk Lake, though this species is more likely to be associated with the nearby Grand River.
Bombus affinis	Rusty-patched Bumble Bee	END	END	G1	S1	Brantford SAR List (MNRF 2018)	Generally inhabits a range of diverse habitats including mixed farmland, sand dunes, marshes, urban and wooded areas. It usually nests underground in abandoned rodent burrows.	**Not Present:** Since 2002, this species has only been recorded in Ontario at Pinery Provincial Park.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	**Common Name**							
MAMMALS								
Taxidea taxis	American Badger	END	END	G5	S2	Brantford SAR List (MNRF 2018)	Open grasslands and oak savannahs; dens in new hole or enlarged existing hole; sometimes makes food caches. Primarily nocturnal and wary of humans.	**Potentially Present:** No sightings or evidence (e.g., burrows) documented in the study area during field investigations. The only potential habitat for this species is located in Communities 10 and 11 west of Mohawk Lake. The high level of human activity in these units decreases the likelihood that American Badger will occupy the habitat; however, it is possible that this species could be present.
Myotis leibii	Eastern Small-footed Myotis	END	END	G4	S2S3	Brantford SAR List (MNRF 2018)	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: primarily under loose rocks on exposed rock outcrops, crevices and cliffs, and occasionally in buildings, under bridges and highway overpasses, and under tree bark.	**Overwintering Habitat Not Present:** Caves and mines are not present within the study area. **Maternity Roosts Potentially Present**: It is not known if maternity roosting habitat is present within the study area. According to the most recent *Survey Protocol for Species at Risk Bats within Treed Habitats* (MNRF, 2017), "any coniferous, deciduous, or mixed wooded ecosite, including treed swamps, that includes trees at least 10 cm dbh should be considered suitable maternity roost habitat", to be confirmed through further study. Woodlands are present in the study area, and may provide potentially suitable habitat (i.e. tree snags with cracks, crevices, cavities, loose bark, etc.) for bats.
Myotis lucifugus	Little Brown Myotis	END	END	G5	S4	Brantford SAR List (MNRF 2018)	Overwintering habitat: Caves and mines that remain above freezing. Maternal roosts: Often associated with buildings (attics, barns, etc.). Occasionally found in trees (25-44 cm dbh).	
Myotis septentrionalis	Northern Myotis	END	END	G4	S3	Brantford SAR List (MNRF 2018)	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.)	
Perimyotis subflavus	Tri-coloured Bat	END	END	G5	S3?	Brantford SAR List (MNRF 2018)	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: Can be in trees or dead clusters of leaves or arboreal lichens on trees. May also use barns or similar structures.	
PLANTS								
Castanea dentata	American Chestnut	END	END	G4	S2	Brantford SAR List (MNRF 2018)	Moist to well-drained forests on sand, occasionally heavy soils.	**Unlikely Present:** This species was not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Frasera caroliniensis	American Columbo	END	END	G5	S2	Brantford SAR List (MNRF 2018)	Most commonly associated with open deciduous forested slopes, thickets and clearings.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Viola pedata	Bird's Foot Violet	END	END	G5	S1	Brantford SAR List (MNRF 2018)	Generally grows in open, disturbed, well-drained, sandy sites and in Ontario, is found in black oak savannah habitats within deciduous forests.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Ranunculus hispidus var. hispidus	Bristly Buttercup	-	-	G5	S3	NHIC (1997)	Dry, open deciduous woods.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Phegopteris hexagonoptera	Broad Beech Fern	SC	SC	G5	S3	Brantford SAR List (MNRF 2018)	Shady areas of beech and maple forests where the soil is moist or wet.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Juglans cinerea	Butternut	END	END	G4	S2?	Brantford SAR List (MNRF 2018)	Generally grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldomly, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows. MNRF considers Butternut habitat includes suitable lands within 50 m of a Butternut tree.	**Potentially Present:** Not identified during the vegetation surveys undertaken in 2018; however, several young walnut species (*Juglans sp.*) were found in Communities 10 and 11 that exhibited some signs of butternut hybridity, but had not yet developed enough features to be fully assessed as hybrid. No parent butternut tree was found.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	**Common Name**							
Ptelea trifoliata	Common Hoptree	SC	SC	G5	S3	Brantford SAR List (MNRF 2018)	Generally grows in sandy soils in areas with a lot of natural disturbance – such as the outer edge of shoreline vegetation, sand spits, and sand points.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present along the edges of Mohawk Lake.
Cornus florida	Eastern Flowering Dogwood	END	END	G5	S2?	Brantford SAR List (MNRF 2018)	Generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments. Also grows around edges and hedgerows.	**Unlikely Present:** Not identified during the vegetation surveys undertaken in 2018. Potentially suitable habitat is present in forested communities north of Mohawk Lake.
Carya glabra	Pignut Hickory	-	-	G5	S3	**Aquafor Beech (2018)**	Habitats include upland woodlands, rocky wooded slopes, bluffs, upland savannas, and limestone glades. These habitats are typically dominated by oaks, or a combination of hickories and oaks. Pignut Hickory also occurs in woodlands that are more moist, but this is less typical.	**Present:** While rare provincially, this species could be considered locally common; it was confirmed in Communities 1, 2, 4, 5, and 8 during he vegetation surveys undertaken in 2018. All of these communities are located north of Mohawk Lake, within Mohawk Park and in the valley system to the east.
Aesculus glabra	Ohio Buckeye	-	-	G5	S1	**Aquafor Beech (2018)**	Habitats include moist to mesic deciduous woodlands, wooded valleys along rivers, and rocky wooded slopes in sheltered areas.	**Present:** This species was identified in Community 20 during the vegetation surveys undertaken in 2018. Two trees were found in a wooded area, south of the canal. One was a mature tree with a diameter at breast height (DBH) of 40 cm and the other was a young tree growing up in the understory with a DBH of 9.5 cm.
Eupatorium altissimum	Tall Boneset	-	-	G5	S1	**Aquafor Beech (2018)**	Habitats include mesic to slightly dry black soil prairies, clay prairies, gravel prairies, savannas, thickets, openings in upland forests, dry banks of lakes, limestone glades, pastures and abandoned fields, fence rows, vacant lots, and areas along railroads. This plant favors disturbed areas, where it may form large colonies.	**Present:** This species was identified in an open canopy area within the highly disturbed Community 11.
REPTILES								
Emydoidea blandingii	Blanding's Turtle	THR	THR	G4	S3	MNRF (Buck 2018); Brantford SAR List (MNRF 2018)	Generally occur in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. They prefer shallow water that is rich in nutrients, organic soil and dense vegetation. Adults are generally found in open or partially vegetated sites, and juveniles prefer areas that contain thick aquatic vegetation including sphagnum, water lilies and algae. They dig their nest in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average about one metre in depth, or in slow-flowing streams.	**Present:** Not identified during the surveys undertaken in 2018, but confirmed by MNRF to have a recent record (no date provided) within Mohawk Lake and/or the canal.
Heterodon platirhinos	Eastern Hog-nosed Snake	THR	THR	G5	S3	Brantford SAR List (MNRF 2018)	Sandy upland fields, pastures, savannahs, sandy beaches, dry open oak-pine-maple forest with sandy soils, prefer forest areas > 5 ha.	**Unlikely Present:** Not identified during the surveys undertaken in 2018. Unlikely to be present given the marginally suitable habitat conditions and lack of sightings in this highly urbanized area (no records in the NHIC or ONRAA (10 km square) databases).
Thamnophis sauritus	Eastern Ribbonsnake	SC	SC	G5	S3	Brantford SAR List (MNRF 2018)	COSWEIC (2002b, p. iv) defines ribbonsnake habitat as follows: "The Northern Ribbonsnake is semi-aquatic and most frequently found along wetland edges. Quiet, shallow water with low surrounding cover is preferred, although areas with good exposure to sunlight are also required. Gravid females may move away from water before nesting, as females and juveniles are occasionally found in upland areas."	**Potentially Present:** Not identified during the surveys undertaken in 2018. Potentially suitable habitat in the study area includes riparian areas adjacent to wetlands.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	Common Name							
Graptemys geographica	Northern Map Turtle	SC	SC	G5	S3	NHIC (1986); ONRAA (2016, 2014, 2013, 2012, 2012, 2011, 2010, 2009, 2008, 1990, 1989, 1988, 1987, 1986, 1952); Brantford SAR List (MNRF 2018)	Large bodies of water with soft bottoms and aquatic vegetation, basks on logs or rocks or on beaches and grassy edges. Uses soft soil or clean dry sand for nest sites, may nest some distance from water.	**Unlikely Present:** Both sexes of this species require good water quality and an abundance of aquatic vegetation. Given that water quality is poor to fair in Mohawk Lake, and aquatic vegetation is scarce (City of Brantford, 1995), it is unlikely that this species is in the study area. however, numerous sightings have been recorded in the NHIC and ONRAA (10 km square) public databases, which may be associated with the Grand River or other nearby habitats.
Chelydra serpentina	Snapping Turtle	SC	SC	G5	S3	**Aquafor Beech (2018);** MNRF (Buck 2018); ONRAA (2017, 2016, 2013, 2012, 2011, 2010, 2009, 1991, 1989, 1952); Brantford SAR List (MNRF 2018)	Generally inhabit shallow waters where they can hide under the soft mud and leaf litter. Nesting sites usually occur on gravely or sandy areas along streams. Snapping turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.	**Present:** Snapping turtle was identified using habitat in the Mohawk Canal upstream and downstream of Mohawk Lake during the surveys undertaken in 2018. Snapping was also confirmed as occurring in the Lake and channel by the MNRF. This species was also confirmed by MNRF to have a recent record (no date provided) within Mohawk Lake and/or the canal. In addition, numerous sightings have been recorded in the ONRAA public database (10 km square).
Apalone spinifera	Spiny Softshell	END	THR	G5	S3	Brantford SAR List (MNRF 2018)	Highly aquatic turtles that rarely travel far from water. They are found primarily in rivers and lakes but also in creeks and even ditches and ponds near rivers. Key habitat requirements are open sand or gravel nesting areas, shallow muddy or sandy areas to bury in, deep pools for hibernation, areas for basking, and suitable habitat for crayfish and other food species.	**Unlikely Present:** Not identified during the surveys undertaken in 2018. Unlikely to be present given the marginally suitable habitat conditions and lack of sightings in this highly urbanized area (no records in the NHIC or ONRAA (10 km square) databases).
MUSSELS								
Villosa iris	Rainbow Mussel	SC	SC	G5	S2S3	Brantford SAR List (MNRF 2018); DFO SAR Mapping	Most abundant in shallow, well oxygenated reaches of small- to medium-sized rivers and sometimes lakes, on substrates of cobble, gravel, sand and occasionally mud.	**Potentially Present:** Potentially suitable habitat is present within the study area and host fish for glochida were observed during fish community surveys (Largemouth bass and Rock bass) though in extremely low numbers compared to other species. However, Mohawk Lake displays characteristics of a lacustrine setting with extremely low dissolved oxygen which the species requires. Suitable habitat for this species is found in the Grand River downstream of Mohawk Lake.
Pleurobema sintoxia	Round Pigtoe	END	END	G4G5	S1	Brantford SAR List (MNRF 2018); DFO SAR Mapping	Generally occur in small rivers in areas of moderate flow on substrates of gravel, cobble and boulder. In larger rivers, they are found in mud, sand, and gravel at varying depths.	**Potentially Present:** Potentially suitable habitat is present within the study area and host fish for glochida were observed during fish community surveys (Bluntnose minnow and Bluegill). However, Mohawk Lake displays characteristics of a lacustrine setting with decreased water quality from siltation and pollution which threatens this species. Critical habitat for this species is noted by DFO to occur in the Grand River downstream of Mohawk Lake.

Species		SARA Status	ESA Status	G-Rank	S-Rank	Data Source	Habitat Requirements	Assessment of Species Occurrence in Study Area
Scientific Name	**Common Name**							
Lampsilis fasciola	Wavy-rayed Lampmussel	SC	THR	G5	S1	DFO SAR Mapping; Brantford SAR List (MNRF 2018)	Generally inhabit clear rivers and streams of a variety of sizes, where the water flow is steady and the substrate is stable.	**Potentially Present:** Potentially suitable habitat is present within the study area and host fish for glochida were observed during fish community surveys (Largemouth bass) though in extremely low numbers compared to other species. However, Mohawk Lake displays characteristics of a lacustrine setting with low flow and unstable substrate.
FISH								
Moxostoma duquesnei	Black Redhorse	THR	THR	G5	S2	NHIC (1975); Brantford SAR List (MNRF 2018); DFO SAR mapping	Generally lives in moderately sized rivers and streams, with generally moderate fast currents.	**Not Present:** Species not observed during fish community surveys. However, this species was noted to be present or potentially present in the Grand River downstream of Mohawk Lake.
Ammocrypta pellucida	Eastern Sand Darter	THR	END	G4	S2	NHIC (no date); Brantford SAR List (MNRF 2018) DFO SAR Mapping	Generally prefer sandy-bottomed streams and rivers.	**Not Present:** Species not observed during fish community surveys. However, this species and its critical habitat is known to occur in the Grand River downstream of Mohawk Lake.
Ichthyomyzon fossor	Northern Brook Lamprey	SC	SC	G4	S3	Brantford SAR List (MNRF 2018)	Generally inhabits small rivers and clear streams of varying sizes. Adults spawn in gravelly riffles.	**Not Present:** Species not observed during fish community surveys.
Notropis Photogenis	Silver Shiner	THR	THR	G5	S2S3	Brantford SAR List (MNRF 2018); DFO SAR Mapping	Generally prefer moderate to large, deep, relatively clear streams with swift currents, and moderate to high gradients.	**Not Present:** Species not observed during fish community surveys. However, this species was noted to be present or potentially present in the Grand River downstream of Mohawk Lake.

Appendix E-8 – Significant Wildlife Habitat Screening Table

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Waterfowl Stopover and Staging Areas (Terrestrial) **Rationale:** Habitat important to migrating waterfowl.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	CUM1 CUT1 Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. - Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lk. St. Clair, Grand Bend and Pt. Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid-March to May). •Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available.	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • Any mixed species aggregations of 100 or more individuals required. • The flooded field ecosite habitat plus a 100-300m radius, dependant on local site conditions and adjacent land use is the significant wildlife habitat. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). •SWH MISTIndex #7 provides development effects and mitigation measures.	**Not Present:** Open field habitat is rare and fragmented in the study area, limited to ELC Community 10 and two fields under active agricultural cultivation. No evidence of spring flooding in these areas was documented.
Waterfowl Stopover and Staging Areas (Aquatic) **Rationale:** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water)	Studies carried out and verified presence of: Aggregations of 100 or more of listed species for 7 days, results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH • The combined area of the ELC ecosites and a 100m radius area is the SWH • Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWH MIST Index #7 provides development effects and mitigation	**Not Present:** The study area includes Mohawk Lake itself and other small wetland features that could provide suitable habitat for waterfowl. However, bird observation records at this location (via Terrastory breeding bird surveys and eBird records) do not indicate large numbers of waterfowl are present at any time of year. As the site is in an urban center and is known to birders, it is highly likely that significant concentrations of migrating waterfowl, if they occurred, would be known from this location.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Shorebird Migratory Stopover Area **<u>Rationale:</u>** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden- Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBO1 BBO2 BBS1BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. • Sewage treatment ponds and storm water ponds do not qualify as a SWH. <u>Information Sources</u> • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • Natural Heritage Information Centre (NHIC) Shorebird Migratory Concentration Area	Studies confirming: Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #8 provides development effects and mitigation measures.	**Not Present**: The study area does not include the extensive mud flats or shallow, weedy shorelines that are required for this habitat type. None of the indicator bird species have been documented in the study area.
Raptor Wintering Area **<u>Rationale:</u>** Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **<u>Special Concern:</u>** Short-eared Owl Bald Eagle	<u>Hawks/Owls</u>: Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM; CUT; CUS; CUW. Bald Eagle: Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering (hawk/owl) sites need to be > 20 ha with a combination of forest and upland. • Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water and large trees and snags available for roosting <u>Information Sources</u>: • OMNRF Ecologist or Biologist • Naturalist clubs • Natural Heritage Information Centre (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada • Results of Christmas Bird Counts • Reports and other information available from Conservation Authorities.	Studies confirm the use of these habitats by: One or more Short-eared Owls or; One of more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #10 and • #11 provides development effects and mitigation measures.	**Candidate**: ELC Community 10 in combination with the adjacent forest Communities 1, 2, and 4 could potentially provide suitable raptor wintering habitat.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Bat Hibernacula **<u>Rationale:</u>** Bat hibernacula are rare habitats in all Ontario landscapes.	Big Brown Bat Tri-coloured Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH • The locations of bat hibernacula are relatively poorly known. <u>Information Sources</u> • OMNRF for possible locations and contact for local experts • Natural Heritage Information Centre (NHIC) Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club) • University Biology Departments with bat experts.	• All sites with confirmed hibernating bats are SWH. • The area includes 200m radius around the entrance of the hibernaculum for most development types and 1000m for wind farms. • Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #1 provides development effects and mitigation measures.	**Not present**: there are no caves, mines, or similar features in the study area.

Bat Maternity Colonies
 	
<u>Rationale:</u> Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.
	Big Brown Bat
	Silver-haired Bat
		Maternity colonies considered SWH are found in forested Ecosites.
		
		All ELC Ecosites in ELC Community Series:
		FOD FOM SWD SWM
			• Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH).
			• Maternity roosts are not found in caves and mines in Ontario.
			• Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25cm dbh) wildlife trees
			Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2.
			• Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred.
			
			<u>Information Sources</u>
			• OMNRF for possible locations and contact for local experts
			• University Biology Departments with bat experts.
				• Maternity Colonies with confirmed use by;
				  • >10 Big Brown Bats
				  • >5 Adult Female Silver- haired Bats
				• The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies.
				Evaluation methods for maternity colonies should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”.
				• SWH MIST Index #12 provides development effects and mitigation measures.
					Candidate: There is potential for bat species to be using treed habitats within the study area as maternity roosting habitat. This includes Communities 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 18, 20, 22, and 23.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Turtle Wintering Areas **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles; ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO Northern Map Turtle; Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. Information Sources: EIS studies carried out by Conservation Authorities. • Field Naturalists Clubs • OMNRF Ecologist or Biologist Natural Heritage Information Centre (NHIC)	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep- water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May). Congregation of turtles is more common where wintering areas are limited and therefore significant. • SWH MIST Index #28 provides development effects and mitigation measures for turtle wintering habitat.	**Candidate**: Suitable overwintering habitat for turtles may be present in Mohawk Lake and other ponds/wetlands containing permanent standing water. While turtle hibernation has not been confirmed within the study area, Snapping turtle has been confirmed using habitat in Mohawk Canal and Mohawk Lake by Aquafor Beech Limited and MNRF staff. Northern Map Turtle has not been confirmed within Mohawk Lake / Canal; however, the Ontario Nature Reptile and Amphibian Atlas contains numerous records of this species in the 10 km square containing the study area.
Reptile Hibernaculum **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	**Snakes:** Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **Special Concern:** Milksnake Eastern Ribbonsnake	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Information Sources • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs • University herpetologists • Natural Heritage Information Centre (NHIC)	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct) • Note: If there are Special Concern Species present, then site is SWH Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e. strong hibernation site fidelity). Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH • SWH MIST Index #13 provides development effects and mitigation measures for snake hibernacula.	**Candidate**: No potential hibernacula were documented during field investigations. However, due to the size of the study area additional surveys would be required to confirm the absence of candidate habitat. No Talus, Rock Barren, Crevice, Cave, or Alvar community types are present within the study area; however, there is potential for hibernaculum that may occur in burrows, rock piles, old stone fences, abandoned crumbling foundations, and wetlands.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff) **<u>Rationale:</u>** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Cliff Swallow Northern Rough- winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns. Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. <u>Information Sources</u> Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas • Bird Studies Canada; *NatureCounts* <u>http://www.birdscanada.org/b irdmon/</u> Field Naturalist Clubs.	Studies confirming: • Presence of 1 or more nesting sites with 8[cxlix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50m radius habitat area from the peripheral nests[ccvii] Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #4 provides development effects and mitigation measures	**Not present**: The shoreline slopes of Mohawk Lake are generally well vegetated and in many areas gently sloping, lacking areas of erosion or exposed soil. Some exposed sandy hills are present in the southern portion of Community 11. However, these areas are small and are subject to active disturbance due to their use within the local ad-hoc multiuse (e.g., ATV, dirt bike, etc.) trail system.
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs) **<u>Rationale:</u>** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree. <u>Information Sources</u> • Ontario Breeding Bird Atlas, colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNRF). • Natural Heritage Information Centre (NHIC) Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries. • Reports and other information available from Conservation Authorities. • MNRF District Offices. • Field Naturalist Clubs.	Studies confirming: • Presence of 2 or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWH MIST Index #5 provides development effects and mitigation measures.	**Not present**: Evidence of nest colonies in suitable wetland habitat was not observed in the study area.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Colonially - Nesting Bird Breeding Habitat (Ground) **Rationale:** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6; MAS1 – 3; CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. Information Sources • Ontario Breeding Bird Atlas, rare/colonial species records. • Canadian Wildlife Service • Reports and other information available from Conservation Authorities. • Natural Heritage Information Centre (NHIC) Colonial Waterbird Nesting Area • MNRF District Offices. • Field Naturalist Clubs.	Studies confirming: • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern. • Presence of 5 or more pairs for Brewer's Blackbird. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #6 provides development effects and mitigation measures.	**Not present**: The required habitat is not present in the study area.
Migratory Butterfly Stopover Areas **Rationale:** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral Special Concern Monarch	Combination of ELC Community Series; need to have present one Community Series from each landclass: Field: CUM CUT CUS Forest: FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Erie or Lake Ontario. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south. The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes Information Sources • MNRF District Offices • Natural Heritage Information Centre (NHIC) • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities	Studies confirm: The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5000 **or** >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWH MIST [cxlix] Index #16 provides development effects and mitigation measures.	**Not Present:** The site is not located within 5 km of Lake Erie or Lake Ontario.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Landbird Migratory Stopover Areas **<u>Rationale:</u>** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	• Woodlots >5 ha in size and within 5 km of Lake Erie and Lake Ontario. If woodlands are rare in an area of shoreline, woodland fragments 2-5ha can be considered for this habitat • If multiple woodlands are located along the shoreline those Woodlands <2km from Lake Erie and Lake Ontario are more significant • Sites have a variety of habitats; forest, grassland and wetland complexes. • The largest sites are more significant • Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5km of Lake Erie and Lake Ontario are Candidate SWH. <u>Information Sources</u> • Bird Studies Canada • Ontario Nature • Local birders and field naturalist clubs • Ontario Important Bird Areas (IBA) Program	Studies confirm: • Use of the habitat by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (Mar to May) and fall (Aug to Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #9 provides development effects and mitigation measures.	**Not Present:** The site is not located within 5 km of Lake Erie or Lake Ontario.
Deer Winter Congregation Areas **<u>Rationale:</u>** Deer movement during winter in the southern areas of Eco- region 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions[cxlviii].	White-tailed Deer	All Forested Ecosites with these ELC Community Series; FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in a planning area woodlots>50ha • Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands. • Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha. • Woodlots with high densities of deer due to artificial feeding are not significant. <u>Information Sources</u> • MNRF District Offices. • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF. • Use of the woodlot by white- tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF • Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques, ground or road surveys. or a pellet count deer density survey. • SWH MIST Index #2 provides development effects and mitigation measures.	**Not Present:** MNRF did not identify deer winter congregation habitat in the study area.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris	Most cliff and talus slopes occur along the Niagara Escarpment. Information Sources The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF Districts • Natural Heritage Information Centre (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes • SWH MIST Index #21 provides development effects and mitigation measures.	**Not Present**: The required vegetation community types were not identified during vegetation community surveys.
Sand Barren **Rationale:** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket- like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.	A sand barren area >0.5ha in size. Information Sources • OMNRF Districts. • Natural Heritage Information Centre (NHIC) has location information available on their website. • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST[cxlix] Index #20 provides development effects and mitigation measures.	**Not Present**: The required vegetation community types were not identified during vegetation community surveys.
Alvar **Rationale:** Alvars are extremely rare habitats in Ecoregion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:** 1) *Carex crawei* 2) *Panicum philadelphicum* 3) *Eleocharis compressa* 4) *Scutellaria parvula* 5) *Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 7E	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover.	An Alvar site > 0.5 ha in size. Alvar is particularly rare in Ecoregion 7E where the only known sites are found in the western islands of Lake Erie. Information Sources • Alvars of Ontario (2000), Federation of Ontario Naturalists. • Ontario Nature – Conserving Great Lakes Alvars. • Natural Heritage Information Centre (NHIC) has location information available on their website. • OMNRF Staff. • Field Naturalist Clubs. • Conservation Authorities.	• Field studies that identify four of the five **Alvar Indicator Species** at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses • SWH MIST Index #17 provides development effects and mitigation measures.	**Not Present**: The required indicator plant species were not identified during vegetation surveys. Open meadow and thicket habitats in the study area are all highly disturbed and dominated by common/non-native old field species.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Old Growth Forest **Rationale:** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in Ecoregion 7E.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over- storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	Woodland area is >0.5ha Information Sources • OMNRF Forest Resource Inventory mapping • OMNRF Districts. • Field Naturalist Clubs • Conservation Authorities • Sustainable Forestry Licence (SFL) companies will possibly know locations through field operations. • Municipal forestry departments	Field Studies will determine: • If dominant trees species of the are >140 years old, then the area containing these trees is Significant Wildlife Habitat • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present) • The area of forest ecosites combined or an eco-element within an ecosite that contain the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest area containing the old growth characteristics • SWH MIST Index #23 provides development effects and mitigation measures.	**Not Present**: Old growth forest was not identified during vegetation community surveys.
Savannah **Rationale:** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60% In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources Natural Heritage Information Centre (NHIC) has location data available on their website. • OMNRF Districts. • Field Naturalists Clubs. • Conservation Authorities.	Field studies confirm one or more of the Savannah indicator species listed in Appendix N should be present Note: Savannah plant spp. list from Ecoregion 7E should be used· • Area of the ELC Ecosite is the SWH. Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST Index #18 provides development effects and mitigation measures.	**Not Present:** This vegetation community was not identified during vegetation community surveys.
Tallgrass Prairie **Rationale:** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	No minimum size to site Ⓔ. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • OMNRF Districts. • Natural Heritage Information Centre (NHIC) has location information available on their website. • Field Naturalists Clubs. • Conservation Authorities.	Field studies confirm one or more of the Prairie indicator species listed in Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 7E should be used • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST Index #19 provides development effects and mitigation measures.	**Not Present:** This vegetation community was not identified during vegetation community surveys.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Other Rare Vegetation Communities **Rationale:** Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M The OMNRF/NHIC will have up to date listing for rare vegetation communities. Information Sources • Natural Heritage Information Centre (NHIC) has location information available on their website. • OMNRF Districts. • Field Naturalists Clubs. • Conservation Authorities.	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. • Area of the ELC Vegetation Type polygon is the SWH. • SWH MIST Index #37 provides development effects and mitigation measures.	**Confirmed**: Black Walnut Lowland Deciduous Forest (FOD7-4), which is ranked S2S3 in Ontario, was documented within the study area in Vegetation Communities 6 (narrow strip along north shore of Mohawk Lake), 18 (assessed from edge – permission to enter not granted), and 20 (where it is one of two community types existing within a complex mosaic). Each of these communities is highly disturbed. It is expected that this community type may have historically been more common along the lower valley slopes and lowlands surrounding Mohawk Lake.
Waterfowl Nesting Area **Rationale:** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 **Note: includes adjacency to Provincially Significant Wetlands**	A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. Information Sources • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. Reports and other information available from Conservation Authorities	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWH MIST Index #25 provides development effects and mitigation measures.	**Not present**: Potentially suitable habitat is not present within the study area. Concentrations of indicator species have not been documented in the study area.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat **Rationale:** Nest sites are fairly uncommon in Ecoregion 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey **Special Concern** Bald Eagle	ELC Forest Community Series: FOD FOM FOC SWD SWM SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). Information Sources • Natural Heritage Information Centre (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF District. • Check the Ontario Breeding Bird Atlas or Rare Breeding Birds in Ontario for species documented • Reports and other information available from Conservation Authorities. • Field Naturalists clubs	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with large trees within this area is important. For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area ofthe habitat from 400-800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for ≥3 years or suspected of not being used for >5 years before being considered not significant. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from early March to mid August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" SWH MIST Index #26 provides development effects and mitigation measures	**Confirmed**: Osprey is a confirmed breeding bird in the study area, and Bald Eagle has also been documented in the area at large on multiple occasions. The Osprey nest was located on a telecommunications tower south of Mohawk Lake, and therefore does not qualify as SWH per the criteria excluding man-made structures. However, even excluding the nest itself, Mohawk Lake and associated drainage features provide suitable foraging and perching habitat for both species.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Woodland Raptor Nesting Habitat **<u>Rationale:</u>** Nests sites for these species are rarely identified; these area sensitive habitats are often used annually by these species	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in SWC SWM SWD CUP3	All natural or conifer plantation woodland/forest stands >30ha with >4ha of interior habitat. Interior habitat determined with a 200m buffer Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. <u>Information Sources</u> • OMNRF Districts. • Check the Ontario Breeding Bird Atlas [ccv] or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of 1 or more active nests from species list is considered significant. Red-shouldered Hawk and Northern Goshawk – A 400m radius around the nest or 28 ha area of habitat is the SWH [ccvii]. (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest) • Barred Owl – A 200m radius around the nest is the SWH • Broad-winged Hawk and Coopers Hawk,– A 100m radius around the nest is the SWH. • Sharp-Shinned Hawk – A 50m radius around the nest is the SWH. • Conduct field investigations from early March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST Index #27 provides development effects and mitigation measures.	**Not Present**: Interior forest habitat is not present within the study area. Stick nests were not observed at any point during field investigations.
Turtle Nesting Areas **<u>Rationale:</u>** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	Midland Painted Turtle <u>Special Concern Species</u> Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m) or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle- nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. <u>Information Sources</u> • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well- drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Centre (NHIC) • Field Naturalist Clubs	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH. • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30-100m area of habitat. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST Index #28 provides development effects and mitigation measures for turtle nesting habitat.	**Candidate**: Potentially suitable habitat is present within the study area. While turtle nesting has not been confirmed within the study area, Snapping turtle has been confirmed using habitat in Mohawk Canal and Mohawk Lake by Aquafor Beech Limited and MNRF staff. Northern Map Turtle has not been confirmed within Mohawk Lake / Canal; however, the Ontario Nature Reptile and Amphibian Atlas contains numerous records of this species in the 10 km square containing the study area.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Seeps and Springs **Rationale:** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system. Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species. Information Sources • Topographical Map. • Thermography. • Hydrological surveys conducted by Conservation Authorities and MOE. • Field Naturalists Clubs and landowners. • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.	Field Studies confirm: Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of an ELC forest ecosite or an ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat. • SWH MIST Index #30 provides development effects and mitigation measures	**Not Present**: No evidence of seeps and springs has been observed in the study area.
Amphibian Breeding Habitat (Woodland). **Rationale:** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians	• Presence of a wetland, pond or woodland pool (including vernal pools) >500m2 (about 25m diameter) within or adjacent (within 120m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF Districts and wetland evaluations • Field Naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm; • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3. A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the wetland area plus a 230m radius of woodland area . If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST [cxlix] Index #14 provides development effects and mitigation measures.	**Not Present**: Suitable numbers of the indicator species were not documented in the study area during amphibian call surveys.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Amphibian Breeding Habitat (Wetlands) **Rationale:** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.	• Wetlands>500m^2 (about 25m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. Bullfrogs require permanent water bodies with abundant emergent vegetation. Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3. **or;** Wetland with confirmed breeding Bullfrogs are significant. The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWH MIST Index #15 provides development effects and mitigation measures.	**Confirmed:** American Bullfrog breeding habitat was documented during amphibian call surveys at station #1, located in Mohawk Canal west of Mohawk Lake. The presence of breeding American Bullfrog confirms SWH in shoreline wetlands in this area. In addition, large numbers of Green Frog and American Toad were observed incidentally by Aquafor Beech Staff during field surveys in 2018 at Communities 21 and 24 (the northwest pond of two). Therefore, both of these areas also constitute SWH.
Woodland Area-Sensitive Bird Breeding Habitat **Rationale:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker **Special Concern:** Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. Interior forest habitat is at least 200 m from forest edge habitat. Information Sources • Local birder clubs. • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #34 provides development effects and mitigation measures.	**Not Present:** Potentially suitable habitat (i.e. interior forest) is not present within the study area.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Marsh Breeding Bird Habitat **<u>Rationale:</u>** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. <u>Information Sources</u> • OMNRF District and wetland evaluations. • Field Naturalist clubs • Natural Heritage Information Centre (NHIC) Records. • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas.	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren **or** breeding by any combination of 4 or more of the listed species. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH. • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #35 provides development effects and mitigation measures	**Not present**: Green Heron was observed in the study area but did not exhibit evidence of breeding. Wetland habitat in the study area is generally limited to small patches and disturbed sites.
Open Country Bird Breeding Habitat **<u>Rationale:</u>** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern** Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years). • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. <u>Information Sources</u> • Agricultural land classification maps, Ministry of Agriculture. • Local bird clubs. • Ontario Breeding Bird Atlas • EIS Reports and other information available from Conservation Authorities.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #32 provides development effects and mitigation measures	**Not present**: Indicator species were not observed in the study area during breeding bird surveys. Vegetation Community 10 provides a suitable ELC ecosite type for this SWH category but does not meet the 30 ha size requirement for candidacy.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Shrub/Early Successional Bird Breeding Habitat **Rationale:** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	Indicator Spp: Brown Thrasher Clay-coloured Sparrow Common Spp. Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	Large field areas succeeding to shrub and thicket habitats >10 ha in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live- stock pasturing in the last 5 years). • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. Information Sources • Agricultural land classification maps, Ministry of Agriculture. • Local bird clubs. • Ontario Breeding Bird Atlas • Reports and other information available from Conservation Authorities.	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #33 provides development effects and mitigation measures.	**Candidate:** Target species were not observed in suitable numbers during breeding bird surveys. However, Vegetation Community 11 consists of a cultural thicket-woodland complex which meets the 10 ha size requirement for candidacy and could support suitable breeding populations of target species in future.
Terrestrial Crayfish **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	Chimney or Digger Crayfish; (Fallicambarus fodiens) Devil Crayfish or Meadow Crayfish; (Cambarus Diogenes)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh ecosites can be used by terrestrial crayfish.	Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish. Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. • Both species are a semi- terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult • SWH MIST Index #36 provides development effects and mitigation measures.	**Not Present**: Evidence of target species (i.e. crayfish chimneys) were not observed during field studies.

Significant Wildlife Habitat Type: Seasonal Concentrations of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Potential for Candidate and/or Confirmed SWH on Subject Property**
		ELC Ecosite Codes	**Habitat Criteria and Info. Sources**	**Defining Criteria**	
Special Concern and Rare Wildlife Species **Rationale:** These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre (NHIC).	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites Information Sources • Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas • Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWH MIST Index #37 provides development effects and mitigation measures.	**Confirmed**: Special Concern and provincially rare species observed or documented in the study area include: • Eastern Wood-pewee (SC) (Communities 1, 2, 8, 9, 11, 15, 16, 18, and 20) • Wood Thrush (SC) (Communities 1 and 2) • Ohio Buckeye (S1) (Community 20; south of Mohawk Canal only) • Pignut Hickory (S3) (Communities 1, 2, 4, 5, and 8) • Sharp-leaved Goldenrod (S3) (Communities 2 & 3) • Tall Boneset (S1) (Community 11) • Monarch (SC) (Communities 10, 11, 14, 17, 22, 25, and 26) • Snapping Turtle (SC) (Community 3)

Appendix F-1 – 2018 Sediment Investigation Workplan & Summary Report

September 14, 2018

William Cowlin
Aquafor Beech Ltd.
55 Regal Road, Unit 3
Guelph, ON
N1K 1B6

Dear William,

RE: Mohawk Lake - 2018 Sediment Investigation Workplan

Further to our recent discussions, Pollutech EnviroQuatics Limited (Pollutech) is pleased to provide Aquafor Beech Ltd. (ABL) with this workplan for the completion of a sediment investigation in Mohawk Lake and Canal in Brantford, Ontario.

It is our understanding that the City of Brantford wants to improve the environmental quality of Mohawk Lake and Mohawk Canal in order to provide enhanced recreational, fish and wildlife habitat, and downstream water quality conditions. As such, the City of Brantford commissioned ABL to complete the "*Mohawk Lake and Mohawk Canal Cleanup and Rehabilitation Project",* which is to be completed in the following four phases:

Phase 1 – Characterization Study
Phase 2 – Sub-watershed Stormwater Plan Phase
Phase 3 – Environmental Assessment and Master Plan Phase
Phase 4 – Design & Construction of the Cleanup and Remedial Work

This sediment investigation is being completed as part of the Phase 1 Characterization Study, with the goal of determining/confirming the environmental quality of sediments within the lake and canal.

A significant amount of sediment investigative work has been conducted in Mohawk Lake and Canal historically. Over time, various remedial measures have been implemented and the catchment areas that discharge water to the lake and canal have seen major declines in heavy industry. As such, it is anticipated that the sediment quality has likely not deteriorated/worsened since the previous investigative work was completed. For cost control measures, ABL determined that spot checks of the sediment quality should be completed to confirm the environmental quality of sediments versus commissioning a comprehensive characterization study. Furthermore, given that remediation of the sediments is well into the future (i.e., Phase 4 - Design & Construction of the Cleanup and Remedial Work), results collected as part of Phase 1- Characterization Study could be out-of-date and not applicable for construction use (i.e., determination of appropriate sediment disposal options).

With this in mind, a less comprehensive sediment investigation was developed to assist in the confirmation of the environmental quality of sediments. The 2018 sediment investigation includes the collection of surficial sediment samples representative of the top 10 centimetres (cm) and deeper sediment core samples to a maximum depth of 1.0 metres (m), 1.5 m, or 2.0 m at various locations within Mohawk Lake and Canal. Following collection, the sediment cores will be segregated two characterize two depth intervals. For core samples collected to a depth of 1.0 m, the core samples will be segregated into increments of 10-55 cm and 55-100 cm. Core samples collected to a depth of 1.5 m and 2.0 m, will be segregated into increments of 10-100 cm and 100 cm - end of core. For all core samples, the top 10 cm of the core sample will be excluded as this increment will be collected during the surficial sampling. Note: Following the review of historical sediment investigative work completed, it is not anticipated that individual layers of distinct strata will be encountered. However; should this assumption be proven incorrect, ABL will be consulted to determine the appropriate intervals to be utilized. It is currently anticipated that four sampling locations will be established within Mohawk Canal – West; 12 sampling locations within Mohawk Lake; and, two locations within Mohawk Canal – East. An additional two sampling locations have been included for quality assurance/quality control (QA/QC) purposes. Therefore, there will be a total of 20 sampling locations in which both surficial and sediment core sampling will be completed. At each location, three distinct samples will be collected/formed (i.e., one surficial sample and two samples representing two distinct depth intervals) for a grand total of 60 individual samples. One additional sample will be collected from two of the 2.0m core sampling locations for specialized testing (i.e., Lead 210). Details pertaining to these additional two samples is not available at this time but will be confirmed prior to mobilization of the field crew.

The following provides a summary of the anticipated scope-of-work, site selection, methodology, site access and assembly areas, housekeeping policy, pre-job checklists, project specific health and safety health and safety requirements, roles and responsibilities, project schedule, and contacts.

1.0 SCOPE-OF WORK

The anticipated scope-of-work includes:

a) Mobilization of personnel and equipment from Point Edward to Brantford to complete a sediment investigation in Mohawk Lake and Canal. This investigation includes the collection of surficial sediment samples and deeper sediment core samples at various locations within lake and canal. The surficial sediment samples will be collected via Petite Ponar; whereas, the sediment core samples will be collected using Pollutech's hammer core sampler equipped with 5.08 cm diameter PVC core tubes. All sampling activities will be staged from Pollutech work vessels.

b) The surficial sediment and sediment core samples will be collected from a maximum of 20 locations. Note: Two of the 20 sampling locations have been included for QA/QC purposes, for which the locations have not yet been identified. It is currently anticipated that these QA/QC locations will be positioned immediately adjacent other sampling

locations and will act as a duplicate samples. Refer to Section 2.0 for further details pertaining to the sampling locations.

c) The surficial sediment samples will be collected to represent the top 10 cm of depositional sediment. Whereas; the sediment core samples will be collected to a maximum sediment depth of 1.0 m at four of the sampling locations, 1.5 m at nine locations, 2.0 m at nine locations, or refusal, whichever occurs first. It is currently anticipated that five individual core samples will be required per 1.0 m location, four will be required per 1.5 m location, and three per 2.0 m location; to provide sufficient sample volume (i.e., 1.74 Litres) for the targeted core intervals. Refer to Section 2.0 for further details pertaining to the sampling locations. Refer to Section 3.2.2 for further details pertaining to core sample intervals.

d) Upon the collection and retrieval of the surficial sediment samples aboard the vessel, the contents of the Ponar sampler will be emptied into a stainless steel bowl where they will be homogenized until a consistent colour and texture are obtained. The appropriate sample bottles, provided by ABL, will then be filled, sealed and appropriately labeled. The quantity of grab samples needed to obtain the required volume of sediment will be recorded. Refer to Section 3.1.1 for further details pertaining to sample collection and processing activities. Prior to each use, all sampling equipment will be pre-cleaned following Pollutech's in-house procedures to prevent cross contamination. Refer to Section 5.2 for further details pertaining to decontamination procedures.

e) Upon the collection and retrieval of each sediment core sample aboard the vessel, the core tube will be removed from the core extension/drive unit, capped and appropriately labeled. Refer to Section 3.1.2 for further details pertaining to sample collection activities. All core samples will be stored onboard the vessel in a semi-inclined position to minimize disturbance of the sediment sample contained within. Refer to Section 3.3.1 for further details pertaining to onsite sample storage and transport activities. Prior to each use, all sampling equipment will be pre-cleaned following Pollutech's in-house procedures to prevent cross contamination. Refer to Section 5.2 for further details pertaining to decontamination procedures.

f) At each sampling location, all pertinent information will be collected and recorded on the appropriate field log sheets. Refer to Section 3.1.3 for further details pertaining to field data collection requirements.

g) All surficial samples collected for chemical analyses will be stored in chilled coolers onboard the vessel until which time they transferred to shore and stored within a vehicle. Once daily, the surficial samples will be shipped under chain-of-custody ALS Laboratories (ALS), in Waterloo for the required chemical analysis. It is currently anticipated that either ABL or ALS will pick up and transport the samples to the testing laboratory on a daily basis. Refer to Section 3.3 for details pertaining to sample storage and transport and Section 3.4 for details pertaining to the required chemical analysis.

h) Routinely throughout sample collection activities, all sediment core samples will be transferred to shore and temporarily stored within a vehicle until which time processing

and sub-sampling are completed. It is currently anticipated that sample processing activities will be completed the day following sample collection within an enclosed utility trailer. Refer to Section 3.3 for details pertaining to sample storage and transport.

i) The following provides a brief summary of the processing and sub-sampling activities that will be completed. Refer to Section 3.2.2 for further details pertaining to core sample processing activities.

   i. Obtain all of the sediment core samples collected from an individual sampling location. Note: To minimize exposure to air, prevent loss of sediment, and to prevent cross contamination, processing and sub-sampling activities will only be completed for one sample location at a time.
   ii. Open each of the core tubes collected from a given sampling location and decant the column of water on top of the sediment from within each core tube.
   iii. Extrude the sediments contained within each core tube onto a plastic lined core extrusion tray using Pollutech's air extrusion technique.
   iv. Measure and separate the sediment core into the required core intervals.
   v. Combine the sediments from all core samples collected from an individual location for a specific core interval into a stainless steel bowl where they will be homogenized until a consistent colour and texture are obtained.
   vi. Fill, seal and label the required number of sample bottles, provided by ABL. Note: Prior to each use, all sampling equipment will be pre-cleaned following Pollutech's in-house procedures to prevent cross contamination. Refer to Section 5.2 for further details pertaining to decontamination procedures.
   vii. Repeat as required for the remaining core intervals.
   viii. Once daily, the core samples will be shipped (in chilled coolers) under chain-of-custody ALS Laboratories (ALS), in Waterloo for the required chemical analysis. As with the surficial samples, it is currently anticipated that either ABL or ALS will pick up and transport the samples to the testing laboratory. Refer to Section 3.4 for details pertaining to the required chemical analysis.

j) Demobilization of personnel and equipment from Brantford to Point Edward upon the completion of all sampling activities.

k) Preparation of a brief summary report detailing sample collection and processing procedures and data tables summarizing all field notes/observations collected.

2.0 SITE SELECTION

The most recent bathymetric survey of the lake and canals was completed in the spring of 2018 by ABL. From the survey, ABL reported that the total volume of sediments accumulated within the lake and canals was 155,000 and 30,000 cubic metres, respectively. Previous bathymetric surveys were completed in 1994 by Ecological Services For Planning Limited (ESPL). ESPL reported that the total volume of sediments accumulated within the lake at that time was 300,000 cubic metres, which is significantly greater than the approximate 168,000 cubic metres reported in 1972 by M.M. Dillon Limited Consulting Engineers and Planners. It is our understanding that no additional hydrographic survey work was completed between 1994 and

2018. Rationale for the significant difference between sediment accumulation quantities amongst the three hydrographic surveys is not known.

For reasons previously identified, it was determined that spot checks of the sediment be completed to confirm their environmental quality versus commissioning a comprehensive study to characterize the sediment that has accumulated within the lake and canal. With this in mind, Pollutech believes that it would be prudent to maintain the number of sampling locations originally requested by ABL rather than reducing them, given the quantity of sediment reported in the 2018 hydrographic survey. It should be noted that the number of sampling locations is NOT based on the current quantity, thickness, and/or distribution of the sediments. Appropriate characterization of the sediments may need to be completed in the future prior to sediment removal in order to determine/confirm the appropriate use/disposal options.

For the purposes of this sediment investigation, Mohawk Lake and Canal was sub-divided into three areas as follows:

Zone 1 = Mohawk Lake
Zone 2 = Mohawk Canal – West
Zone 3 = Mohawk Canal – East.

Mohawk Lake is approximately 900 m long and 300 m wide at its widest point. Due to the size and shape of the lake, it was sub-divided into four equally spaced quadrants. Due to the size of each quadrant two sample locations were positioned in Quadrant 1, three sample locations were positioned in Quadrant 2, four sample locations were positioned in Quadrant 3 and three sample locations were positioned in Quadrant 4. The approximate position of each of the sampling locations was based on the 2018 hydrographic survey results and the required water depths following future sediment removal activities as identified by ABL. Areas in which sediment removal activities would not be required to maintain the required water depths have not been targeted for sampling. A drawing depicting the approximate position of the sampling locations has been provided as Figure 1.

The length of the Mohawk Canal – West is approximately 1,800 m. Due to its length and narrow width, the canal was sub-divided into four reaches approximately 450 m in length. A single sampling location was positioned at the midpoint of each reach within the middle of the canal. A drawing depicting the approximate position of the sampling locations has been provided as Figure 2.

The length of the Mohawk Canal – East is approximately 600 m. Due to its length and narrow width, the canal was sub-divided into two reaches approximately 300 m long. A single sampling location was positioned at the midpoint of each reach within the middle of the canal. A drawing depicting the approximate position of the sampling locations has been provided as Figure 2.

In summary, 12 sampling locations have been established within Mohawk Lake; four sampling locations within Mohawk Canal – West; and, two locations within Mohawk Canal – East. An additional two sampling locations have been included for quality assurance/quality control (QA/QC) purposes. Therefore, there will be a total of 20 sampling locations in which both surficial and sediment core sampling will be completed.

The positions of the two QA/QC and Lead 210 sampling locations have not been identified and will be established in the field. It is currently anticipated that these locations will be positioned immediately adjacent other sampling locations within Mohawk Lake and will act as a duplicate samples.

3.0 METHODOLOGY

3.1 SAMPLE COLLECTION

Two different sample collection methods will be used to collect the required sediment samples in Mohawk Lake and Canal. The surficial samples (0-10cm) will be collected via Petite Ponar; whereas the deeper sediments 10 cm to a maximum depth of 2.0 m will be collected via core sampling via Pollutech's hammer core technique.

Collection of the surficial samples via Petite Ponar is primarily a cost control measure that will allow for:

- Reduction of the total number of core tubes and increased labour that would be needed to collect the quantity of sediment required to complete the requested chemical analysis.
- Reduction of the time required to process and form sub-samples from the 0-10cm increment.
- Reduction of the lag/hold time between sample collection and submission of the samples to the testing laboratory for *e.coli* and Total Coliform analysis, which has a maximum acceptable 48-hour hold time from sample collection to analysis. Note: *e.coli* and Total Coliform analysis will only be conducted on the surficial samples and not the deeper sediments.
- Reducing down time between core sample collection and subsequent processing. More specifically; utilizing both sample collection techniques together allows for staggering/offsetting core sample collections and subsequent processing by one day making better use of the field crews time. Note: The shortest acceptable hold time from sample collection to laboratory analysis for the deeper sediments is 72-hours for nitrate and nitrite. Therefore; allowing processing of the core samples to be completed the day following collection instead of the same day.

3.1.1 Surficial Sediment Sampling

The following steps provide a summary of the sample collection procedures that are to be followed for the collection of surficial sediment samples via Petite Ponar. Note: All observations and pertinent data will be recorded on field log sheets.

1. Secure project vessel on location using anchor and/or mooring lines as appropriate to ensure a fixed position is maintained.
2. Determine water depth using the vessels depth sounder, survey rod or weighted shot line and record on the field sample collection log sheet.

3. Determine the sampling location GPS position and record on the field sample collection log sheet. Also record secondary position information using a rangefinder and record on the field sample collection log sheet (as required). When using rangefinder, distances to three fixed shore based locations should be obtained to allow for position triangulation.
4. Record weather and environmental/lake conditions on the field sample collection log sheet.
5. Connect a lift line to the top of the Petite Ponar (via shackle) and slowly lower the Ponar to the canal/lake bottom and allow the lift line to go slack once contact with the bottom is made.
6. Slowly apply tension to the lift line. This will cause the Ponar jaws to close encapsulating the sediment sample representative of the top 10 cm of surficial sediment.
7. Recover the Ponar onboard the vessel and decant the water out of the sampler through the top screens by tipping the sampler on its side.
8. Right the sampler and empty the contents into a stainless steel bowl.
9. Homogenize the sediment sample within the bowl using a stainless steel spoon until a consistent colour and texture are obtained.
10. Repeat steps 7 to 12 until a sufficient quantity of sediment has been obtained.
11. Once the required volume of sediment has been obtained, Fill the required quantity of sample bottles such that there is zero headspace and secure the lid.
12. Affix the appropriate labels (provided by ABL) to each sample bottle.
13. Using a sharpie or paint marker, place a secondary ID marking on the top cap of each sample bottle.
14. Record any pertinent observations on the field log sheet (*e.g.,* presence of organic material/detritus, aggregate material, evidence of staining, odour, etc.).
15. Identify the number of Ponar grab attempts made to collect the required quantity of surficial sediment and any difficulties encountered.

3.1.2 Sediment Core Sampling

The following steps provide a summary of the sample collection procedures that are to be followed for the collection of sediment core samples. Note: All observations and pertinent data will be recorded on field log sheets.

1. Secure project vessel on location using anchor and/or mooring lines as appropriate to ensure a fixed position is maintained.
2. Determine water depth using the vessels depth sounder, survey rod or weighted shot line and record on the field sample collection log sheet.
3. Determine the sampling location GPS position and record on the field sample collection log sheet. Also record secondary position information using a rangefinder and record on the field sample collection log sheet (as required). When using rangefinder, distances to three fixed shore based locations should be obtained to allow for position triangulation.
4. Record weather and environmental/lake conditions on the field sample collection log sheet.
5. Obtain the appropriate quantity and length of pre-cleaned core tubes required for the individual sampling location. Measure the tube length of each core tube and record it on the field sample collection log sheet. Refer to Figures 1 to 3 and Table 1 for details pertaining to the required core tube length.

6. Insert new or pre-cleaned core catcher and into the bottom end of the core tube and attach a pre-cleaned 5.08cm stainless steel cutter head.
7. Obtain and thread the integrated check valve/extension adaptor/lifting lug to the top end of the core tube.
8. Attach the lifting chain to the lifting lug via shackle.
9. Thread on the appropriate lengths of 2.54 cm black iron extension rods to the top of the extension adaptor based on the water depth at the given sampling location.
10. Using a measuring tape or survey rod, measure and mark the required drive distance on the extension rods. The drive distance is calculated by adding the water depth to the required core sample penetration depth for the given location. Refer to Table 1 for details pertaining to the required core sample penetration depth required for each location.
11. Attach the slide hammer to the top of the extension rods. Alternatively, a fence post puncher could be used.
12. Lower the cure tube into the water until it makes contact with the lake/canal bottom.
13. Manually push the core tube into the sediments until the required core penetration is obtained or refusal is encountered. If refusal is encountered, impact the core tube further into the sediments via slide hammer or fence post puncher until the required core penetration is obtained or refusal is encountered.
14. Using a tape measure or survey rod, measure the actual core penetration depth by measuring down to the waters' surface from the mark previously affixed to the extension rods identifying the required core depth. The actual core penetration is then calculated by subtracting this value from the required core sample depth. Record the core penetration depth on the field sample collection log sheet.
15. Remove the slide hammer or fence post puncher from the top of the extension rods.
16. Connect the lifting chain that was connected to the lifting lug (Step 8) to the fence post puller and extract the core tube from the sediments.
17. Recover the core sample onboard the vessel after disconnecting/removing the extension rods and adaptor. Note: Ensure the sediment core sample remains inclined throughout the entire process.
18. Using a pre-cleaned measuring tape, measure and record the total core headspace (measured from the top of core tube to the top of sediment) and record on the field sample collection log sheet.
19. Calculate the total sediment height in the core tube by subtracting the total core headspace (Step 18) from total core tube length) and record on the field sample collection log sheet.
20. Remove the cutter head and core catcher and install a new 5.08cm plastic cap on the bottom of the core tube.
21. Secure the bottom cap to the core tube via gear clamp.
22. Install a new 5.08 cm cap on the top of the core tube and secure with a gear clamp.
23. Install sample label on the side of core tube.
24. Using a sharpie or paint marker, place a secondary ID marking on the core tube top cap. Also record the secondary ID on the field sample collection log sheet.
25. Wipe the exterior of the core tube with paper towel or rag as required.
26. Record any pertinent observations on the field log sheet (*e.g.,* clay plug present, evidence of staining, odour, etc.).

27. Repeat steps 6 to 26 as required until the required number of core samples are collected from the specific location.
28. Identify the number of attempts made to collect the required amount of cores, whether a core catcher was required, and any issues encountered.
29. Secure the filled core tubes to the vessel in a slightly inclined position to minimize disturbance of the sediment sample contained within.

3.1.3 Field Data Collection

At each sampling location, the following information will be collected and recorded on field log sheets:

a. Date and Time
b. Names of sample collection personnel
c. Location identification/name
d. GPS position
e. Secondary position information collected (if and as required)
f. Water depth
g. Weather and water conditions at the time of sample collection
h. Sample collection time and date
i. Number of successful and unsuccessful deployments of the sampling equipment
j. Depth of core tube penetration
k. Quantity of sediment recovered in the core tube (i.e., sediment height)
l. Confirmation of whether a clay plug was obtained in the core sample
m. Evidence of staining on the core tube or Ponar, odours, or if a sheen is detected on the waters' surface following extraction of the core tube/sampler from the lake bottom.
n. Issues encountered
o. Sample numbers and secondary ID markings used

An individual field log sheet will be completed for the surficial and sediment core samples, respectively.

3.2 SEDIMENT CORE SAMPLE PROCESSING

The following steps provide a summary of the sample processing procedures that are to be followed for the extrusion of the sediment core samples and subsequent sub-sampling activities. All core sample processing will be completed within an enclosed utility trailer stationed onshore within close proximity to the vessel staging area.

1. Place core extrusion tray(s) on top of flat surface (e.g., tables). Ensure one end of the extrusion tray(s) is elevated.
2. Install new plastic liner(s) on the core extraction tray(s).
3. Secure the air supply tank to the sample processing table or an inside wall of the enclosed utility trailer using appropriate tie down straps such that it cannot move or fall over.
4. Attach the bottle regulator, pressure gauge, and air fill line to the air supply tank.

5. Obtain all core samples collected from a given location and place within the core extraction tray(s). Note: Ensure that all core samples are oriented in the same direction (i.e., the bottom of the core tubes are all at the lowest end of the extraction tray), when processing numerous core tubes collected from a single location simultaneously.
6. Remove the gear clamp and test cap from the top of the first core tube and slowly decant the standing water on top of the sediment sample from the core tube into a 20L pail. Care must be taken to ensure the fine grained sediments are not removed with the decant water.
7. Remove the gear clamp and test cap from the bottom of the first core tube and place back in the extraction tray with the bottom of the core tube at the lowest end of the extraction tray.
8. Repeat Steps 6 and 7 for all remaining core tubes collected from a single location.
9. Thread the air extraction coupling on to the bottom end of the first core tube.
10. Attach the air extrusion control valve and pressure gauge to the extraction coupling connected to the core tube.
11. Connect the air supply line already connected to the air supply tank regulator (Step 4) to the extrusion control valve.
12. After ensuring the extrusion control valve is closed and the air supply tank regulator is set to 0 P.S.I., slowly open the air supply tank main valve fully and then adjust the tank regulator to 20 P.S.I.
13. While holding the core tube within the extraction tray such that the top of the core tube is at the highest end of the extraction tray, slowly open the extrusion control valve allowing compressed air to enter the core tube and slowly walk backwards with the open end of the core tube within the extraction tray. Note: The compressed air will slowly push the sediment core sample out of the core tube and into the extrusion tray. Care must be taken to walk backwards slowly while allowing the sediment core to be pushed out of the tube in a controlled and uniform manner. If completed too fast, the sediment core will separate into a series of smaller increments on the extraction tray. Whereas, completing this too slow will cause the sediment core to bunch up on the extraction tray.
14. Once the entire sediment core sample has been extruded from the core tube into the extraction tray, close the extrusion control valve and shut off the air supply tank regulator.
15. Repeat Steps 9 through 14 for the remaining core tubes collected from a single location.
16. Record any pertinent observations pertaining to the individual core samples on the processing log sheet (*e.g.,* presence of organic material/detritus, aggregate material, evidence of staining, odour, stratification, etc.). Note: Following the review of historical sediment investigative work completed, it is not anticipated that individual layers of distinct strata will be encountered. However; should this assumption be proven incorrect, ABL will be consulted to determine the appropriate intervals to be utilized.
17. Place a pre-cleaned measuring tape or ruler along the length of the core sample with the zero mark at the top of the sediment sample.
18. Measure the required distance for the first core interval (i.e., 0-10cm) and insert a pre-cleaned trowel/putty knife into the sample identifying the core interval.
19. Since the 0-10cm depth interval was sampled during the surficial sampling using a Petite Ponar, the 0-10cm interval is not required from the core samples. Therefore, the 0-10cm interval will be removed from the extrusion tray and placed within pre-labelled plastic waste pail.

20. Repeat Step 17 to 19 for all core tubes collected from a single location.
21. Measure the required distance for the second core interval and insert a pre-cleaned trowel/putty knife into the sample identifying the core interval. For core samples collected to a depth of 1.0 m, the second increment will be 10-55 cm. For core samples collected to a depth of 1.5 m and 2.0 m, the second increment will be 10-100 cm.
22. Using a pre-cleaned stainless steel spoon or trowel, scoop the sediment from the second sediment core interval into a pre-cleaned stainless steel bowl.
23. Repeat Step 21 and 22 for all core tubes collected from a single location.
24. The sediments from a given core interval and from all core tubes will then be homogenized together within the stainless steel bowl until a consistent colour and texture are obtained.
25. Fill the required quantity of sample bottles (provided by ABL) such that there is zero headspace and secure the lid.
26. Affix the appropriate labels (provided by ABL) to each sample bottle.
27. Using a sharpie or paint marker, place a secondary ID marking on the top cap of each sample bottle.
28. Repeat Steps 21 to 27 for the third core interval. For core samples collected to a depth of 1.0 m, the third increment will be 55-100 cm. For core samples collected to a depth of 1.5 and 2.0 m, the third increment will be 100cm-end of core.
29. Repeat Steps 2, and 5 to 28 for all remaining locations in which core samples were collected.

3.3 SAMPLE STORAGE/TRANSPORT

3.3.1 Onsite

All surficial samples collected for chemical analyses will be stored in coolers onboard the vessel until which time they transferred to shore and stored within a vehicle. Appropriate measures will be implemented (e.g., freezer packs or ice) to ensure the samples are appropriately chilled following collection (i.e., < Celsius). Once daily, the surficial samples will be shipped under chain-of-custody ALS Laboratories (ALS), in Waterloo for the required chemical analysis. It is currently anticipated that either ABL or ALS will pick up and transport the samples to the testing laboratory on a daily basis.

Once collected, all core samples will be appropriately secured to the vessel and/or support skiff. Samples will be transported to shore periodically throughout the day for storage within a land based support vehicle until which time the samples are processed. Note: All core samples shall be transported and stored in a vertical or slightly inclined position to prevent slumping or intermixing of the core sample.

Upon the completion of the core sample processing and sub-sampling activities for a given location, all core samples for chemical analyses will be stored in coolers within the enclosed utility trailer. Appropriate measures will be implemented (e.g., freezer packs or ice) to ensure the samples are appropriately chilled following sample processing and sub-sampling i.e., Celsius). Once daily, the core samples will be shipped under chain-of-custody ALS Laboratories (ALS), in Waterloo for the required chemical analysis. It is currently anticipated that either ABL or ALS will pick up and transport the samples to the testing laboratory on a daily basis.

3.4 CHEMICAL ANALYSIS

The following provides a summary of the laboratory analysis, sediment sample bottle and volume requirements that will be conducted:

3.4.1 Bulk Sediment Analysis

Analytical Testing	Surficial Sample	Core Sample Interval		Bottle Size (ml)	Bottle Quantity	Total Volume (ml)
		1.0 m Cores (cm)	1.5 & 2.0 m Cores (cm)			
E. coli and Total Coliform	0-10 cm	N/R	N/R-	500	1	500
PAHs	0-10 cm	10-55 55-100	10-100 100-end	40	2	80
PHCs, VOCs, BTEX	0-10 cm	10-55 55-100	10-100 100-end	120	1	120
				40	1	40
Conductivity, Metals, Inorganics, pH, SAR	0-10 cm	10-55 55-100	10-100 100-end	250	1	250
% solids, Total P, Nitrates, Total N	0-10 cm	10-55 55-100	10-100 100-end	250	1	250
Grain Size Analysis	0-10 cm	10-55 55-100	10-100 100-end	250	1	250

Notes:
N/R = Not required

3.4.2 Ontario Regulation 347, Schedule 4 Waste Classification Analysis

Analytical Testing	Surficial Sample	Core Sample Interval		Bottle Size (ml)	Bottle Quantity	Total Volume (ml)
		1.0 m Cores (cm)	1.5 & 2.0 m Cores (cm)			
TCLP Metals & Inorganics	0-10 cm	10-55 55-100	10-100 100-end	250	1	250

3.4.3 Other Analysis

Analytical Testing	Surficial Sample	Core Sample Interval		Bottle Size (ml)	Bottle Quantity	Total Volume (ml)
		1.0 m Cores	1.5 & 2.0 m Cores			
Lead 210	TBD	TBD	TBD	TBD	TBD	TBD

Notes:
TBD = To be determined

4.0 SITE ACCESS AND ASSEMBLY AREAS

All Sediment sampling and processing activities will be staged out of an enclosed utility trailer that will be stationed in the public parking lot located Greenwich St immediately southwest of the bend in the road before the intersection Greenwich/Mohawk intersection.

The equipment/contents of both project vessels will be unloaded at the end of each day, the vessels will be left unattended and secured appropriately to shore nightly at a location in close proximity to the staging area (trailer).

5.0 HOUSEKEEPING POLICY

5.1 GENERAL

Good housekeeping on the job site is the responsibility of all employees involved on the job site and is essential. All garbage should be sorted, bagged, labelled and disposed of at the site following each site's specific waste disposal guidelines. If large quantities of waste are produced, they should be disposed a minimum of once per day. All equipment and tools should be stored neatly in their appropriate storage containers when not in use. All floors or other surfaces must be kept free of obstructions, hazards, and accumulations of refuse, snow or ice. Hazardous conditions (*e.g.,* excavated pit, welding area, etc.) should be clearly identified with signs, barricades and/or caution tape. These areas should be free of equipment, tools, vehicles, etc. at all times so that they are clearly visible. All ropes and extension cords should be coiled up and stored such they do not create a trip, slip, fall hazard when not in use.

All equipment and/or material to be transported within a company vessel must be properly secured with rope, bungee cords, and/or tie down straps. When possible the load should be secured to the vessel gunnels to prevent it from sliding across the deck and at no time should a load be positioned in such a way that it would obstruct the vessel operator's view of the water in any direction. When possible, all parts of a load should be secured inside a vessels perimeter (gunnels).

5.2 DECONTAMINATION PROCEDURES

All non-disposable sampling/processing equipment and supplies (e.g., Petite Ponar, stainless steel bowls, spoons, putty knives, trowels, core tube cutter heads, core catchers) must be appropriately cleaned between individual sampling locations using the following procedures:

1. Scrub the interior and exterior of the equipment using a phosphate free detergent (i.e., Detergent 8).
2. Triple rinse using De-chlorinated or Millipore water.
3. Perform a methanol rinse.
4. Perform a final rinse using Mohawk Lake/Canal or De-chlorinated water.

A new plastic liner must be installed on the core extraction tray(s) prior to processing additional samples.

5.3 WASTE DISPOSAL

All waste generated throughout the course of this sediment investigation (spent core tubes, core catchers, nitrile gloves, plastic liners, etc.) are to be bagged and returned to Pollutech for proper disposal upon the completion of the sample collection activities as per Pollutech in-house procedures.

All excess sediment extruded from the core tubes will be deposited into a pre-lined 20L plastic pail. Lids and appropriate WHMIS labels will be affixed to the pails. Note: ABL will be responsible for the disposal of all waste/unused sediment generated during sample processing activities. It is currently anticipated that ABL will pick up this material upon the completion of the sample processing activities.

6.0 PRE-JOB CHECKLISTS

6.1 JOB SAFETY ANALYSIS

As part of Pollutech's safety program, a job safety analysis JSA) must be completed identifying all potential hazards associated with the task(s) to be conducted and identifying specific mitigative measures to control these hazards specific to a specific project.

Project specific procedures (*e.g.,* project specific health and safety plan, workplan, SOPs, etc) should be prepared following the completion of the JSA to ensure that specific work procedures are identified to ensure the safe and successful completion of the project. All mitigative measures identified within the JSA must be incorporated into project specific procedures and be followed by all workers while completing the required project tasks.

The JSA should be reviewed with all workers during the first pre-job meeting. All workers must sign the JSA to ensure that they understand and agree to abide by the requirements identified.

6.2 TASC

TASC cards are a key part of Pollutech's Hazard recognition program and are used to identify hazards associated with various work activities, and identify how the individual hazards will be eliminated and/or controlled throughout the job. A TASC card will be completed on a daily basis prior to the commencement of any work activities. The TASC card will be reviewed with all crew members during the tailgate meeting daily. Each group member must completely read, understand and sign the TASC card.

Should a new hazard arise during the course of completing a task, or should a new task not previously identified on the TASC card need to be completed, work activities should be temporarily halted while the TASC card is updated.

6.3 TAILGATE MEETING

As part of Pollutech's safety program, daily Tailgate Meeting will be held prior to and during field related job activities. All employees to be involved in the job are required to be in attendance. The purpose of these tailgate meetings is to review the anticipated scope-of work for the day in detail, with special emphasis placed on PPE requirements, safety policies and procedures, special permit requirements, safety issues and or concerns, and anticipated timeline and/or schedules. It is the responsibility of the manager and/or supervisor to initiate a tailgate meeting. In the event that neither is able to attend, it is the responsibility of the worker to call the meeting. All tailgate meetings must be documented appropriately on Pollutech's Daily Tailgate Meeting Template. All workers are required to review and sign the tailgate form upon the completion of the meeting.

6.4 VESSEL PRE-DEPARTURE CHECKLIST

It is each individual employee's responsibility to ensure that the vessel is safe to use prior to its use. A safety inspection should be performed on each work boat prior to use by the vessel operator or designate. Safety Inspections must be conducted before a vessel is unloaded off a trailer, leaves the dock and/or before it is started after it has been moored unattended for any period of time. Safety inspections should include, but not limited to: hull damage, navigation light operation, equipment check (*e.g.,* GPS, compass, VHF radio operation, etc.), examination of the bilge for water and/or oil levels, blower operation, adequate number of mooring lines, floats, oars, lifejackets, and security of load. The complexity of the safety inspection will be dictated by the size of the vessel being used.

An individual safety inspection shall be completed on every project vessel on a daily basis and documented on Pollutech's Vessel Pre-Departure Checklist.

7.0 PROJECT SPECIFIC HEALTH AND SAFETY REQUIREMENTS

7.1 GENERAL SAFETY

7.1.1 Trips/Slips/Falls

When in the field, it is common to encounter uneven or rough terrain as well as other obstacles (*e.g.,* equipment, debris, etc.) that can be potential tripping hazards to a worker in motion. Weather conditions such as rain, sleet or snow can cause an otherwise safe surface to become slippery, resulting in slips and falls. The following general work practices should be utilised in order to minimize these potential hazards:

- practice good housekeeping (*e.g.,* clear debris, organize tools and equipment, etc.) to ensure a clear and dry work area
- maintain awareness of foot position on uneven ground, around obstacles and in low light or reduced visibility conditions

- allow an unobstructed view of the ground and surrounding obstacles, and do not overload when loading equipment or carrying objects
- use stairs and handrails instead of slopes whenever possible
- avoid loose or slippery slopes
- Maintain three (3) point contact whenever possible when working on a marine vessel, and when boarding or disembarking the vessel.
- remain cognisant of vehicle and heavy equipment location and movement

7.1.2 Pinch Points

When in the field, it is common to encounter situations in which a body part may be placed between two objects that have the potential to come together (*e.g.,* hand placed between the gunnels of two boats) and pinch the body part. The following general work practices should be utilized in order to minimize these potential hazards:

- always be alert of potential pinch points
- never place a body part between two moving objects
- be on the lookout for circumstances that may suddenly cause an object to be put into motion
- if possible lock out all mechanical equipment prior to initiating work
- do not remove protective guards from equipment
- be alert when operating any mechanically operated equipment
- utilize the buddy system
- remain cognisant of vehicle and heavy equipment location and movement

7.1.3 Cuts/Sharp Objects

Throughout the workplace sharp objects are frequently encountered which have the potential to create abrasions. Examples of situations where this hazard may occur are handling tools, utility knives, metal or wooden objects, plants, furniture, etc. To reduce this hazard appropriate body protection (e.g., long pants) and hand protection (e.g., appropriate gloves for task being completed) should always be worn.

7.1.4 Particle in Eye

When in the field, it is common to encounter situations in which a foreign object may get lodged in the eye. Examples of situations where this hazard may occur are walking through tall grass, handling liquid or sediment/sludge samples, handling chemicals/sample preservatives, working in a dusty environment, decontaminating equipment, etc. To reduce this hazard appropriate eye protection should always be worn. An eye wash bottle should be maintained in vessels in which sample collections are being facilitated and in all areas in which sediment samples are being processed. In addition, eye wash bottles shall be present in all company vehicles.

7.1.5 Heat and Cold Stress

Due to the nature of Pollutech's business, field staff are susceptible to heat and cold stresses. . Both heat and cold stress should be taken very seriously; severe cases of either (*i.e.,* heat stroke or hypothermia) can be life threatening if unnoticed and untreated.

Heat stress is caused when the body's methods of heat elimination (radiation and convection from the skin and lungs and through the evaporation of sweat) become less effective causing the body core temperature to raise and an excessive water loss due to sweat. Common heat stress disorders are heat stroke, heat exhaustion, and heat cramps. Severe symptoms indicating heat stroke include dry, hot skin with no sweating, mental confusion or loss of consciousness, and seizures or convulsions. If a heat stress disorder is suspected, the employee should be removed to a cooler environment (*e.g.,* shade), laid down and instructed to rest, given plenty of fluids, and vigorously fanned. If symptoms persist, medical attention should be sought immediately.

Cold stress is caused when the body's core temperature drops below normal operating temperature due to the continuous exposure to a cold environment (*e.g.,* falling in cold water, wearing wet clothing, being exposed to wind, etc.). Common cold stress disorders are hypothermia and frost bite. If a cold stress disorder is suspected the employee should remove all wet clothing and be moved into a warm environment, use warm damp cloths to warm the body, provide warm liquids to drink and avoid rubbing the skin. If symptoms are severe, medical attention should be sought immediately.

According to the Occupational Health and Safety Act (s. 25-(2) (h)) employers must take every precaution reasonable in the circumstances for the protection of the worker. This includes developing procedures to protect workers working in both hot and cold environments. Pollutech has developed guidelines and procedures for the recognition, assessment and control for both heat and cold stress which must be adhered to through the course of this project. A copy of Pollutech's heat/cold stress guidelines and procedures will be maintained onsite for the duration of the project.

7.2 UNDERGROUND UTILITIES

All underwater utilities (if present) must be identified and located prior to the commencement of any sediment core sample collection activities. Aquafor Beech will be responsible for obtaining the required utility locates (e.g., Ontario One Call) prior to the mobilization of the field crew. Once received, the utility locates shall be provided to Pollutech to ensure that there are not utilities within close proximity to the proposed sampling locations. If required, alternative sample locations will be identified.

7.3 VESSEL SAFETY

The following conditions apply when working from a boat:

- The boat used for the work must be appropriate to the type of work and suitable for safe carriage of the workers necessary for the task.
- When possible, all operations should be completed in day light hours under reasonable weather conditions with good visibility.
- The operator of the boat must have sufficient experience and knowledge to be competent in the operation of the boat at the work site location.
- Except during the following circumstances, there must be at least two people onboard the vessel during all working activities:
  - One person can be on the vessel while moving the vessel to and from the job site as long as appropriate communication and a trip itinerary (float plan) have been established prior to departure;
  - One person can be on the vessel if the vessel is securely moored and/or anchored;
  - If two vessels are being utilized at the same time and location in which a qualified vessel operator is piloting each vessel (e.g., when deploying/recovering anchors prior to/following sampling collection activities or where one vessel is in tow/being propelled by the other); or
  - If the two vessels are securely lashed together such that they act as one vessel (e.g., tug and barge).
- It is understood that a vessel, when used as a taxi vehicle, must be operated by a trained vessel operator. During these taxiing operations eye contact will be maintained between the two vessels or shore (as appropriate).
- The boat and personnel must be properly equipped with all required safety equipment.
- No recreational equipment for fishing, hunting, water skiing, or SCUBA diving will be allowed on the boat unless specifically authorized as part of the work-related equipment.
- The vessel(s) must be operated in a safe manner and all waterway and navigational acts and regulations must be obeyed.
- The vessel operator must be intimately familiar with all aspects of the boat, its intended use, the local area, and expected weather conditions.
- Prior to departure, all crew members must be familiar with the marine emergency procedures specific to the vessel, type voyage being undertaken and the work being performed. Pollutech's project specific Marine Emergency Response Procedures shall be reviewed with all project personnel prior to departure from the dock.

7.4 WHMIS

Every controlled product not in a container, and every container of a controlled product, received at any Pollutech facility or project site from a supplier must be labelled with a supplier WHMIS label. If a label applied to a controlled product or a container of a controlled product becomes illegible or is removed, Pollutech shall replace the label with either a supplier label or a workplace label. If a controlled product is transferred to another container, Pollutech must ensure that each transfer container is labelled with a workplace label. Material Data Safety

Sheets (MSDS) must be obtained from the original supplier at the time of purchase. Updated MSDS's are to be obtained from the supplier every three years. Copies of the MSDS must accompany and controlled product while in transport or on a Pollutech project site.

MSDS will be maintained onsite for the following products: Gasoline, 2-stroke engine oil, methanol, Detergent 8, and sample bottle preservatives.

Appropriate WHMIS labels will be affixed to the outside all containers in which unused sediment is stored.

7.5 PERSONNEL PROTECTIVE EQUIPMENT

7.5.1 Personal Flotation Device

All Pollutech EnviroQuatics Limited employees must wear a Canadian Coast Guard approved Personal Floatation Device PFD) while working on the water or within one metre of the water's edge when there is the potential to fall into water where no guard rail is present and fall restraint is not used.

7.5.2 Eye and Face Protection

Adequate eye and face protection (appropriate in the circumstances) shall be worn when a worker is exposed to the hazard of eye or face injury. Canadian Standards Association (CSA) approved safety glasses with side shields are to be worn at all times while working on an industrial or construction site or when conducting sampling activities. Please note that a face shield may be required under specified conditions. The majority of Pollutech's clients do not permit contact lenses to be worn on their site. Therefore, Pollutech has made it policy that contact lenses are NOT permitted to be worn at any time while working in the field. As such, prescription glasses should be worn underneath CSA approved safety glasses or should be affixed with CSA approved side shields. Also note that mono goggles may be required when the potential of a splash hazard exists

7.5.3 Hand Protection

Protective gloves (*e.g.,* leather faced work gloves, nitrile gloves, vinyl gloves or rubber gauntlet gloves) must be worn during all work activities on an industrial or construction site. The appropriate gloves should be chosen for the type of work being conducted (*e.g.*, when handling effluents, toxic materials, dry or wet chemicals, and/or analytical samples, nitrile or vinyl gloves should be worn). When performing manual labour, the appropriate type of leather faced glove should be worn. When dealing with highly toxic or contaminated samples it is good practice to use a double layer method. That is, wear two nitrile gloves on each hand, or wear a nitrile glove under a vinyl or rubber glove. This will help prevent spreading contamination onto your skin when removing the outer layer (contaminated glove). Form fitting gloves must be worn in the vicinity of rotating equipment to prevent entanglement.

All jewellery such as rings, necklaces, and bracelets (other than those for medical purposes such as “Medic Alert”) must be removed or covered with electrical tape prior to entering an industrial facility or construction site. Some sites may require that all jewellery (including watches) be removed prior to entering a job site.

7.5.4 Head Protection

Adequate head protection (appropriate in the circumstances) shall be worn when a worker is exposed to the hazard of head injury. Class E, CSA approved hard hats are to be worn at all times while conducting work on an industrial or construction site, unless both a client representative and Pollutech management have provided prior approval. Class E hard hats are required because they consist of a shell and suspension that adequately protects a person’s head against impact and against flying or falling small objects. Additionally, the shell can withstand a dielectric strength test at 20 000 volts phase to ground.

Hard hats are required when conducting sediment sampling activities using Pollutech’s hammer core sampler. Hard hats will NOT be required when conducting the following activities: sample collection via ponar, sample processing, general marine navigation/positioning, loading/unloading vessels.

Long hair should be tied and/or contained to ensure that hair will not get tangled within rotating equipment. If the hair is tied up it is not to hinder the operation of the hard hat suspension.

7.5.5 Foot and Leg Protection

Adequate foot protection (appropriate in the circumstances) shall be worn when a worker is exposed to the hazard of foot injury. CSA approved (green patch) safety boots must be worn at all times while working in the field. The safety boots must be equipped with a box toe that is adequate to protect the wearer’s toes against injury due to impact and is capable of resisting at least 125 joules impact. Additionally, the safety boots must have a sole or insole that is adequate to protect the worker’s feet against injury due to puncture and is capable of resisting a penetration load of 1.2 kilo-newton’s when tested with a DIN standard pin. As well, the boots must have a six inch rise above the heel to provide adequate ankle support.

Adequate leg protection (appropriate in the circumstances) shall be worn when a worker is exposed to the hazard of leg injury. If Nomex III coveralls (or equivalent) are not required at a specific job site, long pants and/or cotton coveralls must be worn.

7.5.6 Hearing Protection

Not applicable

7.5.7 Fall Protection

Not applicable

7.5.8 Respiratory Protection

Not applicable

8.0 ROLES AND RESPONSIBILITIES

Pollutech

- Preparation of project specific procedures and health and safety documentation including a JSA and emergency procedures.
- Completion of the required utility locate request.
- Provision or personnel and equipment to complete the required sample collection and processing activities.
- Disposal of all wastes generated throughout the course of this project excluding waste/unused sediment.
- Preparation of summary tables of field notes collected and brief summary of the sample collection/processing activities completed.

ABL

- Attend site meetings with the various utility companies (as required) after the initial utility locate request has been initiated by Pollutech.
- Provision of the required sample bottles and associated MSDS for any preservatives used.
- Provision of appropriate labels to be affixed to the samples once collected.
- Making arrangements to have daily pick-ups of the samples collected and shipment to the testing laboratory.
- Completion of the required chemical analysis, interpretation and reporting.
- Disposal of any waste/unused sediment generated throughout the course of this investigation.

9.0 PROJECT SCHEDULE

The schedule for completion of this sediment investigation is not currently known but is anticipated to commence in early October 2018. However, the expected schedule is as follows:

Sample Collections:
Sunday – Mobilize from Point Edward to Brantford
Monday – Collect surficial and sediment core samples from 4 locations
Tuesday - Collect surficial and sediment core samples from 4 locations
Wednesday - Collect surficial and sediment core samples from 4 locations
Thursday - Collect surficial and sediment core samples from 4 locations
Friday - Collect surficial and sediment core samples from 4 locations
Saturday – Demobilize from Brantford to Point Edward

Sample Processing:
Monday - Mobilize from Point Edward to Brantford
Tuesday – Set up processing facility and process 4 core samples
Wednesday – Process 4 core samples
Thursday - Process 4 core samples
Friday - Process 4 core samples
Saturday - Process 4 core samples and disassemble processing facility
Sunday – Demobilize from Brantford to Point Edward

10.0 CONTACT LIST

Pollutech EnviroQuatics	Project Manager	
	Jeff Houtby	Office: 519-339-8787 Cell:519-464-6737
	Field Crew – Sample Collections	
	Jeff Houtby	519-464-6737
	Terry Dolbear	519-384-2300
	Field Crew – Sample Processing	
	Tanya Calver	519-381-0730
	Matt McFadden	780-862-6990
Aquafor Beech	Project Manager	
	William Cowlin	519-224-3749
	Other:	
ALS Laboratories	Gayle Braun	519-652-6044

11.0 GENERAL ASSUMPTIONS/LIMITATIONS

- Visual examination of sediment core samples will not be required prior to extrusion of the sediments from the core tube.
- There are no restrictions regarding the use of a vessel equipped with an outboard engine to conduct the sample collections within Mohawk Lake or Canal.
- All sampling locations will be accessible by boat. More specifically; the lake and canal will be free of obstructions within the study area allowing for the safe passage of a vessel.
- There will be adequate water depth at all locations to allow for the safe operation/navigation of the support vessels. The minimum and maximum water depths in the study area will be 0.45 m and 4.0 m, respectively.
- Pollutech will be responsible for obtaining the required utility locates (e.g., Ontario One Call). ABL will be responsible for attending any site meetings with the utility companies.
- ABL will be responsible for making arrangements to have the samples picked up from site and transported to the testing laboratory at the end of day daily.
- Pollutech will not be required to attend a site meeting or complete a site reconnaissance prior to the initiation of sample collection activities. This includes attending site meetings with Utility Companies or agents acting on their behalf as part of the utility locate request.
- Only one mobilization/demobilization event to/from site will be required in order to collected the required samples.
- GPS Accuracy of +/-15 metres is all that is required.
- The project vessels can be left in the water nightly at a secure location and do not need to be recovered/re-launched daily.
- Once collected, the sediment core samples will not need to be refrigerated/heated to be maintained at a specific temperature prior to sample processing and sub-sampling.
- Stand-by rates would apply for downtime associated with inclement weather and/or water conditions not conducive sample collection. Stand-by costs will be applicable up to a maximum of 8 hours (regular time) per day plus per diem
- ABL will provide approval to proceed a minimum of two weeks prior to commencement of the sediment investigation. Furthermore, any modifications to the quantity and/or depth of the sampling requirements must be identified two weeks in advance to ensure that sufficient quantity of materials (e.g., core tubes) are on hand at the time of sample collection

October 28, 2018

William Cowlin
Aquafor Beech Ltd.
55 Regal Road, Unit 3
Guelph, ON
N1K 1B6

Dear William,

RE: Mohawk Lake - 2018 Sediment Investigation Summary Report

Pollutech EnviroQuatics Limited (Pollutech) was retained by Aquafor Beech Ltd. (ABL) to assist in the completion of a sediment investigation in Mohawk Lake and Canal in Brantford, Ontario. This sediment investigation was completed as part of the Phase 1 Characterization Study, with the goal of determining/confirming the environmental quality of sediments within the lake and canal.

The investigation included the collection of surficial sediment samples and deeper sediment core samples from various locations within lake and canal. The surficial sediment samples representing the top 10 centimeters (cm) were collected via Petite Ponar; whereas, deeper sediment core samples were collected using Pollutech's hammer core sampler equipped with 5.08 cm diameter PVC core tube. All sediment sampling and processing activities were completed following the requirements of the *Mohawk Lake Sediment Investigation Work Plan*, dated September 14, 2018, with any exceptions noted below. The sediment investigation was completed between October 9 and 14, 2018.

The following provides a summary of the sample collection and processing scope-of-work completed. All analytical testing results will be furnished by the various testing laboratories to ABL directly. ABL is responsible for the compilation, review, and interpretation and reporting of the results.

Scope-of-Work Completed:

The following provides a brief summary of the scope-of-work completed:

1. Completion of the required underground utility locate request (i.e., Ontario One Call) to determine the presence of underground utilities within the vicinity of the sampling locations.

2. Mobilization of personnel and equipment to Brantford, Ontario to complete a sediment investigation in Mohawk Lake and Canal.

3. Collection of sediment samples from 12 sampling locations in Mohawk Lake; four sampling locations within Mohawk Canal – West; and, two locations within Mohawk Canal – East. Additionally, samples were collected from two locations (Loc #9 and Loc #14) for quality assurance/quality control (QA/QC) purposes and were collected as duplicate samples. Samples were also collected from two locations (Loc #8 and Loc #14) for specialized testing (i.e., Lead 210). Refer to Figures 1 to 3 for drawings depicting the approximate position of the sampling locations.

4. Two different sample collection methods were utilized during this sediment investigation. The surficial samples (representing the top 10 cm) were collected via Petite Ponar; whereas, the deeper sediments (10 cm to a maximum depth of 2.0 metres) were collected via core sampling using Pollutech's hammer corer that was equipped with 5.08 cm diameter PVC core tubes.

5. Low water depths, shallow refusal depths (Loc #3) and the presence of debris/obstacles in Mohawk Canal – West, prevented vessel access throughout the entire length of the canal at the time the investigation was completed. Upon review with ABL representatives, the following modifications to the *Mohawk Lake Sediment Investigation Work Plan* were implemented:

    a. Location #1 was relocated to the mouth of the canal, just prior to discharge into Mohawk Lake.
    b. Surficial samples were collected at Location #2; however, core samples were not due to the lack of vessel access.
    c. Location #3 was repositioned further to the east due to the presence of fallen trees and debris blocking access within the canal. Additionally, core samples were not collected, due to the lack of depositional sediment (shallow refusal depths).

    Additional details pertaining to the individual sampling locations (e.g., GPS position, water depth, sample depth, etc) have been summarized and included in Table 1.

6. At each sample location, the surficial sediment samples collected via Petite Ponar were composited and homogenized in a pre-cleaned stainless steel bowl. After which, the appropriate type and quantity of sample bottles were filled, labelled and stored in chilled coolers until which time the samples were picked up by the testing laboratory or ABL and transported under chain-of-custody to the testing laboratory (ALS Laboratory Group (ALS)). All pertinent information/observations were recorded for each location on the appropriate surficial sampling field log sheets, which have been summarized and included in Table 1 and have been scanned and appended as Attachment 1.

7. Except as noted above, deeper sediment core samples were collected at each sample location concurrently with the collection of the surficial sediment samples. The target core sampling depths ranged from 1.0 metres to 2.0 metres depending on the individual sampling location. Refer to Table 2 for the target sediment sampling depths and Table 3 for a summary of the actual core penetration depth obtained and quantity of cores

collected from each location. Once collected, the core samples were stored onboard the vessel in an inclined position until which time they were transported to shore for additional storage and processing. All pertinent information/observations were recorded for each location on the appropriate core sampling field log sheets, which have been scanned and appended to this report as Attachment 2.

8. All core sample processing and sub-sampling activities were completed inside an enclosed trailer stationed at the public parking lot, located immediately south of Mohawk Lake. In Summary, the sample processing activities included:

    a. obtaining all of the core samples collected from a given location;
    b. decanting the standing water from the top of the core samples;
    c. extruding the sediments from each core tube via Pollutech's air extrusion technique onto an extraction tray;
    d. conducting physical examination of the cores;
    e. determining and subdividing the cores into the required sample intervals;
    f. compositing/homogenizing the sediments from each sample interval in a pre-cleaned stainless steel bowl;
    g. filling the appropriate type and quantity of sample bottles; and,
    h. labelling and storing the filled bottles within chilled coolers until which time they were picked up by the ALS or ABL and transported under chain-of-custody to ALS.

9. Varying core sample recoveries (refer to Table 3) at and amongst the individual sampling locations, prevented segmentation of the core samples into the target sampling intervals summarized in Table 2. Upon review with ABL representatives, the following modifications to the *Mohawk Lake Sediment Investigation Work Plan* were implemented:

    a. upon extrusion of the core samples, each core collected from a given location was evaluated and measured;
    b. the top 10 cm of material was removed from each core and discarded. Note: The top 10 cm of sediment removed was NOT included in the total core length measurement recorded on the processing log sheet (Attachment #3);
    c. the core tube containing the least amount of sediment was used to determine the appropriate core intervals to be established for that specific location. The total core length (excluding the top 10 cm) was then divided by two, in order to establish two equal core intervals. For Example: after removing the top 10 cm of sediment, the shortest core tube for Location X contained 50cm of sediment. The two intervals (for that specific core tube) were determined to be 25cm in height (50/2=25). Therefore; the core intervals used for that Location X, were determined to be 10-35cm (10+25) and 35cm to end of core.

    The target sample intervals have been provided in Table 2 and the actual core intervals obtained have been provided in Table 4. The percentage of sample recovery for each core sample has been provided in Table 3. The processing log sheets identifying sample

intervals, core identification, and sediment descriptions have been provided in Attachment 3.

10. Demobilization of personnel and equipment upon the completion of the sediment investigation in Mohawk Lake and Canal.

    Note: All unused sediments currently being stored at Pollutech's Point Edward facility will be disposed of at an appropriate MOECC approved landfill site upon receipt of the waste classification results from ABL.

Closure:

On behalf of Pollutech, I would like to extend our appreciation for contacting us regarding these services. Should you require further details or have any questions or comments please do not hesitate to call at your earliest convenience. On behalf of Pollutech, I would like to extend our appreciation for contacting us regarding this project opportunity and look forward to working with Aquafor Beech Ltd. again in the future.

Sincerely,

Pollutech EnviroQuatics Limited

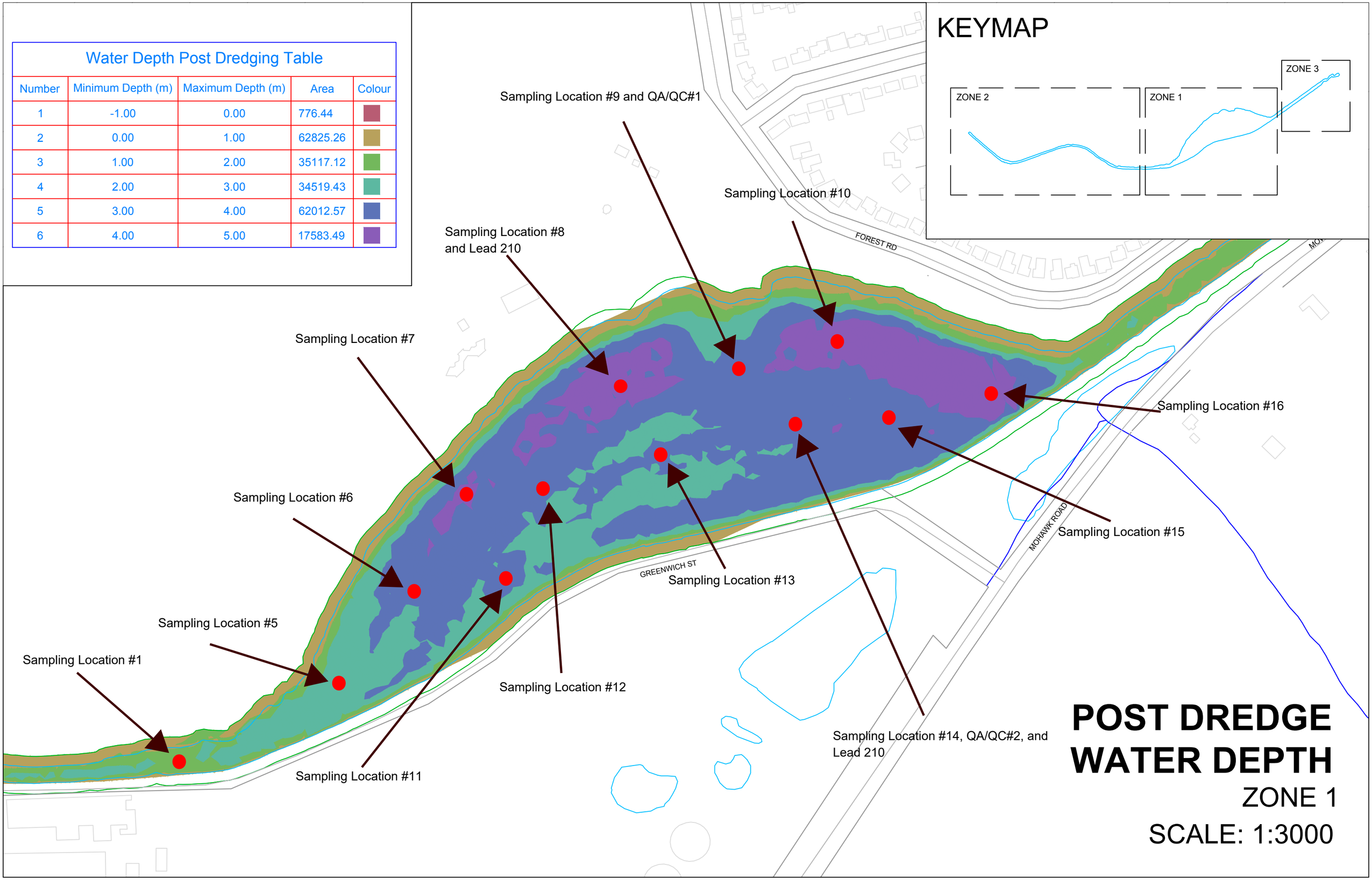
Jeff Houtby
Senior Project Coordinator, Marine Services

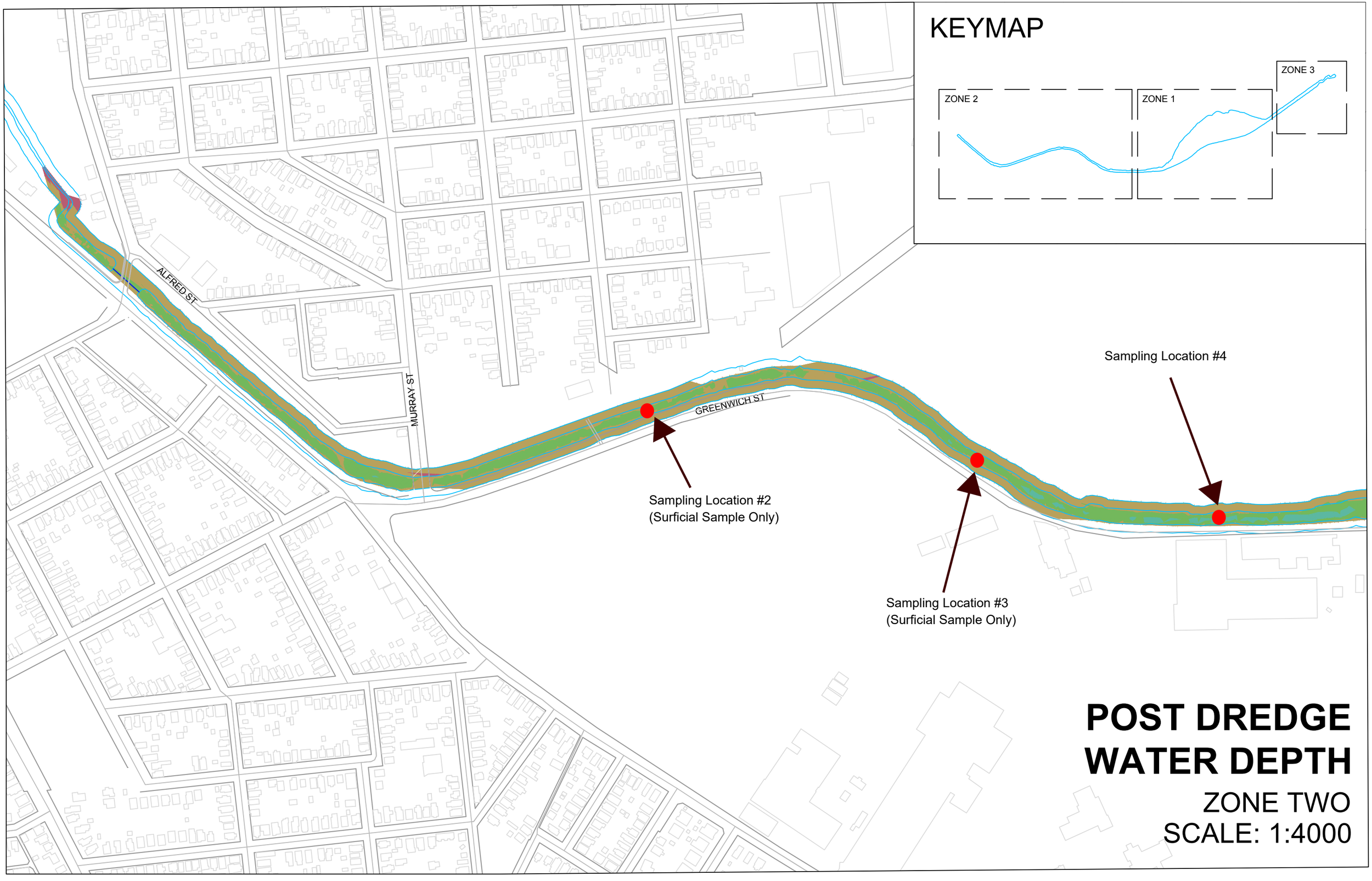
pollutech
enviroquatics limited

FIGURES

Water Depth Post Dredging Table

Number	Minimum Depth (m)	Maximum Depth (m)	Area	Colour
1	-1.00	0.00	776.44	
2	0.00	1.00	62825.26	
3	1.00	2.00	35117.12	
4	2.00	3.00	34519.43	
5	3.00	4.00	62012.57	
6	4.00	5.00	17583.49	

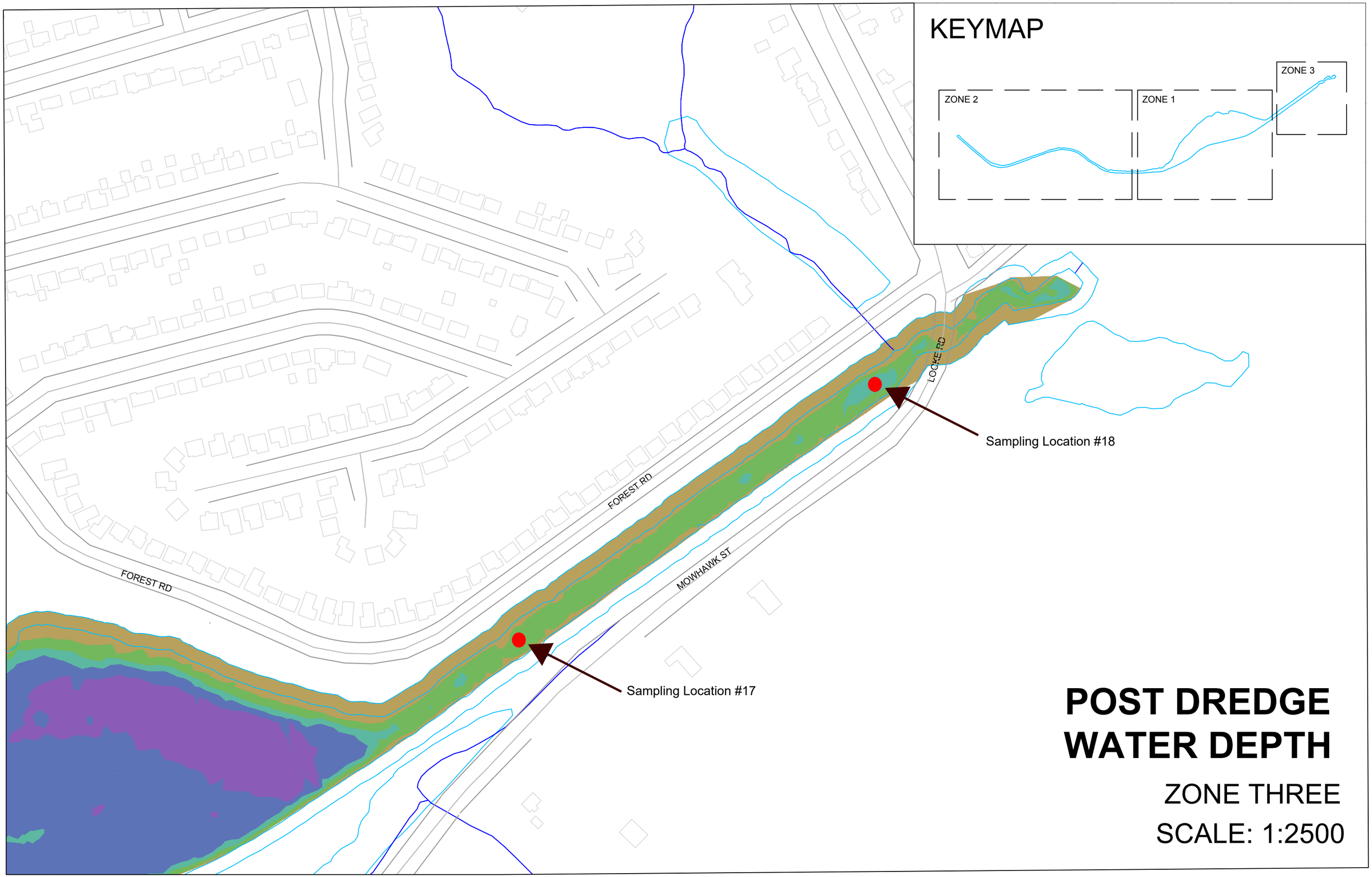




POST DREDGE WATER DEPTH

ZONE TWO

SCALE: 1:4000



POST DREDGE WATER DEPTH

ZONE THREE

SCALE: 1:2500

TABLES

Table 1. Mohawk Lake Sediment Investigation - 2018 Surficial Sample Location Information (0-10cm)

Location	Sample Number	Date (mm/dd/yy)	Time	Water Depth (m)	GPS Position		Ponar Recovery	Organic Material (Y/N)	Detritus (Y/N)	Aggregate Present (Y/N)	Visible Staining (Y/N)	Odour (Y/N)	Comments
					Northing	Easting							
Loc #1	240000011801	10/13/18	1125	0.50	N 43 ° 7 ' 53.7 "	W 80 ° 14 ' 12.1 "	Good	Yes	Yes	No	Yes	No	Hydrocarbon sheen in bowl upon sample homogenization. This location was moved adjacent the south end of the Brant Instore due to lack of access in west canal
Loc #2	240000011804	10/13/18	1525	0.30	N 43 ° 7 ' 57.8 "	W 80 ° 14 ' 52.3 "	Good	Yes	Yes	No	No	No	
Loc #3	240000011807	10/13/18	955	1.20	N 43 ° 7 ' 54.9 "	W 80 ° 14 ' 32.7 "	Good	Yes	Yes	Yes	Yes	No	Hydrocarbon sheen in bowl upon sample homogenization.
Loc #4	240000011810	10/13/18	1201	0.90	N 43 ° 7 ' 53.1 "	W 80 ° 14 ' 21.3 "	Good	Yes	Yes	No	Yes	No	Hydrocarbon sheen in bowl upon sample homogenization.
Loc #5	240000011813	10/10/18	1000	1.20	N 43 ° 7 ' 56.5 "	W 80 ° 14 ' 5.5 "	Good	No	No	No	No	No	
Loc #6	240000011816	10/10/18	1420	1.70	N 43 ° 7 ' 59.4 "	W 80 ° 14 ' 2.5 "	Good	No	No	No	No	No	
Loc #7	240000011819	10/10/18	1440	1.90	N 43 ° 8 ' 1.6 "	W 80 ° 14 ' 0.5 "	Good	No	No	No	No	No	
Loc #8	240000011822	10/10/18	1545	2.00	N 43 ° 8 ' 5.0 "	W 80 ° 13 ' 54.8 "	Good	No	No	No	No	No	
Loc #9	240000011825	10/11/18	920	2.10	N 43 ° 8 ' 5.1 "	W 80 ° 13 ' 50.2 "	Good	No	No	No	No	No	
Loc #10	240000011828	10/11/18	1202	2.20	N 43 ° 8 ' 6.0 "	W 80 ° 13 ' 45.2 "	Good	No	No	No	No	No	
Loc #11	240000011831	10/09/18	950	1.70	N 43 ° 7 ' 59.1 "	W 80 ° 13 ' 57.1 "	Moderate	No	No	No	No	No	
Loc #12	240000011834	10/09/18	1230	1.80	N 43 ° 8 ' 1.6 "	W 80 ° 13 ' 57.7 "	Good	No	No	No	No	No	
Loc #13	240000011837	10/09/18	1447	1.80	N 43 ° 8 ' 2.5 "	W 80 ° 13 ' 52.9 "	Good	No	No	No	No	No	
Loc #14	240000011840	10/12/18	833	2.00	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 47.6 "	Good	No	No	No	No	No	
Loc #15	240000011843	10/11/18	1318	2.10	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 43.1 "	Good	No	No	No	No	No	
Loc #16	240000011846	10/12/18	1500	2.40	N 43 ° 8 ' 4.4 "	W 80 ° 13 ' 39.1 "	Good	No	No	No	No	No	
Loc #17	240000011849	10/12/18	1308	0.90	N 43 ° 8 ' 7.2 "	W 80 ° 13 ' 31.9 "	Moderate	Yes	Yes	Yes	No	No	
Loc #18	240000011852	10/12/18	1140	0.80	N 43 ° 8 ' 13.8 "	W 80 ° 13 ' 18.8 "	Good	Yes	Yes	No	No	No	
QA/QC #1 (Loc #9)	240000011855	10/11/18	940	2.10	N 43 ° 8 ' 5.1 "	W 80 ° 13 ' 50.2 "	Good	No	No	No	No	No	
QA/QC #1 (Loc #14)	240000011858	10/12/18	843	2.00	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 47.6 "	Good	No	No	No	No	No	

Notes:

m	Metres
mm/dd/yy	month/day/year

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Table 2. Mohawk Lake Sediment Investigation - Target Sampling Requirements

Location I.D.	2018 Water Depth (m)	Target Sediment Sampling Depth (m)	Surficial Sample (cm)	Target Core Interval (cm)	
1	assumed 0.5	1.5	0-10	10-100	100-end
2	assumed 0.5	1	0-10	10-55	55-end
3	assumed 0.5	1	0-10	10-55	55-end
4	assumed 0.5	1.5	0-10	10-100	100-end
5	1.0-1.5	2	0-10	10-100	100-end
6	1.5-2.0	2	0-10	10-100	100-end
7	2.0-2.5	2	0-10	10-100	100-end
8	2.0-2.5	2	0-10	10-100	100-end
9	2.0-2.5	2	0-10	10-100	100-end
10	2.0-2.5	2	0-10	10-100	100-end
11	1.5-2.0	1	0-10	10-55	55-end
12	2.0-2.5	1.5	0-10	10-100	100-end
13	2.0-2.5	1.5	0-10	10-100	100-end
14	2.0-2.5	1.5	0-10	10-100	100-end
15	2.0-2.5	1.5	0-10	10-100	100-end
16	2.5-3.0	2	0-10	10-100	100-end
17	assumed 0.5	1	0-10	10-55	55-end
18	assumed 0.5	1.5	0-10	10-100	100-end
Lead 210	n/a	2	TBD	TBD	TBD
Lead 210	n/a	2	TBD	TBD	TBD
QA/QC 1	n/a	1.5	0-10	10-100	100-end
QA/QC 2	n/a	1.5	0-10	10-100	100-end

Notes:

TBD = to be determined

End = end of core

Total quantity of locations for 1m cores	4
Total quantity of locations for 1.5m cores	9
Total quantity of locations for 2.0m cores	9
Smallest core interval	45cm (10-55cm)

Surficial samples (0-10cm) collected via Petite Ponar

QA/QC and Lead 210 sampling locations to be identified in the field

Table 3. Mohawk Lake Sediment Investigation - 2018 Core Sample Location Information

Location	Date (mm/dd/yy)	Water Depth (m)	GPS Position		Core 1			Core 2			Core 3			Core 4			Core 5			Core 6			Comments
			Northing	Easting	Time	Penetration Depth (m)	Sample Recovery (%)	Time	Penetration Depth (m)	Sample Recovery (%)	Time	Penetration Depth (m)	Sample Recovery (%)	Time	Penetration Depth (m)	Sample Recovery (%)	Time	Penetration Depth (m)	Sample Recovery (%)	Time	Penetration Depth (m)	Sample Recovery (%)	
Loc #1	10/13/18	0.50	N 43 ° 7 ' 53.7 "	W 80 ° 14 ' 12.1 "	1038	1.50	0.41	1042	1.50	0.31	1047	1.50	0.41	1053	1.50	0.40	1059	1.50	0.34	1107	1.50	0.62	This location was moved adjacent the south end of the Brant Instore due to lack of access in west canal
Loc #2	-	-	N 43 ° 7 ' 57.8 "	W 80 ° 14 ' 52.3 "	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No core sample collected due to lack of vessel access in west canal
Loc #3	10/13/18	1.20	N 43 ° 7 ' 54.9 "	W 80 ° 14 ' 32.7 "	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No core sample collected due to lack of depositional sediment
Loc #4	10/13/18	0.90	N 43 ° 7 ' 53.1 "	W 80 ° 14 ' 21.3 "	1205	1.50	0.46	1211	1.50	0.33	1220	1.75	0.57	1224	1.75	0.42	1239	1.75	0.47	N/A	1.75	0.41	
Loc #5	10/10/18	1.20	N 43 ° 7 ' 56.5 "	W 80 ° 14 ' 5.5 "	1026	1.24	0.59	1240	2.00	0.60	1245	1.50	0.46	1256	2.00	0.56							
Loc #6	10/10/18	1.70	N 43 ° 7 ' 59.4 "	W 80 ° 14 ' 2.5 "	1343	2.00	0.55	1347	2.00	0.46	1400	2.00	0.50	-	-	-	-	-	-	-	-	-	
Loc #7	10/10/18	1.90	N 43 ° 8 ' 1.6 "	W 80 ° 14 ' 0.5 "	1501	2.00	0.71	1507	2.00	0.59	1513	2.00	0.52	-	-	-	-	-	-	-	-	-	
Loc #8	10/10/18	2.00	N 43 ° 8 ' 5.0 "	W 80 ° 13 ' 54.8 "	1554	2.00	0.74	1602	2.00	0.53	N/A	2.00	0.53	-	-	-	-	-	-	-	-	-	
Loc #9	10/11/18	2.10	N 43 ° 8 ' 5.1 "	W 80 ° 13 ' 50.2 "	955	2.00	0.68	1005	2.00	0.63	1014	2.00	0.64	-	-	-	-	-	-	-	-	-	
Loc #10	10/11/18	2.20	N 43 ° 8 ' 6.0 "	W 80 ° 13 ' 45.2 "	1212	2.00	0.40	1220	2.00	0.65	1228	2.00	0.40	1237	2.00	0.58	-	-	-	-	-	-	
Loc #11	10/09/18	1.78	N 43 ° 7 ' 59.1 "	W 80 ° 13 ' 57.1 "	1025	1.00	0.61	1050	1.40	0.76	1058	1.40	0.78	1106	1.40	0.72	1120	1.40	0.64	-	-	-	
Loc #12	10/09/18	1.80	N 43 ° 8 ' 1.6 "	W 80 ° 13 ' 57.7 "	1305	1.50	0.55	1315	1.50	0.60	1326	1.50	0.49	1333	1.50	0.71	1342	1.50	0.72	-	-	-	
Loc #13	10/09/18	1.80	N 43 ° 8 ' 2.5 "	W 80 ° 13 ' 52.9 "	1500	1.50	0.75	1511	1.50	0.59	1524	1.50	0.66	1532	1.50	0.66	1545	1.50	0.63	-	-	-	
Loc #14	10/12/18	2.00	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 47.6 "	835	1.50	0.79	901	1.50	0.66	905	1.50	0.71	911	1.50	0.56	N/A	1.50	0.75	-	-	-	
Loc #15	10/11/18	2.10	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 43.1 "	1334	2.00	0.75	1346	2.00	0.62	1355	2.00	0.65	-	-	-	-	-	-	-	-	-	
Loc #16	10/12/18	2.40	N 43 ° 8 ' 4.4 "	W 80 ° 13 ' 39.1 "	1517	2.00	0.73	1530	2.00	0.70	1535	2.00	0.51	-	-	-	-	-	-	-	-	-	
Loc #17	10/12/18	0.90	N 43 ° 8 ' 7.2 "	W 80 ° 13 ' 31.9 "	1325	1.00	0.62	1334	1.00	0.40	1343	1.00	0.73	1354	1.00	0.85	1401	1.10	0.96	1410	1.00	0.32	
Loc #18	10/12/18	0.80	N 43 ° 8 ' 13.8 "	W 80 ° 13 ' 18.8 "	1156	1.50	0.47	1205	1.50	0.59	1214	1.50	0.37	1219	1.50	0.49	1226	1.50	0.61	-	-	-	
QA/QC #1 (Loc #9)	10/11/18	2.10	N 43 ° 8 ' 5.1 "	W 80 ° 13 ' 50.2 "	1028	2.00	0.65	1036	2.00	0.61	1045	2.00	0.68	-	-	-	-	-	-	-	-	-	
QA/QC #1 (Loc #14)	10/12/18	2.00	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 47.6 "	941	1.50	0.74	947	1.50	0.72	952	1.50	0.72	1001	1.50	0.70	-	-	-	-	-	-	
Lead 210 (Loc #14)	10/12/18	2.00	N 43 ° 8 ' 3.3 "	W 80 ° 13 ' 47.6 "	1014	1.50	0.74	1021	1.50	0.77	-	-	-	-	-	-	-	-	-	-	-	-	
Lead 210 (Loc #8)	10/12/18	2.00	N 43 ° 8 ' 4.7 "	W 80 ° 13 ' 54.9 "	1550	2.00	0.61	1600	2.00	0.54	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:

m	Metres
mm/dd/yy	month/day/year
N/A	Not available
-	Sample not required/collected

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Table 4. Mohawk Lake Sediment Investigation - Summary of Sample Numbers

Pollutech EnviroQuatics Limited - Job Number #2400-001				
Date Collected	**Date Processed**	**Sample Number**	**Sample Name**	**Core Interval (cm)**
Bulk Sediment and TCLP Analysis				
10/13/2018	10/13/2018	24000011801	Loc #1, Int #1	0-10
10/13/2018	10/13/2018	24000011802	Loc #1, Int #2	10-35
10/13/2018	10/13/2018	24000011803	Loc #1, Int #3	35-end
10/13/2018	10/13/2018	24000011804	Loc #2, Int #1	0-10
N/A	N/A	24000011805	Loc #2, Int #2	N/A
N/A	N/A	24000011806	Loc #2, Int #3	N/A
10/13/2018	10/13/2018	24000011807	Loc #3, Int #1	0-10
N/A	N/A	24000011808	Loc #3, Int #2	N/A
N/A	N/A	24000011809	Loc #3, Int #3	N/A
10/13/2018	10/14/2018	24000011810	Loc #4, Int #1	0-10
10/13/2018	10/14/2018	24000011811	Loc #4, Int #2	10-38
10/13/2018	10/14/2018	24000011812	Loc #4, Int #3	38-end
10/10/2018	10/10/2018	24000011813	Loc #5, Int #1	0-10
10/10/2018	10/11/2018	24000011814	Loc #5, Int #2	10-38
10/10/2018	10/11/2018	24000011815	Loc #5, Int #3	38-end
10/10/2018	10/10/2018	24000011816	Loc #6, Int #1	0-10
10/10/2018	10/11/2018	24000011817	Loc #6, Int #2	10-40.5
10/10/2018	10/11/2018	24000011818	Loc #6, Int #3	40.5-end
10/10/2018	10/10/2018	24000011819	Loc #7, Int #1	0-10
10/10/2018	10/11/2018	24000011820	Loc #7, Int #2	10-58
10/10/2018	10/11/2018	24000011821	Loc #7, Int #3	58-end
10/10/2018	10/10/2018	24000011822	Loc #8, Int #1	0-10
10/10/2018	10/11/2018	24000011823	Loc #8, Int #2	10-54.5
10/10/2018	10/11/2018	24000011824	Loc #8, Int #3	54.5-end
10/11/2018	10/11/2018	24000011825	Loc #9, Int #1	0-10
10/11/2018	10/11/2018	24000011826	Loc #9, Int #2	10-65
10/11/2018	10/11/2018	24000011827	Loc #9, Int #3	65-end
10/11/2018	10/11/2018	24000011828	Loc #10, Int #1	0-10
10/11/2018	10/12/2018	24000011829	Loc #10, Int #2	10-45.5
10/11/2018	10/12/2018	24000011830	Loc #10, Int #3	45.5-end
10/9/2018	10/9/2018	24000011831	Loc #11, Int #1	0-10
10/9/2018	10/10/2018	24000011832	Loc #11, Int #2	10-36.5
10/9/2018	10/10/2018	24000011833	Loc #11, Int #3	36.5-end
10/9/2018	10/9/2018	24000011834	Loc #12, Int #1	0-10
10/9/2018	10/10/2018	24000011835	Loc #12, Int #2	10-45
10/9/2018	10/10/2018	24000011836	Loc #12, Int #3	45-end
10/9/2018	10/9/2018	24000011837	Loc #13, Int #1	0-10
10/9/2018	10/10/2018	24000011838	Loc #13, Int #2	10-46.5
10/9/2018	10/10/2018	24000011839	Loc #13, Int #3	46.5-end
10/12/2018	10/12/2018	24000011840	Loc #14, Int #1	0-10
10/12/2018	10/12/2018	24000011841	Loc #14, Int #2	10-56
10/12/2018	10/12/2018	24000011842	Loc #14, Int #3	56-end
10/11/2018	10/11/2018	24000011843	Loc #15, Int #1	0-10
10/11/2018	10/12/2018	24000011844	Loc #15, Int #2	10-71.5
10/11/2018	10/12/2018	24000011845	Loc #15, Int #3	71.5-end
10/12/2018	10/12/2018	24000011846	Loc #16, Int #1	0-10
10/12/2018	10/13/2018	24000011847	Loc #16, Int #2	10-62
10/12/2018	10/13/2018	24000011848	Loc #16, Int #3	62-end
10/12/2018	10/12/2018	24000011849	Loc #17, Int #1	0-10
10/12/2018	10/13/2018	24000011850	Loc #17, Int #2	10-43
10/12/2018	10/13/2018	24000011851	Loc #17, Int #3	43-end
10/12/2018	10/12/2018	24000011852	Loc #18, Int #1	0-10
10/12/2018	10/13/2018	24000011853	Loc #18, Int #2	10-44

Table 4. Mohawk Lake Sediment Investigation - Summary of Sample Numbers

Pollutech EnviroQuatics Limited - Job Number #2400-001				
Date Collected	**Date Processed**	**Sample Number**	**Sample Name**	**Core Interval (cm)**
10/12/2018	10/13/2018	24000011854	Loc #18, Int #3	44-end
10/11/2018	10/11/2018	24000011855	QA/QC #1, Int #1	0-10
10/11/2018	10/12/2018	24000011856	QA/QC #1, Int #2	10-73.5
10/11/2018	10/12/2018	24000011857	QA/QC #1, Int #3	73.5-end
10/12/2018	10/12/2018	24000011858	QA/QC #2, Int #1	0-10
10/12/2018	10/12/2018	24000011859	QA/QC #2, Int #2	10-49
10/12/2018	10/12/2018	24000011860	QA/QC #2, Int #3	49-end
Lead 210 Samples				
10/12/2018	10/14/2018	24000011861	Lead 210, Loc #14	1-2
10/12/2018	10/14/2018	24000011862	Lead 210, Loc #14	3-4
10/12/2018	10/14/2018	24000011863	Lead 210, Loc #14	5-6
10/12/2018	10/14/2018	24000011864	Lead 210, Loc #14	7-8
10/12/2018	10/14/2018	24000011865	Lead 210, Loc #14	9-10
10/12/2018	10/14/2018	24000011866	Lead 210, Loc #14	11-12
10/12/2018	10/14/2018	24000011867	Lead 210, Loc #14	13-14
10/12/2018	10/14/2018	24000011868	Lead 210, Loc #14	15-16
10/12/2018	10/14/2018	24000011869	Lead 210, Loc #14	17-18
10/12/2018	10/14/2018	24000011870	Lead 210, Loc #14	19-20
10/12/2018	10/14/2018	24000011871	Lead 210, Loc #14	21-22
10/12/2018	10/14/2018	24000011872	Lead 210, Loc #14	23-24
10/12/2018	10/14/2018	24000011873	Lead 210, Loc #14	25-26
10/12/2018	10/14/2018	24000011874	Lead 210, Loc #14	27-28
10/12/2018	10/14/2018	24000011875	Lead 210, Loc #14	29-30
10/12/2018	10/14/2018	24000011876	Lead 210, Loc #14	31-32
10/12/2018	10/14/2018	24000011877	Lead 210, Loc #14	33-34
10/12/2018	10/14/2018	24000011878	Lead 210, Loc #14	35-36
10/12/2018	10/14/2018	24000011879	Lead 210, Loc #14	37-38
10/12/2018	10/14/2018	24000011880	Lead 210, Loc #14	39-40
10/12/2018	10/14/2018	24000011881	Lead 210, Loc #14	41-42
10/12/2018	10/14/2018	24000011882	Lead 210, Loc #14	43-44
10/12/2018	10/14/2018	24000011883	Lead 210, Loc #14	45-46
10/12/2018	10/14/2018	24000011884	Lead 210, Loc #14	47-48
10/12/2018	10/14/2018	24000011885	Lead 210, Loc #14	49-50
10/12/2018	10/14/2018	24000011886	Lead 210, Loc #14	51-52
10/12/2018	10/14/2018	24000011887	Lead 210, Loc #14	53-54
10/12/2018	10/14/2018	24000011888	Lead 210, Loc #14	55-56
10/12/2018	10/14/2018	24000011889	Lead 210, Loc #14	57-58
10/12/2018	10/14/2018	24000011890	Lead 210, Loc #14	59-60
10/12/2018	10/14/2018	24000011891	Lead 210, Loc #14	61-62
10/12/2018	10/14/2018	24000011892	Lead 210, Loc #14	63-64
10/12/2018	10/14/2018	24000011893	Lead 210, Loc #14	65-66
10/12/2018	10/14/2018	24000011894	Lead 210, Loc #14	67-68
10/12/2018	10/14/2018	24000011895	Lead 210, Loc #14	69-70
10/12/2018	10/14/2018	24000011896	Lead 210, Loc #14	71-72
10/12/2018	10/14/2018	24000011897	Lead 210, Loc #14	73-74
10/12/2018	10/14/2018	24000011898	Lead 210, Loc #14	75-76
10/12/2018	10/14/2018	24000011899	Lead 210, Loc #14	77-78
10/12/2018	10/14/2018	240000118100	Lead 210, Loc #14	79-80
10/12/2018	10/14/2018	240000118133	Lead 210, Loc #8	45-46
10/12/2018	10/14/2018	240000118134	Lead 210, Loc #8	47-48
10/12/2018	10/14/2018	240000118135	Lead 210, Loc #8	49-50
10/12/2018	10/14/2018	240000118136	Lead 210, Loc #8	51-52
10/12/2018	10/14/2018	240000118137	Lead 210, Loc #8	53-54
10/12/2018	10/14/2018	240000118138	Lead 210, Loc #8	55-56
10/12/2018	10/14/2018	240000118139	Lead 210, Loc #8	57-58

Table 4. Mohawk Lake Sediment Investigation - Summary of Sample Numbers

Pollutech EnviroQuatics Limited - Job Number #2400-001				
Date Collected	**Date Processed**	**Sample Number**	**Sample Name**	**Core Interval (cm)**
10/12/2018	10/14/2018	240000118140	Lead 210, Loc #8	59-60
10/12/2018	10/14/2018	240000118141	Lead 210, Loc #8	61-62
10/12/2018	10/14/2018	240000118142	Lead 210, Loc #8	63-64
10/12/2018	10/14/2018	240000118143	Lead 210, Loc #8	65-66
10/12/2018	10/14/2018	240000118144	Lead 210, Loc #8	67-68
10/12/2018	10/14/2018	240000118145	Lead 210, Loc #8	69-70
10/12/2018	10/14/2018	240000118146	Lead 210, Loc #8	71-72
10/12/2018	10/14/2018	240000118147	Lead 210, Loc #8	73-74
10/12/2018	10/14/2018	240000118148	Lead 210, Loc #8	75-76
10/12/2018	10/14/2018	240000118149	Lead 210, Loc #8	77-78
10/12/2018	10/14/2018	240000118150	Lead 210, Loc #8	79-80
10/12/2018	10/14/2018	240000118151	Lead 210, Loc #8	83-84
10/12/2018	10/14/2018	240000118152	Lead 210, Loc #8	87-88
10/12/2018	10/14/2018	240000118153	Lead 210, Loc #8	91-92
10/12/2018	10/14/2018	240000118154	Lead 210, Loc #8	95-96
10/12/2018	10/14/2018	240000118155	Lead 210, Loc #8	99-100
10/12/2018	10/14/2018	240000118156	Lead 210, Loc #8	103-104
10/12/2018	10/14/2018	240000118157	Lead 210, Loc #8	107-108
10/12/2018	10/14/2018	240000118158	Lead 210, Loc #8	111-112
10/12/2018	10/14/2018	240000118159	Lead 210, Loc #8	115-116
10/12/2018	10/14/2018	240000118160	Lead 210, Loc #8	119-120

Notes:
Loc # = Sampling Location
Int #1 = Interval at top of core (0-10cm)
Int #2 = Interval at middle of core
Int #3 = Interval at middle of core
end = end of core

ATTACHMENT A

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 13, 2018	**Position Information**	
Sampled By:	J. Houtby	**Northing:**	N 43° 07' 53.7"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 12.1"
Location:	Loc #1		
Weather:	overcast, 6°C 15 Km h W	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop no vis	**Water Depth (m):**	0.5

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 24000011801
Organic Material Present	✓		
Detritus Present	✓		
Aggregate Present		✓	
Visible Staining/Contamination Present	✓	✓	small sheen in bowl
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: ✓ 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes:

Sample collected at 1125

Secondary Position Information:

brownish grey silt w some roots, twigs, leaves high moisture content

NEW Loc #1 South end of the Brant Inn store mid point of east parking lot.

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 13 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 07' 57.8"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 52.3"
Location:	Loc #2		
Weather:	Sunny few clouds 9°C / 24 Km/h SW	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm Ice Vis	**Water Depth (m):**	0.3

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400011804
Organic Material Present	✓		
Detritus Present	✓		
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes:

Sample collected 1525

Secondary Position Information:

dark brown, lots of silt, some sand/grit
some twigs, leaves, sticks
Very very high moisture content

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 13, 2018		**Position Information**
Sampled By:	K Houtby + DH	**Northing:**	N 43° 07' 54.9"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 32.7"
Location:	Loc #3		
Weather:	4°C Partly cloudy, 11 Km/h S gusting to 17 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm < 1 ft w/s	**Water Depth (m):**	1.2 m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001807
Organic Material Present	✓		
Detritus Present	✓		
Aggregate Present		✓	
Visible Staining/Contamination Present	✓	~~✓~~	some hydrocarbon sheen after mixing in bowl, likely biological
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: ✓		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes: black silt w high moisture, twigs, leaves, plastic
immediately below surficial sediment it turns into gravel / pebbles.

Secondary Position Information:

TARGET 43° 7' 55.5"
80° 14' 34.4"

0955 sample collection time

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 13 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 7' 53.1"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 80° 14' 21.3"
Location:	Loc # 4		
Weather:	6°C overcast 15 Kmh W gusting to 30 Kmh	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop no WLS	**Water Depth (m):**	0.90

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 2400CD1810
Organic Material Present	✓		
Detritus Present	✓		
Aggregate Present		✓	
Visible Staining/Contamination Present	✓		hydrocarbon sheen in bowl
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: ✓ ~~3~~ 4		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes:

SAMPLE COLLECTED AT 1201

Secondary Position Information:

TARGET 43° 7' 53.1"
80° 14' 21.3"

Brownish ~~grey~~ black with lots of sticks, high moisture
some leaves and plastic
mainly silt. + roots
very very high moisture content

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 10, 2018		**Position Information**
Sampled By:	J. Houtby & D.H.	**Northing:**	N 43° 7' 56.5"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 05.5"
Location:	Location #5		
Weather:	Sunny, 14°C, 7 Kmh S Gusts to 11 Kmh.	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	Calm 1.5 ft visibility	**Water Depth (m):**	1.2

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001181 #3
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes: - very high silt content
- high moisture content
- like very wet grout mixture

Secondary Position Information:

Collection time 10:00

Target depth 2.0m

Target GPS
N 43° 7' 56.4"
W 80° 14' 5.2"

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 10, 2015	**Position Information**	
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 07' 59.4"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 02.5"
Location:	Loc #6		
Weather:	few clouds, 25°C 19 Km/h SW	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm, 1ft visibility	**Water Depth (m):**	1.70

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001816
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: ✓		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes: Silty w high moisture content.

Sample collected at 1420

Secondary Position Information:

~~#3~~

Target GPS

43° 7' 59.2"
80° 14' 2.50"

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct 10, 2018		**Position Information**
Sampled By:	J. Houtby + D. H.	**Northing:**	N 43° 08' 01.6"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 14' 0.5"
Location:	Loc # 7		
Weather:	26° C, partial cloudy 20 Km/hr SW gusts to 30	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop 1ft Vis	**Water Depth (m):**	1.90

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 2400001819
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes:

Sample collected at 1440
Same as others very silty with high moisture content

Secondary Position Information:

Target GPS
43° 8' 1.6"
80° 14' 0.6"

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 10, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 8' 05.0"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 54.8"
Location:	Loc 8		
Weather:	Partial cloudy 26°C 22 Km/h SW gust to 31	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop, 1[2]E vis.	**Water Depth (m):**	2.0

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 4 Sample #: ~~2400001824~~
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes:

2400001824
Sample collected at 1545

Secondary Position Information:

Target 43° 8' 4.79"
80° 13' 54.70"

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 11, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 05.1"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 50.2"
Location:	Loc #9		
Weather:	19°C partly cloudy 13 Kmh SW Gust to 20Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop 1ft vis	**Water Depth (m):**	2.1m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001825
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes: Sample collected at 0920

Secondary Position Information:

Target 43° 8' 5.2"
80° 13' 50.2"

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 11 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 06.0"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 45.2"
Location:	Loc #10		
Weather:	19°C Partly cloudy 31 Kmh W gust to 44 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop 1ft vis	**Water Depth (m):**	2.2

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001828
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes:

SAMPLE COLLECTED AT 1202

Secondary Position Information:

TARGET 43° 8' 5.9"
80° 13' 45.4"

Silty with lots moisture
feels like little clay content
greyish brown in colour

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 9, 2015		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 71 59.1"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 131 57.1
Location:	Loc #11		
Weather:	21°C, Partly cloudy, 13Kmh S → 20 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm, clear	**Water Depth (m):**	1.7m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001153 1
Organic Material Present	✓	✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 3		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		moderate

Other Applicable Notes:

Sample collected 09:50

Secondary Position Information:

high moisture content.

dark brown high silt content

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct 9, 2018		**Position Information**
Sampled By:	J. Houtby	**Northing:**	N 43° 08' 1.6"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 57.7"
Location:	LOC #12		
Weather:	Sunny, 25°C 23 Km/hr SW Wind	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	Slight chop, clear	**Water Depth (m):**	1.5m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001183[redacted]4
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		600D

Other Applicable Notes: Sample collected 12:30

Secondary Position Information:

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 9, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 2.5"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 52.9"
Location:	Loc #13		
Weather:	27°C, Few clouds 13 Km/h SW → 20 Km/h	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop, clear	**Water Depth (m):**	1.80 m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 2400001837
Organic Material Present		N	
Detritus Present		N	
Aggregate Present		N	
Visible Staining/Contamination Present		N	
Odour Detected		N	
Number of Ponar Grab Sample Attempts Made	Chemistry: 4 Toxicity: N/A		Ponar Recovery: (Poor/Moderate/Good)

Other Applicable Notes: Collected at 1447

Secondary Position Information:

high water content, smooth not gritty meaning no sand.

Loc 11, 12, 13 very silty. almost like goods consistency. measuring tape may not feel the top of sed in core tube.

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 12, 2015		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 3.3"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 47.6"
Location:	Loc #14		
Weather:	6°C overcast 19 Km/hr W Gust to 28 Km/h	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight chop < 1ft v/s	**Water Depth (m):**	2.0

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400C0118 40
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 1		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes:

grey brown high silt and water content. consistent with all other ponar grabs from previous locations

Secondary Position Information:

Target 43° 8' 3.2"
080° 13' 47.7"

SAMPLE COLLECTED: 0833

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 11 2018		**Position Information**
Sampled By:	J. Houtby + D.H	**Northing:**	N 43°08' 3.3"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 43.1"
Location:	Loc #15		
Weather:	overcast, 17°C, 22 Kmh W gusting to 31 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	slight choppy, 1ft vis	**Water Depth (m):**	2.1

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001843
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 1		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes:

SAMPLE COLLECTION TIME: 1318

Secondary Position Information:

TARGET 43° 8' 3.4"
80° 13' 43.3"

greyish brown
silty & high moisture.

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct 12, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 430 08' 4.4"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 39.1"
Location:	Location 16		
Weather:	8°C overcast light rain, 19 Kmh W ⇒ 28 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	4-5" CHOP Lite Vis	**Water Depth (m):**	2.4

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001846
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes:

Sample collected at 1500

Secondary Position Information:

TARGET 43° 8' 4.3"
80° 13' 38.9"

brown & grey very high silt content
high moisture content

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 12, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 7.2"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 31.9"
Location:	Loc. 17		
Weather:	7°C, overcast, 20 Kmh W gusting to 30 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm/sheltered, no VIS.	**Water Depth (m):**	90 cm

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 2400001849
Organic Material Present	✓		
Detritus Present	✓	~~No~~ Jut	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2 ~~3~~ 4 Toxicity: N/A		Ponar Recovery: (Poor/Moderate/Good) JW

Other Applicable Notes: Sample collected 1308

Secondary Position Information:

TARGET 43° 8' 7.3"
80° 13' 31.7"

brown grey silt with organic material/fibres in it.
very high moisture content

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 12, 2018		**Position Information**
Sampled By:	J. Houtby	**Northing:**	N 43°08' 13.8"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080°13' 18.8"
Location:	Loc 18		
Weather:	8°C, partly cloudy 17 Km/h NW gust to 28	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	calm	**Water Depth (m):**	0.8

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9 Sample #: 2400001 1852
Organic Material Present	✓	~~✓~~	
Detritus Present	✓	~~✓~~	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes:

Sample collected at 1140

Secondary Position Information:

Target 43° 8' 13.8"
80° 13' 18.9"

* AIS may not be able to analyze these due to the moisture content !!

Some wood debris (sticks, branches)
Some leaves & other organic material

brown w little grey tinge
lots of silt & very high moisture content

highest moisture content of all samples collected thus far - very soupy.

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 11, 2018		**Position Information**
Sampled By:	J. Houtby + DH	**Northing:**	N 43° 08' 05.1"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 50.2"
Location:	QAQC #1 (Loc #9)		
Weather:	19°C partly cloudy 13 Km/h SW Gust to 20 Km	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	Slight chop 1Ft vis	**Water Depth (m):**	2.1 m

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 240c0011855
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/Good)
	Toxicity: N/A		

Other Applicable Notes: Sample collected at 0940

NOTE: This is a duplicate of Loc #9

Secondary Position Information:

pollutech
environmental limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date:	Oct. 12, 2015		**Position Information**
Sampled By:	J. Houtby r Dit	**Northing:**	N 44° 08' 33"
Water Body:	Mohawk Lake & Canals	**Easting:**	W 080° 13' 47.6"
Location:	QAQC2 (SAME AS LOC #14)		
Weather:	6°C, overcast, 19 Kmhr W gust to 28 Kmh	**Sampling Interval/Depth (cm):**	0-10
Water Conditions:	Slight chop < 1 Km Vis.	**Water Depth (m):**	2.0

Surficial Sediment Sample Collection via Standard Ponar

Item	Yes	No	Comments:
Samples for Chemical Analyses Collected	✓		# Bottles Filled: 9
			Sample #: 2400001185S
Organic Material Present		✓	
Detritus Present		✓	
Aggregate Present		✓	
Visible Staining/Contamination Present		✓	
Odour Detected		✓	
Number of Ponar Grab Sample Attempts Made	Chemistry: 2		Ponar Recovery: (Poor/Moderate/(Good))
	Toxicity: N/A		

Other Applicable Notes: COLLECTED FROM LOC #14 AS DUPLICATE SAMPLE

SAMPLE COLLECTED : 0843

Secondary Position Information:

Grey brown with high silt and H_2O content. consistent with all previous ponar grabs at all locations thus far

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enviroquatics limited

ATTACHMENT B

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct 13, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: LOC #1
Weather: 6°C partly cloudy 15 Km hr W → 23 Km
Water Conditions: Calm No visibility

Northing: N 43° 07' 53.7"
Easting: W 080° 14' 12.7"
Target Core Depth (m): ~~0.5~~ 1.5m
Target Core Intervals (cm):
Water Depth (m): 0.5

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1038	1042	1047	1053	1059	1107
Depth of core penetration (cm)	1.5	1.5	1.5	1.5	1.5	1.5
Clay Plug Present (Y/N)	N	N	N	N	N	N
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	Y
# of Attempts Made	1	1	1	1	1	1
Total Core Tube Length (cm)	152	152	152	152	152	~~180~~
Total Core Headspace cm (measured from top of core tube to the sediment)	91	105	91	92	101	137
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	61	47	61	60	51	93
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	N
Odour (Y/N)	N	N	N	N	N	N
Sample Identification/Number Affixed to Core	2400001	1802	→	→	→	
Secondary ID Marking Included on Caps	71	72	73	74	75	76
Issues Encountered	NONE	NONE	NONE	NONE	NONE	NONE

Other Applicable Notes:

Secondary Position Information:

NOTE: This location was moved to South end of the Brant Instore

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See back

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 13, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: LOC #3
Weather: 4°C partly cloudy 11 Km/hr S → 17 Km/h
Water Conditions: Calm, < 1km vis

Northing: N 43° 07' 54.9"
Easting: W 080° 14' 32.7"
Target Core Depth (m): 1.0
Target Core Intervals (cm): ~~6~~
Water Depth (m): 1.2m

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	0915	0920				
Depth of core penetration (cm)	~~1.0~~ 0.71	~~1.0~~ 0.6	1.0	1.0	1.0	1.0
Clay Plug Present (Y/N)	N					
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	Y
# of Attempts Made	1	1	1	1	1	1
Total Core Tube Length (cm)	152	152	152	152	152	152
Total Core Headspace cm (measured from top of core tube to the sediment)	129					
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	23					
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sedimeht Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)						
Odour (Y/N)						
Sample Identification/Number Affixed to Core	2400001 1505					
Secondary ID Marking Included on Caps	70	71	72	73	74	75
Issues Encountered	NONE *	NONE				

Other Applicable Notes: * REFUSAL AT 71 cm

Secondary Position Information: TARGET :

had to adjust sample location due to fallen tree ~~in the~~ across the canal

100 − 029 = 71

160 − 39 = 61

6 @ 1m
5 @ 2m

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Can't core due to lack of sediment

refusal at around 20cm

called will to review.

- ponar only at 1 or 2
- ponar only at 3
- ponar + core at 4
- extra location between 4 and 5 both core + ponar

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 13, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc #4
Weather: 6°C overcast
15 Km/hr W → 30 Km/h
Water Conditions: slight chop no vis

Northing: N 43° 7' 53.1"
Easting: W 080° 14' 21.3"
Target Core Depth (m): 1.5 m
Target Core Intervals (cm):
Water Depth (m): 0.90

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1205	1211	1220	1224	1239	
Depth of core penetration (cm)	1.5	1.5	1.75	1.75	1.75	1.75
Clay Plug Present (Y/N)	N	N	~~N~~ Y	Y	N	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	Y
# of Attempts Made	1	1	1	1	1	1
Total Core Tube Length (cm)	230	230	230	230	230	230
Total Core Headspace cm (measured from top of core tube to the sediment)	161	181	131	167	147	158
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	69	49	99	73	~~83~~	72
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	N
Odour (Y/N)	N	N	N	N	N	N
Sample Identification/Number Affixed to Core	240000118 11	→	→	→	→	→
Secondary ID Marking Included on Caps	77	78	79	80	81	82
Issues Encountered	NONE	NONE	NONE	NONE	NONE	NONE

Other Applicable Notes:

Secondary Position Information:

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 10, 2018
Sampled By: J. Houtby + D. H
Water Body: Mohawk Lake & Canals
Location: Loc #5
Weather: Sunny, 19°C, 7Km/h S
Water Conditions: Calm 1.5 ft visibility

Northing: N 43° 7' 56.5"
Easting: W 080° 14' 05.5"
Target Core Depth (m): 2.0
Target Core Intervals (cm)
Water Depth (m): 1.2m

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1026	1240	1245	1256		
Depth of core penetration (cm)	1.24	2.0	1.5	2.0		
Clay Plug Present (Y/N)	N SAND	N Peat	N Sand	N PEAT		
Core Catcher Installed (Y/N)	Y	Y	Y	Y		
# of Attempts Made	1	1	1	1		
Total Core Tube Length (cm)	230	230	230	230		
Total Core Headspace cm (measured from top of core tube to the sediment)	107	110	161	119		
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	73	120	69	111		
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N		
Odour (Y/N)	N	N	N	N		
Sample Identification/Number Affixed to Core	240000118	14	→	→		
Secondary ID Marking Included on Caps	15	16	17	18		
Issues Encountered	NONE	YES	NO	NO		

Other Applicable Notes:

Core tube driven to 2.0m but could not extract from Lake bottom

Got out after several attempts + modifying grips

Secondary Position Information:

NEED 3 tubes

200
80
124

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 10, 2018
Sampled By: J. Houtby
Water Body: Mohawk Lake & Canals
Location: Loc 6
Weather: few clouds, 25°C, 19 Km/h SW
Water Conditions: Calm - slight chop 1st visit

Northing: N 43° 07' 59.4"
Easting: W 080° 14' 0[illegible]"
Target Core Depth (m): 2.0
Target Core Intervals (cm): 3
Water Depth (m): 1.70

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1343	1357	1400			
Depth of core penetration (cm)	2.0	2.0	2.0			
Clay Plug Present (Y/N)	transition in → Yes w/peat	~~Yes~~	Sand + some clay			
Core Catcher Installed (Y/N)	Y cutterhead/ core catcher	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	~~230~~ 230			
Total Core Headspace cm (measured from top of core tube to the sediment)	121	138	131			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	109	92	99			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)						
Odour (Y/N)						
Sample Identification/Number Affixed to Core	240000118 17 →			→		
Secondary ID Marking Included on Caps	19	~~20~~	20			
Issues Encountered						

Other Applicable Notes:

Core 2 - clay plug w some sand

Secondary Position Information:

NOT NUMBERED

2.30 tube
1.70 H2O
3.7 m

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 10, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc #7
Weather: 26°C partial cloudy 20 Km/h SW gust to 30 Km
Water Conditions: slight chop 1ft vis

Northing: N 43° 08' 01.6"
Easting: W 080° 14' 0.5"
Target Core Depth (m): 2.0m
Target Core Intervals (cm):
Water Depth (m): 1.40

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1501	1507	1513			
Depth of core penetration (cm)	2.0	2.0	2.0			
Clay Plug Present (Y/N)	Y	Y Clump Head	Y			
Core Catcher Installed (Y/N)	Y	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230			
Total Core Headspace cm (measured from top of core tube to the sediment)	88	113	126			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	142	117	104			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N			
Odour (Y/N)	N	N	N			
Sample Identification/Number Affixed to Core	2400001 1520	→		→		
Secondary ID Marking Included on Caps	21	22	23			
Issues Encountered	NONE	NONE	NONE			

Other Applicable Notes:

Secondary Position Information:

3.9

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 10, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc 8
Weather: partial cloud, 26°C 22Km SW gust to 31
Water Conditions: slight chop 1Ft visibility

Northing: N 43° 8' 05.0"
Easting: W 080° 13' 54.8"
Target Core Depth (m): 2.0
Target Core Intervals (cm):
Water Depth (m): 2.0

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1854	1602				
Depth of core penetration (cm)	2.0	2.0				
Clay Plug Present (Y/N)	N Peat	N Peat				
Core Catcher Installed (Y/N)	Y	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230			
Total Core Headspace cm (measured from top of core tube to the sediment)	82	103	135			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	148	127	105			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N			
Odour (Y/N)	N	N	N			
Sample Identification/Number Affixed to Core	2400018	25	→	→		
Secondary ID Marking Included on Caps	24	25	26			
Issues Encountered	NONE	NONE	NONE			

Other Applicable Notes:

Secondary Position Information:

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 11, 2015
Sampled By: J. Houtby + D H
Water Body: Mohawk Lake & Canals
Location: Loc #9
Weather: 19°C Partly cloudy 13 Km/h SW gusting to 20 Km
Water Conditions: Slight chop 1 ft vis

Northing: N 43° 08' 05.1"
Easting: W 080° 13' 50.2"
Target Core Depth (m): 2.0
Target Core Intervals (cm):
Water Depth (m): 2.1

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	0955	1005	1014			
Depth of core penetration (cm)	2.0	2.0	2.0			
Clay Plug Present (Y/N)	Y	Y	clay + Peat			
Core Catcher Installed (Y/N)	Y	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230			
Total Core Headspace cm (measured from top of core tube to the sediment)	94	105	103			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	136	125	127			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N			
Odour (Y/N)	N	N	N			
Sample Identification/Number Affixed to Core	24000011826 →					
Secondary ID Marking Included on Caps	31	32	33			
Issues Encountered	NONE →					

Other Applicable Notes:

Secondary Position Information:

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 11, 2015
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc #10
Weather: 19°C Partly cloudy
Water Conditions: 31 Km/hr W gusting to 44 Slight Chop 1/2 VIS

Northing: N 43° 08' 06.0"
Easting: W 080° 13' 45.2"
Target Core Depth (m): 2.0
Target Core Intervals (cm): ~~20~~
Water Depth (m): 2.2 m

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1212	1220	1228	1237		
Depth of core penetration (cm)	2.0	2.0	2.0	2.0		
Clay Plug Present (Y/N)	N PEAT + WOOD *	N	Y	N		
Core Catcher Installed (Y/N)	Y	Y	Y	Y		
# of Attempts Made	1	1	1	1		
Total Core Tube Length (cm)	230	230	230	230		
Total Core Headspace cm (measured from top of core tube to the sediment)	151	100	150	115		
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	79	130	80	115		
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N		
Odour (Y/N)	N	N	N	N		
Sample Identification/Number Affixed to Core	2400001	1829	→	→		
Secondary ID Marking Included on Caps	37	38	39	40		
Issues Encountered	NONE	NONE	NONE	NONE		

Other Applicable Notes:

* SOLID WOOD IN CUTTERHEAD FROM TREE

Secondary Position Information:

pollutech
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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 9, 2018
Sampled By: J. Houtby + D. H.
Water Body: Mohawk Lake & Canals
Location: Rec #11
Weather: 21°C, Partly cloudy, 13 Kmhr S Gusting to 20 Kmh
Water Conditions: Calm, clear

Northing: N 43° 7' 59.1"
Easting: W 080° 13' 57.1"
Target Core Depth (m): 1.0m
Target Core Intervals (cm): 0-10, 10-55, 55-END
Water Depth (m): 1.75

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1025	1050	1058	1106	1120	
Depth of core penetration (cm)	1.0	1.4	1.4	1.4	1.4	
Clay Plug Present (Y/N)	N	N	N	N	N	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	
# of Attempts Made	1	#1	1	1	1	
Total Core Tube Length (cm) 152	152	152	152	152	152	
Total Core Headspace cm (measured from top of core tube to the sediment)	91	46	43	51	62	
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	61	106	109	101	90	
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)	155.2	155.2	→	→		
Sediment Verticle Height in 2nd Core Interval (cm)	51					
Sediment Volume in 2nd Core Interval (ml)	791.4					
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	
Odour (Y/N)	N	N	N	N	N	
Sample Identification/Number Affixed to Core	2400001832	→	→	→	→	
Secondary ID Marking Included on Caps	1	2	3	4	5	
Issues Encountered	NONE	NONE	NONE	NONE	NONE	

Other Applicable Notes:

Secondary Position Information:

* drive unit 58cm

2.8m

152
210

NEED 1.75L

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 9, 2018
Sampled By: J. Houtby
Water Body: Mohawk Lake & Canals
Location: Loc # 12
Weather: Sunny 25 °C, 23 Kmh SE
Water Conditions: Slight chop, clear

Northing: N 43° 08' 1.6"
Easting: W 080° 13' 57.7"
Target Core Depth (m): 1.5
Target Core Intervals (cm): 0-10, 10-100, 100-end
Water Depth (m): 1.8m

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1305	1315	1326	1333	1342	
Depth of core penetration (cm)	1.5	1.5	1.5	1.5	1.5	
Clay Plug Present (Y/N)	N SAND	SAND	SAND	SAND	CLAY/SAND	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	
# of Attempts Made	1	1	1	1	1	
Total Core Tube Length (cm)	230	230	230	230	230	
Total Core Headspace cm (measured from top of core tube to the sediment)	148	140	156	134	122	
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	82	90	74	106	108	
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	
Odour (Y/N)	N	N	N	N	N	
Sample Identification/Number Affixed to Core	6	7	8	9	10	
Secondary ID Marking Included on Caps	2400001835	→	→	→	→	
Issues Encountered	NONE	NONE	NONE	NONE	NONE	

Other Applicable Notes:

Secondary Position Information:

1.8
1.5
3.3

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Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 9, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: LOC #13
Weather: Sunny w few clouds, 13 Km/h SW → 20 Km/h
Water Conditions: slight chop, clear

Northing: N 43° 08' 27.5"
Easting: W 080° 13' 52.9"
Target Core Depth (m): 1.5m
Target Core Intervals (cm)
Water Depth (m): 1.80

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1500	1511	1524	1532	1545	
Depth of core penetration (cm)	1.5	1.5	1.5	1.5	1.5	
Clay Plug Present (Y/N)	Y	L. Hle clay	Y some clay	Y	Y	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	
# of Attempts Made	1	1	1	1	1	
Total Core Tube Length (cm)	230	230	230	230	230	
Total Core Headspace cm (measured from top of core tube to the sediment)	117	151	131	131	145	
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	113	89	~~89~~ 99	99	95	
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	
Odour (Y/N)	N	N	N	N	N	
Sample Identification/Number Affixed to Core	2400001183B					
Secondary ID Marking Included on Caps	11	12	13	~~14~~	~~15~~ 14	
Issues Encountered	NONE	NONE	NONE	NONE	NONE	

Other Applicable Notes:

NO NUMBER.

Secondary Position Information:

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2018
Sampled By: J. Houtby
Water Body: Mohawk Lake & Canals
Location: Loc #14
Weather: 6°C, overcast, 19 Km/hr gust to 28
Water Conditions: slight chop <1 ft vis

Northing: N 43° 08' 3.3"
Easting: W 080° 13' 47.6"
Target Core Depth (m): 1.5m
Target Core Intervals (cm):
Water Depth (m): 2.0m

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	0855	0901	0905	911		
Depth of core penetration (cm)	1.5	1.5	1.5	1.5	1.5	
Clay Plug Present (Y/N)	Y	Y	Y	Y	Y	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	
# of Attempts Made	1	1	1	1	1	
Total Core Tube Length (cm)	230	230	230	230	230	
Total Core Headspace cm (measured from top of core tube to the sediment)	111	131	123	146	118	
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	119	99	107	84	112	
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	
Odour (Y/N)	N	N	N	N	N	
Sample Identification/Number Affixed to Core	2400001184	→	→	→	→	
Secondary ID Marking Included on Caps	44	45	46	47	48	
Issues Encountered	NONE	NONE	NONE	NONE	NONE	

Other Applicable Notes:

Secondary Position Information:

3.5

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 11, 2015
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc #15
Weather: overcast, 17°C 22 Km/hr W gusting to 31 Km
Water Conditions: slightly choppy, 1 ft vis.

Northing: N 43° 08' 3.3"
Easting: W 080° 13' 43.1"
Target Core Depth (m): 1.5
Target Core Intervals (cm):
Water Depth (m): 2.1

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1334	1346	1355			
Depth of core penetration (cm)	20 ~~15~~	2.0	2.0			
Clay Plug Present (Y/N)	N SAND	YES	YES			
Core Catcher Installed (Y/N)	Y	Y	Y	Y		
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230	230		
Total Core Headspace cm (measured from top of core tube to the sediment)	81	107	102			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	149	123	128			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)						
Odour (Y/N)						
Sample Identification/Number Affixed to Core	2400001	1844		→		
Secondary ID Marking Included on Caps	41	42	43	44		
Issues Encountered	NONE	NONE	NONE			

Other Applicable Notes:

Secondary Position Information:

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2018
Sampled By: J. Houtby T DH
Water Body: Mohawk Lake & Canals
Location: Loc #16
Weather: 8°c overcast light rain. 15 Kmhr W → 28 Km
Water Conditions: 4-5 in chop < 1 ft VIS

Northing: N 43° 08' 4.4"
Easting: 080° 13' 39.1"
Target Core Depth (m): 2.0
Target Core Intervals (cm):
Water Depth (m): 2.4

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1517	1530	1535			
Depth of core penetration (cm)	2.0	2.0	2.0			
Clay Plug Present (Y/N)	N	N	N			
Core Catcher Installed (Y/N)	Y	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230			
Total Core Headspace cm (measured from top of core tube to the sediment)	84	91	129			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	146	139	101			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N			
Odour (Y/N)	N	N	N			
Sample Identification/Number Affixed to Core	2400001	1847	→			
Secondary ID Marking Included on Caps	63	64	65			
Issues Encountered	NONE	NONE	NONE			

Other Applicable Notes:

PLUG - PEAT MOSS Core 1+2+3

Secondary Position Information:

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2015
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc 17
Weather: 7°C overcast 20 Km/hr W gust to 30
Water Conditions: Calm / sheltered Zero Vis

Northing: N 43° 08' 7.2"
Easting: W 080° 13' 31.9"
Target Core Depth (m): 1.0
Target Core Intervals (cm)
Water Depth (m): 90 cm

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1325	1334	1343	1354	1401	1410
Depth of core penetration (cm)	1.0	1.0	1.0	1.0	1.0	1.0
Clay Plug Present (Y/N)	Y	Y	Y	Y	Y	Y
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	Y
# of Attempts Made	1	1	1	1	1	1
Total Core Tube Length (cm)	152	152	152	152	152	~~152~~ 230
Total Core Headspace cm (measured from top of core tube to the sediment)	90	112	79	67	46	198
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	62	40	73	85	106	32
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	N
Odour (Y/N)	N	N	N	N	N	N
Sample Identification/Number Affixed to Core	24000011850	→	→	→	→	→
Secondary ID Marking Included on Caps	57	58	59	60	61	62
Issues Encountered	NONE	NONE	NONE	NONE	NONE	NONE

Other Applicable Notes:

BIG ROCK IN TUBE JUST ABOVE CORE CATCHER UNLIKELY WONT EXTRUDE

LOST CATCHER

Secondary Position Information:

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc 18
Weather: 8°C, partly cloudy, 17 Km/h NW ⇒ 28 Km
Water Conditions: calm, NO VIS.

Northing: N 43° 08' 13.8"
Easting: W 080° 13' 18.8"
Target Core Depth (m): 1.5
Target Core Intervals (cm):
Water Depth (m): 0.8

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1156	1205	1214	1219	1226	
Depth of core penetration (cm)	1.5	1.5	1.5	1.5	1.5	
Clay Plug Present (Y/N)	Y	N	N	N	N	
Core Catcher Installed (Y/N)	Y	Y	Y	Y	Y	
# of Attempts Made	1	1	1	1	1	
Total Core Tube Length (cm)	~~230~~ 152	230	230	230	230	
Total Core Headspace cm (measured from top of core tube to the sediment)	82	152	174	156	139	
Total Sediment Height in Core Tube (cm) (calculated by subtractingthé total core headspace from the total core tube length)	70	88	56	74	91	
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N	N	
Odour (Y/N)	N	N	N	N	N	
Sample Identification/Number Affixed to Core	2400001853	→	→	→	→	
Secondary ID Marking Included on Caps	52	53	54	55	56	
Issues Encountered	NONE	NONE	NONE	NONE	NONE	

Other Applicable Notes:

#66 REGRATE IN CUTTER HEAD

Secondary Position Information:

88 70 158 56 214

214 74 288

288 91 379

220 needed

1.7 x 2 / 34

200 = 310?

3400 3100 3300

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 11, 2018
Sampled By: J. Houtby + D. H
Water Body: Mohawk Lake & Canals
Location: QAQC #1 (Same loc as Loc #9)
Weather: 19°C partly cloudy 13 Kmh SW gust to 20 Km
Water Conditions: Slight chop 1 ft vis

Northing: N 43° 08' 05.1"
Easting: W 050° 13' 50.2"
Target Core Depth (m) 2.0
Target Core Intervals (cm)
Water Depth (m): 2.1

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1028	1036	1045			
Depth of core penetration (cm)	~~2.0~~	2.0	2.0			
Clay Plug Present (Y/N)	Y	Y clay plug	Y L. Hlc			
Core Catcher Installed (Y/N)	Y	Y	Y			
# of Attempts Made	1	1	1			
Total Core Tube Length (cm)	230	230	230			
Total Core Headspace cm (measured from top of core tube to the sediment)	101	99	94			
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	129	121	136			
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N			
Odour (Y/N)	N	N	N			
Sample Identification/Number Affixed to Core	2400001	1856	→			
Secondary ID Marking Included on Caps	34	35	36			
Issues Encountered	NONE	NONE	NONE			

Other Applicable Notes:

Secondary Position Information:

pollutech
enviroquatics limited

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: QAQC #2 (Same as loc 14)
Weather: 6°C, light rain, 19 Km/hr W
Water Conditions: slight chop, < 1 ft WIS

Northing: N 43° 08' 3.3"
Easting: W 080° 13' 47.6"
Target Core Depth (m): 1.5
Target Core Intervals (cm):
Water Depth (m): 2.0

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	0941	0947	0952	1001		
Depth of core penetration (cm)	1.5	1.5	1.5	1.5		
Clay Plug Present (Y/N)	Y	Y	Y	Y		
Core Catcher Installed (Y/N)	Y	Y	Y	Y		
# of Attempts Made	1	1	1	1		
Total Core Tube Length (cm)	230	230	230	230		
Total Core Headspace cm (measured from top of core tube to the sediment)	119	122	122	125		
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	111	108	108	105		
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N	N	N		
Odour (Y/N)	N	N	N	N		
Sample Identification/Number Affixed to Core	2400011859 →					
Secondary ID Marking Included on Caps	49	50	51	52		
Issues Encountered	NONE	N	N	N		

Other Applicable Notes:
NOTE THIS IS QA SAMPLE COLLECTED AS DUPLICATE AT LOCATION #14

Secondary Position Information:

pollutech
enviroquatics limited

LEAD 210

1st LOCATION

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct 12, 2018
Sampled By: J. Houtby + DH
Water Body: Mohawk Lake & Canals
Location: Loc #14 - LEAD 210
Weather: 6°C overcast, sunny periods
Water Conditions: slight chop, Life vis

Northing: N 43° 08' 3.3"
Easting: W 080° 13' 47.6"
Target Core Depth (m): 1.5 m
Target Core Intervals (cm):
Water Depth (m): 2.0

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1014	1021				
Depth of core penetration (cm)	1.5	1.5				
Clay Plug Present (Y/N)	Y	Y				
Core Catcher Installed (Y/N)	Y	Y				
# of Attempts Made	1	1				
Total Core Tube Length (cm)	230	230				
Total Core Headspace cm (measured from top of core tube to the sediment)	119	125				
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	111	115				
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N				
Odour (Y/N)	N	N				
Sample Identification/Number Affixed to Core	2400001186	1				
Secondary ID Marking Included on Caps	XX	ZZ				
Issues Encountered	NONE	NONE				

Other Applicable Notes:

SAMPLES FOR LEAD 210 COLLECTED FROM LOC #14. 2 CORES COLLECTED JUST IN CASE NEEDED

Secondary Position Information:

very high headspace value!!

pollutech
environmental aquatics limited

2nd LEAD 210 SAMPLE

Aquafor Beech - Mohawk Lake - Sediment Sampling
Pollutech Project #2400-001

Date: Oct. 12, 2018
Sampled By: J. Houtby
Water Body: Mohawk Lake & Canals
Location: Adjacent location 8
Weather: 9°C overcast 20 Km/h W gusting to 30 Km
Water Conditions: Slight chop < 1 ft Vis

Northing: N 43° 8' 04.7"
Easting: W 080° 13' 54.9"
Target Core Depth (m): 2.0
Target Core Intervals (cm):
Water Depth (m): 2.0

Sediment Core Sample Collection

	Core 1	Core 2	Core 3	Core 4	Core 5	Core 6
Sample Collection Time	1550	1600				
Depth of core penetration (cm)	2.0	2.0				
Clay Plug Present (Y/N)	N	N				
Core Catcher Installed (Y/N)	Y	Y				
# of Attempts Made	1	1				
Total Core Tube Length (cm)	230	230				
Total Core Headspace cm (measured from top of core tube to the sediment)	108	128				
Total Sediment Height in Core Tube (cm) (calculated by subtractingthe total core headspace from the total core tube length)	122	108				
Sediment Verticle Height in 1st Core Interval (cm)	10	10	10	10	10	10
Sediment Volume in 1st Core Interval (ml)						
Sediment Verticle Height in 2nd Core Interval (cm)						
Sediment Volume in 2nd Core Interval (ml)						
Sediment Verticle Height in 3rd Core Interval (cm)						
Sediment Volume in 3rd Core Interval (ml)						
Evidence of Staining (Y/N)	N	N				
Odour (Y/N)	N	N				
Sample Identification/Number Affixed to Core	2400001188	1				
Secondary ID Marking Included on Caps	AA	BB				
Issues Encountered	NONE	NONE				

Other Applicable Notes:

This is the Second lead 210 sample

Verify headspace

Plug = Peat.

Secondary Position Information:

pollutech
enviroquatics limited

ATTACHMENT C

pollutech
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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: N/B, BS
Interval 2 Sample #: 2400011802
Interval 3 Sample #: 2400011803
Method: —

Location ID: #1
Process Date: 10.13.18
Page: of
Location: #1
Start/Finish Time: 1512-

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-35	Length 62 cm 1	Grey, Relatively fine grained, moderate density, homogenous odorless	1125
35-End		Fine grained moderate density, dark grey in color. relatively high density, odorless, clay at end	"
10-35	Length 50 cm 2	See tube #1 int #1	1125
35-End		See tube #1 int #2	"
10-35	Length 63 cm 3	See tube #1 int #1	1125
35-End		Similar to previous, lighter color clay some organic detritus.	"
10-35	Length 58 cm 4	See tube #1 int #1	1125
35-End		See tube 3 int #2	"
10-35	Length 55 cm 5	See tube #1 int #1	1125
35-End		Similar to previous but several large stones near terming end of core	"
10-35	Length 98 cm 6	See tube #1 int #1	1125
35-End		See tube 5 int #2. Stones smaller but more numerous	"

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, BS
Interval 2 Sample #: 2400011811
Interval 3 Sample #: 2400011812
Method: —

Location ID: #4
Date: 10.14.18
Page: of
Location: #4
Start/Finish Time: 0900

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-38	Length 72 1 cm	very dark, Sandy Surface layer, Slight hydrocarbon smell.	1201
		Relatively low moisture, Finer grained thicker mud layer at end	"
38-End		Dark, muddy layer, some hydrocarbon smell, small > 4cm rocks	"
		in small Sandy layer, also some wood slivers in layer terminal mud layer	"
10-38	Length 56 2 cm	slightly more liquid content, sandy dark first layer	1201
		followed by muddy second layer.	"
38-End		Dark, Sandy layer low moisture, some organic detritus,	"
		moderately large muddy layer.	"
10-38	Length 103 3 cm	Sandy but dark, moderately more liquid content, muddy	1201
		layer after.	"
38-End		muddy first layer, small grain size, small Sandy layer	"
		following, significant organic detritus in layer. muddy final layer	"
	4	N/A	
	5	N/A	
	6	N/A	

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400001181 4
Interval 3 Sample #: 2400001181 5
Method: ←

Location ID: #5
Process Date: 10-10-18
Page: of
Location: #5
Start/Finish Time: NB ~~1500~~ → 0830-930

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-38	Length: 56 cm 1	very moist, low density, Grey, odorless, very fine grained - silt	10:00
38-End		core short. Large grain size near terminus, Medium moisture odorless	"
			"
10-38	Length: 90 cm 2 (A)	very moist, low density, Grey, Fine grained - silt	10:00
38-End		Sediment type stratification: mud → Sand → Peat ratio 1:1:1	"
		Rocks in sand layer ≤ 4.5 cm Diameter. Peat very dense + humic w. roots	"
10-38	Length: 79 cm 3	very Fine, moist, Silty, homogenous, odorless, grey	10:00
38-End		mud → Sand → Peat Ratio: 3:1:2, rocks ≤ 1cm in Sand, Peat very dark and dense with some organic detritus and roots, Grey color in mud + Sand	"
			"
10-38	Length: 94 cm 4	moist, Fine grained, odorless, grey, homogenous	10:00
38-End		mud → Sand → mud → Peat. Mud grey, dense, dry, odorless. Peat dark, humic, contains detritus, odorless. Sand with rocks ≤ 1cm	"
			"
10-NB -End	5	N/A	
	6	N/A	

* All Lengths Exclude 0-10 cm
(A) Some peat discarded from core terminus as per contact. NB

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400011817
Interval 3 Sample #: 2400011818
Method: —

Location ID: #6
Process Date: 10-11-18
Page: of
Location: #6
Start/Finish Time: 0956- 1100

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-40.5	Length: 102 cm 1	Grey, very fine, moist, low density, odorless	1420
40.5-End		Mud-Sand progression. 2/3 of Interval is mud, 1/3 is sand. No large rocks. Brown mud at terminal 5 cm of core. Odorless. Clay at end	"
10-40.5 NB-End	Length: 75 cm 2	Grey, very fine, moist, low density, odorless	1420
40.5-End		Mud-sand. Mud is fine, low moisture, high density composes 80% of Interval. Sand large grain size, brown-grey color, no large stones. Clay at end	"
10-40.5	Length: 60 cm 3	Grey, very fine, moist, low density, odorless	1420
40.5-End		Lacks sand layer. Mud 95% of core, terminal 5% is brown, dense clay.	"
	4	N/A	
	5	N/A	
	6	N/A	

All Lengths Exclude 0-10cm

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400011820
Interval 3 Sample #: 2400011821
Method: —

Location ID: #7
Process Date: 10-11-18
Page: of
Location: #7
Start/Finish Time: 1110 - 1220

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-58	Length: 96 cm 1	moist, low density, very fine sediment size, Grey, odorless,	1440
		Since interval is large, density gradient increasing with depth	"
58-End	06m	Mud → small sand layer → mud → clay. very dense at terminus clay location,	"
		low moisture, brown color. sand layer ≤ 10cm Grey, ~~Clay~~ Mud majority Grey odorless	"
10-58	Length: 120 cm 2	moist Low density, very fine Sediment, Grey, Odorless, density and	1440
		moisture gradients. Density positively correlated, moisture negatively correlated with depth	"
58-End	Dem	Mud 60% → Sand 10% → Clay 30%. Mud grey moderate density, sand Grey-brown,	"
		Low density, Clay brown very high density	"
10-58	Length: 96 cm 3	See Tube #2 Interval 1	1440
			"
58-End		Mud 30%. → Sand 15%. → 55%. clay. Mud Grey low moisture, moderate density	"
		Sand brown-grey moderate density. Clay brown-Grey Very high density	"
	4	N/A	
	5	N/A	
	6	N/A	

All Lengths exclude 0-10cm

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400001823
Interval 3 Sample #: 2400001824
Method: —

Location ID: #8
Process Date: 10-11-18
Page: of
Location: #8
Start/Finish Time: 1300 - 1400

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-54.5	Length: 143 cm 1	Grey - with brown streaks, odorless, very fine grained silt, moderate density, homogenous	1545
54.5-End		mud 35% → Sand (fine grained) 10% → thick mud 35% → decomposting wood 20%. Mud + Sand Grey Brown, odorless, dry dense, wood layer dark, very dry	"
10-54.5	Length: 120 cm 2 Int-3	See core #1 interval 1	1545
54.5 End		mud 40% → Fine Sand 10% → Clay-mud 25% → decomp. wood 25%. mud Grey, fine grained low moisture, odorless, dense, Sand layer small and fine grained, Clay-mud is Grey/Brown, wood is dry near preserved	"
10-54.5	Length: 99 cm 3	See core #1 Interval #1	1545
54.5-End		mud 5% → Decomp. wood 50%. Lacks Sand layer. Wood layer is more composted, extremely rich in organic detriths + fibers.	"
	4	N/A	
	5	N/A	
	6	N/A	

All lengths Exclude 0-10 Discarded layer

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400011826
Interval 3 Sample #: 2400011827
Method: —

Location ID: #9
Process Date: 10.11.18
Page: of
Location: #9
Start/Finish Time: 1430 – 1530

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-65	Length: 119 cm 1	very moist near surface, uniformly thick consistancy throughout decreasing moisture with depth, Grey to Grey brown at depth. Odorless. Homogenous	0920
65-End		Grey brown mud 20% → Sandy mud 20% → peat/wood/humic matter 20% → brown clay near terminus. Qualities consistant with descriptions in other sheets.	"
10-65	Length: 114.5 cm 2	See tube #1 interval 1, Flecks of deteriorated a synthetic material.	0920
65-End		Mud with flecks of synthetic material 20% → Sandy mud 20% → dense humic substance like compressed peat → clay - Brown + very dense	"
10-65	Length: 110 cm 3	See tube #1 interval 1	0920
65-End		Mud without Synthetic → sand mud → clay → compressed peat → clay All very dense + dark in color	"
	4	N/A	~~0920~~
	5	N/A	
	6	N/A	

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Sediment Sampling Form

Project Number/Name 2400-001
Field Personnel NB, MM
Interval 2 Sample # 2400-odl829
Interval 3 Sample # 2400odl1830
Method –

Location ID #10
Process Date 10.12.18
Page of
Location #10
Start/Finish Time 0800 - 0915

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-45.5	Length 87 1 cm	Dark grey-black, very moist near surface, relatively high density	1202
		Odorless, Fine grained, very smooth	"
45.5-End		Homogenous viscous Grey mud throughout. Near terminal end wood plug followed by small amount of dry crumbling humic earth	"
10-45.5	Length 118 2 cm	Dark grey w. streaks of brown. Limited organic detritus near	1202
		Surface ≤ 10 cm deep. Fine grained, less moist ? higher density than #1	"
45.5 End		consistant grey brown viscous mud, near end humic soil dry,	"
		crumbly, high amount of organic detritus	"
10-45.5	Length 92 3 cm	see core #2 Interval 1	1202
			"
45.5 End		Majority is Grey brown mud, low moisture, odorless. Near end	"
		humic peat like sediment with high organic component. dry # end.	"
10-45.5	Length 98 4 cm	See core #2 Interval 1	1202
			"
45.5-End		See core tube #2 Int. 2	"
			"
10-	5	N/A	
	6	N/A	

Lengths Exclude 0-10 cm and are an approximation

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 240000111832
Interval 3 Sample #: 240000 11833
Method: —

Location ID: H11
Process Date: 10-10.18
Page: of
Location: #11
Start/Finish Time: 1330 - 1500

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-36.5	1	Extremely fine, very high density, Low moisture, No odor, thick consistency	0950
		Dark grey/Brown	"
36.5-End		"	"
		" * very short core approx. 2/3 of others	"
10-36.5	2	Dark grey/brown, odorless, high density, thick consistancy	0950
		"	"
36.5-End		Dark grey	"
		very high density, very fine, very thick - near solid consistancy	"
10-36.5	3	thinner consistancy, moderate moisture, odorless	0950
		Grey-brown	"
36.5-End		Low moisture, thicker consistancy, Extremely low moisture + very	"
		thick near terminus	"
10-36.5	4	thin, moist, Fine grained, Grey-brown	0950
		"	"
36.5-End		very thick & solid, Fine grain, low moisture, dark ~~brown~~ Grey	"
			"
10-36.5	5	moderate thickness, Grey-brown, moderate moisture, low density	0950
		"	"
36.5-End		very dense, very low moisture, Dark grey, Some brown	"
			"
	6	N/A	

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 2400001835
Interval 3 Sample #: 2400001836
Method: —

Location ID: #12
Process Date: 10.10.18
Page: of
Location: #12
Start/Finish Time: 1130 - 1300

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-45	1	Grain size gradient: Large Sandy at deep, Small, muddy at surface, odorless, dry, high density	1230
		Small grain size "	"
45-End		"	"
		Large grain size "	"
10-45	2	Grain size gradient, dark grey color, high density, odorless	1230
		Small grain size "	"
4.5-End		"	"
		Large Grain size "	"
10-45	3	Grain size gradient, Grey, high density	1230
		Small Grain Size	"
45-End			"
		Large grain size	"
10-45	4	Grey, Grain size gradient, odorless, high density	1230
		Small grain size "	"
45-End		"	"
		Large grain size "	"
10-45	5	Grey, Grain size gradient, odorless	1230
		Small grain size "	"
45-End		"	"
		Large grain size "	"
	6	N/A	

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Sediment Sampling Form

Project Number/Name 2400-001

Field Personnel NB, MM

Interval 2 Sample # 2400011838

Interval 3 Sample # 2400011839

Method —

Location ID #13

Process Date 10.10.18

Page of

Location #13

Start/Finish Time 0930 - 1130

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-46.5	1	Very Fine, Dark Grey, Low moisture, very viscous near solid, high density	1447
46.5-End		"	"
		"	"
		"	"
10-46.5	2	Very Fine, odorless, Dark grey, High density, low moisture	1447
46.5-End		"	"
		"	"
		"	"
10-46.5	3	Very Fine, odorless, low moisture, high density	1447
46.5-End		"	"
		"	"
		"	"
10-46.5	4	Very Fine, Odorless, low moisture, high density	1447
46.5-End		"	"
		"	"
		"	"
	5	N/A	
	6	N/A	

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, MM
Interval 2 Sample #: 24000011841
Interval 3 Sample #: 24000011842
Method: —

Location ID: #14
Process Date: 10.12.18
Page: of
Location: #14
Start/Finish Time: 1240 ~~NB~~ 1400

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-56	Length: 114 cm 1	Low density gelatenous high moisture, high water content black-dark grey odorless	0833
56-End		60%. Grey black / relatively low density mud. Subsequent peat layer containing moderate organic detritus. Terminal dense clay plug.	"
10-56	Length: 94 cm 2	see tube #1 int. #1	0833
56-End		80%. Grey mud. Smaller peat layer than typical. Clay plug at end - brown, dry.	"
10-56	Length: 112 cm 3	see tube #1 int #1 Some limited organic detritus near end of interval	0833
56-End		See tube #2 int 2.	"
10-56	Length: 92 cm 4	See tube #1 int. #1	0833
56 End		Less mud layer than previous 3. Slightly larger peat and clay layers:	"
10-56	Length: 100 cm 5	see tube #1 int #1	0833
56 End		Similar to previous, but very large peat layer (40% of int.) clay plug at end.	"
	6	N/A	

All lengths exclude 0-10 cm discarded

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB MM
Interval 2 Sample #: 2400001 1844
Interval 3 Sample #: 2400001 1845
Method: —

Location ID: # 15
Process Date: 10-12-18
Page: of
Location: # 15
Start/Finish Time: 0915 - 1030

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-71.5	Length 141 cm 1	Dark Grey w. light grey streaks, very fine grained, moderate moisture near surface but drier at depth. Normal density and moisture gradients	1318
71.5-End		majority grey with brown streaks approx. 15 cm layer of humic peat near end followed by approx 15 cm of very dense clay at end.	"
10-71.5	Length 123 cm 2	see core tube #1 int. 1. Slightly more moist near surface	1318
71.5-End		Go. typical Grey brown mud. Some organic detritus near a small preserved wood plug. wood plug followed by approx 10cm brown clay.	"
10-71.5	Length ~~145~~ cm 3 140 cm	see core tube #1 int 1	1318
71.5-End		Half typical Grey brown mud followed by approx 25cm peat humic layer followed by 15cm dense clay near end.	"
	4	N/A	
	5	N/A	
	6	N/A	

All lengths exclude 0-10 cm discarded

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Sediment Sampling Form

Project Number/Name 2400-001
Field Personnel NB, BS
Interval 2 Sample # 24000011847
Interval 3 Sample # 24000011848
Method —

Location ID #16
Process Date 10.13.18
Page of
Location #16
Start/Finish Time 0820-0956

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-62	Length 136 cm 1	Low density, relatively moist. fine grained gelatenous consistancy black-grey-dark brown color, relatively odorless	1500
62-End		Mainly grey mud transitioning into grey clay, small peat layer near terminal end. Some synthetic plastics in peat layer. Faint hydrocarbon odor	"
10-62	Length: 144 cm 2	See tube #1 int #1	1500
62-End		90% mud-clay gradient. very small peat layer near end contains some wood, some small annelid spiral shells near mud-peat interface.	"
10-62	Length: 104 cm 3	See tube #1 int #1	1500
62-End		See tube #2 int #2. very rich organic peat layer with high concentration of calcareous tubes.	"
	4	N/A	
	5	N/A	
	6	N/A	

All lengths exclude 0-10 cm discarded

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Sediment Sampling Form

Project Number/Name 2400-001

Field Personnel NB, BS

Interval 2 Sample # 2400 001 1850

Interval 3 Sample # 2400 ~~001~~ 001 1851

Method —

Location ID #17

Date 10.13.18

Page of

Location #17

Start/Finish Time 1015 - 1200

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-43	Length: 66 cm 1	Dark grey very large grained no rocks, few small shells - bivalve / brown clay plug at end	1308
43-End		Extremely fine grained light brown color, extremely dense Entire interval is clay	"
10-43	Length: 42 cm 2	~~Dark grey - brown sand, very large~~ Discarded due to length, large rocks in core	1308
43-End			"
10-43	Length: 75 cm 3	Dark grey-brown Sand very large grained with rocks ≤5cm diameter large clay layer at end brownish color	1308
43-End		Sandy top 5 cm Rest of core is very dense brown clay, low moisture	"
10-43	Length: 82 cm 4	Dark grey large grained, lacks clay plug at end. moderate density	1308
43-End			"
10-43	Length: 110 cm 5	Dark grey, no clay plug. Large grained, moderate density, no rocks or shells present	1308
43-End		Top 40% is dark grey, sandy moderate density, mostly light brown clay, very dense very fine grained	"
10-43	Length: 32 cm 6	Discarded due to length	1308
End			"

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Sediment Sampling Form

Project Number/Name: 2400-001
Field Personnel: NB, BS
Interval 2 Sample #: 2400011853
Interval 3 Sample #: 2400011854
Method: —

Location ID: #18
Process Date: 10.13.18
Page: of
Location: #18
Start/Finish Time: 1240 - 1430

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-44	Length 76 cm 1	moderate grain size, dark grey color, odorless, pudding like	1140
		density some organic detritus throughout core mainly small sticks. Sandy at end.	"
44-End		Sandy with wood chunks near start. some organic detritus	"
		in sandy layer. Larger wood plugs follow, ends in smooth grey-brown clay.	"
10-44	Length 79 cm 2	Similar mud layer to #1, less sandy end, but wood	1140
		fragments near Int. 2/3 split.	"
44-End		Sandy, moderate-small grain size, small roots in sand layer. Sand layer	"
		persists throughout until small brown clay plug at end. Some small stones.	"
10-44	Length 68 cm 3	Similar mud layer, larger sandy layer near end. Sandy	1140
		layer contains some small rocks.	"
44-End		See Tube #2 int #2. Some small yellow plastic flecks near	"
		clay layer at end.	"
10-44	Length 75 cm 4	Similar mud layer, presence of clay layer between mud and	1140
		sand layers.	"
44-End		2 sandy grey layers seperated by small grey clay layer. Several	"
		medium-large sized rocks near end of core before terminal clay plug.	"
10-44	Length 107 cm 5	Similar mud and clay layer, but lacks sand layer at end.	1140
		Few small plastic flecks near surface of core	"
44-End		Large sandy layer at start, contains some small roots. Small muddy	"
		clay layer followed by sandy layer containing med.→lg rocks + small amt. of garbage. Clay plug	
	6	N/A	

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Sediment Sampling Form

Project Number/Name 2400-001

Field Personnel NB, MM

Interval 2 Sample # 2400011856

Interval 3 Sample # 2400011857

Method –

Location ID QAQC #1 Loc#9

Process Date 10.12.18

Page of

Location QAQC #1 Loc #9

Start/Finish Time 1050 – 1150

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-73.5	Length: ~~130~~ 127 cm 1	very low density, gelatenous, fine grained dark-light grey mud. High moisture content especially near surface	0940
73.5 End		Slight mud layer consistant with description above. Followed by large layer medium ~~sized~~ grain sized sand brown coloration, small peat layer. Dense clay end	"
10-73.5	Length: 131 2 cm	See #1 Interval #1 Mud near black in places ~~Small mud layer. Large (Approx. 1/3 core) Sandy layer Follo~~ Int. NB	0940
73.5-End		Small mud layer at beginning. Large (1/3 Interval) Sandy layer after that Followed by large (1/3) peat layer ending in small but dense clay layer	"
10-73.5	Length: 123 3 cm	See Tube #2 Interval #1	0940
73.5 End		Near identical to tube #2 int. #2 except exaggerated sandy and clay layers with minimal peat layer seperating them.	"
	4	N/A	
	5	N/A	
	6	N/A	

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Sediment Sampling Form

Project Number/Name 2400-001

Field Personnel NB, MM

Interval 2 Sample # 2400011859

Interval 3 Sample # 2400011860

Method —

Location ID QAQC #2 Loc14

Process Date 10.12.18

Page of

Location QAQC #2 Loc14

Start/Finish Time 1420 - 1530

Sample Interval (cm)	Core Tube #	Soil Description: Grain size, colour, texture, structure, moisture, consistency, relative density, staining, odour, etc.	Sample Time
10-49	Length: 106 cm	homogenous dark brown/black smooth mud, near gelatenous moderate-low moisture, moderate consistancy odorless	0843
49-End	1	90% homogenous smooth black-Grey-brown mud. very small <5cm peat layer after mud layer. Terminal clay plug black/brown	"
10-49	Length: 112 cm	see tube #1 int #1	0843
49-End	2	50% smooth mud. Larger (30%) peat/humic layer followed by terminal Grey-brown clay plug. Mud layer very moist.	"
10-49	Length: 106 cm	see tube #1 int #1	0843
49-End	3	40% smooth mud, small peat layer very dark in color. some organic detritus in mud near peat. Large clay layer at end.	"
10-49	Length: 98 cm	see tube #1 int #1	0843
49-End	4	50% smooth mud layer followed by small (10 cm) peat layer followed by large (40%) clay layer at terminus	"
	5	N/A	
	6	N/A	

All lengths exclude 0-10cm discarded

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Appendix F-2 – Sediment Investigation Results

Analytes	Units	O. Reg 153/04 Soil Standards: Table 1 All except Agricultural	Table 3 Non-Potable Res/Park/Ins Fine	Table 3 Non-Potable Ind/Comm Fine	Table 5 Stratified Non-Potable Ind/Comm Fine	Site 1 Int 1	Site 1 Int 2	Site 1 Int 3	Site 2 Int 1	Site 3 Int 1	Site 4 Int 1	Site 4 Int 2	Site 4 Int 3	Site 5 Int 1	Site 5 Int 2	Site 5 Int 3
Moisture Content		-	-	-	-	57.5	43.9	47.1	61.2	53.8	43.5	42.2	33.5	64.3	56.8	40.5
Metals																
Antimony (Sb)	µg/g	1.3	7.5	50	63	1.7	1.7	2.3	1.7	1.8	1.3	2.3	4.2	1.5	<1.0	<1.0
Arsenic (As)	µg/g	18	18	18	47	3.5	5	8.4	5	3.6	3	5.2	7	5.7	6	5.9
Barium (Ba)	µg/g	220	390	670	8600	87.2	118	166	146	74.6	56.7	85	108	154	116	106
Beryllium (Be)	µg/g	2.5	5	10	60	<0.50	<0.50	0.8	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	0.5	0.7
Boron (B), Hot Water Ext.	µg/g	NA	1.5	2	NA	0.89	0.81	1.01	1.04	1.12	0.63	0.97	1.4	0.71	0.84	0.59
Boron (B)	µg/g	36	120	120	7900	8.9	8.7	10.8	8.7	9.9	7.1	7.4	9.7	11.6	10.9	12.6
Cadmium (Cd)	µg/g	1.2	1.2	1.9	7.9	1.3	2.2	3.6	1.3	1.1	0.6	3.6	6.6	3.0	3.6	0.8
Chromium (Cr)	µg/g	70	160	160	18000	49.8	42.6	53.4	50.6	38.9	34.5	32.8	41	55	41.3	39.6
Chromium VI	µg/g	0.66	10	10	40	<0.40	<0.20	<0.20	<0.40	<0.40	<0.20	<0.20	<0.20	<0.40	0.42	<0.20
Cobalt (Co)	µg/g	21	22	100	2500	4.9	5.8	7.7	5.2	4.4	3.9	4.8	5.6	8.4	6.4	7.9
Copper (Cu)	µg/g	92	180	300	5600	75.6	95	83.3	114	71.9	55	69	76	117	78	38.5
Lead (Pb)	µg/g	120	120	120	1000	117	311	468	148	94.7	73	472	798	278	417	82.4
Mercury (Hg)	µg/g	0.27	1.8	20	30	0.117	0.267	0.661	0.185	0.104	0.0723	0.282	0.418	0.271	0.451	0.351
Molybdenum (Mo)	µg/g	2	6.9	40	1200	1.6	1.6	1.7	1.6	1.6	1.1	1.5	2	1.6	1.4	<1.0
Nickel (Ni)	µg/g	82	130	340	510	15.3	17.3	21.6	17.7	14.3	10.4	15.7	20.8	23.1	19.9	17.8
Selenium (Se)	µg/g	1.5	2.4	5.5	1200	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	1.8	1.1	<1.0
Silver (Ag)	µg/g	0.5	25	50	490	<0.20	0.36	0.59	0.22	0.76	<0.20	0.5	0.89	0.31	0.43	0.25
Thallium (Tl)	µg/g	1	1	3.3	33	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	µg/g	2.5	23	33	300	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	1	<1.0	1.1	<1.0
Vanadium (V)	µg/g	86	86	86	160	19.5	23	27.8	20	19.5	16	17.7	21	26.9	20	28.6
Zinc (Zn)	µg/g	290	340	340	24000	435	503	672	641	389	279	652	1110	810	695	248
VOC's																
Acetone	µg/g	0.5	28	28	28	<0.75	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<0.50	<1.0	<0.75	1.21
Benzene	µg/g	0.02	0.17	0.4	4.4	<0.010	0.0118	0.0925	<0.014	<0.010	<0.0068	0.0357	0.0831	0.04	0.134	<0.0068
Bromodichloromethane	µg/g	0.05	13	18	63	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Bromoform	µg/g	0.05	0.26	1.7	2.7	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Bromomethane	µg/g	0.05	0.05	0.05	0.05	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Carbon Tetrachloride	µg/g	0.05	0.12	1.5	1.7	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Chlorobenzene	µg/g	0.05	2.7	2.7	2.7	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Chloroform	µg/g	0.05	0.18	0.18	0.19	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Dibromochloromethane	µg/g	0.05	9.4	13	25	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,2-Dichlorobenzene	µg/g	0.05	4.3	8.5	68	<0.075	<0.050	<1.6	<0.10	<0.075	<0.050	<0.050	<0.80	<0.10	<0.075	<0.050
1,3-Dichlorobenzene	µg/g	0.05	6	12	67	<0.075	<0.050	<1.6	<0.10	<0.075	<0.050	<0.050	<0.80	<0.10	<0.075	<0.050
1,4-Dichlorobenzene	µg/g	0.05	0.097	0.84	0.97	<0.075	<0.050	<1.6	<0.10	<0.075	<0.050	<0.050	<0.80	<0.10	<0.075	<0.050
1,1-Dichloroethane	µg/g	0.05	11	21	45	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,2-Dichloroethane	µg/g	0.05	0.05	0.05	0.05	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,1-Dichloroethylene	µg/g	0.05	0.05	0.48	0.53	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
CIS 1,2-Dichloroethylene	µg/g	0.05	30	37	43	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
TRANS-1,2-Dichloroethylene	µg/g	0.05	0.75	9.3	11	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Dichlorodifluoromethane	µg/g	0.05	25	25	25	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,2-Dichloropropane	µg/g	0.05	0.085	0.68	0.75	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
CIS-1,3-Dichloropropene	µg/g	-	-	-	-	<0.045	<0.030	<0.030	<0.060	<0.045	<0.030	<0.030	<0.030	<0.060	<0.045	<0.030
TRANS-1,3-Dichloropropene	µg/g	-	-	-	-	<0.045	<0.030	<0.030	<0.060	<0.045	<0.030	<0.030	<0.030	<0.060	<0.045	<0.030
1,3-Dichloropropene (Cis + Trans)	µg/g	0.05	0.083	0.21	0.24	<0.064	<0.042	<0.042	<0.085	<0.064	<0.042	<0.042	<0.042	<0.085	<0.064	<0.042
Ethylbenzene	µg/g	0.05	15	19	19	<0.027	<0.018	0.098	<0.036	<0.027	<0.018	0.055	0.102	0.054	0.161	<0.018
Ethylene Dibromide	µg/g	0.05	0.05	0.05	0.05	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
n-Hexane	µg/g	0.05	34	88	88	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Methyl Ethyl Ketone	µg/g	0.5	44	88	380	<0.75	<0.50	<0.50	<1.0	<0.75	<0.50	<0.50	<0.50	<1.0	<0.75	<0.55
Methyl Isobutyl Ketone	µg/g	0.5	4.3	210	210	<0.75	<0.50	<0.50	<1.0	<0.75	<0.50	<0.50	<0.50	<1.0	<0.75	<0.50
Methyl tert-butyl Ether	µg/g	0.05	1.4	3.2	3.4	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Methylene Chloride	µg/g	0.05	0.96	2	9.8	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Styrene	µg/g	0.05	2.2	43	75	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.05	0.11	0.14	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,1,2,2-Tetrachloroethane	µg/g	0.05	0.05	0.094	0.11	<0.075	<0.080	<0.23	<0.10	<0.075	<0.050	<0.055	<0.33	<0.10	<0.11	<0.050
Tetrachloroethylene	µg/g	0.05	2.3	21	21	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Toluene	µg/g	0.2	6	78	78	<0.12	<0.080	0.381	<0.16	0.15	<0.080	0.209	0.369	0.17	0.38	<0.080
1,1,1-Trichloroethane	µg/g	0.05	3.4	12	12	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
1,1,2-Trichloroethane	µg/g	0.05	0.05	0.11	0.13	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Trichloroethylene	µg/g	0.05	0.52	0.61	0.69	<0.015	<0.010	0.035	<0.020	<0.015	<0.010	0.031	0.047	0.024	0.061	<0.010
Trichlorofluoromethane	µg/g	0.25	5.8	5.8	5.8	<0.075	<0.050	<0.050	<0.10	<0.075	<0.050	<0.050	<0.050	<0.10	<0.075	<0.050
Vinyl Chloride	µg/g	0.02	0.022	0.25	0.28	<0.030	<0.020	<0.020	<0.040	<0.030	<0.020	<0.020	<0.020	<0.040	<0.030	<0.020
o-Xylene	µg/g	0.05	25	30	30	<0.030	0.047	0.248	<0.040	<0.030	<0.020	0.163	0.31	0.064	0.355	<0.020
m & p-Xylene	µg/g	0.05	25	30	30	<0.060	0.076	0.408	<0.060	<0.045	<0.030	0.246	0.504	0.166	0.663	<0.030
Xylene Mixture (Total)	µg/g	0.05	25	30	30	<0.067	0.123	0.656	<0.072	<0.054	<0.050	0.41	0.814	0.23	1.02	<0.050
4-Bromofluorobenzene	%	-	-	-	-	95	92.8	85.9	88.3	96	88.7	83.9	85.3	84.2	85.5	69.4
1,4-Difluorobenzene	%	-	-	-	-	97.1	96.4	91.4	92.6	98.6	95.1	89.5	92.3	92.1	93.2	90.8
PAH's																
Acenaphthene	µg/g	0.072	58	96	620	0.92	<0.50	0.46	<1.0	<0.75	0.59	0.356	0.373	0.11	0.266	<0.050
Acenaphthylene	µg/g	0.093	0.17	0.17	0.17	<0.75	<0.50	0.225	<1.0	<0.75	<0.50	0.096	0.083	<0.10	0.102	0.233
Anthracene	µg/g	0.16	0.74	0.74	0.74	1.63	0.55	0.693	<1.0	<0.75	1.65	0.563	0.516	0.29	0.42	0.151
Benzo(a)anthracene	µg/g	0.02	0.63	0.96	36	8.2	3.03	2.3	3.4	2.34	7.31	2.1	1.32	1.94	1.18	0.661
Benzo(a)pyrene	µg/g	0.3	0.3	0.3	3.6	8.39	3.62	2.25	4.8	3.16	7.03	2.14	1.2	2.51	1.19	0.752
Benzo(b)fluoranthene	µg/g	0.47	0.78	0.96	36	9.16	3.91	1.96	7.4	4.54	7.32	2.42	1.37	3.3	1.38	0.519
Benzo(g,h,i)perylene	µg/g	0.68	7.8	9.6	360	5.97	2.87	1.51	4.6	2.84	4.86	1.77	0.971	3.03	1.22	0.661
Benzo(k)fluoranthene	µg/g	0.48	0.78	0.96	36	8.51	3.92	2.03	4.1	2.58	7.19	2.33	1.34	2.4	1.06	0.619
Chrysene	µg/g	2.8	7.8	9.6	360	11.5	4.71	3.09	6.8	4.21	9.36	3.05	1.85	3.47	1.92	0.828
Dibenz(a,h)anthracene	µg/g	0.1	0.1	0.1	3.6	1.96	0.8	0.325	1.2	0.76	1.59	0.372	0.202	0.81	0.37	0.153
Fluoranthene	µg/g	0.56	0.69	0.96	360	24.7	8.98	4.99	11.8	7.94	21.6	5.93	3.29	5.61	2.98	1.03
Fluorene	µg/g	0.12	69	69	69	1.01	<0.50	0.684	<1.0	<0.75	0.65	0.632	0.717	0.19	0.578	0.099
Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.48	0.95	36	5.54	2.65	0.945	3.9	2.58	4.61	1.23	0.599	2.9	1.14	0.551
2-and 1-methyl Naphthalene	µg/g	0.59	3.4	85	85	<0.64	1.12	2.45	<0.85	<0.64	<0.42	2.08	3.34	0.485	2.55	0.247
Naphthalene	µg/g	0.09	0.75	28	220	0.63	0.73	1.5	<0.26	<0.20	0.27	1.27	2.09	0.287	1.66	0.153
Phenanthrene	µg/g	0.69	7.8	16	300	14	3.7	3.45	3.2	2.82	9.34	3.51	2.87	1.62	2.15	0.331
Pyrene	µg/g	1	78	96	2900	18.6	7.12	5.49	9.1	6.19	16.2	4.95	2.95	4.48	2.57	1.27
Petroleum Hydrocarbons (PHCs)																
F1 (C6 to C10)	µg/g	25	65	65	65	<7.5	<5.5	20.3	<10	<7.5	<5.0	14.3	22.9	<10	19.2	<5.0
F1 (C6 to C10) minus BTEX	µg/g	25	65	65	65	<7.5	<5.5	19.1	<10	<7.5	<5.0	13.5	21.5	<10	17.5	<5.0
F2 (C10 to C16)	µg/g	10	150	250	250	50	102	143	24	33	25	114	239	38	138	35
F2 (C10 to C16) minus Naphthalene	µg/g	10	150	250	250	49	101	141	24	33	24	113	237	38	137	35
F3 (C16 to C34)	µg/g	240	1300	2500	7200	2390	2340	2150	2730	2060	928	1280	2730	2760	1760	623
F3 (C16 to C34) minus PAHs	µg/g	240	1300	2500	7200	2290	2300	2130	2680	2030	845	1260	2720	2740	1740	617
F4 (C34 to C50)	µg/g	-	-	-	-	1680	1090	859	1690	1320	623	457	882	1480	520	173
F4G-SG (GHH-Silica)	µg/g	120	5600	6600	8000	6680	2780	1770	6340	6000	1310	1360	2740	4640	1530	660
OC Pesticides (Soil)																
Aldrin	mg/Kg	0.05	0.05	0.11	6.3	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
alpha-BHC	mg/Kg	-	-	-	-	<0.060	<0.150	<0.400	<0.080	<0.060	<0.040	<0.500	<0.600	<0.080	<0.090	<0.040
beta-BHC	mg/Kg	-	-	-	-	<0.060	<0.040	<0.080	<0.080	<0.060	<0.040	<0.040	<0.150	<0.080	<0.060	<0.040
gamma-BHC (Lindane)	mg/Kg	0.01	0.063	0.063	0.063	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
delta-BHC	mg/Kg	-	.	-	-	<0.060	<0.200	<0.500	<0.080	<0.060	<0.040	<0.500	<0.700	<0.080	<0.060	<0.040
a-chlordane	mg/Kg	0.05	0.05	0.05	30	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
g-chlordane	mg/Kg	0.05	0.05	0.05	30	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
op-DDD	mg/Kg	0.05	3.3	4.6	110	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
pp-DDD	mg/Kg	0.05	3.3	4.6	110	<0.060	<0.040	<0.150	<0.080	<0.060	<0.040	<0.040	<0.200	<0.080	<0.060	<0.040
o,p-DDE	mg/Kg	0.05	0.33	0.65	110	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
pp-DDE	mg/Kg	0.05	0.33	0.65	110	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Dieldrin	mg/Kg	0.05	0.05	0.11	0.12	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
alpha-Endosulfan	mg/Kg	-	.	-	-	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.090	<0.080	<0.060	<0.040
beta-Endosulfan	mg/Kg	-	.	-	-	<0.060	<0.040	<0.060	<0.080	<0.060	<0.040	<0.060	<0.150	<0.080	<0.090	<0.040
Endosulfan	mg/Kg	0.04	0.04	0.38	0.51	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Endrin	mg/Kg	0.04	0.04	0.04	0.079	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Endrin Aldehyde	mg/Kg	-	.	-	-	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Heptachlor	mg/Kg	0.12	0.15	0.19	2	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Heptachlor Epoxide	mg/Kg	0.05	0.05	0.05	0.05	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Hexachlorobenzene	mg/Kg	0.01	0.52	0.66	15	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Mirex	mg/Kg	-	-	-	-	<0.060	<0.040	<0.040	<0.080	<0.060	<0.040	<0.040	<0.040	<0.080	<0.060	<0.040
Oxychlordane	mg/Kg	-	-	-	-	<0.300	<0.040	<0.040	<0.300	<0.150	<0.100	<0.040	<0.040	<0.50	<0.060	<0.040
PCBs (Soil)																
Aroclor 1242	mg/Kg	-	-	-	-	<0.015	<0.130	0.324	<0.015	<0.018	<0.010	0.386	0.698	<0.0450	<0.30	<0.020
Aroclor 1248	mg/Kg	-	-	-	-	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.010	<0.010	<0.020	<0.015	<0.010
Aroclor 1254	mg/Kg	-	-	-	-	<0.070	0.12	0.323	<0.030	<0.050	<0.040	0.435	0.74	0.117	0.421	<0.0310
Aroclor 1260	mg/Kg	-	-	-	-	<0.015	<0.020	<0.080	<0.015	<0.015	<0.010	<0.150	<0.150	<0.040	<0.0650	<0.020
Total PCBs	mg/Kg	0.3	0.35	1.1	4.1	<0.075	<0.140	0.647	<0.040	<0.060	<0.044	0.821	1.438	0.117	0.421	<0.0450
General																
Electrical Conductivity	ms/cm	0.57	0.7	1.4	NA	1.02	1.01	0.866	0.928	1.99	1.38	0.983	0.821	1.51	1.36	1.11
Chloride	µg/g	NA	NA	NA	NV	257	352	328	356	357	207	313	198	467	498	216
Sodium Adsorption Ratio	SAR	2.4	5	12	NA	4.33	6.46	5.27	3.09	3.74	2.68	4	2.39	3.29	6.34	5.17
Sodium	µg/g	NA	NA	NA	NV	196	141	110	124	192	123	98.7	59.9	149	186	155
Cyanide	µg/g	0.051	0.051	0.051	0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Analytes	Site 6 Int 1	Site 6 Int 2	Site 6 Int 3	Site 7 Int 1	Site 7 Int 2	Site 7 Int 3	Site 8 Int 1	Site 8 Int 2	Site 8 Int 3	Site 9 Int 1	Site 9 Int 2	Site 9 Int 3	Site 10 Int 1	Site 10 Int 2	Site 10 Int 3	Site 11 Int 1	Site 11 Int 2	Site 11 Int 3	Site 12 Int 1	Site 12 Int 2	Site 12 Int 3
Moisture Content	60.2	59.1	51.6	65.3	61.9	47.5	63.8	63.8	51.9	70.2	62.4	33.3	71.9	63.4	58.4	72.1	63	45.0	67	62.2	49
Metals																					
Antimony (Sb)	1.4	1.4	<1.0	1.2	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	1.8	<1.0	1.5	1.1	<1.0	1.5	1.5	<1.0
Arsenic (As)	6	9.7	6	6	9	4.3	5	6.9	6	4.1	8	1.8	4	7.1	7	5.7	12	7.1	5	13.2	7
Barium (Ba)	180	165	117	178	168	87.2	175	139	134	124	129	67.3	132	153	146	173	344	149	153	211	130
Beryllium (Be)	0.6	0.8	0.7	0.6	0.6	0.5	0.6	0.6	0.8	<0.50	0.7	<0.50	<0.50	0.7	0.8	0.6	0.8	0.8	0.5	0.7	0.7
Boron (B), Hot Water Ext.	0.64	0.69	1.04	0.7	0.83	0.89	0.63	1.2	1.24	0.56	0.66	0.76	0.75	0.75	1.03	0.73	0.79	0.76	0.6	0.65	0.62
Boron (B)	12	11.5	13.8	11.7	9.5	9.1	11.3	9.4	13.5	8.9	11.2	5.7	9	12.5	11.9	8.8	10.6	13.1	9.6	10.7	11.5
Cadmium (Cd)	3.0	5.7	0.9	2.9	4.4	0.5	2.2	3.8	0.7	2.2	1.7	<0.50	1.8	3.6	0.8	2.8	2.8	0.7	2.7	5.7	0.9
Chromium (Cr)	58	57.6	41.7	55.4	59.4	31.9	44.9	48.6	42	37.8	49.6	16.1	36.6	48.2	42.7	49.8	75.3	44.2	49.6	65.9	49.6
Chromium VI	<0.40	<0.40	<0.40	<0.40	<0.40	<0.20	<0.40	<0.40	<0.40	<0.40	<0.40	<0.20	<0.40	<0.40	<0.40	<0.40	<0.40	<0.20	<0.40	<0.40	<0.20
Cobalt (Co)	8.5	7.9	8.1	8.3	7.8	6.7	7.9	7.4	10	6.7	8.9	6.4	6.6	7.5	10	8.3	10	11.1	7.4	9.0	8.3
Copper (Cu)	139	93.9	42	127	88	28.3	95	76.8	40	82.3	52	12.9	76	74.3	43	114	90	38.2	109	106	48
Lead (Pb)	282	636	89	281	459	54.3	235	432	66	230	186	11.8	206	396	89	305	926	56.4	298	589	103
Mercury (Hg)	0.256	0.582	0.331	0.276	0.557	0.216	0.2	0.454	0.273	0.203	0.464	0.042	0.181	0.293	0.337	0.239	0.728	0.257	0.229	0.619	0.531
Molybdenum (Mo)	1.8	2	<1.0	1.7	1.3	<1.0	1.3	1.4	<1.0	1	<1.0	<1.0	1.1	1.2	<1.0	1.4	2.3	<1.0	1.5	2.1	<1.0
Nickel (Ni)	23.5	25.4	18.6	23.6	24.6	15.1	21.7	23.6	22.8	18.8	22.3	13.4	18.4	22.9	23.2	24.3	26.9	24.3	21.2	29.2	19.5
Selenium (Se)	1.8	1.2	<1.0	1.8	1.2	<1.0	1.6	1.1	<1.0	1.4	<1.0	<1.0	1.4	1.3	<1.0	1.8	1.5	<1.0	1.6	1.4	<1.0
Silver (Ag)	0.4	0.73	0.26	0.41	0.68	<0.20	0.33	0.56	0.23	0.32	0.34	<0.20	0.29	0.56	0.24	0.36	0.59	<0.20	0.35	0.76	0.32
Thallium (Tl)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	1.2	<1.0
Vanadium (V)	31	29.6	30	32.8	28	24.9	32	28.8	38	25.8	34	20	27	33.6	39	32.7	36	39.6	30	34.2	32
Zinc (Zn)	799	950	273	733	774	169	540	623	210	494	366	98.3	428	632	232	818	739	220	659	989	292
VOC's																					
Acetone	<1.0	<0.75	<0.75	<1.0	<1.0	<0.50	<1.0	<1.0	<0.75	<1.5	<1.0	<0.50	<1.5	<1.0	<0.75	<1.5	<1.0	<0.50	<1.0	<1.0	<0.50
Benzene	0.03	0.04	<0.010	0.021	<0.014	<0.0068	<0.014	0.017	<0.010	<0.020	<0.014	<0.0068	<0.020	<0.014	<0.010	<0.020	<0.014	<0.0068	<0.014	<0.014	<0.0068
Bromodichloromethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Bromoform	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Bromomethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Carbon Tetrachloride	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Chlorobenzene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Chloroform	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Dibromochloromethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,2-Dichlorobenzene	<0.10	<0.11	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,3-Dichlorobenzene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,4-Dichlorobenzene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,1-Dichloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,2-Dichloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,1-Dichloroethylene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
CIS 1,2-Dichloroethylene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
TRANS-1,2-Dichloroethylene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Dichlorodifluoromethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,2-Dichloropropane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
CIS-1,3-Dichloropropene	<0.060	<0.045	<0.045	<0.060	<0.060	<0.030	<0.060	<0.060	<0.045	<0.090	<0.060	<0.030	<0.090	<0.060	<0.045	<0.090	<0.060	<0.030	<0.060	<0.060	<0.030
TRANS-1,3-Dichloropropene	<0.060	<0.045	<0.045	<0.060	<0.060	<0.030	<0.060	<0.060	<0.045	<0.090	<0.060	<0.030	<0.090	<0.060	<0.045	<0.090	<0.060	<0.030	<0.060	<0.060	<0.030
1,3-Dichloropropene (Cis + Trans)	<0.085	<0.064	<0.064	<0.085	<0.085	<0.042	<0.085	<0.085	<0.064	<0.13	<0.085	<0.042	<0.13	<0.085	<0.064	<0.13	<0.085	<0.042	<0.085	<0.085	<0.042
Ethylbenzene	<0.045	0.069	<0.027	<0.036	<0.036	<0.018	<0.036	<0.036	<0.027	<0.054	<0.036	<0.018	<0.054	<0.036	<0.027	<0.054	<0.036	<0.018	<0.036	<0.036	<0.018
Ethylene Dibromide	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
n-Hexane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Methyl Ethyl Ketone	<1.0	<0.75	<0.75	<1.0	<1.0	<0.50	<1.0	<1.0	<0.75	<1.5	<1.0	<0.50	<1.5	<1.0	<0.75	<1.5	<1.0	<0.50	<1.0	<1.0	<0.50
Methyl Isobutyl Ketone	<1.0	<0.75	<0.75	<1.0	<1.0	<0.50	<1.0	<1.0	<0.75	<1.5	<1.0	<0.50	<1.5	<1.0	<0.75	<1.5	<1.0	<0.50	<1.0	<1.0	<0.50
Methyl tert-butyl Ether	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Methylene Chloride	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Styrene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,1,1,2-Tetrachloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,1,2,2-Tetrachloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Tetrachloroethylene	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.21	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Toluene	0.17	0.19	<0.12	<0.16	0.17	<0.080	<0.16	<0.16	<0.12	<0.24	<0.16	<0.080	<0.24	<0.16	<0.12	<0.24	<0.16	<0.080	<0.16	<0.16	<0.080
1,1,1-Trichloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
1,1,2-Trichloroethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Trichloroethylene	<0.020	0.063	<0.015	<0.020	<0.020	<0.010	<0.020	<0.020	<0.015	<0.030	<0.020	<0.010	<0.030	<0.020	<0.015	<0.030	<0.020	<0.010	<0.020	<0.020	<0.010
Trichlorofluoromethane	<0.10	<0.075	<0.075	<0.10	<0.10	<0.050	<0.10	<0.10	<0.075	<0.15	<0.10	<0.050	<0.15	<0.10	<0.075	<0.15	<0.10	<0.050	<0.10	<0.10	<0.050
Vinyl Chloride	<0.040	<0.030	<0.030	<0.040	<0.040	<0.020	<0.040	<0.040	<0.030	<0.060	<0.040	<0.020	<0.060	<0.040	<0.030	<0.060	<0.040	<0.020	<0.040	<0.040	<0.020
o-Xylene	0.058	0.184	<0.030	<0.048	0.159	<0.020	<0.040	0.138	<0.030	<0.060	<0.040	<0.020	<0.060	<0.040	<0.038	<0.060	0.042	<0.020	<0.040	0.099	<0.020
m & p-Xylene	0.14	0.329	<0.045	0.121	0.253	<0.030	0.077	0.176	<0.045	<0.090	<0.060	<0.030	<0.090	0.062	0.052	0.12	0.062	<0.030	<0.060	0.104	<0.030
Xylene Mixture (Total)	0.198	0.513	<0.054	0.121	0.412	<0.050	0.077	0.314	<0.054	<0.11	<0.072	<0.050	<0.11	<0.072	<0.059	0.12	0.104	<0.050	<0.072	0.204	<0.050
4-Bromofluorobenzene	82.1	78.4	85.5	83	84.7	94	91.4	89.4	91.9	95.7	89.8	96	92.9	83.7	90.1	93.1	75.8	83.1	77.6	79.4	91.5
1,4-Difluorobenzene	97.3	84.9	89.2	92.4	89	95.1	100.3	93.7	93.5	98.7	91.8	101.7	96.1	89.9	96.3	96.4	80.6	88.6	81.7	85.6	95.3
PAH's																					
Acenaphthene	0.1	0.311	<0.075	<0.10	0.3	0.062	<0.10	0.15	<0.075	<0.15	<0.10	<0.050	<0.15	0.11	<0.075	<0.15	0.15	<0.050	<0.10	0.23	0.051
Acenaphthylene	0.1	0.117	0.195	<0.10	0.11	0.132	<0.10	0.16	<0.075	<0.15	0.16	<0.050	<0.15	<0.10	0.146	<0.15	0.1	0.218	0.12	<0.10	0.383
Anthracene	0.3	0.445	0.175	0.25	0.42	0.141	0.13	0.26	<0.075	<0.15	0.2	<0.050	<0.15	0.2	0.165	0.3	0.23	0.127	0.28	0.32	0.205
Benzo(a)anthracene	2.18	1.3	0.736	1.83	1.18	0.523	0.98	0.92	0.335	0.86	0.72	0.071	0.86	0.87	0.57	1.59	0.93	0.728	1.97	1.09	0.997
Benzo(a)pyrene	2.82	1.27	0.82	2.48	1.23	0.628	1.42	1.02	0.309	1.38	0.86	0.057	1.27	1.11	0.753	2.16	1.13	0.815	2.69	1.24	1.22
Benzo(b)fluoranthene	3.66	1.45	0.65	3.37	1.41	0.481	2.12	1.22	0.26	2.24	0.83	<0.050	2.61	1.41	0.843	3.16	1.46	0.556	3.65	1.5	0.853
Benzo(g,h,i)perylene	3.32	1.32	0.835	3.04	1.29	0.545	1.92	1.11	0.219	1.28	0.99	<0.050	1.63	1.38	0.88	2.47	1.61	0.77	2.99	1.43	1.14
Benzo(k)fluoranthene	2.71	1.16	0.746	2.43	1.16	0.515	1.43	0.92	0.298	1.59	0.9	0.075	0.71	1.16	0.64	2.2	1.15	0.703	2.7	1.28	1.02
Chrysene	3.82	2.09	1	3.43	1.97	0.611	2.02	1.49	0.305	1.85	1.04	0.055	1.89	1.64	0.802	2.93	1.65	0.626	3.63	1.87	1.22
Dibenz(a,h)anthracene	0.91	0.396	0.202	0.82	0.37	0.125	0.5	0.29	<0.075	0.27	0.26	<0.050	0.28	0.37	0.232	0.7	0.43	0.186	0.84	0.42	0.268
Fluoranthene	6.08	3.17	1.28	5.34	2.96	0.952	3.02	2.17	0.506	2.71	1.38	0.102	2.81	2.16	1.07	4.55	2.3	1.14	5.62	2.76	1.42
Fluorene	0.18	0.695	0.099	0.16	0.58	0.08	0.1	0.32	<0.075	<0.15	0.19	<0.050	<0.15	0.23	0.122	0.18	0.32	0.064	0.18	0.49	0.121
Indeno(1,2,3-cd)pyrene	2.94	1.19	0.691	2.89	1.03	0.476	1.81	1.02	0.195	1.28	0.83	<0.050	1.36	1.08	0.714	2.23	1.32	0.612	2.68	1.26	0.92
2-and 1-methyl Naphthalene	0.362	3.07	0.133	0.353	2.52	<0.042	0.251	1.12	<0.064	0.29	0.497	<0.042	0.28	0.667	0.233	0.54	0.946	<0.042	0.462	1.82	0.169
Naphthalene	0.211	1.96	0.081	0.198	1.54	0.049	0.137	0.658	0.028	0.157	0.29	<0.013	0.15	0.403	0.14	0.292	0.517	0.03	0.273	1.04	0.099
Phenanthrene	1.59	2.42	0.405	1.31	2.02	0.32	0.7	1.11	0.119	0.64	0.623	<0.046	0.6	0.903	0.399	1.17	1.01	0.15	1.47	1.6	0.396
Pyrene	4.9	2.83	1.49	4.34	2.71	1.17	2.48	2.13	0.547	2.33	1.53	0.102	2.39	2.1	1.23	3.81	2.16	1.46	4.62	2.52	1.83
Petroleum Hydrocarbons (PHCs)																					
F1 (C6 to C10)	<10	9.7	<7.5	<10	14	<5.0	<10	<15	<7.5	<15	<10	<5.0	<15	<10	<7.5	<15	<10	<5.0	<10	12	<5.0
F1 (C6 to C10) minus BTEX	<10	8.9	<7.5	<10	14	<5.0	<10	<15	<7.5	<15	<10	<5.0	<15	<10	<7.5	<15	<10	<5.0	<10	12	<5.0
F2 (C10 to C16)	55	115	78	32	45	21	43	67	23	<30	95	<10	<30	127	33	86	145	12	108	187	28
F2 (C10 to C16) minus Naphthalene	55	113	78	31	44	20	43	67	23	<30	95	<10	<30	127	33	86	145	12	108	186	28
F3 (C16 to C34)	2930	1790	842	2330	530	277	2380	990	411	770	1690	<50	550	4030	907	3640	3770	389	3680	4110	872
F3 (C16 to C34) minus PAHs	2910	1780	835	2300	510	271	2370	980	409	760	1680	<50	540	4020	900	3620	3760	383	3660	4090	864
F4 (C34 to C50)	1540	654	266	1210	140	68	1210	200	95	280	350	<50	170	1510	203	1810	1610	102	1870	1680	313
F4G-SG (GHH-Silica)	5760	1920	850	3310	<500	-	3420	770	-	<750	-	-	-	4160	610	5960	4940	370	4570	4490	660
OC Pesticides (Soil)																					
Aldrin	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.090	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
alpha-BHC	<0.080	<0.090	<0.060	<0.080	<0.14	<0.020	<0.080	<0.130	<0.060	<0.12	<0.160	<0.020	<0.12	<0.20	<0.040	<0.12	<0.14	<0.050	<0.080	<0.40	<0.070
beta-BHC	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
gamma-BHC (Lindane)	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
delta-BHC	<0.080	<0.060	<0.080	<0.080	<0.080	<0.020	<0.080	<0.260	<0.060	<0.12	<0.210	<0.020	<0.12	<0.30	<0.050	<0.12	<0.19	<0.020	<0.080	<0.40	<0.14
a-chlordane	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
g-chlordane	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
op-DDD	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
pp-DDD	<0.080	<0.090	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
o,p-DDE	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
pp-DDE	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Dieldrin	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
alpha-Endosulfan	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
beta-Endosulfan	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.040
Endosulfan	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Endrin	<0.080	<0.080	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.040	<0.080	<0.080	<0.030
Endrin Aldehyde	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Heptachlor	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Heptachlor Epoxide	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Hexachlorobenzene	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Mirex	<0.080	<0.060	<0.060	<0.080	<0.080	<0.020	<0.080	<0.080	<0.060	<0.12	<0.080	<0.020	<0.12	<0.080	<0.030	<0.12	<0.080	<0.020	<0.080	<0.080	<0.020
Oxychlordane	<0.35	<0.060	<0.060	<0.50	<0.080	<0.020	<0.40	<0.080	<0.060	<0.13	<0.080	<0.020	<0.17	<0.080	<0.030	<0.45	<0.080	<0.020	<0.20	<0.080	<0.020
PCBs (Soil)																					
Aroclor 1242	<0.0850	<0.40	<0.0260	<0.0550	<0.310	<0.0250	<0.050	<0.350	<0.0250	<0.080	<0.0850	<0.010	<0.0550	<0.210	<0.060	<0.150	<0.250	<0.020	<0.0820	<0.50	<0.0520
Aroclor 1248	<0.020	<0.015	<0.015	<0.020	<0.020	<0.010	<0.020	<0.020	<0.015	<0.030	<0.020	<0.010	<0.030	<0.020	<0.015	<0.030	<0.020	<0.010	<0.020	<0.020	<0.010
Aroclor 1254	0.118	0.611	<0.030	0.127	0.69	<0.010	0.137	0.479	<0.015	0.144	0.172	<0.010	0.141	0.298	<0.060	0.251	0.326	<0.010	0.183	0.652	<0.040
Aroclor 1260	<0.020	<0.110	<0.040	<0.040	<0.120	<0.020	<0.030	<0.110	<0.020	<0.050	<0.030	<0.010	<0.0650	<0.120	<0.015	<0.0820	<0.080	<0.0150	<0.0550	<0.150	<0.030
Total PCBs	0.118	0.611	<0.060	0.127	0.69	<0.0350	0.137	0.479	<0.040	0.144	0.172	<0.020	0.141	0.298	<0.090	0.251	0.326	<0.030	0.183	0.652	<0.075
General																					
Electrical Conductivity	1.16	1.55	1.11	1.29	2.43	1.06	1.42	2.03	1.91	1.02	1.88	0.492	1.19	1.6	1.09	1.22	1.87	1.13	1.28	1.79	1.12
Chloride	310	719	462	874	1150	458	476	1140	1010	371	852	349	448	931	1030	434	650	300	459	818	460
Sodium Adsorption Ratio	4.03	10.6	8.48	5.6	11	9.68	6.79	13.7	11	4.31	10.5	10.5	6.04	16.3	13	5.55	7.44	6.71	4.84	10.5	11.5
Sodium	139	265	182	178	403	186	215	361	330	117	312	149	161	336	374	166	282	182	162	321	205
Cyanide	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Analytes	Site 13 Int 1	Site 13 Int 2	Site 13 Int 3	Site 14 Int 1	Site 14 Int 2	Site 14 Int 3	Site 15 Int 1	Site 15 Int 2	Site 15 Int 3	Site 16 Int 1	Site 16 Int 2	Site 16 Int 3	Site 17 Int 1	Site 17 Int 2	Site 17 Int 3	Site 18 Int 1	Site 18 Int 2	Site 18 Int 3	Site 19 - QAQC Loc 14 Int 1	Site 19 Int 2	Site 19 Int 3	Site 20 - QAQC Loc 9 Int 1	Site 20 Int 2	Site 20 Int 3
Moisture Content	69.3	61.8	44.5	70.8	65.1	50.2	69.1	59.8	42.3	70.9	61.2	51.9	56.3	27.8	22.6	68.8	45.8	25.7	69.0	62.8	40.7	70.2	58.6	30.4
Metals																								
Antimony (Sb)	1.5	<1.0	<1.0	1.4	1.2	<1.0	<1.0	2.1	<1.0	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	1	<1.0
Arsenic (As)	5.5	9	4.6	5	9	6	4.5	10	3.6	4	9.9	7	3.1	2.9	5	4	4	3.5	4.3	10	3.8	4.4	7	1.9
Barium (Ba)	164	170	130	143	139	132	141	173	108	125	180	130	58.1	43	65.8	83.2	57.7	43.2	130	176	129	129	127	57.4
Beryllium (Be)	0.6	0.8	0.8	0.6	0.6	0.7	<0.50	0.8	0.5	<0.50	0.8	0.7	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50	0.8	0.7	<0.50	0.6	<0.50
Boron (B), Hot Water Ext.	0.64	0.59	0.74	0.64	0.59	0.67	0.79	0.84	1.14	0.53	0.71	1.12	0.5	0.19	0.15	1.07	0.6	0.54	0.61	0.7	0.82	0.74	0.7	0.58
Boron (B)	8.5	13.4	11.2	9.9	10	9.9	9.6	11.1	9	7.2	10.4	11.8	6.4	5.3	8.9	10.6	6.4	5.4	7.5	12.5	10.3	9	9.5	6
Cadmium (Cd)	3.4	1.6	0.5	2.6	2.3	0.6	2.4	3.4	0.5	1.5	4.2	0.5	0.6	<0.50	<0.50	0.6	<0.50	<0.50	2.5	3.2	0.6	2.3	1.7	<0.50
Chromium (Cr)	47.3	63.2	32.1	40.5	54.9	28.1	41.1	62.4	24	33.1	55.3	38.2	19.8	15.8	20.9	28.4	18.2	12.6	37.4	62.7	25	39.5	47.7	14.7
Chromium VI	<0.40	<0.40	<0.20	<0.40	<0.40	<0.40	<0.40	<0.40	<0.20	<0.40	<0.40	<0.40	<0.40	<0.20	<0.20	<0.40	<0.20	<0.20	<0.40	<0.40	<0.20	<0.40	<0.40	<0.20
Cobalt (Co)	7.8	9.9	9.8	7	8.4	8.5	7.2	9.5	6.7	6.3	8.3	9.9	5.9	4.9	10.7	6.2	5.6	4.7	6.7	9.7	7.6	7.0	8.7	5.8
Copper (Cu)	99.7	63	26.8	86	64.1	21	88.2	76	24.8	70	77.5	34	31.6	16.9	23	49.4	32	22.7	84.1	76	18.4	85.4	51	13.3
Lead (Pb)	352	176	30.8	285	265	25	267	384	26.1	184	468	49	76.6	39	12	61	46	38.1	260	358	24.2	243	187	9.3
Mercury (Hg)	0.234	0.554	0.171	0.185	0.62	0.109	0.214	0.482	0.12	0.159	0.57	0.235	0.0521	0.0515	0.0175	0.0552	0.0533	0.0446	0.211	0.55	0.101	0.21	0.443	0.0303
Molybdenum (Mo)	1.3	1.1	<1.0	1.3	1.2	<1.0	1.2	1.4	<1.0	<1.0	2.5	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	1.1	1.7	<1.0	1.1	<1.0	<1.0
Nickel (Ni)	22.1	24.6	20	19.8	22.7	17.7	20.4	27.5	14.6	17.7	26.4	21.6	12.6	9.8	22.9	15.3	12.5	10.5	18.6	27	15.8	19.1	21.8	12.1
Selenium (Se)	1.7	1.1	<1.0	1.6	1.1	<1.0	1.5	1.3	<1.0	1.3	1.3	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	1.3	1.3	<1.0	1.5	<1.0	<1.0
Silver (Ag)	0.41	0.41	<0.20	0.39	0.5	<0.20	0.38	0.64	<0.20	0.25	0.65	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.35	0.58	<0.20	0.32	0.37	<0.20
Thallium (Tl)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	30.3	38	36.1	28	32.6	33	29.1	39	26.3	25	34.3	38	21.6	21.6	28	24.1	21	18.8	24.9	38	29.2	26.6	33	21
Zinc (Zn)	679	407	197	546	497	195	526	601	154	384	643	171	198	112	63.5	268	143	75.1	531	614	193	514	368	52.3
VOC's																								
Acetone	<1.9	<1.0	<0.50	<1.5	<1.0	<0.75	<1.0	<0.75	<0.50	<1.5	<1.0	<0.75	<0.75	<0.50	<0.50	<1.0	<1.5	<0.50	<0.50	<1.0	<0.50	<1.0	<0.75	<0.50
Benzene	<0.026	<0.014	<0.0068	<0.020	<0.014	<0.010	<0.014	<0.010	<0.0068	<0.020	<0.014	<0.010	<0.010	<0.0068	<0.0068	<0.014	<0.0068	<0.0068	<0.0068	<0.014	<0.0068	<0.014	<0.010	<0.0068
Bromodichloromethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Bromoform	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Bromomethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Carbon Tetrachloride	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Chlorobenzene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Chloroform	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Dibromochloromethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,2-Dichlorobenzene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.095	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,3-Dichlorobenzene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,4-Dichlorobenzene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,1-Dichloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,2-Dichloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,1-Dichloroethylene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
CIS 1,2-Dichloroethylene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
TRANS-1,2-Dichloroethylene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Dichlorodifluoromethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,2-Dichloropropane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
CIS-1,3-Dichloropropene	<0.11	<0.060	<0.030	<0.090	<0.060	<0.045	<0.060	<0.045	<0.030	<0.090	<0.060	<0.045	<0.045	<0.030	<0.030	<0.060	<0.030	<0.030	<0.030	<0.060	<0.030	<0.060	<0.045	<0.030
TRANS-1,3-Dichloropropene	<0.11	<0.060	<0.030	<0.090	<0.060	<0.045	<0.060	<0.045	<0.030	<0.090	<0.060	<0.045	<0.045	<0.030	<0.030	<0.060	<0.030	<0.030	<0.030	<0.060	<0.030	<0.060	<0.045	<0.030
1,3-Dichloropropene (Cis + Trans)	<0.16	<0.085	<0.042	<0.13	<0.085	<0.064	<0.085	<0.064	<0.042	<0.13	<0.085	<0.064	<0.064	<0.042	<0.042	<0.085	<0.042	<0.042	<0.042	<0.085	<0.042	<0.085	<0.064	<0.042
Ethylbenzene	<0.068	<0.036	<0.018	<0.054	<0.036	<0.027	<0.036	<0.027	<0.018	<0.054	<0.036	<0.027	<0.027	<0.018	<0.018	<0.036	<0.018	<0.018	<0.018	<0.036	<0.018	<0.036	<0.027	<0.018
Ethylene Dibromide	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
n-Hexane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Methyl Ethyl Ketone	<1.9	<1.0	<0.50	<1.5	<1.0	<0.75	<1.0	<0.75	<0.50	<1.5	<1.0	<0.75	<0.75	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.75	<0.50
Methyl Isobutyl Ketone	<1.9	<1.0	<0.50	<1.5	<1.0	<0.75	<1.0	<0.75	<0.50	<1.5	<1.0	<0.75	<0.75	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.75	<0.50
Methyl tert-butyl Ether	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Methylene Chloride	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Styrene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,1,1,2-Tetrachloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,1,2,2-Tetrachloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.15	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Tetrachloroethylene	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Toluene	<0.30	<0.16	<0.080	<0.24	<0.16	<0.12	<0.16	<0.12	<0.080	<0.24	<0.16	<0.12	<0.12	<0.080	<0.080	<0.16	<0.080	<0.080	<0.080	<0.16	<0.080	<0.16	<0.12	<0.080
1,1,1-Trichloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
1,1,2-Trichloroethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Trichloroethylene	<0.038	<0.020	<0.010	<0.030	<0.020	<0.015	<0.020	<0.015	<0.010	<0.030	<0.020	<0.015	<0.015	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.020	<0.010	<0.025	<0.015	<0.010
Trichlorofluoromethane	<0.19	<0.10	<0.050	<0.15	<0.10	<0.075	<0.10	<0.075	<0.050	<0.15	<0.10	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.075	<0.050
Vinyl Chloride	<0.076	<0.040	<0.020	<0.060	<0.040	<0.030	<0.040	<0.030	<0.020	<0.060	<0.040	<0.030	<0.030	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.040	<0.020	<0.040	<0.030	<0.020
o-Xylene	<0.076	<0.040	<0.020	<0.060	<0.040	<0.030	<0.040	0.067	<0.020	<0.060	0.064	<0.030	<0.030	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.040	<0.020	<0.040	<0.030	<0.020
m & p-Xylene	0.12	<0.060	<0.030	<0.090	0.067	<0.045	<0.093	0.103	<0.030	<0.090	0.081	<0.045	<0.045	<0.030	<0.030	<0.060	<0.030	<0.030	<0.030	0.071	<0.030	<0.090	<0.045	<0.030
Xylene Mixture (Total)	<0.14	<0.072	<0.050	<0.11	<0.072	<0.054	<0.10	0.17	<0.050	<0.11	0.145	<0.054	<0.054	<0.050	<0.050	<0.072	<0.050	<0.050	<0.050	<0.072	<0.050	<0.098	<0.054	<0.050
4-Bromofluorobenzene	94.6	79.8	91.4	92.5	86.4	94.8	89.5	85.2	93	94.8	84	89.7	96.8	110.1	111.1	89.7	106.9	107.5	79.6	81.6	93.7	87.2	85.3	103.3
1,4-Difluorobenzene	98.8	84.6	95	97.7	91.6	98.9	92.9	92.9	98	99.6	88.6	93.5	101	114.8	114.2	94.8	114	107.9	83.9	86.3	98.4	91.5	92	108.7
PAH's																								
Acenaphthene	<0.10	<0.10	<0.050	<0.15	0.14	<0.075	<0.15	0.119	<0.050	<0.15	0.16	<0.075	<0.075	<0.050	<0.050	<0.10	<0.050	0.069	<0.10	<0.10	<0.050	<0.15	0.082	<0.050
Acenaphthylene	<0.10	0.36	0.089	<0.15	0.14	<0.075	<0.15	0.114	0.208	<0.15	<0.10	0.144	<0.075	<0.050	<0.050	<0.10	<0.050	<0.050	<0.10	<0.10	<0.050	<0.15	0.153	<0.050
Anthracene	0.17	0.25	0.072	0.15	0.27	<0.075	<0.15	0.211	0.095	<0.15	0.26	0.126	<0.075	<0.050	<0.050	0.14	0.109	0.062	0.11	0.13	<0.050	<0.15	0.18	<0.050
Benzo(a)anthracene	1.16	1.15	0.371	0.96	0.82	0.249	0.8	0.773	0.448	0.67	0.83	0.459	0.346	0.182	<0.050	1.83	0.917	0.346	0.77	0.57	0.089	0.84	0.644	<0.050
Benzo(a)pyrene	1.69	1.39	0.41	1.53	1	0.287	1.16	0.941	0.642	1.06	1.02	0.678	0.381	0.234	<0.050	2.52	1.31	0.442	1.16	0.71	0.104	1.25	0.817	<0.050
Benzo(b)fluoranthene	2.65	1.06	0.302	2.4	1.24	0.236	2.48	1.16	0.453	1.62	1.35	0.543	0.474	0.229	<0.050	3.05	1.85	0.623	1.71	0.89	0.089	2.53	0.915	<0.050
Benzo(g,h,i)perylene	2.06	1.4	0.301	1.98	1.18	0.224	1.44	1.15	0.552	1.05	1.21	0.589	0.367	0.223	<0.050	2.01	1.24	0.366	1.08	0.65	0.065	1.57	0.891	<0.050
Benzo(k)fluoranthene	1.65	1.26	0.32	1.58	0.94	0.253	0.7	0.937	0.498	1.55	1.04	0.595	0.402	0.232	<0.050	2.26	1.13	0.397	1.28	0.73	0.111	0.89	0.688	<0.050
Chrysene	2.35	1.44	0.386	2.05	1.3	0.217	1.69	1.26	0.335	1.51	1.5	0.453	0.526	0.279	<0.050	3.26	1.71	0.607	1.65	0.83	0.083	1.77	0.927	<0.050
Dibenz(a,h)anthracene	0.55	0.34	0.076	0.52	0.32	<0.075	0.27	0.315	0.116	0.25	0.33	0.146	0.079	0.052	<0.050	0.46	0.37	0.106	0.27	0.15	<0.050	0.27	0.23	<0.050
Fluoranthene	3.49	1.81	0.67	2.99	1.79	0.5	2.85	1.76	0.62	2.16	2.12	0.781	0.961	0.384	<0.050	5.81	3	1.2	2.36	1.14	0.204	2.58	1.26	<0.050
Fluorene	0.13	0.16	<0.050	<0.15	0.3	<0.075	<0.15	0.253	<0.050	<0.15	0.36	<0.075	<0.075	<0.050	<0.050	<0.10	0.071	0.086	0.1	0.14	<0.050	<0.15	0.185	<0.050
Indeno(1,2,3-cd)pyrene	1.86	1.14	0.26	1.77	0.94	0.18	1.19	0.94	0.463	0.93	0.98	0.465	0.273	0.173	<0.050	1.65	1.2	0.336	0.95	0.5	0.054	1.45	0.746	<0.050
2-and 1-methyl Naphthalene	0.368	0.307	<0.042	0.38	0.957	<0.064	0.3	0.746	<0.042	<0.64	1.26	<0.064	<0.064	<0.042	<0.042	<0.085	<0.042	<0.042	<0.42	0.339	<0.042	0.26	0.501	<0.042
Naphthalene	0.2	0.167	<0.013	0.213	0.554	<0.020	0.16	0.432	0.027	<0.20	0.73	0.04	0.02	0.014	<0.013	<0.026	0.019	<0.013	0.16	0.206	<0.013	0.156	0.298	<0.013
Phenanthrene	0.832	0.453	0.124	0.72	0.787	0.083	0.57	0.774	0.098	0.5	1.16	0.15	0.31	0.119	<0.046	1.73	0.898	0.486	0.571	0.422	<0.046	0.61	0.583	<0.046
Pyrene	2.87	2.24	0.801	2.51	1.82	0.649	2.5	1.8	0.852	1.8	2	1	0.751	0.405	<0.050	4.5	2.33	0.901	1.98	1.22	0.246	2.21	1.39	<0.050
Petroleum Hydrocarbons (PHCs)																								
F1 (C6 to C10)	<19	<10	<5.0	<15	<10	<7.5	<10	<7.5	<5.0	<15	<10	<7.5	<7.5	<5.0	<5.0	<10	<5.0	<5.0	<15	<10	<5.0	<10	<7.5	<5.0
F1 (C6 to C10) minus BTEX	<19	<10	<5.0	<15	<10	<7.5	<10	<7.5	<5.0	<15	<10	<7.5	<7.5	<5.0	<5.0	<10	<5.0	<5.0	<15	<10	<5.0	<10	<7.5	<5.0
F2 (C10 to C16)	95	26	48	43	50	16	23	35	16	59	109	29	<15	<10	13	28	15	11	32	46	14	37	28	<10
F2 (C10 to C16) minus Naphthalene	95	26	48	43	50	16	23	35	16	59	108	29	<15	<10	13	28	15	11	32	46	14	37	28	<10
F3 (C16 to C34)	3720	1230	1560	1000	960	135	600	532	251	3670	1890	540	160	243	51	690	534	128	1310	1010	116	830	363	<50
F3 (C16 to C34) minus PAHs	3700	1220	1560	980	950	133	590	523	247	3660	1880	536	156	241	51	660	521	123	1300	1000	115	820	355	<50
F4 (C34 to C50)	1760	440	590	340	260	<75	170	158	51	1790	140	128	<75	84	<50	280	182	59	450	210	<50	260	<75	<50
F4G-SG (GHH-Silica)	4530	2070	<250	1130	750	-	-	470	-	<750						930	830		1180	-	-	-	-	-
OC Pesticides (Soil)																								
Aldrin	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.100	<0.020	<0.080	<0.060	<0.020
alpha-BHC	<0.080	<0.20	<0.020	<0.12	<0.100	<0.030	<0.080	<0.090	<0.040	<0.12	<0.300	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.110	<0.020	<0.080	<0.070	<0.020
beta-BHC	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
gamma-BHC (Lindane)	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
delta-BHC	<0.080	<0.30	<0.020	<0.12	<0.150	<0.030	<0.080	<0.200	<0.040	<0.12	<0.300	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.170	<0.020	<0.080	<0.090	<0.020
a-chlordane	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
g-chlordane	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
op-DDD	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
pp-DDD	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
o,p-DDE	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
pp-DDE	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Dieldrin	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
alpha-Endosulfan	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
beta-Endosulfan	<0.080	<0.050	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.100	<0.020	<0.080	<0.060	<0.020
Endosulfan	<0.080	<0.040	<0.22	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Endrin	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Endrin Aldehyde	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Heptachlor	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Heptachlor Epoxide	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Hexachlorobenzene	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Mirex	<0.080	<0.040	<0.020	<0.12	<0.080	<0.030	<0.080	<0.080	<0.040	<0.12	<0.080	<0.030	<0.030	<0.020	<0.020	<0.080	<0.040	<0.020	<0.080	<0.080	<0.020	<0.080	<0.060	<0.020
Oxychlordane	<0.35	<0.040	<0.020	<0.12	<0.080	<0.030	<0.130	<0.080	<0.040	<0.30	<0.080	<0.030	<0.60	<0.070	<0.020	<0.50	<0.040	<0.020	<0.20	<0.080	<0.020	<0.140	<0.060	<0.020
PCBs (Soil)																								
Aroclor 1242	<0.0650	<0.110	<0.0150	<0.030	<0.120	<0.015	<0.070	<0.090	<0.010	<0.060	<0.200	<0.015	<0.015	<0.010	<0.010	<0.020	<0.010	<0.010	<0.0650	<0.070	<0.0150	<0.080	<0.070	<0.010
Aroclor 1248	<0.020	<0.020	<0.010	<0.030	<0.020	<0.015	<0.020	<0.015	<0.010	<0.030	<0.020	<0.015	<0.015	<0.010	<0.010	<0.020	<0.010	<0.010	<0.020	<0.020	<0.010	<0.030	<0.015	<0.010
Aroclor 1254	0.151	<0.10	<0.0110	<0.150	0.362	<0.015	0.162	0.373	<0.010	0.105	0.541	<0.015	<0.015	<0.010	<0.010	<0.0250	<0.012	<0.010	0.146	0.111	<0.010	0.161	0.199	<0.010
Aroclor 1260	<0.0450	<0.0450	<0.020	<0.030	<0.100	<0.015	<0.050	<0.090	<0.010	<0.030	<0.030	<0.015	<0.015	<0.010	<0.010	<0.020	<0.010	<0.010	<0.0460	<0.0250	<0.0150	<0.0450	<0.015	<0.010
Total PCBs	0.151	<0.20	<0.030	<0.160	0.362	<0.030	0.162	0.373	<0.020	0.105	0.541	<0.030	<0.040	<0.020	<0.020	<0.0430	<0.021	<0.020	0.146	0.111	<0.0260	0.161	0.199	<0.020
General																								
Electrical Conductivity	0.76	1.65	1.09	0.965	1.47	0.884	1.33	0.957	0.96	0.746	0.746	1.36	1.13	0.997	0.496	0.384	1	0.712	0.282	1.6	1.02	0.734	1.26	0.344
Chloride	294	533	446	399	524	375	677	800	506	573	933	590	247	66.3	43.7	495	289	114	421	672	355	418	497	216
Sodium Adsorption Ratio	4.57	9.12	9.01	5.85	9.76	10	6.84	13.4	9.72	6.95	13.3	10	2.66	1.43	0.81	4.43	5.61	3.39	5.6	8.92	9.57	4.42	13.4	10.5
Sodium	157	285	190	134	256	213	205	285	240	212	367	260	96.1	33.1	15.5	159	97	35.6	158	280	192	128	237	106
Cyanide	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Exceedances

Colour	Standard
Green	O.Reg. 153/04 Table 1: soil standards for residential/ parkland/ institutional/ industrial/ commercial/ community property use
Yellow	O.Reg. 153/04 Table 3: fine soil standards for residential/ parkland/ institutional property use in a non-potable groundwater setting
Orange	O.Reg. 153/04 Table 3: fine soil standards for industrial/ commercial property use in a non-potable groundwater setting
Grey	O.Reg. 153/04 Table 5: fine stratified (Subsurface Soil) soil standards for industrial/ commercial property use in a non-potable groundwater setting

O. Reg. 558 Metals and Inorganics **Parameter**	**Unit**	Schedule 4 Leachate Quality Criteria	Location 4 Interval 3	Location 6 Interval 2	Location 11 Interval 2	Bulk Analysis Threshold
Arsenic Leachate	mg/L	2.5	<0.050	<0.050	<0.050	50
Barium Leachate	mg/L	100	0.860	0.860	1.290	2000
Boron Leachate	mg/L	500	<2.5	<2.5	<2.5	10000
Cadmium Leachate	mg/L	0.5	0.0239	<0.0050	0.0093	10
Chromium Leachate	mg/L	5	<0.050	<0.050	<0.050	100
Cyanide Leachate	mg/L	20	<0.10	<0.10	<0.10	400
Fluoride Leachate	mg/L	150	<10	<10	<10	3000
Lead Leachate	mg/L	5	2.59	0.231	0.222	100
Mercury Leachate	mg/L	0.1	<0.00010	<0.00010	<0.00010	2
(Nitrate + Nitrite) as N Leachate	mg/L	1000	<4.0	<4.0	<4.0	20000
Selenium Leachate	mg/L	1	<0.025	<0.025	<0.025	20
Silver Leachate	mg/L	5	<0.0050	<0.0050	<0.0050	100
Uranium Leachate	mg/L	10	<0.25	<0.25	<0.25	200

Analytes	Units	Provincial Sediment Quality Guidelines				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18
		Background	No Effect Level	Lowest Effect Level	Severe Effect Level																		
Nutrients																							
Total Organic Carbon (%)	µg/g		NA	1	10	5.43	7.08	5.3	3.93	7.24	6.6	6.61	5.46	5.28	5.08	6.02	5.98	5.9	5.17	5.34	4.96	5.04	4.88
Total Kjeldahl Nitrogen*	µg/g		NA	550	4800																		
Metals																							
Arsenic (As)	µg/g	4	NA	6	33	3.5	5	4	3	5.7	6.1	6.0	5	4.1	3.9	6	5	6	5	4.5	4	3	4
Cadmium (Cd)	µg/g	1.0	NA	0.6	10	1.3	1.3	1.1	0.6	3.03	2.98	2.92	2.2	2.2	1.8	2.8	2.7	3.4	2.6	2.4	1.5	0.6	0.6
Chromium (Cr)	µg/g	31	NA	26	110	49.8	50.6	38.9	34.5	55	58	55	44.9	37.8	36.6	49.8	49.6	47.3	40.5	41.1	33.1	19.8	28.4
Copper (Cu)	µg/g	25	NA	16	110	75.6	114	72	55	117	139	127	95	82.3	75.6	114	109	100	86	88	70	32	49
Lead (Pb)	µg/g	23	NA	31	250	117	148	95	73	278	282	281	235	230	206	305	298	352	285	267	184	77	61
Mercury (Hg)	µg/g	0.10	NA	0.2	2	0.117	0.185	0.104	0.0723	0.271	0.256	0.276	0.2	0.203	0.181	0.239	0.229	0.234	0.185	0.214	0.159	0.0521	0.0552
Nickel (Ni)	µg/g	31	NA	16	75	15.3	17.7	14.3	10.4	23.1	23.5	23.6	21.7	18.8	18.4	24.3	21.2	22.1	19.8	20.4	17.7	12.6	15.3
Zinc (Zn)	µg/g	65	NA	120	820	435	641	389	279	810	799	733	540	494	428	818	659	679	546	526	384	198	268
PAH's																							
Acenaphthene	µg/g	NA	NA	-	-	0.92	*<1*	*<0.75*	0.59	0.11	0.1	<0.1	<0.1	*<0.15*	*<0.15*	*<0.15*	*<0.1*	*<0.1*	*<0.15*	*<0.15*	*<0.15*	*<0.075*	*<0.1*
Acenaphthylene	µg/g	NA	NA	-	-	*<0.75*	*<1*	*<0.75*	*0.25*	0.05	0.1	<0.1	<0.1	*<0.15*	*<0.15*	*<0.15*	0.12	*<0.1*	*<0.15*	*<0.15*	*<0.15*	*<0.075*	*<0.1*
Anthracene	µg/g	NA	NA	0.220	370	1.63	***<1***	***<0.75***	1.65	0.29	0.3	0.25	0.13	*<0.15*	*<0.15*	0.3	0.28	0.17	0.15	*<0.15*	*<0.15*	*<0.075*	0.14
Benzo(a)anthracene	µg/g	NA	NA	0.320	1480	8.2	3.4	2.34	7.31	1.94	2.18	1.83	0.98	0.86	0.86	1.59	1.97	1.16	0.96	0.8	0.67	0.346	1.83
Benzo(a)pyrene	µg/g	NA	NA	0.370	1440	8.39	4.8	3.16	7.03	2.51	2.82	2.48	1.42	1.38	1.27	2.16	2.69	1.69	1.53	1.16	1.06	0.381	2.52
Benzo(b)fluoranthene	µg/g	NA	NA	-	-	9.16	7.4	4.54	7.32	3.3	3.66	3.37	2.12	2.24	2.61	3.16	3.65	2.65	2.4	2.48	1.62	0.474	3.05
Benzo(g,h,i)perylene	µg/g	NA	NA	0.170	320	5.97	4.6	2.84	4.86	3.03	3.32	3.04	1.92	1.28	1.63	2.47	2.99	2.06	1.98	1.44	1.05	0.367	2.01
Benzo(k)fluoranthene	µg/g	NA	NA	-	-	8.51	4.1	2.58	7.19	2.4	2.71	2.43	1.43	1.59	0.71	2.2	2.7	1.65	1.58	0.7	1.55	0.402	2.26
Chrysene	µg/g	NA	NA	0.340	460	11.5	6.8	4.21	9.36	3.47	3.82	3.43	2.02	1.85	1.89	2.93	3.63	2.35	2.05	1.69	1.51	0.526	3.26
Dibenz(a,h)anthracene	µg/g	NA	NA	0.060	130	1.96	1.2	0.76	1.59	0.81	0.91	0.82	0.5	0.27	0.28	0.7	0.84	0.55	0.52	0.27	0.25	0.079	0.46
Fluoranthene	µg/g	NA	NA	0.750	1020	24.7	11.8	7.94	21.6	5.61	6.08	5.34	3.02	2.71	2.81	4.55	5.62	3.49	2.99	2.85	2.16	0.961	5.81
Fluorene	µg/g	NA	NA	0.190	160	1.01	***0.5***	***<0.75***	0.65	0.19	0.18	0.16	0.1	*<0.15*	*<0.15*	0.18	0.18	0.13	*<0.15*	*<0.15*	*<0.15*	*<0.075*	*<0.1*
Indeno(1,2,3-cd)pyrene	µg/g	NA	NA	0.200	320	5.54	3.9	2.58	4.61	2.9	2.94	2.89	1.81	1.28	1.36	2.23	2.68	1.86	1.77	1.19	0.93	0.273	1.65
Naphthalene	µg/g	NA	NA	-	-	0.63	*<0.26*	*0.1*	0.27	0.287	0.211	0.198	0.137	0.157	0.15	0.54	0.462	0.368	0.213	0.16	*0.1*	0.02	*<0.026*
Phenanthrene	µg/g	NA	NA	0.560	950	14	3.2	2.82	9.34	1.62	1.59	1.31	0.7	0.64	0.6	0.292	0.273	0.2	0.72	0.57	0.5	0.31	1.73
Pyrene	µg/g	NA	NA	-	-	18.6	9.1	6.19	16.2	4.48	4.9	4.34	2.48	2.33	2.39	1.17	1.47	0.832	2.51	2.5	1.8	0.751	4.5
Total PAH	µg/g	NA	NA	4	10000	121.095	62.43	41.56	99.82	32.997	35.821	31.988	18.867	16.887	16.86	24.622	29.605	19.26	19.60	16.11	13.5	5.04	29.383
OC Pesticides + PCBs (Soil)																							
Aldrin	mg/kg	0.001	NA	0.002	8	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
alpha-BHC	mg/kg	0.001	NA	0.006	10	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
beta-BHC	mg/kg	0.001	NA	0.005	21	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
delta-BHC	mg/kg	0.001	0.0002	0.003*	1*	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Chlordane	mg/kg	0.001	0.005	0.007	6	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
pp-DDD	mg/kg	0.002	NA	0.008	6	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
pp-DDE	mg/kg	0.003	NA	0.005	19	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Dieldrin	mg/kg	0.001	0.0006	0.002	91	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Endrin	mg/kg	0.001	0.0005	0.003	130	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
HCB	mg/kg	0.001	0.01	0.02	24	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Heptachlor	mg/kg	0.001	0.0003	NA	NA	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Heptachlor Epoxide	mg/kg	0.001	NA	0.005*	5*	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
Mirex	mg/kg	0.001	NA	0.004	130	<0.060	<0.080	<0.060	<0.040	**<0.08**	**<0.08**	**<0.08**	**<0.08**	**<0.12**	**<0.12**	**<0.12**	**<0.08**	**<0.08**	**<0.12**	**<0.080**	**<0.12**	**<0.030**	**<0.080**
PCB (total)	mg/kg	0.02	0.01	0.07	530	**<0.075**	**<0.040**	**<0.060**	**<0.044**	0.117	0.118	0.127	0.137	0.144	0.141	0.251	0.183	0.151	**<0.160**	0.162	0.105	<0.040	<0.0430
PCB 1248	mg/kg	NA	NA	0.03*	150*	<0.015	<0.015	<0.015	<0.010	<0.020	<0.020	<0.020	<0.020	<0.030	<0.030	<0.030	<0.020	<0.020	<0.030	<0.020	<0.030	<0.015	<0.020
PCB 1254	mg/kg	NA	NA	0.06*	34*	<0.070	<0.030	<0.050	<0.040	0.117	0.118	0.127	0.137	0.144	0.141	0.251	0.183	0.151	<0.150	0.162	0.105	<0.030	<0.0250
PCB 1260	mg/kg	NA	NA	0.005*	24*	<0.015	<0.015	<0.015	<0.010	<0.040	<0.020	<0.040	<0.030	<0.050	<0.0650	<0.0820	<0.0550	<0.0450	<0.030	<0.050	<0.030	<0.015	<0.020

Analytes	Units	Provincial Sediment Quality Guidelines			
		Background	No Effect Level	Lowest Effect Level	Severe Effect Level
Nutrients					
Total Organic Carbon (%)	µg/g	NA	NV	1	10
Total Kjeldahl Nitrogen	µg/g	NA	NV	550	4800
Total Phosphorus	µg/g	NA	NV	600	2000
Metals					
Arsenic (As)	µg/g	4	NV	6	33
Cadmium (Cd)	µg/g	1.0	NV	0.6	10
Chromium (Cr)	µg/g	31	NV	26	110
Copper (Cu)	µg/g	25	NV	16	110
Lead (Pb)	µg/g	23	NV	31	250
Mercury (Hg)	µg/g	0.10	NV	0.2	2
Nickel (Ni)	µg/g	31	NV	16	75
Zinc (Zn)	µg/g	65	NV	120	820
PAH's					*
Acenaphthene	µg/g	NA	NV	-	-
Acenaphthylene	µg/g	NA	NV	-	-
Anthracene	µg/g	NA	NV	0.220	370
Benzo(a)anthracene	µg/g	NA	NV	0.320	1480
Benzo(a)pyrene	µg/g	NA	NV	0.370	1440
Benzo(b)fluoranthene	µg/g	NA	NV	-	-
Benzo(g,h,i)perylene	µg/g	NA	NV	0.170	320
Benzo(k)fluoranthene	µg/g	NA	NV	-	-
Chrysene	µg/g	NA	NV	0.340	460
Dibenz(a,h)anthracene	µg/g	NA	NV	0.060	130
Fluoranthene	µg/g	NA	NV	0.750	1020
Fluorene	µg/g	NA	NV	0.190	160
Indeno(1,2,3-cd)pyrene	µg/g	NA	NV	0.200	320
Naphthalene	µg/g	NA	NV	-	-
Phenanthrene	µg/g	NA	NV	0.560	950
Pyrene	µg/g	NA	NV	-	-
Total PAH	µg/g	NA	NV	4	10000
OC Pesticides + PCBs (Soil)					*
Aldrin	mg/kg	0.001	NV	0.002	8
alpha-BHC	mg/kg	0.001	NV	0.006	10
beta-BHC	mg/kg	0.001	NV	0.005	21
delta-BHC	mg/kg	0.001	0.0002	0.003	1
Chlordane	mg/kg	0.001	0.005	0.007	6
DDT (Total)	mg/kg	0.01	NV	0.004	12
op+pp-DDT	mg/kg	0.005	NV	0.008	71
pp-DDD	mg/kg	0.002	NV	0.008	6
pp-DDE	mg/kg	0.003	NV	0.005	19
Dieldrin	mg/kg	0.001	0.0006	0.002	91
Endrin	mg/kg	0.001	0.0005	0.003	130
HCB	mg/kg	0.001	0.01	0.02	24
Heptachlor	mg/kg	0.001	0.0003	NA	NA
Heptachlor Epoxide	mg/kg	0.001	NV	0.005	5
Mirex	mg/kg	0.001	NV	0.004	130
PCB (total)	mg/kg	0.02	0.01	0.07	530
PCB 1248	mg/kg	NA	NV	0.03	150
PCB 1254	mg/kg	NA	NV	0.06	34
PCB 1260	mg/kg	NA	NV	0.005	24

AQUAFOR BEECH LIMITED
ATTN: Francois Poilly
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 11-OCT-18
Report Date: 23-OCT-18 14:02 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2179314

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: LON-181005
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Conductivity	mS/cm	1.87	1.13	1.51	1.16	1.29	1.42
% Moisture	%	63.0	45.0	64.3	60.2	65.3	63.8
pH	pH units	6.96	7.05	6.99	7.06	7.11	7.08
Volatile Solids	%	7.09	5.75	11.6	10.1	11.0	9.96
Total Solids	%	41.6	55.2	34.2	36.4	35.7	32.4

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Conductivity	mS/cm	1.79	1.12	1.65	1.09
% Moisture	%	62.2	49.0	61.8	44.5
pH	pH units	7.07	7.00	7.14	6.95
Volatile Solids	%	9.71	6.48	7.63	5.73
Total Solids	%	39.8	51.2	38.5	57.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Chloride	ug/g	650	300	467	310	874	476
Total Kjeldahl Nitrogen	%	0.281	0.239	0.377	0.324	0.329	0.312
Total Nitrogen	ERROR	<1.0	<1.0	<1.0	1.4	<1.0	<1.0

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Chloride	ug/g	818	460	533	446
Total Kjeldahl Nitrogen	%	0.278	0.213	0.269	0.218
Total Nitrogen	ERROR	<1.0	<1.0	<1.0	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Nitrate-N	mg/kg	<1.0	<1.0	<1.0	1.1	<1.0	<1.0
Nitrite-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Nitrate-N	mg/kg	<1.0	<1.0	<1.0	<1.0
Nitrite-N	mg/kg	<1.0	<1.0	<1.0	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon (SOIL)

	ALS ID	L2179314-1	L2179314-2	L2179314-3	L2179314-4	L2179314-5	L2179314-6
	Sampled Date	09-OCT-18	09-OCT-18	09-OCT-18	09-OCT-18	09-OCT-18	09-OCT-18
	Sampled Time	09:50	09:50	10:00	14:20	14:40	15:45
	Sample ID	**24000011832 LOC 11 INT 2**	**24000011833 LOC 11 INT 3**	**24000011813 LOC 5 INT 1**	**24000011816 LOC 6 INT 1**	**24000011819 LOC 7 INT 1**	**24000011822 LOC 8 INT 1**
Analyte	Unit						
Fraction Organic Carbon	g/g	0.0639	0.0342	0.0724	0.0660	0.0661	0.0546
Total Organic Carbon	%	6.39	3.42	7.24	6.60	6.61	5.46

Organic / Inorganic Carbon (SOIL)

	ALS ID	L2179314-7	L2179314-8	L2179314-9	L2179314-10
	Sampled Date	09-OCT-18	09-OCT-18	09-OCT-18	09-OCT-18
	Sampled Time	12:30	12:30	14:47	14:47
	Sample ID	**24000011835 LOC 12 INT 2**	**24000011836 LOC 12 INT 3**	**24000011838 LOC 13 INT 2**	**24000011839 LOC 13 INT 3**
Analyte	Unit				
Fraction Organic Carbon	g/g	0.0673	0.0396	0.0417	0.0300
Total Organic Carbon	%	6.73	3.96	4.17	3.00

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
SAR	SAR	7.44	6.71	3.29	4.03	5.60	6.79
Calcium (Ca)	mg/L	89.9	46.7	129	73.0	62.2	62.6
Magnesium (Mg)	mg/L	11.6	5.3	16.7	10.1	8.7	8.2
Sodium (Na)	mg/L	282	182	149	139	178	215

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
SAR	SAR	10.5	11.5	9.12	9.01
Calcium (Ca)	mg/L	57.2	20.1	60.8	28.2
Magnesium (Mg)	mg/L	8.1	2.3	8.2	3.4
Sodium (Na)	mg/L	321	205	285	190

Bacteriological Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
E. Coli	CFU/g dwt	<10 PEHR	<10 PEHT	<10 PEHT	<10 PEHT
Fecal Coliform	CFU/g dwt	<10 PEHR	<10 PEHT	<10 PEHT	10 PEHT

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	L2179314-1 09-OCT-18 09:50 24000011832 LOC 11 INT 2	L2179314-2 09-OCT-18 09:50 24000011833 LOC 11 INT 3	L2179314-3 09-OCT-18 10:00 24000011813 LOC 5 INT 1	L2179314-4 09-OCT-18 14:20 24000011816 LOC 6 INT 1	L2179314-5 09-OCT-18 14:40 24000011819 LOC 7 INT 1	L2179314-6 09-OCT-18 15:45 24000011822 LOC 8 INT 1
Antimony (Sb)	ug/g	1.1	<1.0	1.5	1.4	1.2	<1.0
Arsenic (As)	ug/g	12.0	7.1	5.7	6.1	6.0	5.0
Barium (Ba)	ug/g	344	149	154	180	178	175
Beryllium (Be)	ug/g	0.75	0.81	0.52	0.58	0.56	0.55
Boron (B)	ug/g	10.6	13.1	11.6	12.0	11.7	11.3
Boron (B), Hot Water Ext.	ug/g	0.79	0.76	0.71	0.64	0.70	0.63
Cadmium (Cd)	ug/g	2.84	0.66	3.03	2.98	2.92	2.15
Chromium (Cr)	ug/g	75.3	44.2	55.0	58.0	55.4	44.9
Cobalt (Co)	ug/g	10.0	11.1	8.4	8.5	8.3	7.9
Copper (Cu)	ug/g	90.3	38.2	117	139	127	95.0
Lead (Pb)	ug/g	926	56.4	278	282	281	235
Mercury (Hg)	ug/g	0.728	0.257	0.271	0.256	0.276	0.200
Molybdenum (Mo)	ug/g	2.3	<1.0	1.6	1.8	1.7	1.3
Nickel (Ni)	ug/g	26.9	24.3	23.1	23.5	23.6	21.7
Selenium (Se)	ug/g	1.5	<1.0	1.8	1.8	1.8	1.6
Silver (Ag)	ug/g	0.59	<0.20	0.31	0.40	0.41	0.33
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	1.2	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	35.5	39.6	26.9	30.9	32.8	32.0
Zinc (Zn)	ug/g	739	220	810	799	733	540

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Antimony (Sb)	ug/g	1.5	<1.0	<1.0	<1.0
Arsenic (As)	ug/g	13.2	7.2	9.3	4.6
Barium (Ba)	ug/g	211	130	170	130
Beryllium (Be)	ug/g	0.73	0.66	0.82	0.75
Boron (B)	ug/g	10.7	11.5	13.4	11.2
Boron (B), Hot Water Ext.	ug/g	0.65	0.62	0.59	0.74
Cadmium (Cd)	ug/g	5.65	0.94	1.58	0.51
Chromium (Cr)	ug/g	65.9	49.6	63.2	32.1
Cobalt (Co)	ug/g	9.0	8.3	9.9	9.8
Copper (Cu)	ug/g	106	47.9	63.0	26.8
Lead (Pb)	ug/g	589	103	176	30.8
Mercury (Hg)	ug/g	0.619	0.531	0.554	0.171
Molybdenum (Mo)	ug/g	2.1	<1.0	1.1	<1.0
Nickel (Ni)	ug/g	29.2	19.5	24.6	20.0
Selenium (Se)	ug/g	1.4	<1.0	1.1	<1.0
Silver (Ag)	ug/g	0.76	0.32	0.41	<0.20
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	1.2	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	34.2	31.8	37.9	36.1
Zinc (Zn)	ug/g	989	292	407	197

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Chromium, Hexavalent	ug/g	<0.40 DLHM	<0.20	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Chromium, Hexavalent	ug/g	<0.40 DLHM	<0.20	<0.40 DLHM	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2179314-1 09-OCT-18 09:50 24000011832 LOC 11 INT 2	L2179314-2 09-OCT-18 09:50 24000011833 LOC 11 INT 3	L2179314-3 09-OCT-18 10:00 24000011813 LOC 5 INT 1	L2179314-4 09-OCT-18 14:20 24000011816 LOC 6 INT 1	L2179314-5 09-OCT-18 14:40 24000011819 LOC 7 INT 1	L2179314-6 09-OCT-18 15:45 24000011822 LOC 8 INT 1
Acetone	ug/g	<1.0 VOCJ	<0.50 VOCJ	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM
Benzene	ug/g	<0.014 VOCJ	<0.0068 VOCJ	0.040 DLHM	0.030 DLHM	0.021 DLHM	<0.014 DLHM
Bromodichloromethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Bromoform	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Bromomethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Carbon tetrachloride	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Chlorobenzene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Dibromochloromethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Chloroform	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,2-Dibromoethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,2-Dichlorobenzene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,3-Dichlorobenzene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,4-Dichlorobenzene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Dichlorodifluoromethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,1-Dichloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,2-Dichloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,1-Dichloroethylene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
cis-1,2-Dichloroethylene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
trans-1,2-Dichloroethylene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Methylene Chloride	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,2-Dichloropropane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
cis-1,3-Dichloropropene	ug/g	<0.060 VOCJ	<0.030 VOCJ	<0.060 DLHM	<0.060 DLHM	<0.060 DLHM	<0.060 DLHM
trans-1,3-Dichloropropene	ug/g	<0.060 VOCJ	<0.030 VOCJ	<0.060 DLHM	<0.060 DLHM	<0.060 DLHM	<0.060 DLHM
1,3-Dichloropropene (cis & trans)	ug/g	<0.085	<0.042	<0.085	<0.085	<0.085	<0.085
Ethylbenzene	ug/g	<0.036 VOCJ	<0.018 VOCJ	0.054 DLHM	<0.045 DLHM	<0.036 DLHM	<0.036 DLHM
n-Hexane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Methyl Ethyl Ketone	ug/g	<1.0 VOCJ	<0.50 VOCJ	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM
Methyl Isobutyl Ketone	ug/g	<1.0 VOCJ	<0.50 VOCJ	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM	<1.0 DLHM
MTBE	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Styrene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,1,1,2-Tetrachloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
1,1,2,2-Tetrachloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Tetrachloroethylene	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Toluene	ug/g	<0.16 VOCJ	<0.080 VOCJ	0.17 DLHM	0.17 DLHM	<0.16 DLHM	<0.16 DLHM
1,1,1-Trichloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2179314-7 09-OCT-18 12:30 24000011835 LOC 12 INT 2		L2179314-8 09-OCT-18 12:30 24000011836 LOC 12 INT 3		L2179314-9 09-OCT-18 14:47 24000011838 LOC 13 INT 2		L2179314-10 09-OCT-18 14:47 24000011839 LOC 13 INT 3	
Acetone	ug/g	<1.0	VOCJ	<0.50	VOCJ	<1.0	VOCJ	<0.50	VOCJ
Benzene	ug/g	<0.014	VOCJ	<0.0068	VOCJ	<0.014	VOCJ	<0.0068	VOCJ
Bromodichloromethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Bromoform	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Bromomethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Carbon tetrachloride	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Chlorobenzene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Dibromochloromethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Chloroform	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,2-Dibromoethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,2-Dichlorobenzene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,3-Dichlorobenzene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,4-Dichlorobenzene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Dichlorodifluoromethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,1-Dichloroethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,2-Dichloroethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,1-Dichloroethylene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
cis-1,2-Dichloroethylene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
trans-1,2-Dichloroethylene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Methylene Chloride	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,2-Dichloropropane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
cis-1,3-Dichloropropene	ug/g	<0.060	VOCJ	<0.030	VOCJ	<0.060	VOCJ	<0.030	VOCJ
trans-1,3-Dichloropropene	ug/g	<0.060	VOCJ	<0.030	VOCJ	<0.060	VOCJ	<0.030	VOCJ
1,3-Dichloropropene (cis & trans)	ug/g	<0.085		<0.042		<0.085		<0.042	
Ethylbenzene	ug/g	<0.036	VOCJ	<0.018	VOCJ	<0.036	VOCJ	<0.018	VOCJ
n-Hexane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Methyl Ethyl Ketone	ug/g	<1.0	VOCJ	<0.50	VOCJ	<1.0	VOCJ	<0.50	VOCJ
Methyl Isobutyl Ketone	ug/g	<1.0	VOCJ	<0.50	VOCJ	<1.0	VOCJ	<0.50	VOCJ
MTBE	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Styrene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,1,1,2-Tetrachloroethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
1,1,2,2-Tetrachloroethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Tetrachloroethylene	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ
Toluene	ug/g	<0.16	VOCJ	<0.080	VOCJ	<0.16	VOCJ	<0.080	VOCJ
1,1,1-Trichloroethane	ug/g	<0.10	VOCJ	<0.050	VOCJ	<0.10	VOCJ	<0.050	VOCJ

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
1,1,2-Trichloroethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Trichloroethylene	ug/g	<0.020 VOCJ	<0.010 VOCJ	0.024 DLHM	<0.020 DLHM	<0.020 DLHM	<0.020 DLHM
Trichlorofluoromethane	ug/g	<0.10 VOCJ	<0.050 VOCJ	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Vinyl chloride	ug/g	<0.040 VOCJ	<0.020 VOCJ	<0.040 DLHM	<0.040 DLHM	<0.040 DLHM	<0.040 DLHM
o-Xylene	ug/g	0.042 VOCJ	<0.020 VOCJ	0.064 DLHM	0.058 DLHM	<0.048 DLHM	<0.040 DLHM
m+p-Xylenes	ug/g	0.062 VOCJ	<0.030 VOCJ	0.166 DLHM	0.140 DLHM	0.121 DLHM	0.077 DLHM
Xylenes (Total)	ug/g	0.104	<0.050	0.230	0.198	0.121	0.077
Surrogate: 4-Bromofluorobenzene	%	75.8	83.1	84.2	82.1	83.0	91.4
Surrogate: 1,4-Difluorobenzene	%	80.6	88.6	92.1	97.3	92.4	100.3

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
1,1,2-Trichloroethane	ug/g		<0.10 VOCJ	<0.050 VOCJ	<0.10 VOCJ	<0.050 VOCJ
Trichloroethylene	ug/g		<0.020 VOCJ	<0.010 VOCJ	<0.020 VOCJ	<0.010 VOCJ
Trichlorofluoromethane	ug/g		<0.10 VOCJ	<0.050 VOCJ	<0.10 VOCJ	<0.050 VOCJ
Vinyl chloride	ug/g		<0.040 VOCJ	<0.020 VOCJ	<0.040 VOCJ	<0.020 VOCJ
o-Xylene	ug/g		0.099 VOCJ	<0.020 VOCJ	<0.040 VOCJ	<0.020 VOCJ
m+p-Xylenes	ug/g		0.104 VOCJ	<0.030 VOCJ	<0.060 VOCJ	<0.030 VOCJ
Xylenes (Total)	ug/g		0.204	<0.050	<0.072	<0.050
Surrogate: 4-Bromofluorobenzene	%		79.4	91.5	79.8	91.4
Surrogate: 1,4-Difluorobenzene	%		85.6	95.3	84.6	95.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	L2179314-1 09-OCT-18 09:50 24000011832 LOC 11 INT 2		L2179314-2 09-OCT-18 09:50 24000011833 LOC 11 INT 3		L2179314-3 09-OCT-18 10:00 24000011813 LOC 5 INT 1		L2179314-4 09-OCT-18 14:20 24000011816 LOC 6 INT 1		L2179314-5 09-OCT-18 14:40 24000011819 LOC 7 INT 1		L2179314-6 09-OCT-18 15:45 24000011822 LOC 8 INT 1	
F1 (C6-C10)	ug/g	<10	VOCJ	<5.0	VOCJ	<10	DLHM	<10	DLHM	<10	DLHM	<10	DLHM
F1-BTEX	ug/g	<10		<5.0		<10		<10		<10		<10	
F2 (C10-C16)	ug/g	145	DLHM	12		38	DLHM	55	DLHM	32	DLHM	43	DLHM
F2-Naphth	ug/g	145		12		38		55		31		43	
F3 (C16-C34)	ug/g	3770	DLHM	389		2760	DLHM	2930	DLHM	2330	DLHM	2380	DLHM
F3-PAH	ug/g	3760		383		2740		2910		2300		2370	
F4 (C34-C50)	ug/g	1610	DLHM	102		1480	DLHM	1540	DLHM	1210	DLHM	1210	DLHM
F4G-SG (GHH-Silica)	ug/g	4940		370		4640		5760		3310		3420	
Total Hydrocarbons (C6-C50)	ug/g	5530		503		4280		4520		3570		3640	
Chrom. to baseline at nC50	No Unit	NO		NO		NO		NO		NO		NO	
Surrogate: 2-Bromobenzotrifluoride	%	97.1		97.3		93.4		99.2		70.9		94.5	
Surrogate: 3,4-Dichlorotoluene	%	57.1	SURR-ND	63.9		69.2		73.6		62.6		71.1	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

	ALS ID	L2179314-7		L2179314-8		L2179314-9		L2179314-10	
	Sampled Date	09-OCT-18		09-OCT-18		09-OCT-18		09-OCT-18	
	Sampled Time	12:30		12:30		14:47		14:47	
	Sample ID	**24000011835 LOC 12 INT 2**		**24000011836 LOC 12 INT 3**		**24000011838 LOC 13 INT 2**		**24000011839 LOC 13 INT 3**	
Analyte	Unit								
F1 (C6-C10)	ug/g	12	VOCJ	<5.0	VOCJ	<10	VOCJ	<5.0	VOCJ
F1-BTEX	ug/g	12		<5.0		<10		<5.0	
F2 (C10-C16)	ug/g	187	DLHM	28		26	DLHM	48	
F2-Naphth	ug/g	186		28		26		48	
F3 (C16-C34)	ug/g	4110	DLHM	872		1230	DLHM	1560	
F3-PAH	ug/g	4090		864		1220		1560	
F4 (C34-C50)	ug/g	1680	DLHM	313		440	DLHM	590	
F4G-SG (GHH-Silica)	ug/g	4490		660		2070		<250	
Total Hydrocarbons (C6-C50)	ug/g	5990		1210		1700		2200	
Chrom. to baseline at nC50	No Unit	NO		NO		NO		NO	
Surrogate: 2-Bromobenzotrifluoride	%	97.5		100.4		99.2		99.6	
Surrogate: 3,4-Dichlorotoluene	%	66.1		77.1		70.3		80.8	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2179314-1 09-OCT-18 09:50 24000011832 LOC 11 INT 2	L2179314-2 09-OCT-18 09:50 24000011833 LOC 11 INT 3	L2179314-3 09-OCT-18 10:00 24000011813 LOC 5 INT 1	L2179314-4 09-OCT-18 14:20 24000011816 LOC 6 INT 1	L2179314-5 09-OCT-18 14:40 24000011819 LOC 7 INT 1	L2179314-6 09-OCT-18 15:45 24000011822 LOC 8 INT 1
Acenaphthene	ug/g	0.15 DLHM	<0.050	0.11 DLHM	0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Acenaphthylene	ug/g	0.10 DLHM	0.218	<0.10 DLHM	0.10 DLHM	<0.10 DLHM	<0.10 DLHM
Anthracene	ug/g	0.23 DLHM	0.127	0.29 DLHM	0.30 DLHM	0.25 DLHM	0.13 DLHM
Benzo(a)anthracene	ug/g	0.93 DLHM	0.728 R	1.94 DLHM	2.18 DLHM	1.83 DLHM	0.98 DLHM
Benzo(a)pyrene	ug/g	1.13 DLHM	0.815	2.51 DLHM	2.82 DLHM	2.48 DLHM	1.42 DLHM
Benzo(b)fluoranthene	ug/g	1.46 DLHM	0.556	3.30 DLHM	3.66 DLHM	3.37 DLHM	2.12 DLHM
Benzo(g,h,i)perylene	ug/g	1.61 DLHM	0.770	3.03 DLHM	3.32 DLHM	3.04 DLHM	1.92 DLHM
Benzo(k)fluoranthene	ug/g	1.15 DLHM	0.703	2.40 DLHM	2.71 DLHM	2.43 DLHM	1.43 DLHM
Chrysene	ug/g	1.65 DLHM	0.626	3.47 DLHM	3.82 DLHM	3.43 DLHM	2.02 DLHM
Dibenzo(ah)anthracene	ug/g	0.43 DLHM	0.186	0.81 DLHM	0.91 DLHM	0.82 DLHM	0.50 DLHM
Fluoranthene	ug/g	2.30 DLHM	1.14	5.61 DLHM	6.08 DLHM	5.34 DLHM	3.02 DLHM
Fluorene	ug/g	0.32 DLHM	0.064	0.19 DLHM	0.18 DLHM	0.16 DLHM	0.10 DLHM
Indeno(1,2,3-cd)pyrene	ug/g	1.32 DLHM	0.612	2.90 DLHM	2.94 DLHM	2.89 DLHM	1.81 DLHM
1+2-Methylnaphthalenes	ug/g	0.946	<0.042	0.485	0.362	0.353	0.251
1-Methylnaphthalene	ug/g	0.403 DLHM	<0.030	0.199 DLHM	0.146 DLHM	0.144 DLHM	0.104 DLHM
2-Methylnaphthalene	ug/g	0.543 DLHM	<0.030	0.286 DLHM	0.216 DLHM	0.209 DLHM	0.146 DLHM
Naphthalene	ug/g	0.517 DLHM	0.030	0.287 DLHM	0.211 DLHM	0.198 DLHM	0.137 DLHM
Phenanthrene	ug/g	1.01 DLHM	0.150	1.62 DLHM	1.59 DLHM	1.31 DLHM	0.700 DLHM
Pyrene	ug/g	2.16 DLHM	1.46	4.48 DLHM	4.90 DLHM	4.34 DLHM	2.48 DLHM
Surrogate: 2-Fluorobiphenyl	%	79.2	78.5	77.7	77.2	81.1	80.3
Surrogate: p-Terphenyl d14	%	76.0	74.5	74.7	73.5	77.0	75.6

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2179314-7 09-OCT-18 12:30 24000011835 LOC 12 INT 2	L2179314-8 09-OCT-18 12:30 24000011836 LOC 12 INT 3	L2179314-9 09-OCT-18 14:47 24000011838 LOC 13 INT 2	L2179314-10 09-OCT-18 14:47 24000011839 LOC 13 INT 3
Acenaphthene	ug/g	0.23 DLHM	0.051	<0.10 DLHM	<0.050
Acenaphthylene	ug/g	<0.10 DLHM	0.383	0.36 DLHM	0.089
Anthracene	ug/g	0.32 DLHM	0.205	0.25 DLHM	0.072
Benzo(a)anthracene	ug/g	1.09 DLHM	0.997 R	1.15 R	0.371 R
Benzo(a)pyrene	ug/g	1.24 DLHM	1.22	1.39 DLHM	0.410
Benzo(b)fluoranthene	ug/g	1.50 DLHM	0.853	1.06 DLHM	0.302
Benzo(g,h,i)perylene	ug/g	1.43 DLHM	1.14	1.40 DLHM	0.301
Benzo(k)fluoranthene	ug/g	1.28 DLHM	1.02	1.26 DLHM	0.320
Chrysene	ug/g	1.87 DLHM	1.22	1.44 DLHM	0.386
Dibenzo(ah)anthracene	ug/g	0.42 DLHM	0.268	0.34 DLHM	0.076
Fluoranthene	ug/g	2.76 DLHM	1.42	1.81 DLHM	0.670
Fluorene	ug/g	0.49 DLHM	0.121	0.16 DLHM	<0.050
Indeno(1,2,3-cd)pyrene	ug/g	1.26 DLHM	0.920	1.14 DLHM	0.260
1+2-Methylnaphthalenes	ug/g	1.82	0.169	0.307	<0.042
1-Methylnaphthalene	ug/g	0.766 DLHM	0.072	0.128 DLHM	<0.030
2-Methylnaphthalene	ug/g	1.06 DLHM	0.097	0.179 DLHM	<0.030
Naphthalene	ug/g	1.04 DLHM	0.099	0.167 DLHM	<0.013
Phenanthrene	ug/g	1.60 DLHM	0.396	0.453 DLHM	0.124
Pyrene	ug/g	2.52 DLHM	1.83	2.24 DLHM	0.801
Surrogate: 2-Fluorobiphenyl	%	78.5	77.4	77.2	79.6
Surrogate: p-Terphenyl d14	%	75.1	72.3	73.1	76.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Aroclor 1242	mg/kg	<0.250 DLM	<0.020 DLM	<0.0450 DLM	<0.0850 DLM	<0.0550 DLM	<0.050 DLM
Aroclor 1248	mg/kg	<0.020 DLHM	<0.010	<0.020 DLHM	<0.020 DLHM	<0.020 DLHM	<0.020 DLHM
Aroclor 1254	mg/kg	0.326 PRAR	<0.010	0.117 PRAR	0.118 PRAR	0.127 PRAR	0.137 PRAR
Aroclor 1260	mg/kg	<0.080 DLM	<0.0150 DLM	<0.040 DLM	<0.020 DLHM	<0.040 DLM	<0.030 DLM
Total PCBs	mg/kg	0.326 DLM	<0.030 DLM	0.117 DLM	0.118 DLM	0.127 DLM	0.137 DLM
Surrogate: d14-Terphenyl	%	85.3	85.6	87.8	87.6	86.6	84.9

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Aroclor 1242	mg/kg	<0.50 DLM	<0.0520 DLM	<0.110 DLM	<0.0150 DLM
Aroclor 1248	mg/kg	<0.020 DLHM	<0.010	<0.020 DLHM	<0.010
Aroclor 1254	mg/kg	0.652 PRAR	<0.040 DLM	<0.10 DLM	<0.0110 DLM
Aroclor 1260	mg/kg	<0.150 DLM	<0.030 DLM	<0.0450 DLM	<0.020 DLM
Total PCBs	mg/kg	0.652 DLM	<0.075 DLM	<0.20 DLM	<0.030 DLM
Surrogate: d14-Terphenyl	%	86.8	87.2	84.0	86.6

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2179314-1 09-OCT-18 09:50 **24000011832** **LOC 11 INT 2**	L2179314-2 09-OCT-18 09:50 **24000011833** **LOC 11 INT 3**	L2179314-3 09-OCT-18 10:00 **24000011813** **LOC 5 INT 1**	L2179314-4 09-OCT-18 14:20 **24000011816** **LOC 6 INT 1**	L2179314-5 09-OCT-18 14:40 **24000011819** **LOC 7 INT 1**	L2179314-6 09-OCT-18 15:45 **24000011822** **LOC 8 INT 1**
Aldrin	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
alpha-BHC	mg/kg	<0.14 DLM	<0.050 DLQ	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
beta-BHC	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Lindane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
delta-BHC	mg/kg	<0.19 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
a-chlordane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
g-chlordane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
op-DDD	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
pp-DDD	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
o,p-DDE	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
pp-DDE	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Dieldrin	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
alpha-Endosulfan	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
beta-Endosulfan	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Endosulfan Sulfate	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Endrin	mg/kg	<0.080 DLM	<0.040 DLQ	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Endrin Aldehyde	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Heptachlor	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Heptachlor Epoxide	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Hexachlorobenzene	mg/kg	<0.080 DLM	<0.020 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Mirex	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM
Oxychlordane	mg/kg	<0.080 DLM	<0.020	<0.50 DLQ	<0.35 DLQ	<0.50 DLQ	<0.40 DLQ
Surrogate: 2-Fluorobiphenyl	%	64.8	72.2	82.0	84.2	83.4	80.0
Surrogate: d14-Terphenyl	%	51.8	68.7	62.8	68.6	61.8	61.6

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2179314-7 09-OCT-18 12:30 **24000011835** **LOC 12 INT 2**	L2179314-8 09-OCT-18 12:30 **24000011836** **LOC 12 INT 3**	L2179314-9 09-OCT-18 14:47 **24000011838** **LOC 13 INT 2**	L2179314-10 09-OCT-18 14:47 **24000011839** **LOC 13 INT 3**
Aldrin	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
alpha-BHC	mg/kg	<0.40 DLQ	<0.070 DLQ	<0.20 DLQ	<0.020
beta-BHC	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Lindane	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
delta-BHC	mg/kg	<0.40 DLQ	<0.14 DLQ	<0.30 DLQ	<0.020
a-chlordane	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
g-chlordane	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
op-DDD	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
pp-DDD	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
o,p-DDE	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
pp-DDE	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Dieldrin	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
alpha-Endosulfan	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
beta-Endosulfan	mg/kg	<0.080 DLM	<0.040 DLQ	<0.050 DLQ	<0.020
Endosulfan Sulfate	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.22 DLQ
Endrin	mg/kg	<0.080 DLM	<0.030 DLQ	<0.040 DLM	<0.020
Endrin Aldehyde	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Heptachlor	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Heptachlor Epoxide	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Hexachlorobenzene	mg/kg	<0.080 DLM	<0.020 DLM	<0.040 DLM	<0.020 DLM
Mirex	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Oxychlordane	mg/kg	<0.080 DLM	<0.020	<0.040 DLM	<0.020
Surrogate: 2-Fluorobiphenyl	%	71.0	73.7	76.4	73.5
Surrogate: d14-Terphenyl	%	59.8	61.1	58.1	63.5

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2179314-1	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	
L2179314-7	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	
L2179314-7	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	
L2179314-9	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	
L2179314-9	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L2179314-1	24000011832 LOC 11 INT 2	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
L2179314-10	24000011839 LOC 13 INT 3	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
L2179314-2	24000011833 LOC 11 INT 3	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
L2179314-7	24000011835 LOC 12 INT 2	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
L2179314-8	24000011836 LOC 12 INT 3	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
L2179314-9	24000011838 LOC 13 INT 2	VOCC	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).

Qualifiers for Individual Parameters Listed:

Qualifier	Description
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be

Reference Information

	unaffected.
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
PRAR	PCB Pattern Most Closely Resembles Aroclor Reported
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
VOCJ	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial

Reference Information

requirements (for BC, AB-Tier1, MB, ON, SK).

DLM Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

DLHM Detection Limit Adjusted: Sample has High Moisture Content

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0

5 grams of dried soil is mixed with 10 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD

The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-SOLID-MF-WT	Soil	E. coli on sludge or solid	SM 9222D

A 1g biosolid sample is transferred into buffered dilution water blank. The sample is manually shaken and an aliquot of the sample is then filtered through the membrane filter. The filter is then placed on mFC-BCIG agar and incubated at 44.5 – 0.2 ”C for 24 – 2 hours. Method ID: WT-TM-1200. Results are reported on a dry weight basis. Moisture is required.

EC-WT	Soil	Conductivity (EC)	MOEE E3138

A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ETL-N-TOT-WT	Soil	Calculate from NO2 + NO3+TKN	CALCULATION
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Soil F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

FC-SOLID-MF-WT Soil Fecal Coliform on sludge or solid SM 9222D

HG-200.2-CVAA-WT Soil Mercury in Soil by CVAAS EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

NO2-WT	Soil	Nitrite in Soil	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

NO3-WT	Soil	Nitrate in Soil (NO3-N)	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PCB-WT	Soil	Polychlorinated Biphenyls	EPA 8082

A representative sub-sample of a soil sample is mixed with methanol and extracted with toluene using a shaker technique. An aliquot of the separated toluene is analyzed by GC/MSD.

PEST-OC-WT	Soil	Pesticides, Organochlorine	SW846 8270

A 5g representative sub-sample of the soil sample is mixed with methanol and extracted with toluene. An aliquot is taken and analyzed by GC/MSD.

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PO4-DO-COL-WT	Soil	Orthophosphate in Soil (PO4-P)	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a soil sample that has been extracted and filtered through a 0.45 micron membrane filter.

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

SOLIDS-TS-WT	Soil	Total Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids. Results are reported as the percentage of the total sample.

SOLIDS-VS-WT	Soil	Volatile Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids.
This residue is ignited to constant weight at 550°C. The remaining solids represent the fixed total solids while the weight lost on ignition is the volatile solids. Results are reported as Percent of the Total solids as Volatile.

TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.3.2

Soil is treated with excess acidic dichromate, which reacts with the organic carbon, oxidizing it to CO2. The residual dichromate is titrated with ferrous ammonium sulphate and TOC calculated by difference.

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

LON-181005

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

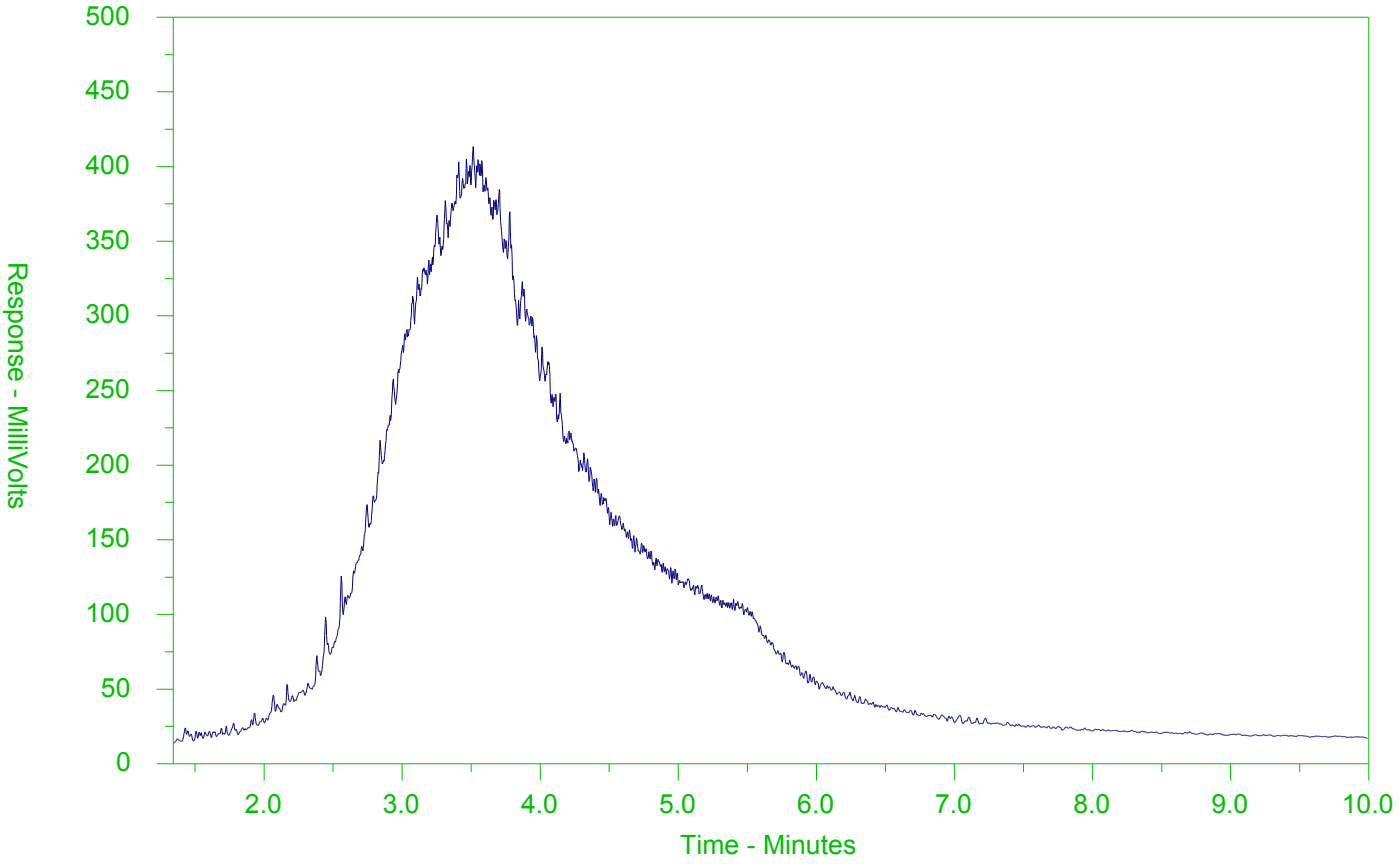
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-1
Client Sample ID: 24000011832 LOC 11 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

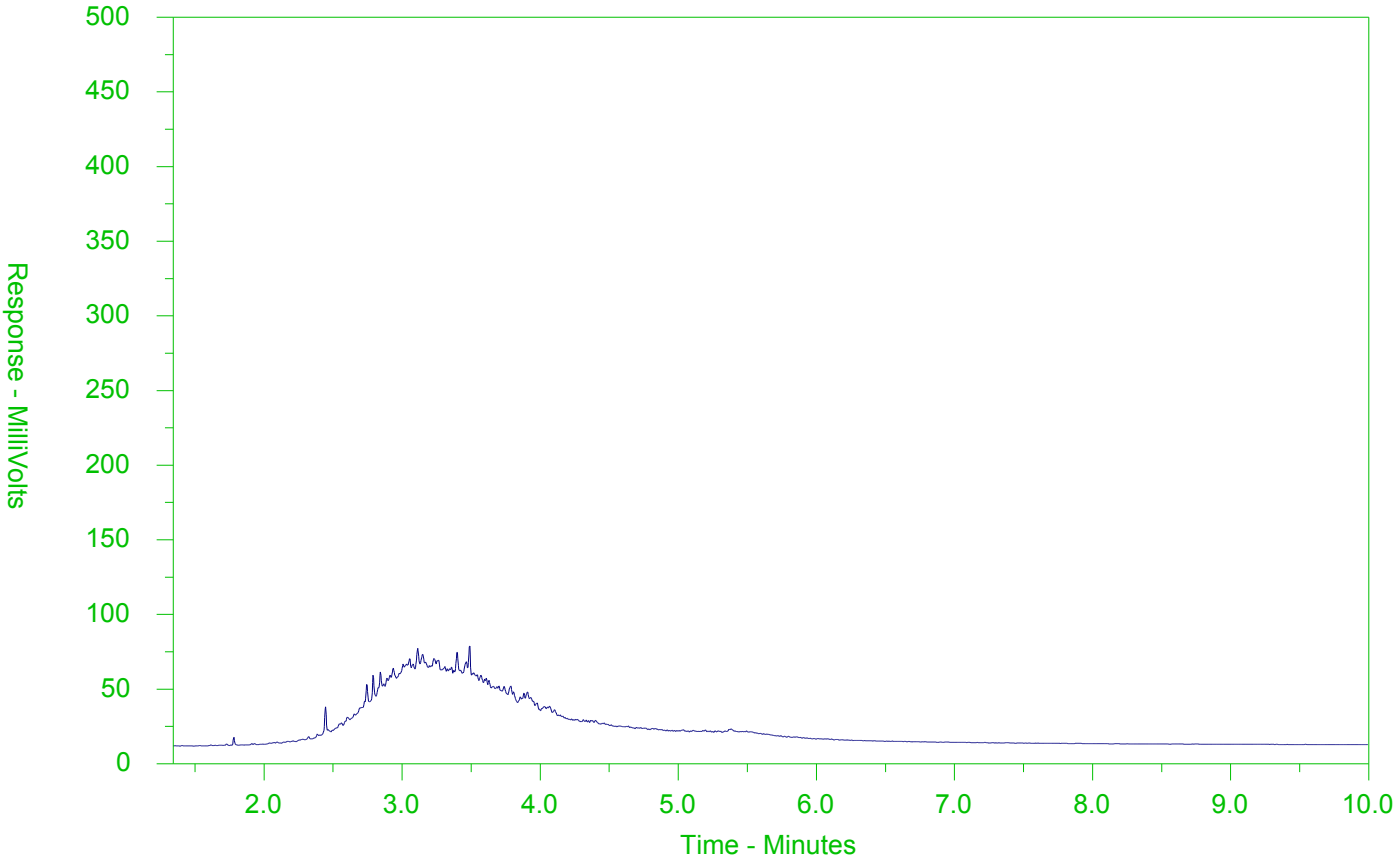
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-2
Client Sample ID: 24000011833 LOC 11 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

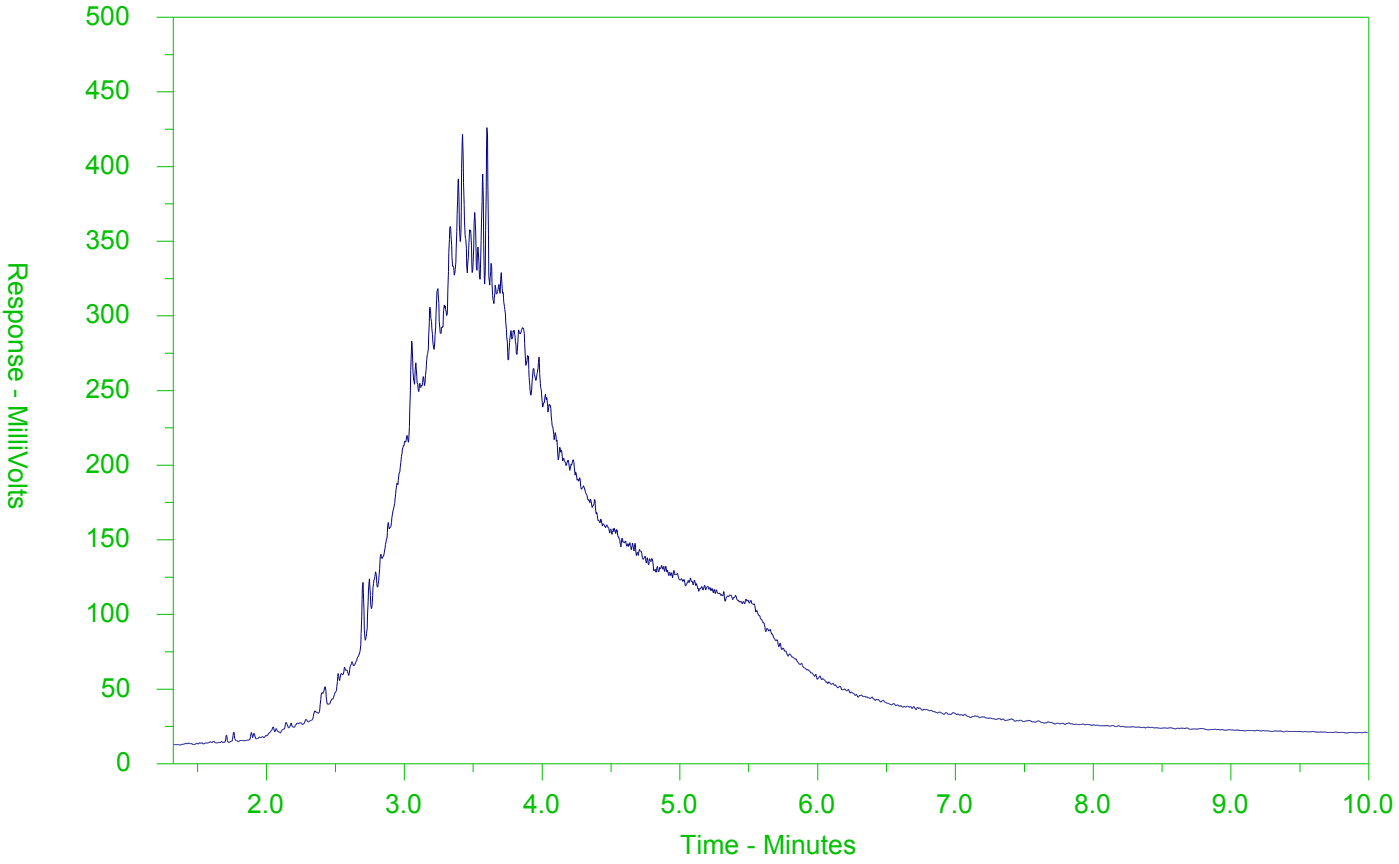
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-3
Client Sample ID: 24000011813 LOC 5 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

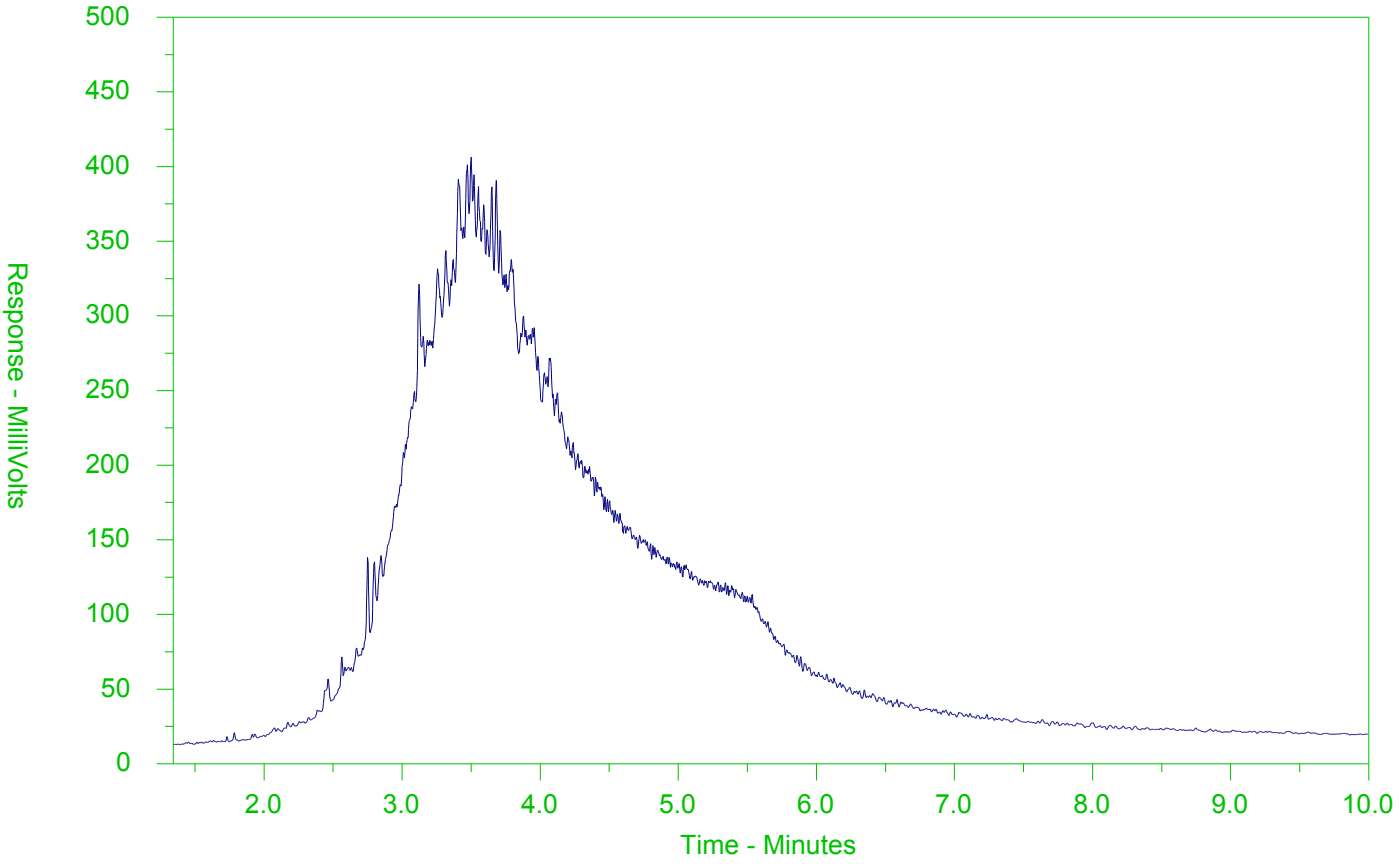
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-4
Client Sample ID: 24000011816 LOC 6 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

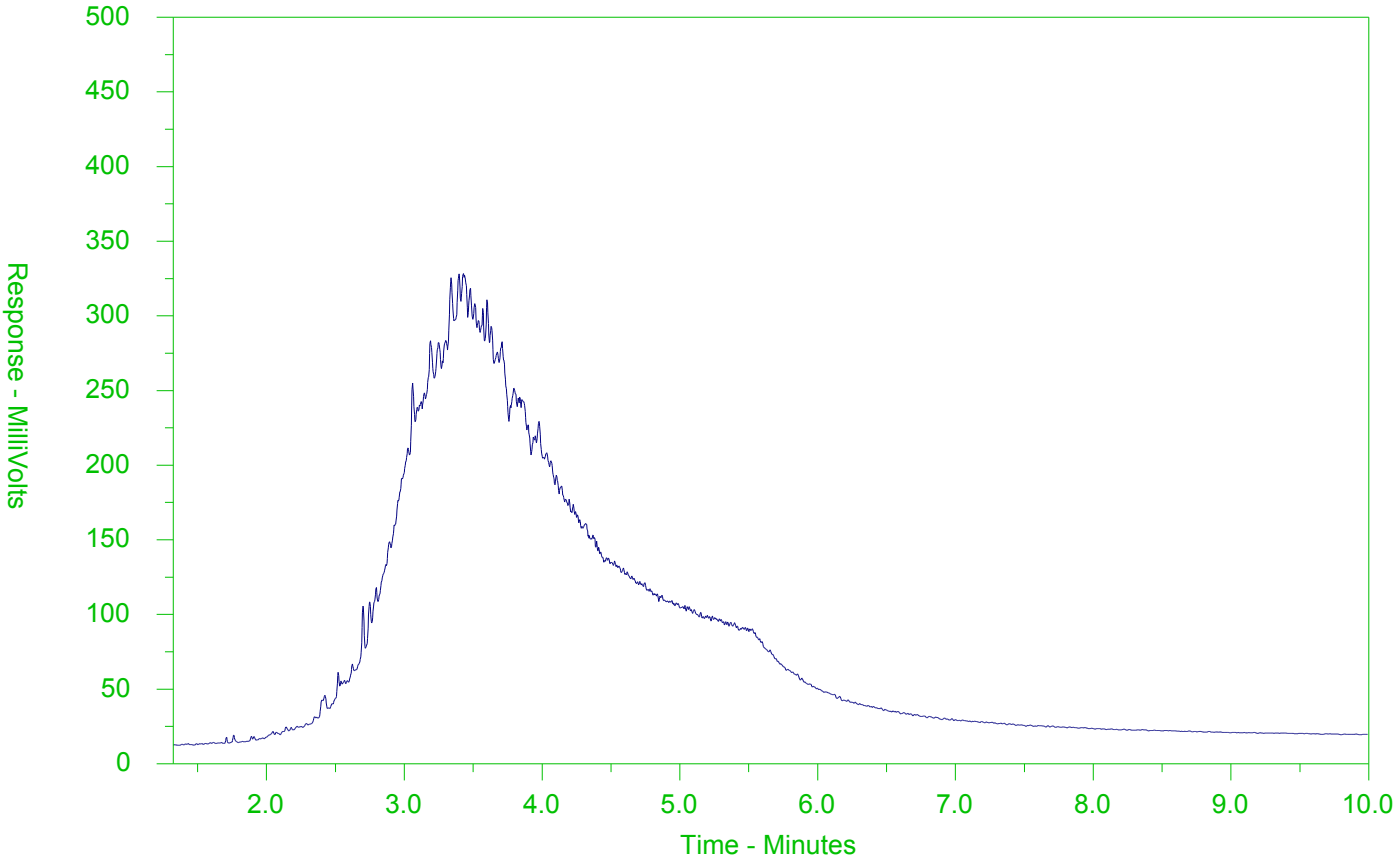
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-5
Client Sample ID: 24000011819 LOC 7 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

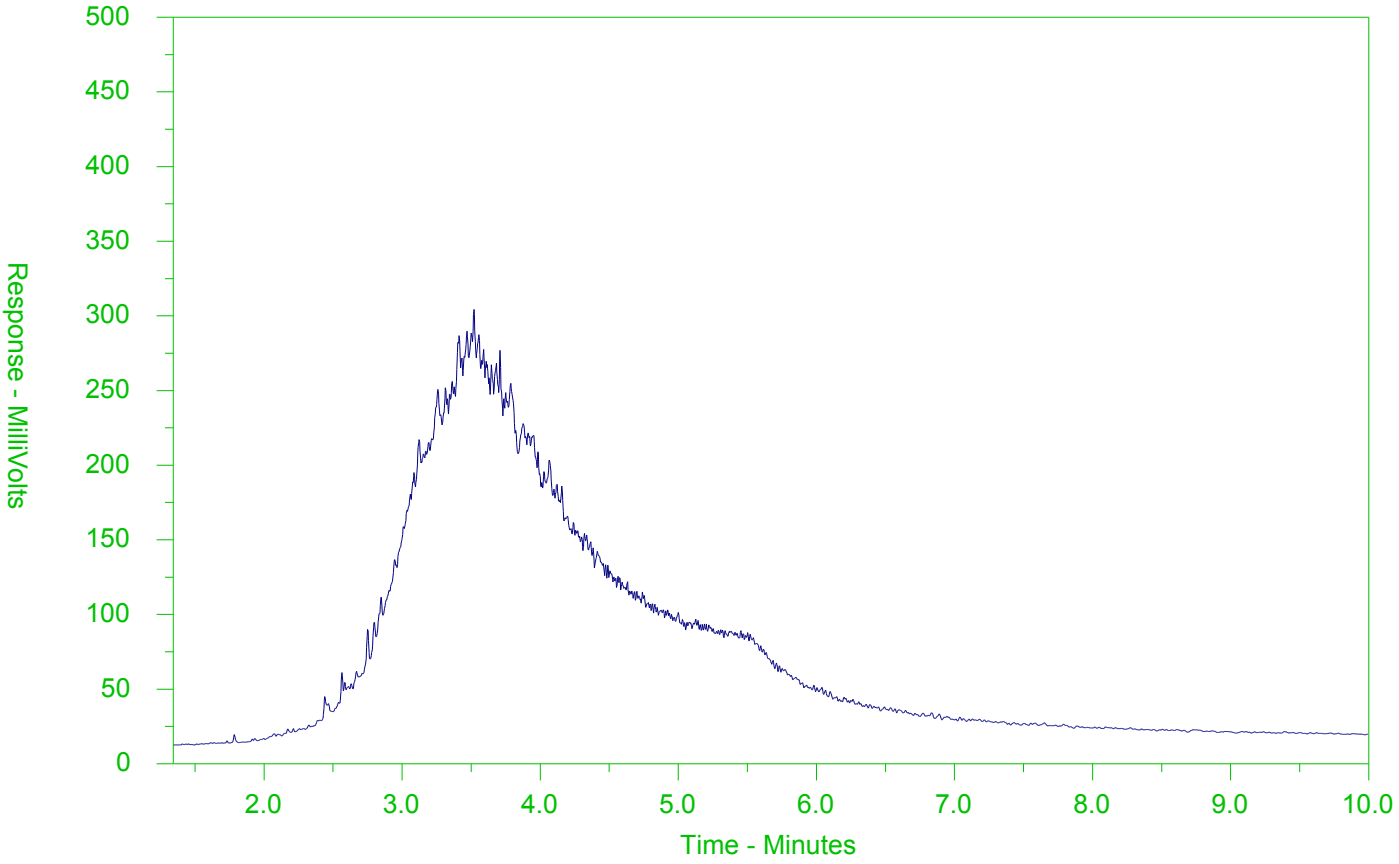
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-6
Client Sample ID: 24000011822 LOC 8 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

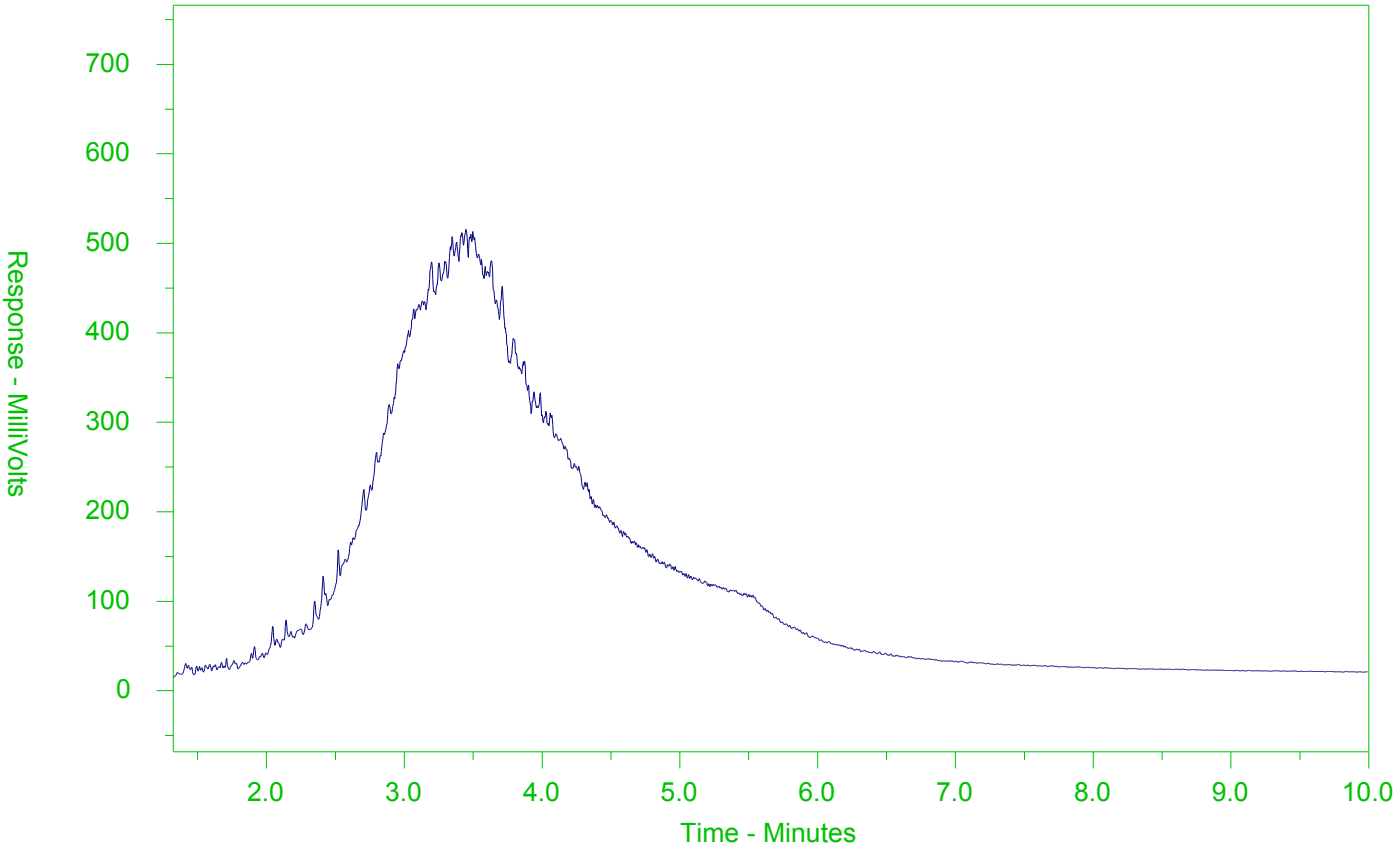
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-7
Client Sample ID: 24000011835 LOC 12 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

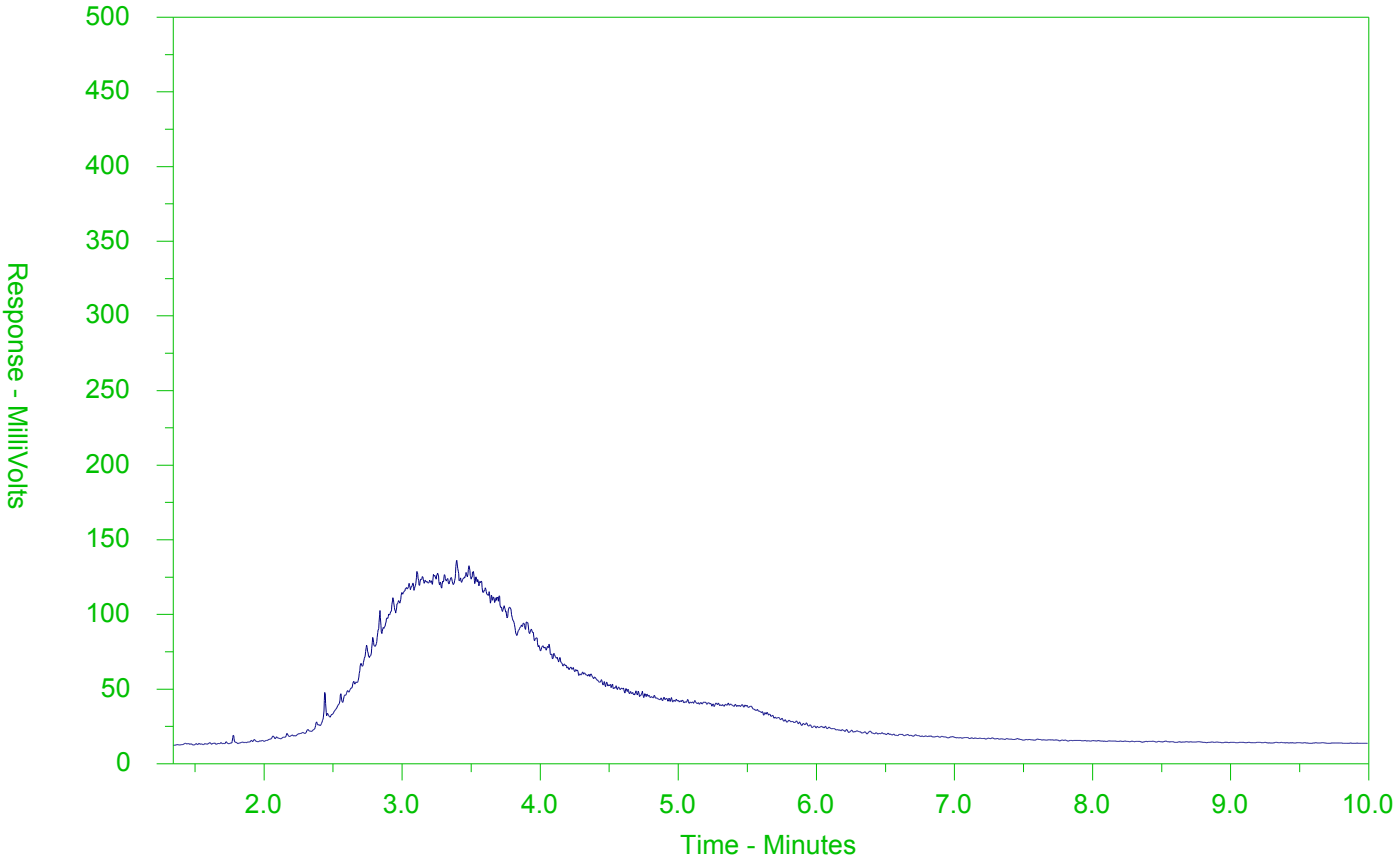
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-8
Client Sample ID: 24000011836 LOC 12 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

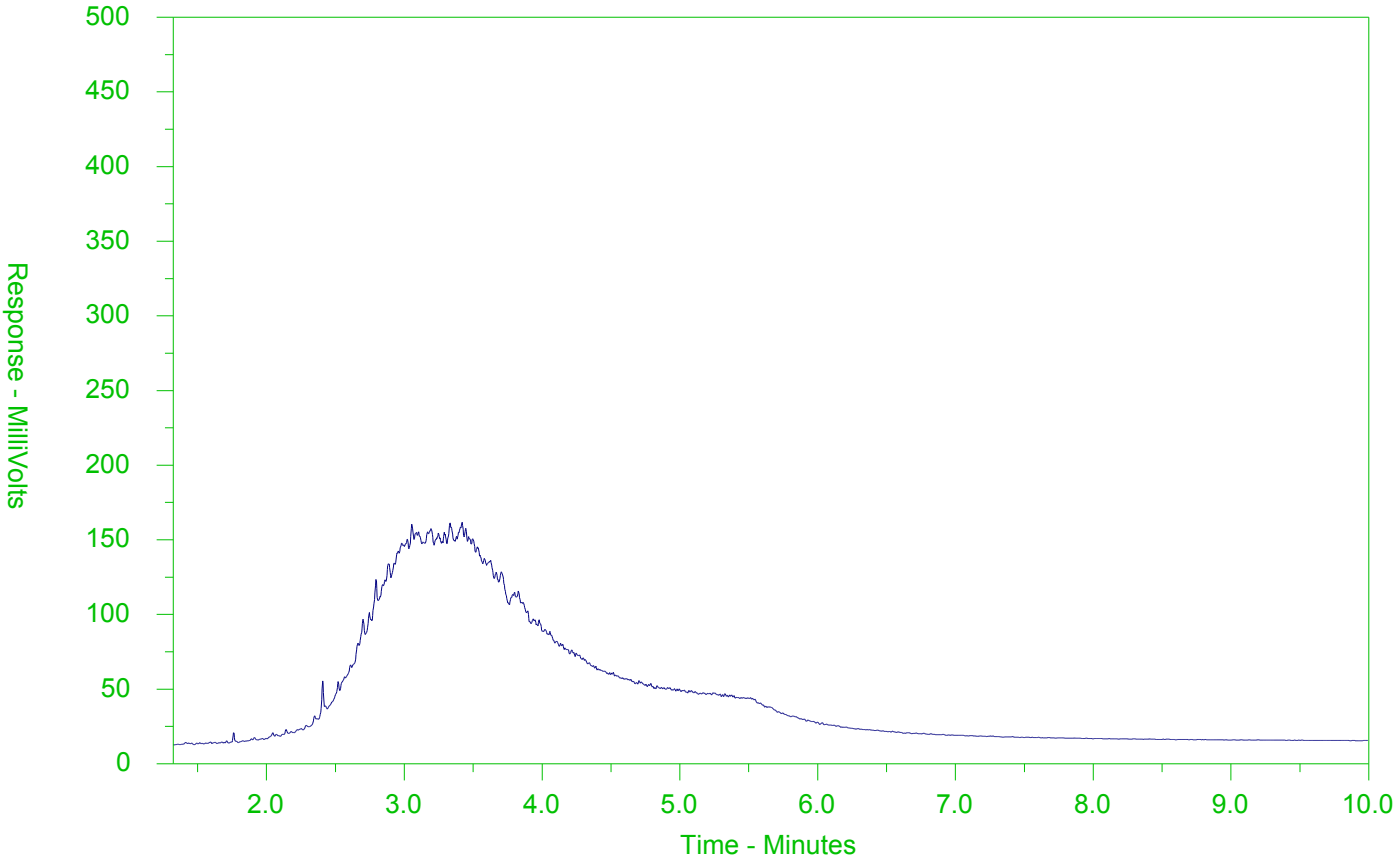
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-9
Client Sample ID: 24000011838 LOC 13 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

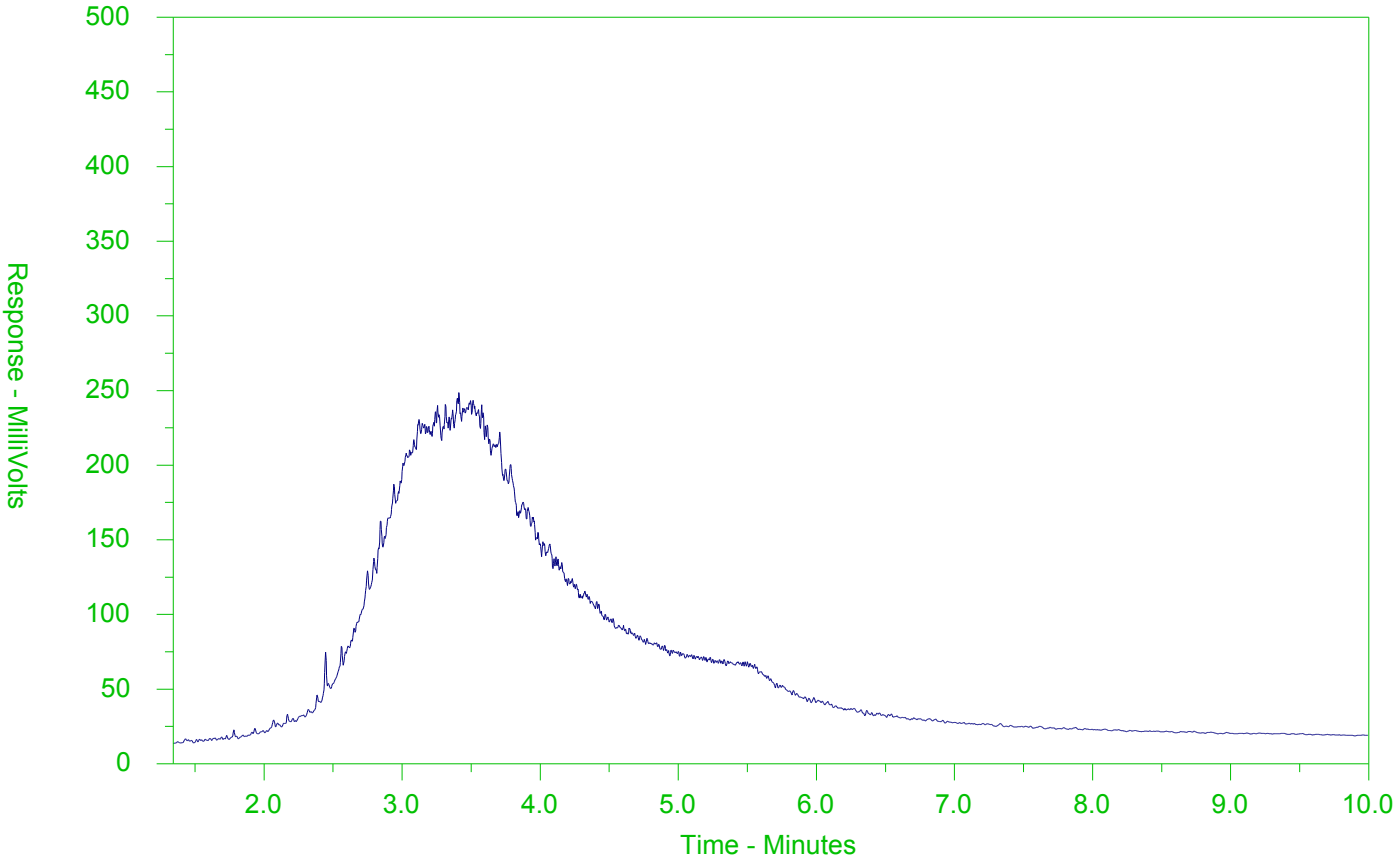
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2179314-10
Client Sample ID: 24000011839 LOC 13 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2179314-COFC

QC Number: LON-181005

Page 1 of 3

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL
Quality Control (QC) Report with Report	☑ Y ☐ N
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	bordi.m@aquaforbeech.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days) 4 day [P4-20%]	☐
3 day [P3-25%]	☐
2 day [P2-50%]	☐
EMERGENCY 1 Business day [E1 - 100%]	☐
Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	☐
Date and Time Required for all E&P TATs:	
For tests that can not be performed according to the service level selected, you will be contacted.	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q67885	AFE/Cost Center:	PO#
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2179314	ALS Contact: Gayle	Sampler: Pollutech

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLIC-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further detail	NUMBER OF CONTAINERS
	2400011832 Loc 11 int 2	09-10-18	0950	Sediment	R	R	R	R	R	R	R	R	R	R								8
	2400011833 Loc 11 int 3	09-10-18	0950	Sediment	R	R	R	R	R	R	R	R	R	R								8
	2400011813 Loc 5 int 1	09-10-18	1000	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
	2400011816 Loc 6 INT 1	09-10-18	1420	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
	2400011819 Loc 7 Int 1	09-10-18	1440	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
	2400011822 Loc 8 Int 1	09-10-18	1545	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ Y ☐ N	also email: poilly.f@aquaforbeech.com
Are samples for human consumption/ use? ☐ Y ☐ N	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs ☐ Ice Cubes ☐		Custody seal intact	Yes ☐	No	☐
Cooling Initiated ☐					

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				13.2			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: SB	Date: 10/11/2018	Time: 13:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2179314-COFC

COC Number: LON-181005

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ Yes ☐ No

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: lframboise.d@aquaforbeech.com

Email 2: cowlin.w@aquaforbeech.com

Email 3: bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885

Job #: MOHAWK LAKE

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only): L2179314

ALS Contact: Gayle

Sampler: Pollutech

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	24000011835 Loc 12 Int 2	09-10-18	1230	Sediment	R	R	R	R	R	R	R	R	R	R								8
	24000011836 Loc 12 Int 3	09-10-18	1230	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 13.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: SB	Date: 10/11/2018	Time: 13:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2179314-COFC

COC Number: LON-181005

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ Yes ☐ No
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: laframboise.d@aquaforbeech.com
Email 2: cowlin.w@aquaforbeech.com
Email 3: bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885
Job #: MOHAWK LAKE
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2179314
ALS Contact: Gayle
Sampler: Pollutech

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	2400011838 Loc 13 Int 2	09-10-18	1447	Sediment	R	R	R	R	R	R	R	R	R	R								8
	2400011839 Loc 13 Int 3	09-10-18	1447	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☒ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:
FINAL COOLER TEMPERATURES °C: 13.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: SB	Date: 10/11/2018	Time: 13:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SEPT 2017 FRONT

AQUAFOR BEECH LIMITED
ATTN: Francois Poilly
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 13-OCT-18
Report Date: 24-OCT-18 07:28 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180552

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: LON-181005
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Conductivity	mS/cm	1.60	1.02	0.737	0.746	0.997	1.00
% Moisture	%	62.8	40.7	69.0	70.9	56.3	68.8
pH	pH units	7.01	7.14	7.03	7.02	7.02	6.75
Volatile Solids	%	8.43	7.65	9.83	9.94	6.04	14.2
Total Solids	%	36.6	50.6	33.7	31.5	44.5	31.8

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Conductivity	mS/cm	1.60	1.09	0.957	0.960	0.344	1.26
% Moisture	%	63.4	58.4	59.8	42.3	30.4	58.6
pH	pH units	7.02	6.97	7.04	7.22	7.05	7.05
Volatile Solids	%	9.08	12.1	8.33	12.0	6.64	7.17
Total Solids	%	39.4	39.5	38.0	51.6	65.0	41.1

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Conductivity	mS/cm	0.965	1.47	0.884
% Moisture	%	70.8	65.1	50.2
pH	pH units	7.06	7.11	7.15
Volatile Solids	%	9.66	8.18	8.12
Total Solids	%	32.5	36.4	49.3

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Chloride	ug/g		672	355	421	573	247	495
Total Kjeldahl Nitrogen	%		0.290 DLHC	0.249 DLHC	0.321 DLHC	0.331 DLHC	0.184	0.338 DLHC
Total Nitrogen	ERROR		<1.0	<1.0	9.1	3.9	1.2	2.2
Orthophosphate-Dissolved (as P)	mg/kg		0.189	0.268	0.391	0.405	0.212	0.421

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Chloride	ug/g		931	1030	800	506	216	497
Total Kjeldahl Nitrogen	%		0.281 DLHC	0.320 DLHC	0.293 DLHC	0.251 DLHC	0.226 DLHC	0.266 DLHC
Total Nitrogen	ERROR		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Orthophosphate-Dissolved (as P)	mg/kg		0.278	0.349	0.233	0.70 DLHC	0.228	0.156

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Chloride	ug/g		399	524	375
Total Kjeldahl Nitrogen	%		0.327 DLHC	0.299 DLHC	0.258 DLHC
Total Nitrogen	ERROR		11.9	<1.0	<1.0
Orthophosphate-Dissolved (as P)	mg/kg		0.234	0.357	0.289

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Nitrate-N	mg/kg	<1.0	<1.0	7.7	3.6	1.0	1.9
Nitrite-N	mg/kg	<1.0	<1.0	1.1	<1.0	<1.0	<1.0

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Nitrate-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Nitrate-N	mg/kg	10.3	<1.0	<1.0
Nitrite-N	mg/kg	1.3	<1.0	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Fraction Organic Carbon	g/g	0.0472	0.0338	0.0497	0.0496	0.0504	0.0488
Total Organic Carbon	%	4.72	3.38	4.97	4.96	5.04	4.88

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Fraction Organic Carbon	g/g	0.0506	0.0292	0.0524	0.0373	0.0315	0.0484
Total Organic Carbon	%	5.06	2.92	5.24	3.73	3.15	4.84

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Fraction Organic Carbon	g/g	0.0517	0.117	0.0147
Total Organic Carbon	%	5.17	11.7	1.47

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
SAR	SAR	8.92	9.57	5.60	6.95	2.66	4.43
Calcium (Ca)	mg/L	59.8	25.4	47.8	56.6	81.1	81.3
Magnesium (Mg)	mg/L	9.0	3.1	7.8	8.5	11.0	10.2
Sodium (Na)	mg/L	280	192	158	212	96.1	159

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
SAR	SAR	16.3	13.0	13.4	9.72	10.5	13.4
Calcium (Ca)	mg/L	25.5	52.9	26.9	38.0	5.7	18.7
Magnesium (Mg)	mg/L	4.0	5.8	4.5	5.1	1.3	3.0
Sodium (Na)	mg/L	336	374	285	240	106	237

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
SAR	SAR	5.85	9.76	10.0
Calcium (Ca)	mg/L	30.8	41.0	27.9
Magnesium (Mg)	mg/L	5.3	6.7	3.8
Sodium (Na)	mg/L	134	256	213

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID				
		L2180552-3 / 12-OCT-18 / 08:43 / **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 / 12-OCT-18 / 15:00 / **24000011846 LOC 16 INT 1**	L2180552-5 / 12-OCT-18 / 13:08 / **24000011849 LOC 17 INT 1**	L2180552-6 / 12-OCT-18 / 11:40 / **24000011852 LOC 18 INT 1**	L2180552-13 / 12-OCT-18 / 08:33 / **24000011840 LOC 14 INT 1**
E. Coli	CFU/g dwt	<10	<10	<10	<10	<10
Fecal Coliform	CFU/g dwt	17	<10	<10	<10	<10

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	L2180552-1 12-OCT-18 08:43 LOC 14 24000011859 QAQC #2 INT 2	L2180552-2 12-OCT-18 08:43 LOC 14 24000011860 QAQC #2 INT 3	L2180552-3 12-OCT-18 08:43 LOC 14 24000011858 QAQC #2 INT 1	L2180552-4 12-OCT-18 15:00 24000011846 LOC 16 INT 1	L2180552-5 12-OCT-18 13:08 24000011849 LOC 17 INT 1	L2180552-6 12-OCT-18 11:40 24000011852 LOC 18 INT 1
Antimony (Sb)	ug/g	1.6	<1.0	<1.0	<1.0	<1.0	1.4
Arsenic (As)	ug/g	10.2	3.8	4.3	3.7	3.1	4.0
Barium (Ba)	ug/g	176	129	130	125	58.1	83.2
Beryllium (Be)	ug/g	0.83	0.67	<0.50	<0.50	<0.50	<0.50
Boron (B)	ug/g	12.5	10.3	7.5	7.2	6.4	10.6
Boron (B), Hot Water Ext.	ug/g	0.70	0.82	0.61	0.53	0.50	1.07
Cadmium (Cd)	ug/g	3.24	0.59	2.53	1.46	0.62	0.60
Chromium (Cr)	ug/g	62.7	25.0	37.4	33.1	19.8	28.4
Cobalt (Co)	ug/g	9.7	7.6	6.7	6.3	5.9	6.2
Copper (Cu)	ug/g	75.7	18.4	84.1	70.0	31.6	49.4
Lead (Pb)	ug/g	358	24.2	260	184	76.6	61.0
Mercury (Hg)	ug/g	0.550	0.101	0.211	0.159	0.0521	0.0552
Molybdenum (Mo)	ug/g	1.7	<1.0	1.1	<1.0	<1.0	1.0
Nickel (Ni)	ug/g	27.0	15.8	18.6	17.7	12.6	15.3
Selenium (Se)	ug/g	1.3	<1.0	1.3	1.3	<1.0	1.0
Silver (Ag)	ug/g	0.58	<0.20	0.35	0.25	<0.20	<0.20
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	1.1	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	38.4	29.2	24.9	24.6	21.6	24.1
Zinc (Zn)	ug/g	614	193	531	384	198	268

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	L2180552-7 11-OCT-18 12:02 **24000011829** **LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830** **LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844** **LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845** **LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9** **24000011857** **QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9** **24000011856** **QAQC1 INT 2**
Antimony (Sb)	ug/g	1.8	<1.0	2.1	<1.0	<1.0	1.0
Arsenic (As)	ug/g	7.1	6.9	9.8	3.6	1.9	7.3
Barium (Ba)	ug/g	153	146	173	108	57.4	127
Beryllium (Be)	ug/g	0.65	0.78	0.82	0.54	<0.50	0.64
Boron (B)	ug/g	12.5	11.9	11.1	9.0	6.0	9.5
Boron (B), Hot Water Ext.	ug/g	0.75	1.03	0.84	1.14	0.58	0.70
Cadmium (Cd)	ug/g	3.63	0.84	3.38	0.52	<0.50	1.68
Chromium (Cr)	ug/g	48.2	42.7	62.4	24.0	14.7	47.7
Cobalt (Co)	ug/g	7.5	10.0	9.5	6.7	5.8	8.7
Copper (Cu)	ug/g	74.3	43.4	75.6	24.8	13.3	51.4
Lead (Pb)	ug/g	396	89.3	384	26.1	9.3	187
Mercury (Hg)	ug/g	0.293	0.337	0.482	0.120	0.0303	0.443
Molybdenum (Mo)	ug/g	1.2	<1.0	1.4	<1.0	<1.0	<1.0
Nickel (Ni)	ug/g	22.9	23.2	27.5	14.6	12.1	21.8
Selenium (Se)	ug/g	1.3	<1.0	1.3	<1.0	<1.0	<1.0
Silver (Ag)	ug/g	0.56	0.24	0.64	<0.20	<0.20	0.37
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	<1.0	<1.0	1.1	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	33.6	38.9	39.0	26.3	21.0	32.5
Zinc (Zn)	ug/g	632	232	601	154	52.3	368

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Antimony (Sb)	ug/g		1.4	1.2	<1.0
Arsenic (As)	ug/g		4.5	9.0	5.5
Barium (Ba)	ug/g		143	139	132
Beryllium (Be)	ug/g		0.56	0.64	0.67
Boron (B)	ug/g		9.9	10.0	9.9
Boron (B), Hot Water Ext.	ug/g		0.64	0.59	0.67
Cadmium (Cd)	ug/g		2.64	2.34	0.56
Chromium (Cr)	ug/g		40.5	54.9	28.1
Cobalt (Co)	ug/g		7.0	8.4	8.5
Copper (Cu)	ug/g		85.7	64.1	20.9
Lead (Pb)	ug/g		285	265	24.9
Mercury (Hg)	ug/g		0.185	0.620	0.109
Molybdenum (Mo)	ug/g		1.3	1.2	<1.0
Nickel (Ni)	ug/g		19.8	22.7	17.7
Selenium (Se)	ug/g		1.6	1.1	<1.0
Silver (Ag)	ug/g		0.39	0.50	<0.20
Thallium (Tl)	ug/g		<0.50	<0.50	<0.50
Uranium (U)	ug/g		<1.0	<1.0	<1.0
Vanadium (V)	ug/g		28.3	32.6	33.0
Zinc (Zn)	ug/g		546	497	195

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Chromium, Hexavalent	ug/g	<0.40 DLHM	<0.20	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Chromium, Hexavalent	ug/g	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM	<0.20	<0.20	<0.40 DLHM

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Chromium, Hexavalent	ug/g	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180552-1 12-OCT-18 08:43 LOC 14 24000011859 QAQC #2 INT 2	L2180552-2 12-OCT-18 08:43 LOC 14 24000011860 QAQC #2 INT 3	L2180552-3 12-OCT-18 08:43 LOC 14 24000011858 QAQC #2 INT 1	L2180552-4 12-OCT-18 15:00 24000011846 LOC 16 INT 1	L2180552-5 12-OCT-18 13:08 24000011849 LOC 17 INT 1	L2180552-6 12-OCT-18 11:40 24000011852 LOC 18 INT 1
Acetone	ug/g	<1.0 DLHM	<0.50	<0.50 VOCJ	<1.5 DLHM	<0.75 DLHM	<1.0 DLHM
Benzene	ug/g	<0.014 DLHM	<0.0068	<0.0068 VOCJ	<0.020 DLHM	<0.010 DLHM	<0.014 DLHM
Bromodichloromethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Bromoform	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Bromomethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Carbon tetrachloride	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Chlorobenzene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Dibromochloromethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Chloroform	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,2-Dibromoethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,2-Dichlorobenzene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,3-Dichlorobenzene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,4-Dichlorobenzene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Dichlorodifluoromethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,1-Dichloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,2-Dichloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,1-Dichloroethylene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
cis-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
trans-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Methylene Chloride	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,2-Dichloropropane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
cis-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.030	<0.030 VOCJ	<0.090 DLHM	<0.045 DLHM	<0.060 DLHM
trans-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.030	<0.030 VOCJ	<0.090 DLHM	<0.045 DLHM	<0.060 DLHM
1,3-Dichloropropene (cis & trans)	ug/g	<0.085	<0.042	<0.042	<0.13	<0.064	<0.085
Ethylbenzene	ug/g	<0.036 DLHM	<0.018	<0.018 VOCJ	<0.054 DLHM	<0.027 DLHM	<0.036 DLHM
n-Hexane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Methyl Ethyl Ketone	ug/g	<1.0 DLHM	<0.50	<0.50 VOCJ	<1.5 DLHM	<0.75 DLHM	<1.0 DLHM
Methyl Isobutyl Ketone	ug/g	<1.0 DLHM	<0.50	<0.50 VOCJ	<1.5 DLHM	<0.75 DLHM	<1.0 DLHM
MTBE	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Styrene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,1,1,2-Tetrachloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
1,1,2,2-Tetrachloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Tetrachloroethylene	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Toluene	ug/g	<0.16 DLHM	<0.080	<0.080 VOCJ	<0.24 DLHM	<0.12 DLHM	<0.16 DLHM
1,1,1-Trichloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180552-7 11-OCT-18 12:02 **24000011829** **LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830** **LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844** **LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845** **LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9** **24000011857** **QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9** **24000011856** **QAQC1 INT 2**
Acetone	ug/g	<1.0 DLHM	<0.75 DLHM	<0.75 DLHM	<0.50	<0.50	<0.75 DLHM
Benzene	ug/g	<0.014 DLHM	<0.010 DLHM	<0.010 DLHM	<0.0068	<0.0068	<0.010 DLHM
Bromodichloromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Bromoform	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Bromomethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Carbon tetrachloride	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Chlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Dibromochloromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Chloroform	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,2-Dibromoethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,2-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.095 DLHM	<0.050	<0.050	<0.075 DLHM
1,3-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,4-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Dichlorodifluoromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,1-Dichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,2-Dichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,1-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
cis-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
trans-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Methylene Chloride	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,2-Dichloropropane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
cis-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.045 DLHM	<0.045 DLHM	<0.030	<0.030	<0.045 DLHM
trans-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.045 DLHM	<0.045 DLHM	<0.030	<0.030	<0.045 DLHM
1,3-Dichloropropene (cis & trans)	ug/g	<0.085	<0.064	<0.064	<0.042	<0.042	<0.064
Ethylbenzene	ug/g	<0.036 DLHM	<0.027 DLHM	<0.027 DLHM	<0.018	<0.018	<0.027 DLHM
n-Hexane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Methyl Ethyl Ketone	ug/g	<1.0 DLHM	<0.75 DLHM	<0.75 DLHM	<0.50	<0.50	<0.75 DLHM
Methyl Isobutyl Ketone	ug/g	<1.0 DLHM	<0.75 DLHM	<0.75 DLHM	<0.50	<0.50	<0.75 DLHM
MTBE	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Styrene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,1,1,2-Tetrachloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
1,1,2,2-Tetrachloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Tetrachloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Toluene	ug/g	<0.16 DLHM	<0.12 DLHM	<0.12 DLHM	<0.080	<0.080	<0.12 DLHM
1,1,1-Trichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180552-13 12-OCT-18 08:33 **24000011840** **LOC 14 INT 1**		L2180552-14 12-OCT-18 08:33 **24000011841** **LOC 14 INT 2**		L2180552-15 12-OCT-18 08:33 **24000011842** **LOC 14 INT 3**	
Acetone	ug/g	<1.5	DLHM	<1.0	DLHM	<0.75	DLHM
Benzene	ug/g	<0.020	DLHM	<0.014	DLHM	<0.010	DLHM
Bromodichloromethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Bromoform	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Bromomethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Carbon tetrachloride	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Chlorobenzene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Dibromochloromethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Chloroform	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,2-Dibromoethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,2-Dichlorobenzene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,3-Dichlorobenzene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,4-Dichlorobenzene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Dichlorodifluoromethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,1-Dichloroethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,2-Dichloroethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,1-Dichloroethylene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
cis-1,2-Dichloroethylene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
trans-1,2-Dichloroethylene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Methylene Chloride	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,2-Dichloropropane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
cis-1,3-Dichloropropene	ug/g	<0.090	DLHM	<0.060	DLHM	<0.045	DLHM
trans-1,3-Dichloropropene	ug/g	<0.090	DLHM	<0.060	DLHM	<0.045	DLHM
1,3-Dichloropropene (cis & trans)	ug/g	<0.13		<0.085		<0.064	
Ethylbenzene	ug/g	<0.054	DLHM	<0.036	DLHM	<0.027	DLHM
n-Hexane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Methyl Ethyl Ketone	ug/g	<1.5	DLHM	<1.0	DLHM	<0.75	DLHM
Methyl Isobutyl Ketone	ug/g	<1.5	DLHM	<1.0	DLHM	<0.75	DLHM
MTBE	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Styrene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,1,1,2-Tetrachloroethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
1,1,2,2-Tetrachloroethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Tetrachloroethylene	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM
Toluene	ug/g	<0.24	DLHM	<0.16	DLHM	<0.12	DLHM
1,1,1-Trichloroethane	ug/g	<0.15	DLHM	<0.10	DLHM	<0.075	DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
1,1,2-Trichloroethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Trichloroethylene	ug/g	<0.020 DLHM	<0.010	<0.010 VOCJ	<0.030 DLHM	<0.015 DLHM	<0.020 DLHM
Trichlorofluoromethane	ug/g	<0.10 DLHM	<0.050	<0.050 VOCJ	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Vinyl chloride	ug/g	<0.040 DLHM	<0.020	<0.020 VOCJ	<0.060 DLHM	<0.030 DLHM	<0.040 DLHM
o-Xylene	ug/g	<0.040 DLHM	<0.020	<0.020 VOCJ	<0.060 DLHM	<0.030 DLHM	<0.040 DLHM
m+p-Xylenes	ug/g	0.071 DLHM	<0.030	<0.030 VOCJ	<0.090 DLHM	<0.045 DLHM	<0.060 DLHM
Xylenes (Total)	ug/g	<0.072	<0.050	<0.050	<0.11	<0.054	<0.072
Surrogate: 4-Bromofluorobenzene	%	81.6	93.7	79.6	94.8	96.8	89.7
Surrogate: 1,4-Difluorobenzene	%	86.3	98.4	83.9	99.6	101.0	94.8

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829** **LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830** **LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844** **LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845** **LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9** **24000011857** **QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9** **24000011856** **QAQC1 INT 2**
1,1,2-Trichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Trichloroethylene	ug/g	<0.020 DLHM	<0.015 DLHM	<0.015 DLHM	<0.010	<0.010	<0.015 DLHM
Trichlorofluoromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.075 DLHM	<0.050	<0.050	<0.075 DLHM
Vinyl chloride	ug/g	<0.040 DLHM	<0.030 DLHM	<0.030 DLHM	<0.020	<0.020	<0.030 DLHM
o-Xylene	ug/g	<0.040 DLHM	<0.038 DLHM	0.067 DLHM	<0.020	<0.020	<0.030 DLHM
m+p-Xylenes	ug/g	0.062 DLHM	0.052 DLHM	0.103 DLHM	<0.030	<0.030	<0.045 DLHM
Xylenes (Total)	ug/g	<0.072	<0.059	0.170	<0.050	<0.050	<0.054
Surrogate: 4-Bromofluorobenzene	%	83.7	90.1	85.2	93.0	103.3	85.3
Surrogate: 1,4-Difluorobenzene	%	89.9	96.3	92.9	98.0	108.7	92.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-13 12-OCT-18 08:33 **24000011840** **LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841** **LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842** **LOC 14 INT 3**
1,1,2-Trichloroethane	ug/g		<0.15 DLHM	<0.10 DLHM	<0.075 DLHM
Trichloroethylene	ug/g		<0.030 DLHM	<0.020 DLHM	<0.015 DLHM
Trichlorofluoromethane	ug/g		<0.15 DLHM	<0.10 DLHM	<0.075 DLHM
Vinyl chloride	ug/g		<0.060 DLHM	<0.040 DLHM	<0.030 DLHM
o-Xylene	ug/g		<0.060 DLHM	<0.040 DLHM	<0.030 DLHM
m+p-Xylenes	ug/g		<0.090 DLHM	0.067 DLHM	<0.045 DLHM
Xylenes (Total)	ug/g		<0.11	<0.072	<0.054
Surrogate: 4-Bromofluorobenzene	%		92.5	86.4	94.8
Surrogate: 1,4-Difluorobenzene	%		97.7	91.6	98.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
F1 (C6-C10)	ug/g		<10 DLHM	<5.0	<15 VOCJ	<15 DLHM	<7.5 DLHM	<10 DLHM
F1-BTEX	ug/g		<10	<5.0	<15	<15	<7.5	<10
F2 (C10-C16)	ug/g		46 DLHM	14	32 DLHM	59 DLHM	<15 DLHM	28 DLHM
F2-Naphth	ug/g		46	14	32	59	<15	28
F3 (C16-C34)	ug/g		1010 DLHM	116	1310 DLHM	3670 DLHM	160 DLHM	690 DLHM
F3-PAH	ug/g		1000	115	1300	3660	156	660
F4 (C34-C50)	ug/g		210 DLHM	<50	450 DLHM	1790 DLHM	<75 DLHM	280 DLHM
F4G-SG (GHH-Silica)	ug/g				1180	<750		930
Total Hydrocarbons (C6-C50)	ug/g		1260	130	1800	5520	160	1000
Chrom. to baseline at nC50	No Unit		YES	YES	NO	NO	YES	NO
Surrogate: 2-Bromobenzotrifluoride	%		97.7	97.2	96.9	102.8	92.1	84.2
Surrogate: 3,4-Dichlorotoluene	%		65.1	74.2	51.6 SURR-ND	69.8	75.4	70.4

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID											
		L2180552-7 11-OCT-18 12:02 **24000011829** **LOC 10 INT 2**		L2180552-8 11-OCT-18 12:02 **24000011830** **LOC 10 INT 3**		L2180552-9 11-OCT-18 13:18 **24000011844** **LOC 15 INT 2**		L2180552-10 11-OCT-18 13:18 **24000011845** **LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9** **24000011857** **QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9** **24000011856** **QAQC1 INT 2**	
F1 (C6-C10)	ug/g	<10	DLHM	<7.5	DLHM	<7.5	DLHM	<5.0	<5.0	<7.5	DLHM
F1-BTEX	ug/g	<10		<7.5		<7.5		<5.0	<5.0	<7.5	
F2 (C10-C16)	ug/g	127	DLHM	33	DLHM	35	DLHM	16	<10	28	DLHM
F2-Naphth	ug/g	127		33		35		16	<10	28	
F3 (C16-C34)	ug/g	4030	DLHM	907	DLHM	532	DLHM	251	<50	363	DLHM
F3-PAH	ug/g	4020		900		523		247	<50	355	
F4 (C34-C50)	ug/g	1510	DLHM	203	DLHM	158	DLHM	51	<50	<75	DLHM
F4G-SG (GHH-Silica)	ug/g	4160		610		470					
Total Hydrocarbons (C6-C50)	ug/g	5670		1140		730		318	<72	390	
Chrom. to baseline at nC50	No Unit	NO		NO		NO		YES	YES	YES	
Surrogate: 2-Bromobenzotrifluoride	%	94.9		92.2		92.7		93.7	79.8	93.9	
Surrogate: 3,4-Dichlorotoluene	%	66.8		72.1		63.4		72.4	76.9	62.1	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**		L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**		L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**	
F1 (C6-C10)	ug/g		<15	DLHM	<10	DLHM	<7.5	DLHM
F1-BTEX	ug/g		<15		<10		<7.5	
F2 (C10-C16)	ug/g		43	DLHM	50	DLHM	16	DLHM
F2-Naphth	ug/g		43		50		16	
F3 (C16-C34)	ug/g		1000	DLHM	960	DLHM	135	DLHM
F3-PAH	ug/g		980		950		133	
F4 (C34-C50)	ug/g		340	DLHM	260	DLHM	<75	DLHM
F4G-SG (GHH-Silica)	ug/g		1130		750			
Total Hydrocarbons (C6-C50)	ug/g		1380		1270		150	
Chrom. to baseline at nC50	No Unit		NO		NO		YES	
Surrogate: 2-Bromobenzotrifluoride	%		90.6		92.2		88.4	
Surrogate: 3,4-Dichlorotoluene	%		69.8		62.0		74.2	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2180552-1 12-OCT-18 08:43 LOC 14 24000011859 QAQC #2 INT 2	L2180552-2 12-OCT-18 08:43 LOC 14 24000011860 QAQC #2 INT 3	L2180552-3 12-OCT-18 08:43 LOC 14 24000011858 QAQC #2 INT 1	L2180552-4 12-OCT-18 15:00 24000011846 LOC 16 INT 1	L2180552-5 12-OCT-18 13:08 24000011849 LOC 17 INT 1	L2180552-6 12-OCT-18 11:40 24000011852 LOC 18 INT 1
Acenaphthene	ug/g	<0.10 DLHM	<0.050	<0.10 DLHM	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Acenaphthylene	ug/g	<0.10 DLHM	<0.050	<0.10 DLHM	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Anthracene	ug/g	0.13 DLHM	<0.050	0.11 DLHM	<0.15 DLHM	<0.075 DLHM	0.14 DLHM
Benzo(a)anthracene	ug/g	0.57 DLHM	0.089	0.77 DLHM	0.67 DLHM	0.346 DLHM	1.83 DLHM
Benzo(a)pyrene	ug/g	0.71 DLHM	0.104	1.16 DLHM	1.06 DLHM	0.381 DLHM	2.52 DLHM
Benzo(b)fluoranthene	ug/g	0.89 DLHM	0.089	1.71 DLHM	1.62 DLHM	0.474 DLHM	3.05 DLHM
Benzo(g,h,i)perylene	ug/g	0.65 DLHM	0.065	1.08 DLHM	1.05 DLHM	0.367 DLHM	2.01 DLHM
Benzo(k)fluoranthene	ug/g	0.73 DLHM	0.111	1.28 DLHM	1.55 DLHM	0.402 DLHM	2.26 DLHM
Chrysene	ug/g	0.83 DLHM	0.083	1.65 DLHM	1.51 DLHM	0.526 DLHM	3.26 DLHM
Dibenzo(ah)anthracene	ug/g	0.15 DLHM	<0.050	0.27 DLHM	0.25 DLHM	0.079 DLHM	0.46 DLHM
Fluoranthene	ug/g	1.14 DLHM	0.204	2.36 DLHM	2.16 DLHM	0.961 DLHM	5.81 DLHM
Fluorene	ug/g	0.14 DLHM	<0.050	0.10 DLHM	<0.15 DLHM	<0.075 DLHM	<0.10 DLHM
Indeno(1,2,3-cd)pyrene	ug/g	0.50 DLHM	0.054	0.95 DLHM	0.93 DLHM	0.273 DLHM	1.65 DLHM
1+2-Methylnaphthalenes	ug/g	0.339	<0.042	<0.42	<0.64	<0.064	<0.085
1-Methylnaphthalene	ug/g	0.140 DLHM	<0.030	<0.30 DLR	<0.45 DLR	<0.045 DLHM	<0.060 DLHM
2-Methylnaphthalene	ug/g	0.200 DLHM	<0.030	<0.30 DLR	<0.45 DLR	<0.045 DLHM	<0.060 DLHM
Naphthalene	ug/g	0.206 DLHM	<0.013	0.16 R	<0.20 DLR	0.020 DLHM	<0.026 DLHM
Phenanthrene	ug/g	0.422 DLHM	<0.046	0.571 DLHM	0.50 DLHM	0.310 DLHM	1.73 DLHM
Pyrene	ug/g	1.22 DLHM	0.246	1.98 DLHM	1.80 DLHM	0.751 DLHM	4.50 DLHM
Surrogate: 2-Fluorobiphenyl	%	72.4	73.7	70.8	71.8	73.1	71.8
Surrogate: p-Terphenyl d14	%	70.7	73.0	71.1	70.7	71.7	68.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2180552-7 11-OCT-18 12:02 24000011829 LOC 10 INT 2	L2180552-8 11-OCT-18 12:02 24000011830 LOC 10 INT 3	L2180552-9 11-OCT-18 13:18 24000011844 LOC 15 INT 2	L2180552-10 11-OCT-18 13:18 24000011845 LOC 15 INT 3	L2180552-11 11-OCT-18 09:40 LOC 9 24000011857 QAQC1 INT 3	L2180552-12 11-OCT-18 09:40 LOC 9 24000011856 QAQC1 INT 2
Acenaphthene	ug/g	0.11 DLHM	<0.075 DLHM	0.119 DLHM	<0.050	<0.050	0.082 DLHM
Acenaphthylene	ug/g	<0.10 DLHM	0.146 DLHM	0.114 DLHM	0.208	<0.050	0.153 DLHM
Anthracene	ug/g	0.20 DLHM	0.165 DLHM	0.211 DLHM	0.095	<0.050	0.180 DLHM
Benzo(a)anthracene	ug/g	0.87 DLHM	0.570 DLHM	0.773 DLHM	0.448	<0.050	0.644 DLHM
Benzo(a)pyrene	ug/g	1.11 DLHM	0.753 DLHM	0.941 DLHM	0.642	<0.050	0.817 DLHM
Benzo(b)fluoranthene	ug/g	1.41 DLHM	0.843 DLHM	1.16 DLHM	0.453	<0.050	0.915 DLHM
Benzo(g,h,i)perylene	ug/g	1.38 DLHM	0.880 DLHM	1.15 DLHM	0.552	<0.050	0.891 DLHM
Benzo(k)fluoranthene	ug/g	1.16 DLHM	0.640 DLHM	0.937 DLHM	0.498	<0.050	0.688 DLHM
Chrysene	ug/g	1.64 DLHM	0.802 DLHM	1.26 DLHM	0.335	<0.050	0.927 DLHM
Dibenzo(ah)anthracene	ug/g	0.37 DLHM	0.232 DLHM	0.315 DLHM	0.116	<0.050	0.230 DLHM
Fluoranthene	ug/g	2.16 DLHM	1.07 DLHM	1.76 DLHM	0.620	<0.050	1.26 DLHM
Fluorene	ug/g	0.23 DLHM	0.122 DLHM	0.253 DLHM	<0.050	<0.050	0.185 DLHM
Indeno(1,2,3-cd)pyrene	ug/g	1.08 DLHM	0.714 DLHM	0.940 DLHM	0.463	<0.050	0.746 DLHM
1+2-Methylnaphthalenes	ug/g	0.667	0.233	0.746	<0.042	<0.042	0.501
1-Methylnaphthalene	ug/g	0.277 DLHM	0.094 DLHM	0.304 DLHM	<0.030	<0.030	0.206 DLHM
2-Methylnaphthalene	ug/g	0.390 DLHM	0.139 DLHM	0.442 DLHM	<0.030	<0.030	0.294 DLHM
Naphthalene	ug/g	0.403 DLHM	0.140 DLHM	0.432 DLHM	0.027 R	<0.013	0.298 DLHM
Phenanthrene	ug/g	0.903 DLHM	0.399 DLHM	0.774 DLHM	0.098	<0.046	0.583 DLHM
Pyrene	ug/g	2.10 DLHM	1.23 DLHM	1.80 DLHM	0.852	<0.050	1.39 DLHM
Surrogate: 2-Fluorobiphenyl	%	76.3	76.1	77.0	73.3	74.0	72.9
Surrogate: p-Terphenyl d14	%	75.1	73.8	74.9	71.9	74.5	69.8

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Acenaphthene	ug/g		<0.15 DLHM	0.14 DLHM	<0.075 DLHM
Acenaphthylene	ug/g		<0.15 DLHM	0.14 DLHM	<0.075 DLHM
Anthracene	ug/g		0.15 DLHM	0.27 DLHM	<0.075 DLHM
Benzo(a)anthracene	ug/g		0.96 DLHM	0.82 DLHM	0.249 DLHM
Benzo(a)pyrene	ug/g		1.53 DLHM	1.00 DLHM	0.287 DLHM
Benzo(b)fluoranthene	ug/g		2.40 DLHM	1.24 DLHM	0.236 DLHM
Benzo(g,h,i)perylene	ug/g		1.98 DLHM	1.18 DLHM	0.224 DLHM
Benzo(k)fluoranthene	ug/g		1.58 DLHM	0.94 DLHM	0.253 DLHM
Chrysene	ug/g		2.05 DLHM	1.30 DLHM	0.217 DLHM
Dibenzo(ah)anthracene	ug/g		0.52 DLHM	0.32 DLHM	<0.075 DLHM
Fluoranthene	ug/g		2.99 DLHM	1.79 DLHM	0.500 DLHM
Fluorene	ug/g		<0.15 DLHM	0.30 DLHM	<0.075 DLHM
Indeno(1,2,3-cd)pyrene	ug/g		1.77 DLHM	0.94 DLHM	0.180 DLHM
1+2-Methylnaphthalenes	ug/g		0.38	0.957	<0.064
1-Methylnaphthalene	ug/g		0.153 DLHM	0.386 DLHM	<0.045 DLHM
2-Methylnaphthalene	ug/g		0.224 DLHM	0.571 DLHM	<0.045 DLHM
Naphthalene	ug/g		0.213 DLHM	0.554 DLHM	<0.020 DLHM
Phenanthrene	ug/g		0.72 DLHM	0.787 DLHM	0.083 DLHM
Pyrene	ug/g		2.51 DLHM	1.82 DLHM	0.649 DLHM
Surrogate: 2-Fluorobiphenyl	%		75.1	74.9	75.5
Surrogate: p-Terphenyl d14	%		73.8	72.9	73.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Aroclor 1242	mg/kg	<0.070 DLM	<0.0150 DLM	<0.0650 DLM	<0.060 DLM	<0.015 DLHM	<0.020 DLHM
Aroclor 1248	mg/kg	<0.020 DLHM	<0.010	<0.020 DLHM	<0.030 DLHM	<0.015 DLHM	<0.020 DLHM
Aroclor 1254	mg/kg	0.111 PRAR	<0.010	0.146 PRAR	0.105 PRAR	<0.030 DLM	<0.0250 DLM
Aroclor 1260	mg/kg	<0.0250 DLM	<0.0150 DLM	<0.0460 DLM	<0.030 DLHM	<0.015 DLHM	<0.020 DLHM
Total PCBs	mg/kg	0.111 DLM	<0.0260 DLM	0.146 DLM	0.105 DLM	<0.040 DLHM	<0.0430 DLM
Surrogate: d14-Terphenyl	%	86.8	88.7	87.8	87.2	88.5	86.3

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180552-7 11-OCT-18 12:02 **24000011829 LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830 LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844 LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845 LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9 24000011857 QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9 24000011856 QAQC1 INT 2**
Aroclor 1242	mg/kg	<0.210 DLM	<0.060 DLM	<0.090 DLM	<0.010	<0.010	<0.070 DLM
Aroclor 1248	mg/kg	<0.020 DLHM	<0.015 DLHM	<0.015 DLHM	<0.010	<0.010	<0.015 DLHM
Aroclor 1254	mg/kg	0.298 PRAR	<0.060 DLM	0.373 PRAR	<0.010	<0.010	0.199 PRAR
Aroclor 1260	mg/kg	<0.120 DLM	<0.015 DLHM	<0.090 DLM	<0.010	<0.010	<0.015 DLHM
Total PCBs	mg/kg	0.298 DLM	<0.090 DLM	0.373 DLM	<0.020	<0.020	0.199 DLM
Surrogate: d14-Terphenyl	%	88.5	92.4	85.1	83.4	78.7	93.3

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID		
		L2180552-13 12-OCT-18 08:33 **24000011840 LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841 LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842 LOC 14 INT 3**
Aroclor 1242	mg/kg	<0.030 DLHM	<0.120 DLM	<0.015 DLHM
Aroclor 1248	mg/kg	<0.030 DLHM	<0.020 DLHM	<0.015 DLHM
Aroclor 1254	mg/kg	<0.150 DLM	0.362 PRAR	<0.015 DLHM
Aroclor 1260	mg/kg	<0.030 DLHM	<0.100 DLM	<0.015 DLHM
Total PCBs	mg/kg	<0.160 DLM	0.362 DLM	<0.030 DLHM
Surrogate: d14-Terphenyl	%	82.5	66.8	67.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180552-1 12-OCT-18 08:43 **LOC 14 24000011859 QAQC #2 INT 2**	L2180552-2 12-OCT-18 08:43 **LOC 14 24000011860 QAQC #2 INT 3**	L2180552-3 12-OCT-18 08:43 **LOC 14 24000011858 QAQC #2 INT 1**	L2180552-4 12-OCT-18 15:00 **24000011846 LOC 16 INT 1**	L2180552-5 12-OCT-18 13:08 **24000011849 LOC 17 INT 1**	L2180552-6 12-OCT-18 11:40 **24000011852 LOC 18 INT 1**
Aldrin	mg/kg	<0.100 DLQ	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
alpha-BHC	mg/kg	<0.110 DLQ	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
beta-BHC	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Lindane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
delta-BHC	mg/kg	<0.170 DLQ	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
a-chlordane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
g-chlordane	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
op-DDD	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
pp-DDD	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
o,p-DDE	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
pp-DDE	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Dieldrin	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
alpha-Endosulfan	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
beta-Endosulfan	mg/kg	<0.100 DLQ	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Endosulfan Sulfate	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Endrin	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Endrin Aldehyde	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Heptachlor	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Heptachlor Epoxide	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Hexachlorobenzene	mg/kg	<0.080 DLM	<0.020 DLM	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Methoxychlor	mg/kg	<0.080 DLM					
Mirex	mg/kg	<0.080 DLM	<0.020	<0.080 DLM	<0.12 DLM	<0.030 DLM	<0.080 DLM
Oxychlordane	mg/kg	<0.080 DLM	<0.020	<0.20 DLQ	<0.30 DLQ	<0.60 DLQ	<0.50 DLQ
Surrogate: 2-Fluorobiphenyl	%	82.0	78.9	75.4	76.0	74.3	81.0
Surrogate: d14-Terphenyl	%	63.8	67.7	55.8	56.4	59.7	65.4

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180552-7 11-OCT-18 12:02 **24000011829** **LOC 10 INT 2**	L2180552-8 11-OCT-18 12:02 **24000011830** **LOC 10 INT 3**	L2180552-9 11-OCT-18 13:18 **24000011844** **LOC 15 INT 2**	L2180552-10 11-OCT-18 13:18 **24000011845** **LOC 15 INT 3**	L2180552-11 11-OCT-18 09:40 **LOC 9** **24000011857** **QAQC1 INT 3**	L2180552-12 11-OCT-18 09:40 **LOC 9** **24000011856** **QAQC1 INT 2**
Aldrin	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
alpha-BHC	mg/kg	<0.20 DLQ	<0.040 DLQ	<0.090 DLQ	<0.040 DLM	<0.020	<0.070 DLQ
beta-BHC	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Lindane	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
delta-BHC	mg/kg	<0.30 DLQ	<0.050 DLQ	<0.200 DLQ	<0.040 DLM	<0.020	<0.090 DLQ
a-chlordane	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
g-chlordane	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
op-DDD	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
pp-DDD	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
o,p-DDE	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
pp-DDE	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Dieldrin	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
alpha-Endosulfan	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
beta-Endosulfan	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Endosulfan Sulfate	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Endrin	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Endrin Aldehyde	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Heptachlor	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Heptachlor Epoxide	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Hexachlorobenzene	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020 DLM	<0.060 DLM
Methoxychlor	mg/kg						
Mirex	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Oxychlordane	mg/kg	<0.080 DLM	<0.030 DLM	<0.080 DLM	<0.040 DLM	<0.020	<0.060 DLM
Surrogate: 2-Fluorobiphenyl	%	82.0	80.4	79.0	80.7	79.8	72.6
Surrogate: d14-Terphenyl	%	64.0	68.1	65.2	65.1	65.4	64.2

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180552-13 12-OCT-18 08:33 **24000011840** **LOC 14 INT 1**	L2180552-14 12-OCT-18 08:33 **24000011841** **LOC 14 INT 2**	L2180552-15 12-OCT-18 08:33 **24000011842** **LOC 14 INT 3**
Aldrin	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
alpha-BHC	mg/kg	<0.12 DLM	<0.100 DLQ	<0.030 DLM
beta-BHC	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Lindane	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
delta-BHC	mg/kg	<0.12 DLM	<0.150 DLQ	<0.030 DLM
a-chlordane	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
g-chlordane	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
op-DDD	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
pp-DDD	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
o,p-DDE	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
pp-DDE	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Dieldrin	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
alpha-Endosulfan	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
beta-Endosulfan	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Endosulfan Sulfate	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Endrin	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Endrin Aldehyde	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Heptachlor	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Heptachlor Epoxide	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Hexachlorobenzene	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Methoxychlor	mg/kg			
Mirex	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Oxychlordane	mg/kg	<0.12 DLM	<0.080 DLM	<0.030 DLM
Surrogate: 2-Fluorobiphenyl	%	75.4	78.8	79.7
Surrogate: d14-Terphenyl	%	56.8	69.0	67.3

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2180552-3	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	
L2180552-3	Soil	Note: Detection Limit Adjusted: Sample has High Moisture Content	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLR	Detection Limit Raised due to required dilution, limited sample amount, and/or high moisture content (soil samples)
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be

Reference Information

	unaffected.
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
PRAR	PCB Pattern Most Closely Resembles Aroclor Reported
VOCJ	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial

Reference Information

	requirements (for BC, AB-Tier1, MB, ON, SK).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0

5 grams of dried soil is mixed with 10 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD

The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-SOLID-MF-WT	Soil	E. coli on sludge or solid	SM 9222D

A 1g biosolid sample is transferred into buffered dilution water blank. The sample is manually shaken and an aliquot of the sample is then filtered through the membrane filter. The filter is then placed on mFC-BCIG agar and incubated at 44.5 – 0.2 ”C for 24 – 2 hours. Method ID: WT-TM-1200. Results are reported on a dry weight basis. Moisture is required.

EC-WT	Soil	Conductivity (EC)	MOEE E3138

A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ETL-N-TOT-WT	Soil	Calculate from NO2 + NO3+TKN	CALCULATION
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Soil F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

FC-SOLID-MF-WT Soil Fecal Coliform on sludge or solid SM 9222D

HG-200.2-CVAA-WT Soil Mercury in Soil by CVAAS EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

NO2-WT	Soil	Nitrite in Soil	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

NO3-WT	Soil	Nitrate in Soil (NO3-N)	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PCB-WT	Soil	Polychlorinated Biphenyls	EPA 8082

A representative sub-sample of a soil sample is mixed with methanol and extracted with toluene using a shaker technique. An aliquot of the separated toluene is analyzed by GC/MSD.

PEST-OC-WT	Soil	Pesticides, Organochlorine	SW846 8270

A 5g representative sub-sample of the soil sample is mixed with methanol and extracted with toluene. An aliquot is taken and analyzed by GC/MSD.

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PO4-DO-COL-WT	Soil	Orthophosphate in Soil (PO4-P)	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a soil sample that has been extracted and filtered through a 0.45 micron membrane filter.

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

SOLIDS-TS-WT	Soil	Total Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids. Results are reported as the percentage of the total sample.

SOLIDS-VS-WT	Soil	Volatile Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids.
This residue is ignited to constant weight at 550°C. The remaining solids represent the fixed total solids while the weight lost on ignition is the volatile solids. Results are reported as Percent of the Total solids as Volatile.

TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.3.2

Soil is treated with excess acidic dichromate, which reacts with the organic carbon, oxidizing it to CO2. The residual dichromate is titrated with ferrous ammonium sulphate and TOC calculated by difference.

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

LON-181005

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

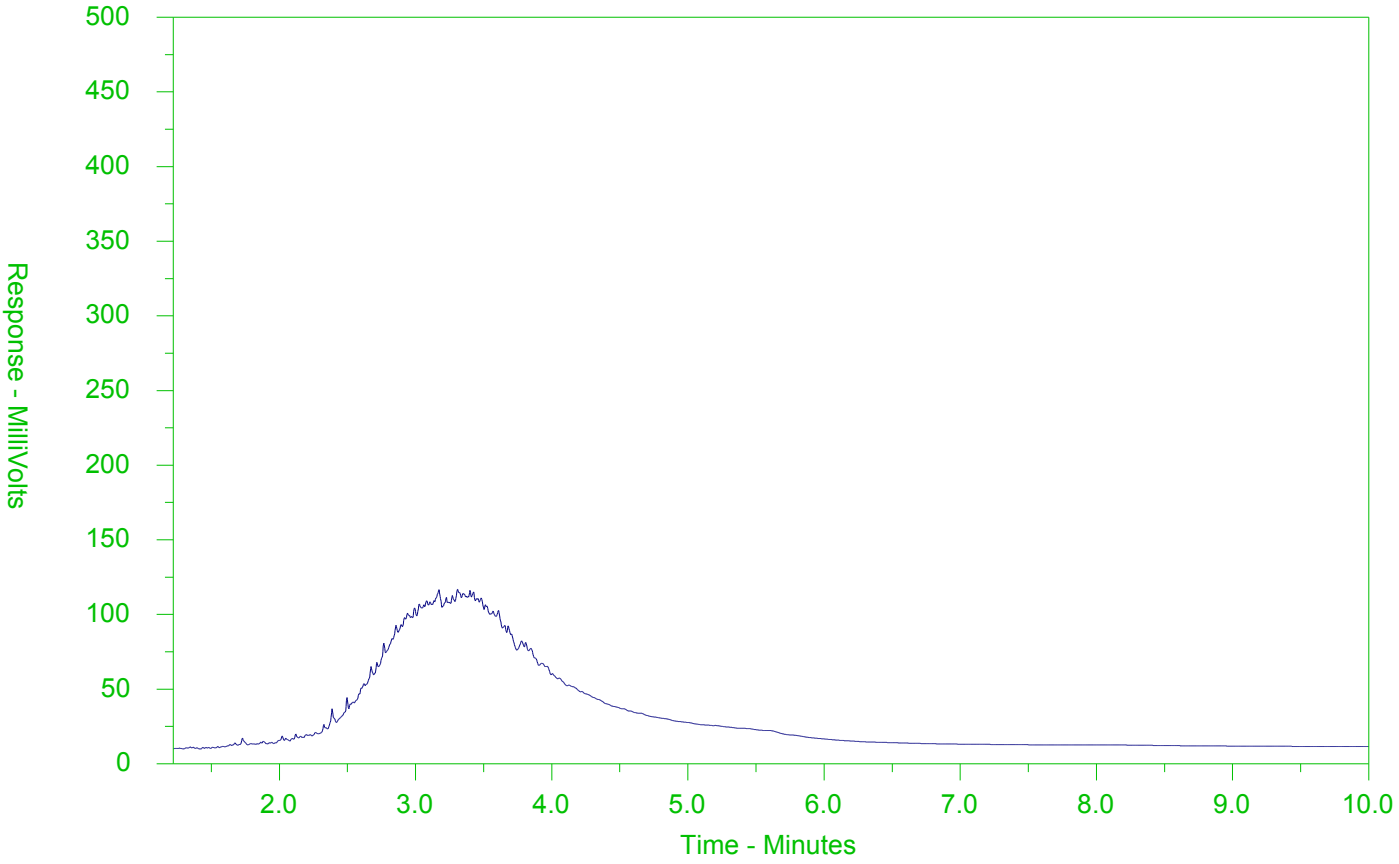
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-1
Client Sample ID: LOC 14 24000011859 QAQC #2 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

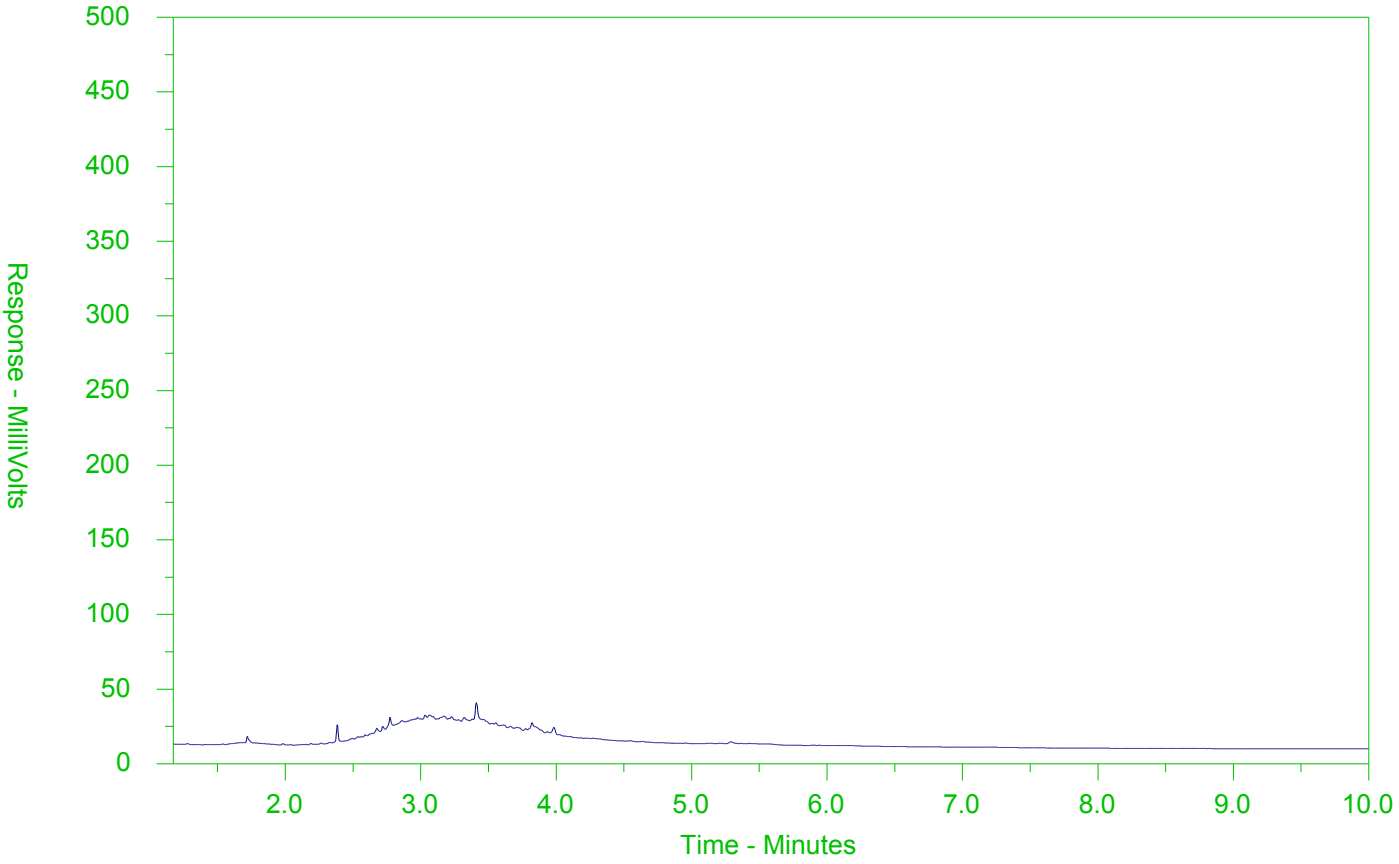
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-2
Client Sample ID: LOC 14 24000011860 QAQC #2 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

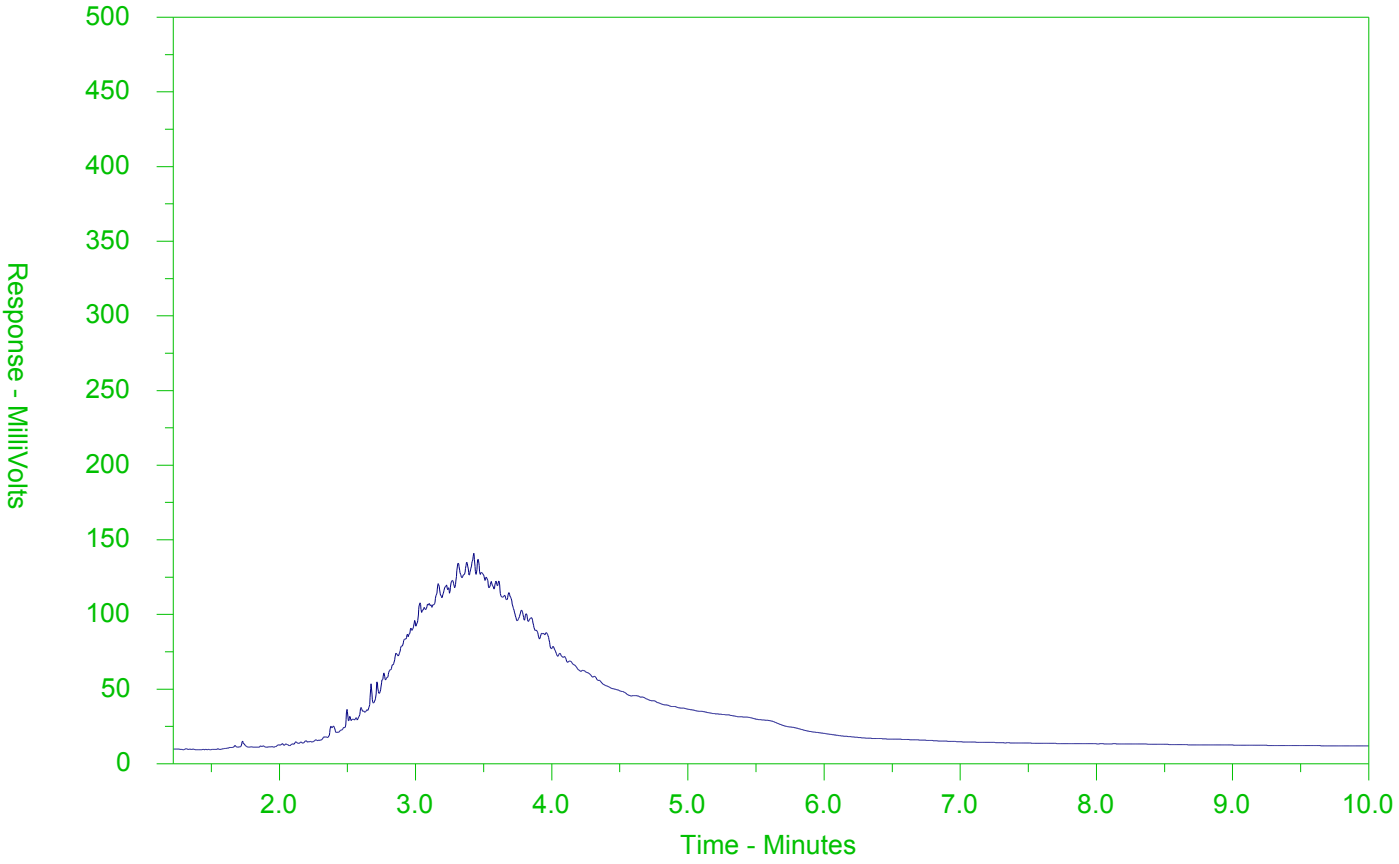
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-3
Client Sample ID: LOC 14 24000011858 QAQC #2 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

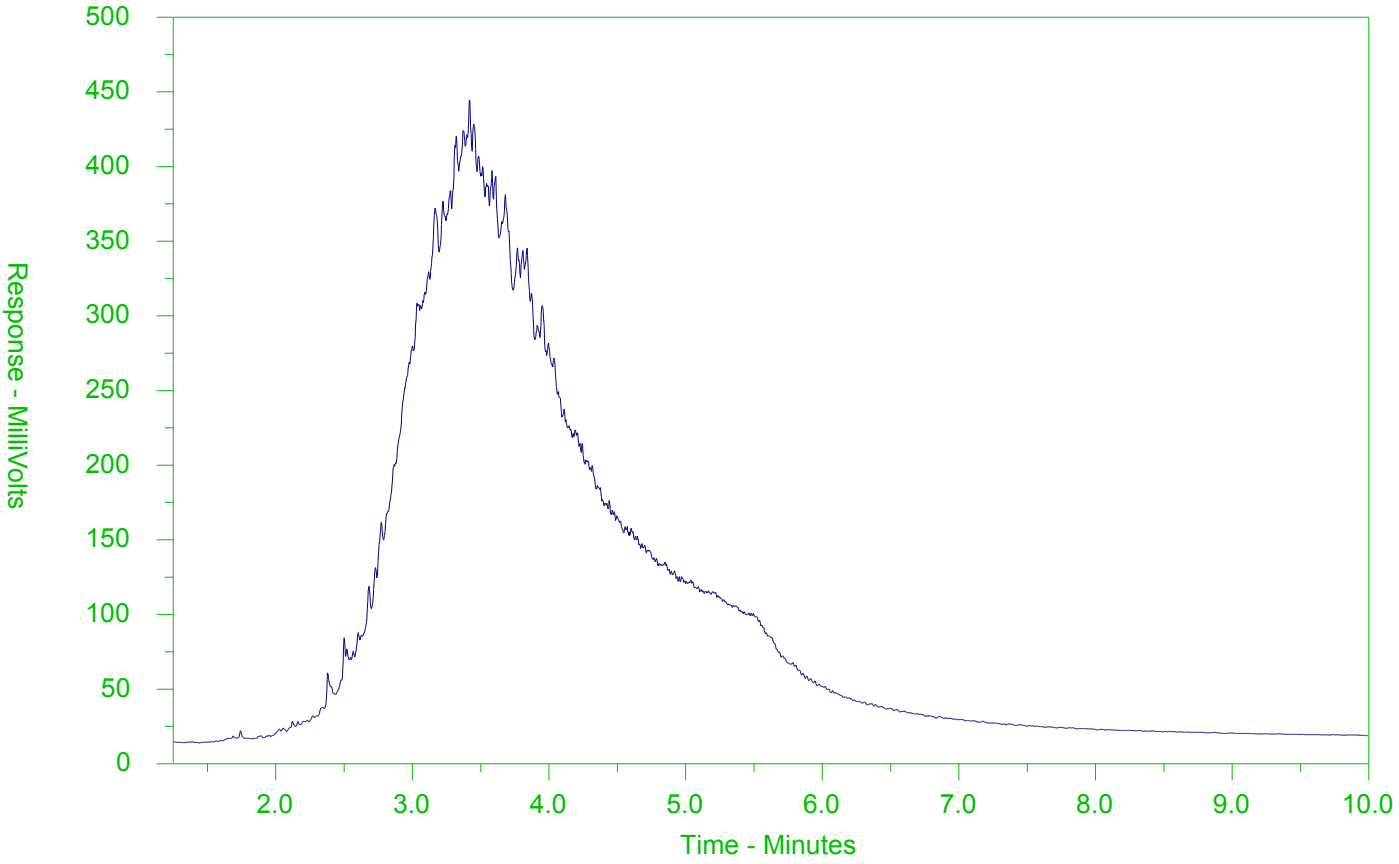
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-4
Client Sample ID: 24000011846 LOC 16 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

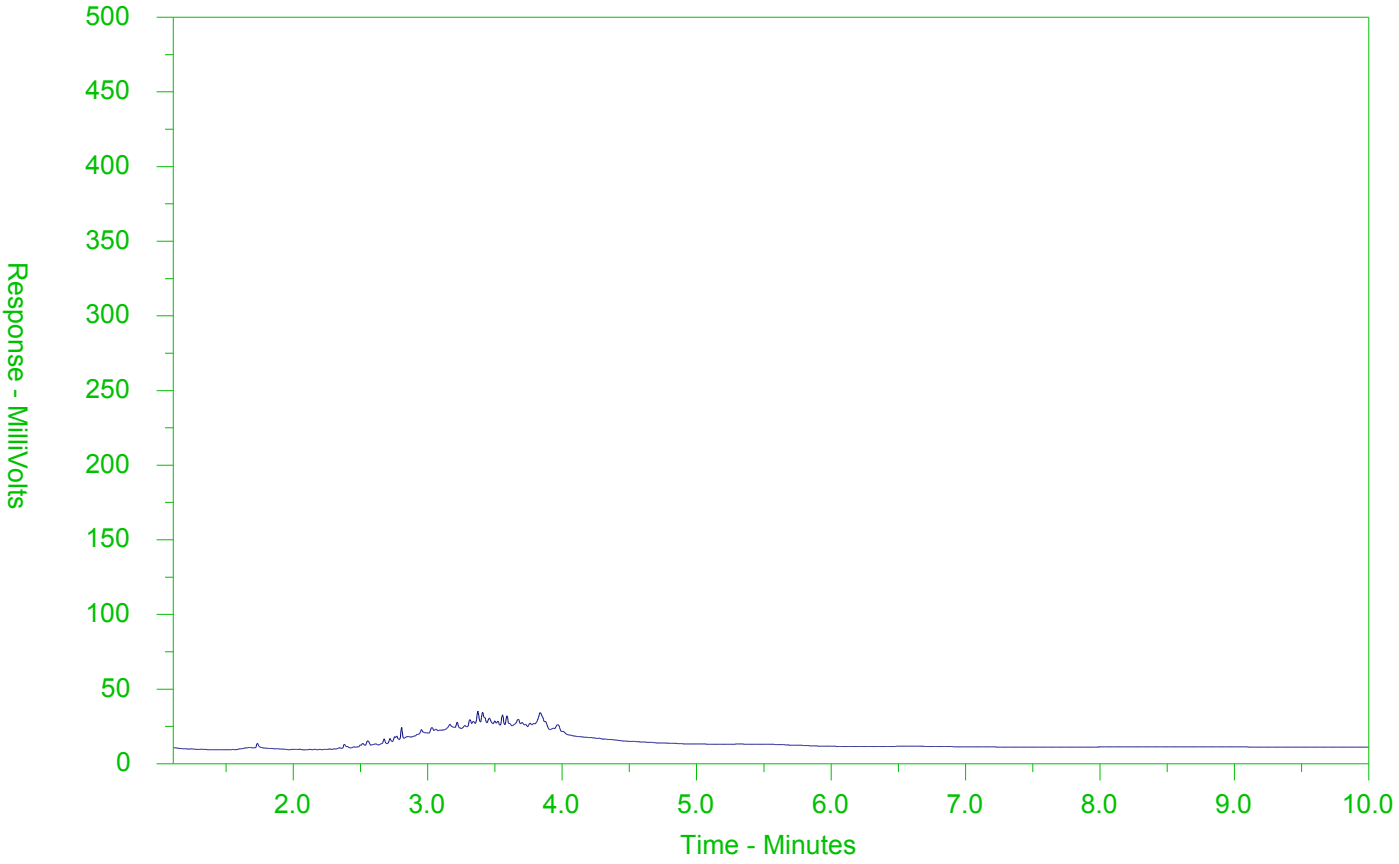
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-5
Client Sample ID: 24000011849 LOC 17 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

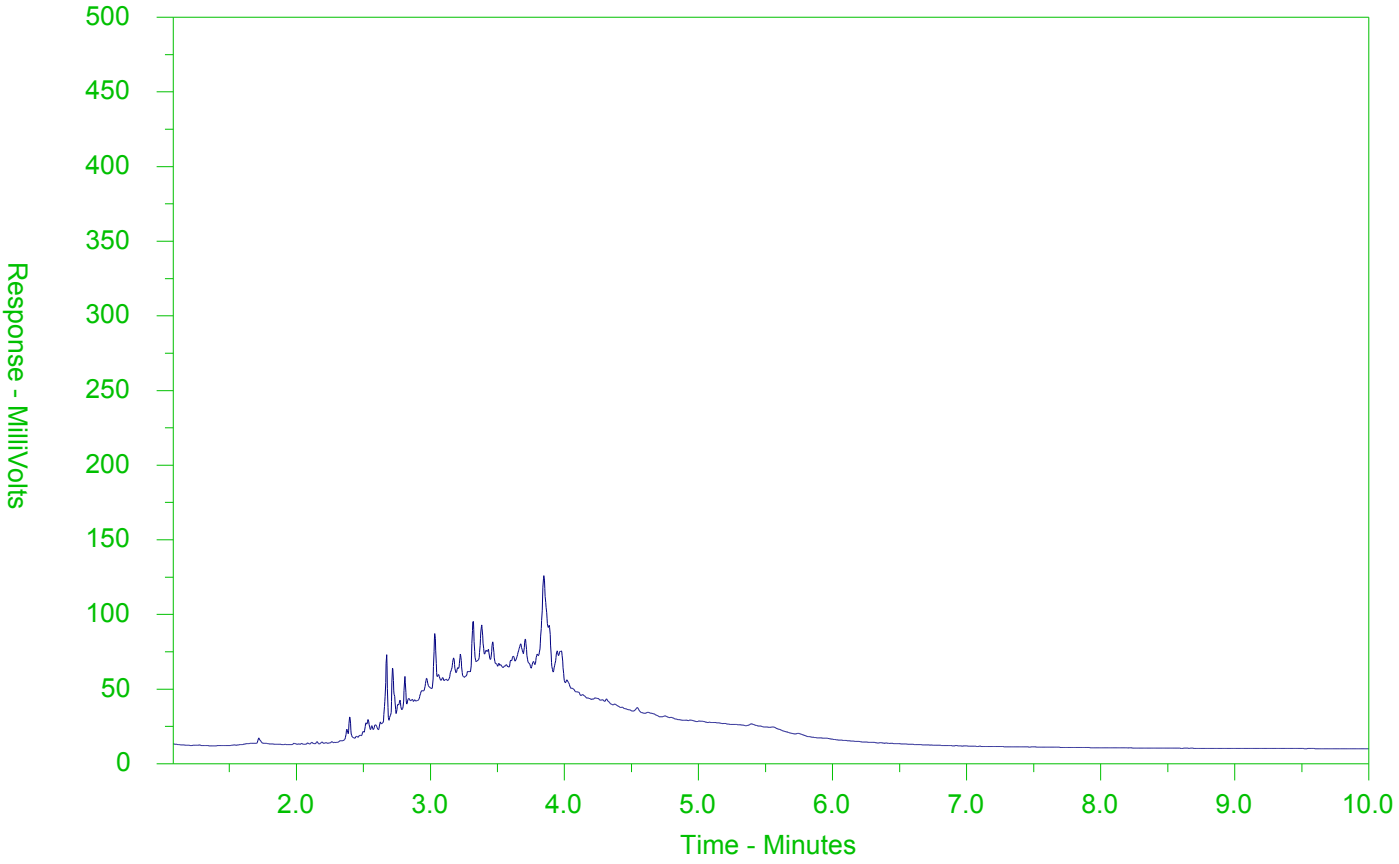
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-6
Client Sample ID: 24000011852 LOC 18 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

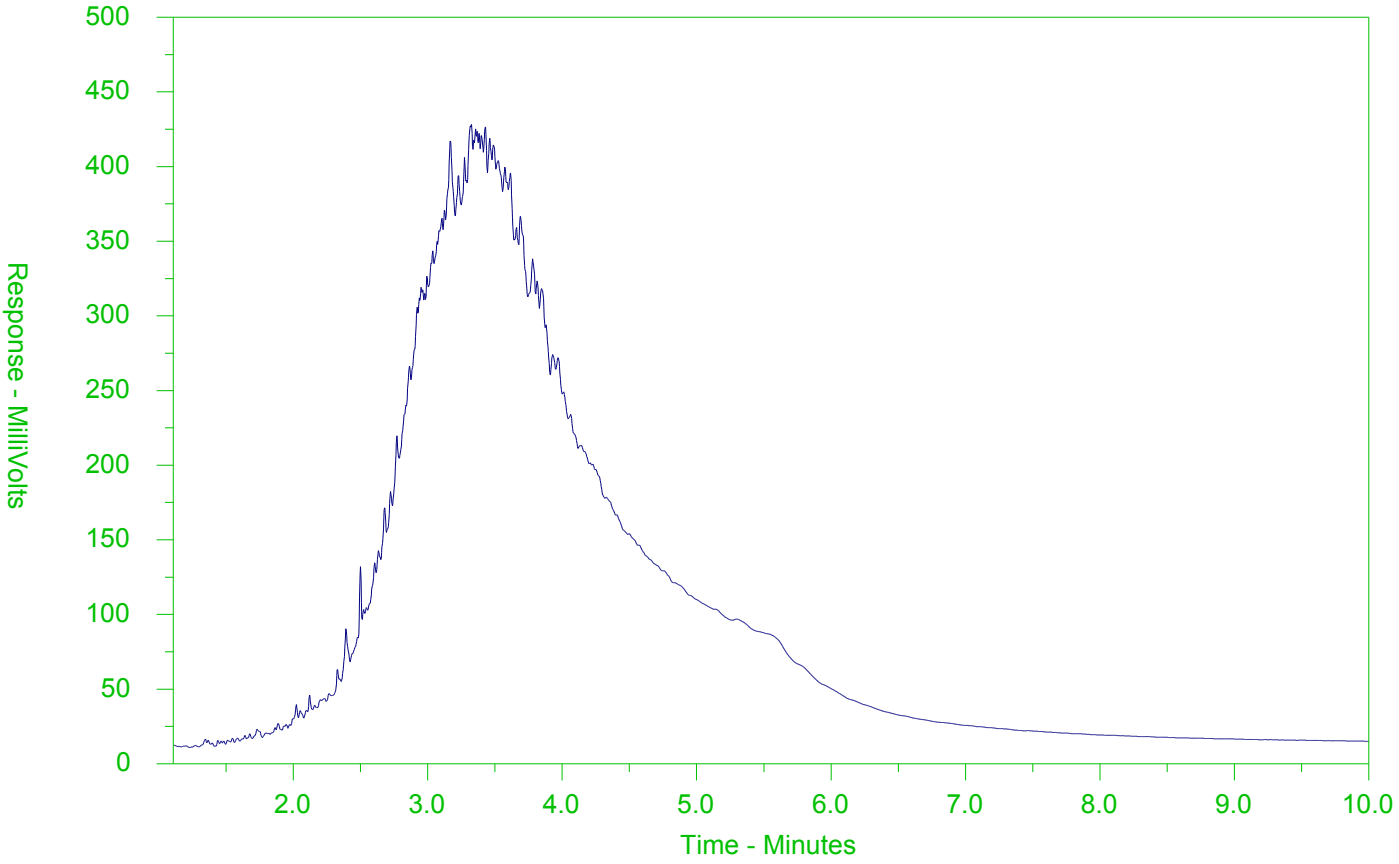
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-7
Client Sample ID: 24000011829 LOC 10 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

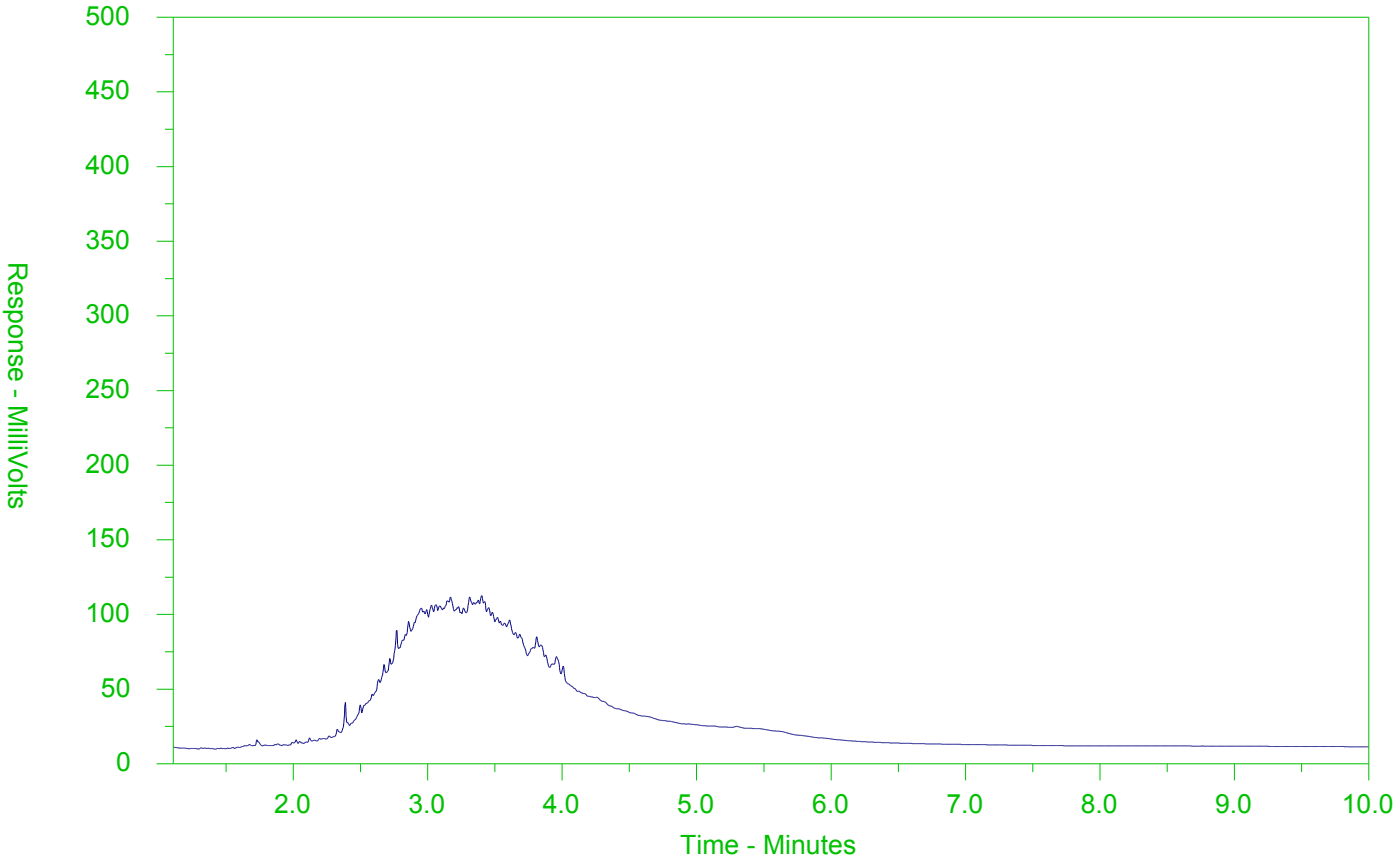
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-8
Client Sample ID: 24000011830 LOC 10 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

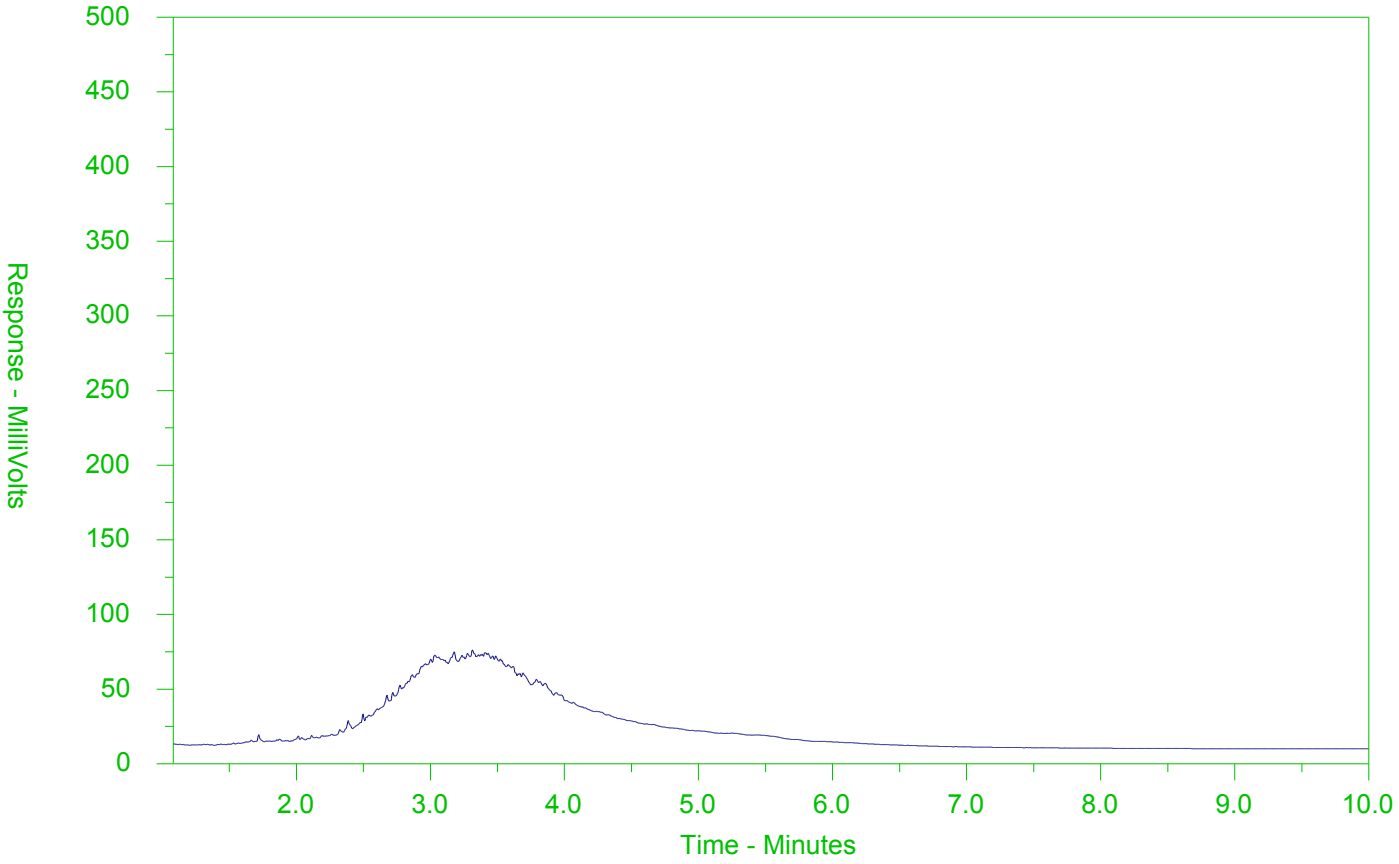
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-9
Client Sample ID: 24000011844 LOC 15 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

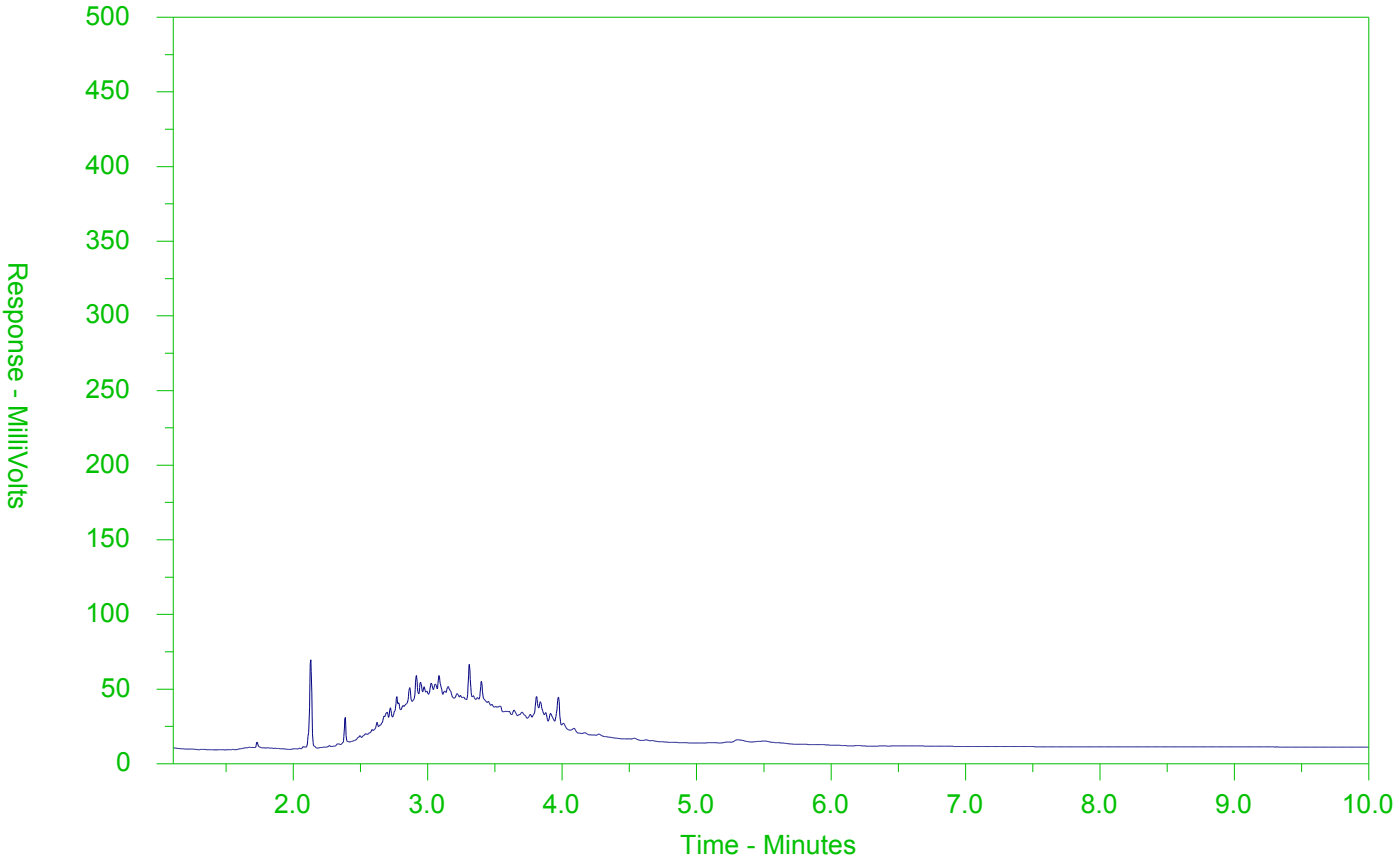
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-10
Client Sample ID: 24000011845 LOC 15 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

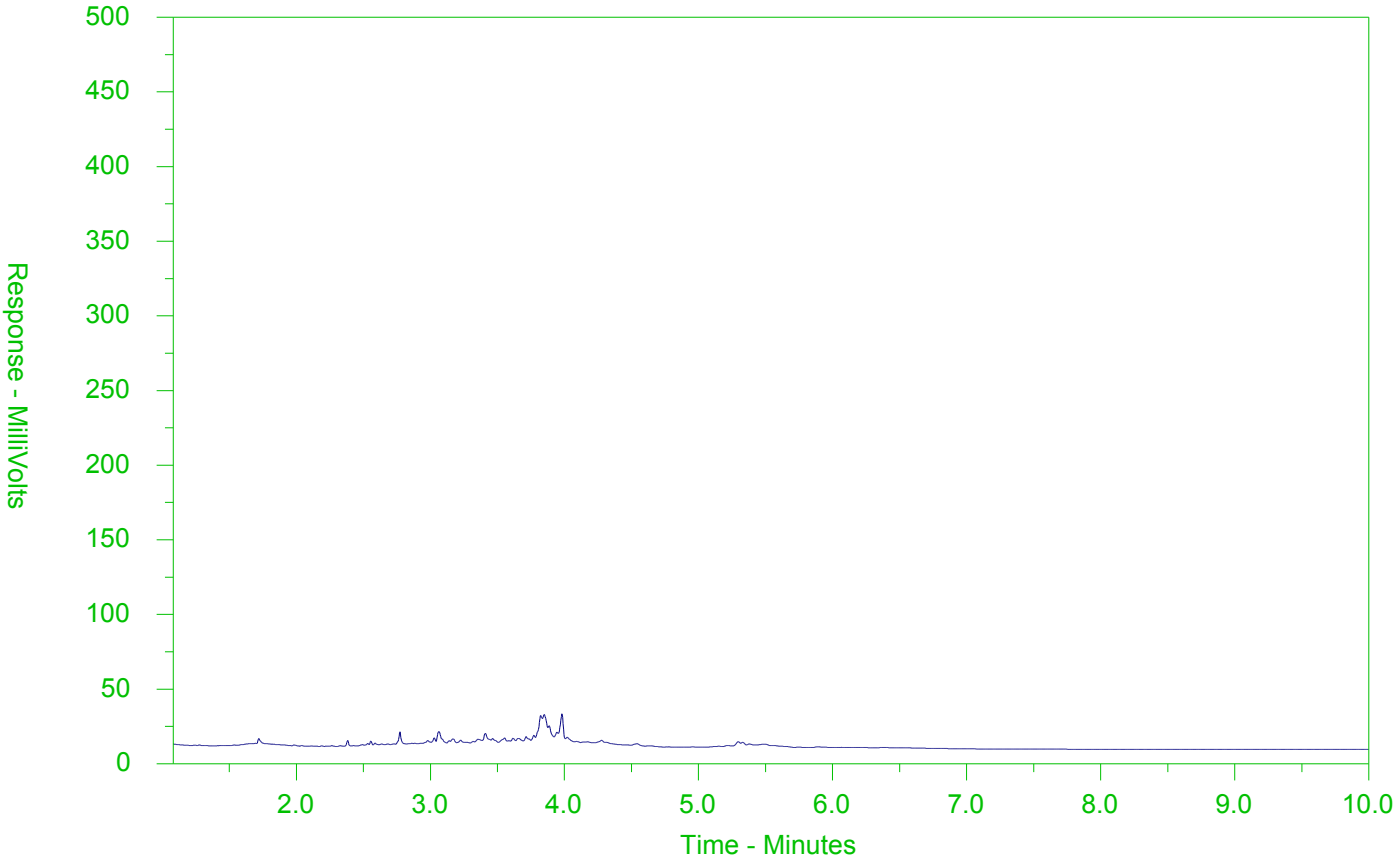
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-11
Client Sample ID: LOC 9 24000011857 QAQC1 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

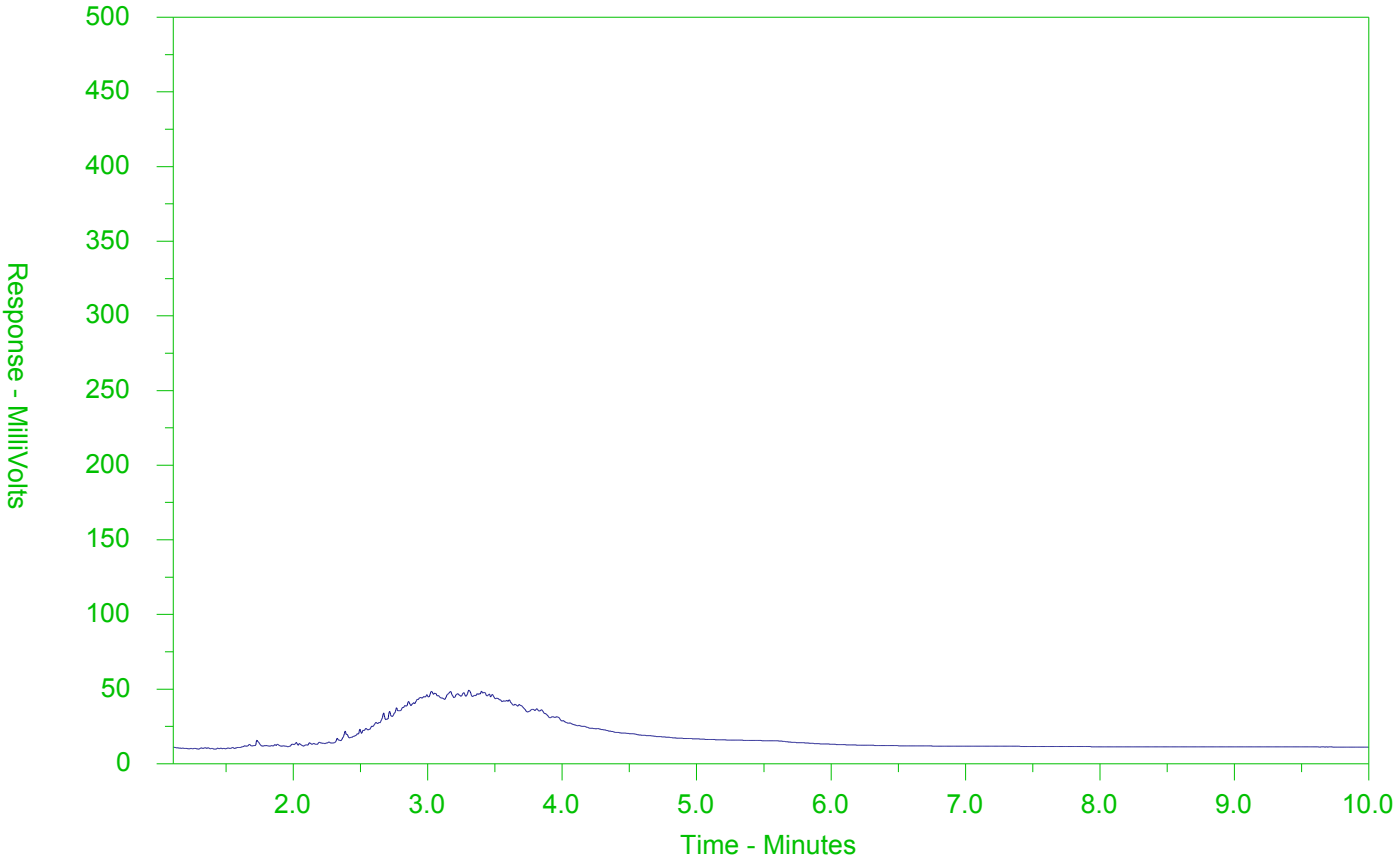
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-12
Client Sample ID: LOC 9 24000011856 QAQC1 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

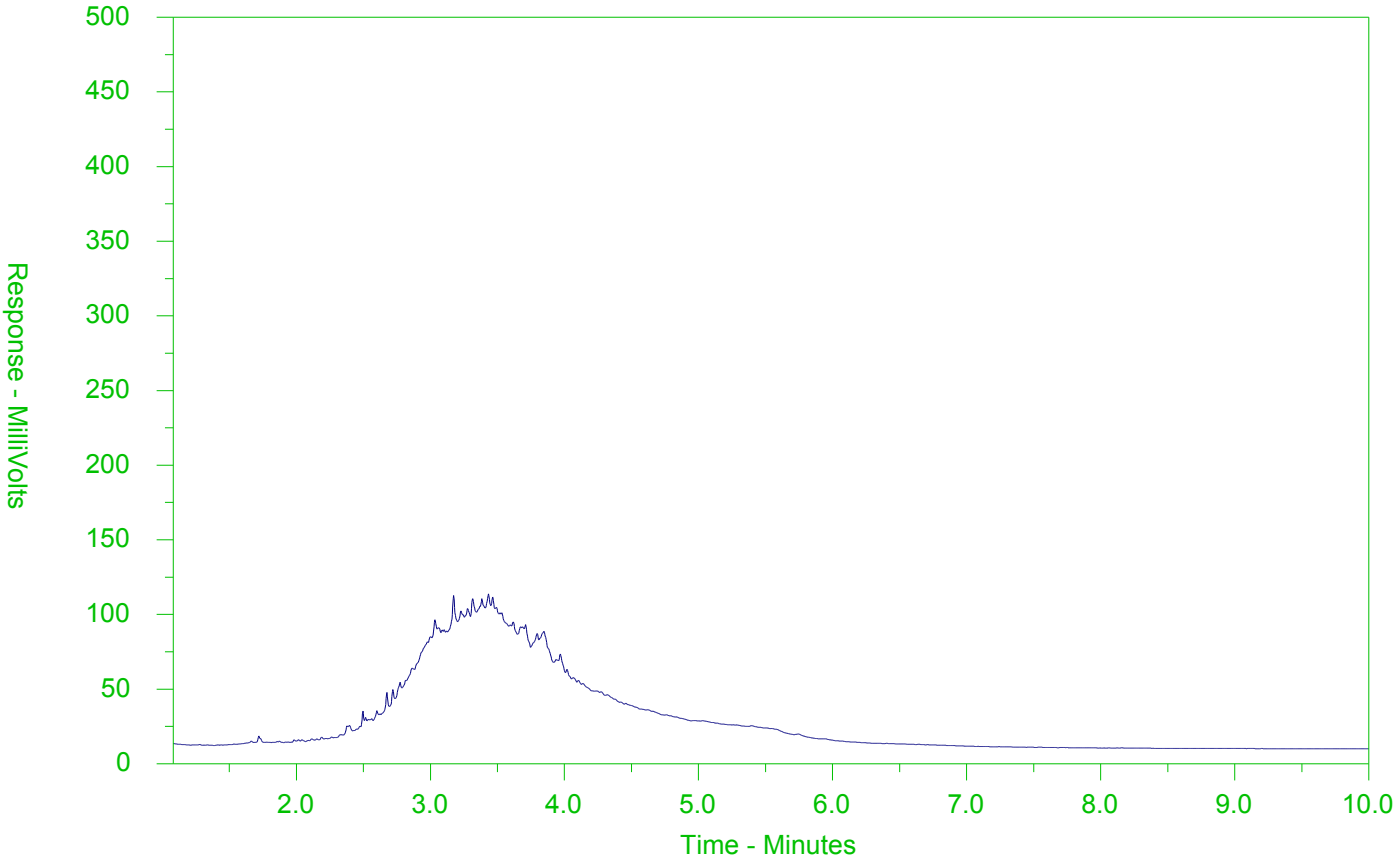
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-13
Client Sample ID: 24000011840 LOC 14 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

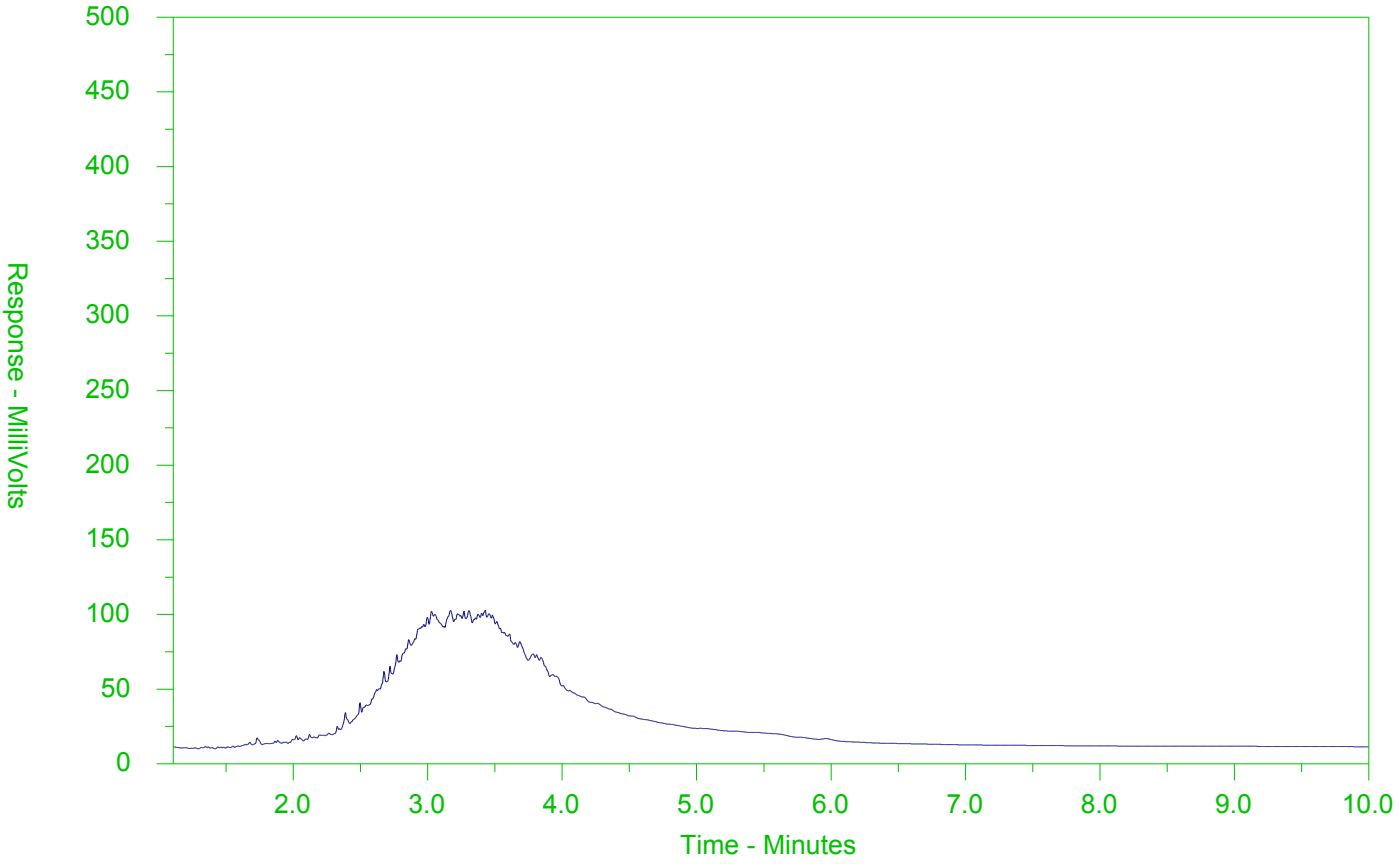
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-14
Client Sample ID: 24000011841 LOC 14 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

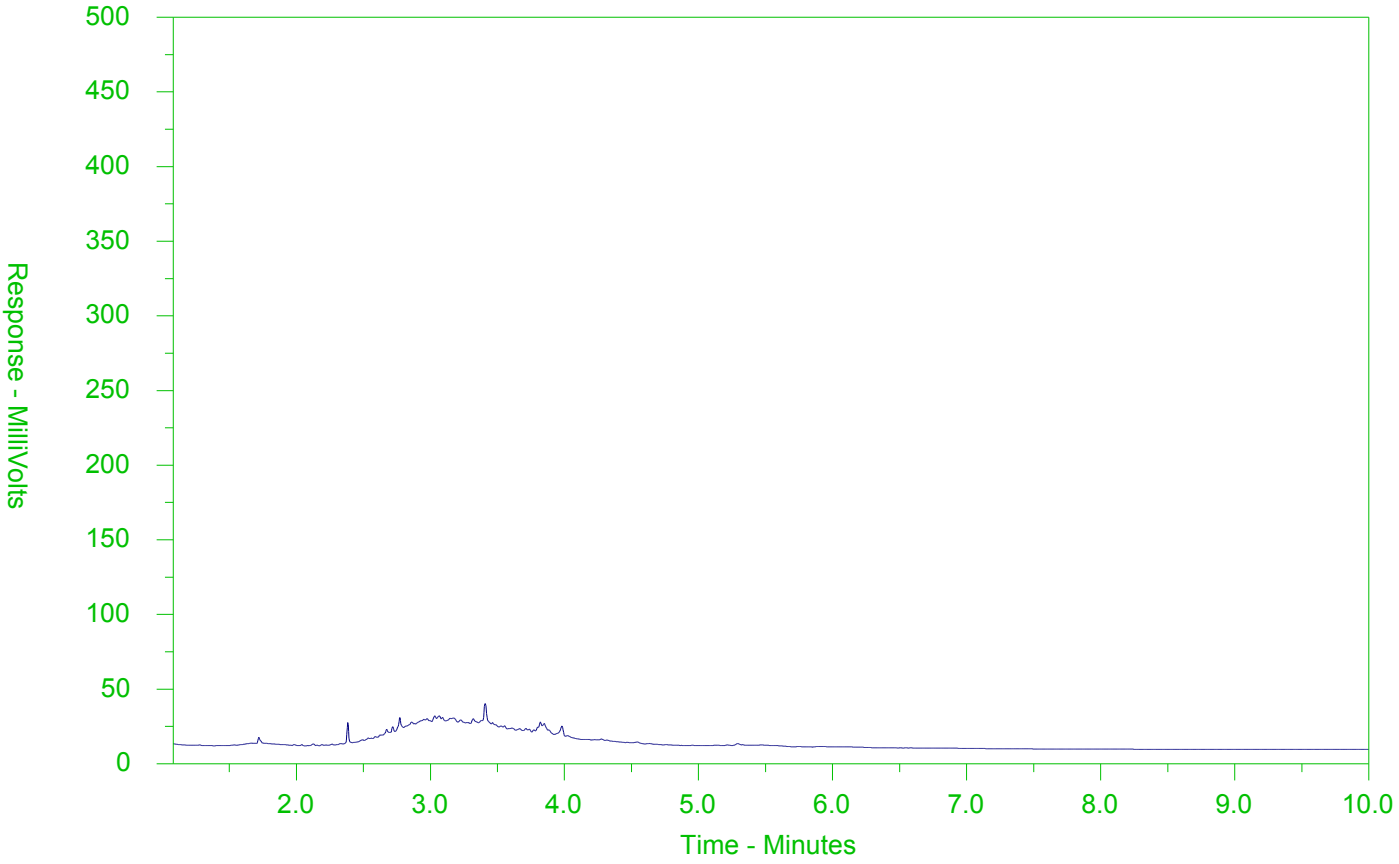
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180552-15
Client Sample ID: 24000011842 LOC 14 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180552-COFC

COC Number: LON-181005

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Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL

Quality Control (QC) Report with Report ☑ Y ☐ N

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: laframboise.d@aquaforbeech.com

Email 2: cowlin.w@aquaforbeech.com

Email 3: bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service levels selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q67885	AFE/Cost Center:	PO#
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2180552 13C

ALS Contact: Gayle

Sampler: Pollutech

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	Loc 14 2400001185 9 QAQC #2 Int 2	12-10-18	0843	Sediment	R	R	R	R	R	R	R	R	R	R								8
2	Loc 14 2400001186 0 QAQC #2 Int 3	12-10-18	0843	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
3	Loc 14 2400001185 8 QAQC #2 Int 1	12-10-18	0843	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
4	2400001184 6 Loc 16 Int 1	12-10-18	1500	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
5	2400001184 9 Loc 17 Int 1	12-10-18	1308	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
6	2400001185 2 Loc 18 Int 1	12-10-18	1140	Sediment	R	R	R	R	R	R	R	R	R	R	X	X						8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				4.5	6.2	5.8	4.0

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: NB	Date: 10.13.18	Time: 0815	Received by:	Date:	Time:	Received by:	Date: 13-Oct-18	Time: 11:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180552-COFC

COC Number: LON-181005

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Report To	Contact and company name below will appear on the final report	Report Format	Turnaround Time (TAT) Requested - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AQUAFOR BEECH	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	FRANCOIS POILLY	Quality Control (QC) Report with Report ☑ Y ☐ N	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	416-894-4216	☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E1 - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	55 REGAL ROAD	Email 1 or Fax laframboise.d@aquaforbeech.com	Date and Time Required for all E&P TATs:
City/Province:	GUELPH, ON	Email 2 cowlin.w@aquaforbeech.com	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	N1K 1B6	Email 3 bordi.m@aquaforbeech.com	
Invoice To	Same as Report To ☑ Y ☐ N	**Invoice Distribution**	**Analysis Request**
	Copy of Invoice with Report ☑ Y ☐ N	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:	AQUAFOR BEECH	Email 1 or Fax	
Contact:	FRANCOIS POILLY	Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q67885	AFE/Cost Center:	PO#
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2180552 13e

ALS Contact: Gayle Sampler: Pollutech

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
7	2400001829 Loc 10 Int 2	11-10-18	1202	Sediment	R	R	R	R	R	R	R	R	R	R								8
8	2400001830 Loc 10 Int 3	11-10-18	1202	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
9	2400001844 Loc 15 Int 2	11-10-18	1318	Sediment	R	R	R	R	R	R	R	R	R	R								8
10	2400001845 Loc 15 Int 3	11-10-18	1318	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
11	(Loc 9) 2400001857 QAQC #1 Int 3	11-10-18	0940	Sediment	R	R	R	R	R	R	R	R	R	R								8
12	(Loc 9) 2400001856 QAQC Int 2	11-10-18	0940	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
13	2400001840 Loc 14 Int 1	12-10-18	0833	Sediment	R	R	R	R	R	R	R	R	R	R								8
14	2400001841 Loc 14 Int 2	12-10-18	0833	Sediment	R	R	R	R	R	R	R	R	R	R								8
15	2400001842 Loc 14 Int 3	12-10-18	0833	Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ Y ☐ N	
Are samples for human consumption/ use? ☐ Y ☐ N	also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				4.5	6.2	5.8	4.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: NB	Date: 12-Oct-18	Time: 0915	Received by:	Date:	Time:	Received by:	Date: 13-Oct-18	Time: 11:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AQUAFOR BEECH LIMITED
ATTN: Francois Poilly
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 12-OCT-18
Report Date: 23-OCT-18 07:45 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180383

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Conductivity	mS/cm	1.36	1.11	1.55	1.11	2.43	1.06
% Moisture	%	56.8	40.5	59.1	51.6	61.9	47.5
pH	pH units	7.05	7.06	7.00	7.28	6.96	7.03
Volatile Solids	%	10.9	6.33	11.0	8.48	10.5	6.83
Total Solids	%	40.9	59.0	38.8	48.8	38.2	54.0

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Conductivity	mS/cm	2.03	1.91	1.88	0.492	1.02	1.19
% Moisture	%	63.8	51.9	62.4	33.3	70.2	71.9
pH	pH units	7.05	6.99	6.99	7.13	7.00	7.01
Volatile Solids	%	9.93	12.0	7.98	4.32	9.67	9.70
Total Solids	%	35.4	44.3	39.3	68.2	31.3	31.3

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Conductivity	mS/cm	1.33	0.734
% Moisture	%	69.1	70.2
pH	pH units	6.98	6.99
Volatile Solids	%	9.86	9.79
Total Solids	%	30.6	30.6

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Chloride	ug/g	498	216	719	462	1150	458
Total Kjeldahl Nitrogen	%	0.320 DLHC	0.276 DLHC	0.277 DLHC	0.290 DLHC	0.307 DLHC	0.262 DLHC
Total Nitrogen	ERROR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Orthophosphate-Dissolved (as P)	mg/kg	0.464	0.229	0.543	0.411	0.414	0.191

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Chloride	ug/g	1140	1010	852	349	371	448
Total Kjeldahl Nitrogen	%	0.288 DLHC	0.36 DLHC	0.286 DLHC	0.141	0.336	0.332
Total Nitrogen	ERROR	<1.0	<1.0	<1.0	<1.0	22.8	3.6
Orthophosphate-Dissolved (as P)	mg/kg	0.396	0.188	0.311	0.300	0.354	0.403

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Chloride	ug/g	677	418
Total Kjeldahl Nitrogen	%	0.325	0.335
Total Nitrogen	ERROR	5.7	7.4
Orthophosphate-Dissolved (as P)	mg/kg	0.453	0.345

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Nitrate-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Nitrate-N	mg/kg	<1.0	<1.0	<1.0	<1.0	22.5	3.3
Nitrite-N	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Nitrate-N	mg/kg	5.4	7.1
Nitrite-N	mg/kg	<1.0	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Cyanide, Weak Acid Diss	ug/g		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Cyanide, Weak Acid Diss	ug/g		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Cyanide, Weak Acid Diss	ug/g		<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Fraction Organic Carbon	g/g	0.0916	0.0450	0.0746	0.0322	0.0618	0.0243
Total Organic Carbon	%	9.16	4.50	7.46	3.22	6.18	2.43

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Fraction Organic Carbon	g/g	0.0516	0.0472	0.0438	0.0183	0.0528	0.0508
Total Organic Carbon	%	5.16	4.72	4.38	1.83	5.28	5.08

Organic / Inorganic Carbon (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Fraction Organic Carbon	g/g	0.0534	0.0535
Total Organic Carbon	%	5.34	5.35

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
SAR	SAR	6.34	5.17	10.6	8.48	11.0	9.68
Calcium (Ca)	mg/L	51.4	56.6	36.3	29.1	84.3	22.8
Magnesium (Mg)	mg/L	8.6	6.9	6.4	3.5	11.3	3.1
Sodium (Na)	mg/L	186	155	265	182	403	186

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
SAR	SAR	13.7	11.0	10.5	10.5	4.31	6.04
Calcium (Ca)	mg/L	42.6	57.0	55.2	12.6	44.9	43.3
Magnesium (Mg)	mg/L	6.1	6.5	7.1	1.7	6.9	6.3
Sodium (Na)	mg/L	361	330	312	149	117	161

Saturated Paste Extractables (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	
		L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
SAR	SAR	6.84	4.42
Calcium (Ca)	mg/L	54.9	51.4
Magnesium (Mg)	mg/L	8.0	7.5
Sodium (Na)	mg/L	205	128

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2180383-11 11-OCT-18 09:20 **24000011825 LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828 LOC 10 INT 1**	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**
E. Coli	CFU/g dwt	<10	<10	<10	<10
Fecal Coliform	CFU/g dwt	<10	<10	<10	<10

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	L2180383-1 10-OCT-18 10:00 24000011814 LOC 5 INT 2	L2180383-2 10-OCT-18 10:00 24000011815 LOC 5 INT 3	L2180383-3 10-OCT-18 14:20 24000011817 LOC 6 INT 2	L2180383-4 10-OCT-18 14:20 24000011818 LOC 6 INT 3	L2180383-5 10-OCT-18 14:40 24000011820 LOC 7 INT 2	L2180383-6 10-OCT-18 14:40 24000011821 LOC 7 INT 3
Antimony (Sb)	ug/g	<1.0	<1.0	1.4	<1.0	<1.0	<1.0
Arsenic (As)	ug/g	6.0	5.9	9.7	6.0	9.4	4.3
Barium (Ba)	ug/g	116	106	165	117	168	87.2
Beryllium (Be)	ug/g	0.51	0.66	0.77	0.66	0.63	0.53
Boron (B)	ug/g	10.9	12.6	11.5	13.8	9.5	9.1
Boron (B), Hot Water Ext.	ug/g	0.84	0.59	0.69	1.04	0.83	0.89
Cadmium (Cd)	ug/g	3.60	0.81	5.66	0.92	4.39	0.54
Chromium (Cr)	ug/g	41.3	39.6	57.6	41.7	59.4	31.9
Cobalt (Co)	ug/g	6.4	7.9	7.9	8.1	7.8	6.7
Copper (Cu)	ug/g	78.0	38.5	93.9	42.1	88.4	28.3
Lead (Pb)	ug/g	417	82.4	636	89.3	459	54.3
Mercury (Hg)	ug/g	0.451	0.351	0.582	0.331	0.557	0.216
Molybdenum (Mo)	ug/g	1.4	<1.0	2.0	<1.0	1.3	<1.0
Nickel (Ni)	ug/g	19.9	17.8	25.4	18.6	24.6	15.1
Selenium (Se)	ug/g	1.1	<1.0	1.2	<1.0	1.2	<1.0
Silver (Ag)	ug/g	0.43	0.25	0.73	0.26	0.68	<0.20
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	1.1	<1.0	1.2	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	20.4	28.6	29.6	29.8	28.1	24.9
Zinc (Zn)	ug/g	695	248	950	273	774	169

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	L2180383-7 10-OCT-18 15:45 **24000011823 LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824 LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826 LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827 LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825 LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828 LOC 10 INT 1**
Antimony (Sb)	ug/g	1.1	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	ug/g	6.9	6.0	7.5	1.8	4.1	3.9
Barium (Ba)	ug/g	139	134	129	67.3	124	132
Beryllium (Be)	ug/g	0.60	0.82	0.70	<0.50	<0.50	<0.50
Boron (B)	ug/g	9.4	13.5	11.2	5.7	8.9	9.0
Boron (B), Hot Water Ext.	ug/g	1.20	1.24	0.66	0.76	0.56	0.75
Cadmium (Cd)	ug/g	3.84	0.67	1.66	<0.50	2.15	1.76
Chromium (Cr)	ug/g	48.6	42.0	49.6	16.1	37.8	36.6
Cobalt (Co)	ug/g	7.4	10.0	8.9	6.4	6.7	6.6
Copper (Cu)	ug/g	76.8	39.5	52.0	12.9	82.3	75.6
Lead (Pb)	ug/g	432	66.1	186	11.8	230	206
Mercury (Hg)	ug/g	0.454	0.273	0.464	0.0420	0.203	0.181
Molybdenum (Mo)	ug/g	1.4	<1.0	<1.0	<1.0	1.0	1.1
Nickel (Ni)	ug/g	23.6	22.8	22.3	13.4	18.8	18.4
Selenium (Se)	ug/g	1.1	<1.0	<1.0	<1.0	1.4	1.4
Silver (Ag)	ug/g	0.56	0.23	0.34	<0.20	0.32	0.29
Thallium (Tl)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium (U)	ug/g	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	ug/g	28.8	38.1	33.7	20.0	25.8	26.8
Zinc (Zn)	ug/g	623	210	366	98.3	494	428

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 / 11-OCT-18 / 13:18 / 24000011843 LOC 15 INT 1	L2180383-14 / 11-OCT-18 / 09:40 / 24000011855 QAQC LOT 1 INT 1
Antimony (Sb)	ug/g		<1.0	<1.0
Arsenic (As)	ug/g		4.5	4.4
Barium (Ba)	ug/g		141	129
Beryllium (Be)	ug/g		<0.50	<0.50
Boron (B)	ug/g		9.6	9.0
Boron (B), Hot Water Ext.	ug/g		0.79	0.74
Cadmium (Cd)	ug/g		2.38	2.26
Chromium (Cr)	ug/g		41.1	39.5
Cobalt (Co)	ug/g		7.2	7.0
Copper (Cu)	ug/g		88.2	85.4
Lead (Pb)	ug/g		267	243
Mercury (Hg)	ug/g		0.214	0.210
Molybdenum (Mo)	ug/g		1.2	1.1
Nickel (Ni)	ug/g		20.4	19.1
Selenium (Se)	ug/g		1.5	1.5
Silver (Ag)	ug/g		0.38	0.32
Thallium (Tl)	ug/g		<0.50	<0.50
Uranium (U)	ug/g		<1.0	<1.0
Vanadium (V)	ug/g		29.1	26.6
Zinc (Zn)	ug/g		526	514

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Chromium, Hexavalent	ug/g		0.42 DLHM	<0.20	<0.40 DLHM	<0.40 DLHM	<0.40 DLHM	<0.20

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Chromium, Hexavalent	ug/g		<0.40 DLHM	<0.40 DLHM	<0.40 DLHM	<0.20	<0.40 DLHM	<0.40 DLHM

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843** **LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855** **QAQC LOT 1 INT 1**
Chromium, Hexavalent	ug/g		<0.40 DLHM	<0.40 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180383-1 10-OCT-18 10:00 24000011814 LOC 5 INT 2	L2180383-2 10-OCT-18 10:00 24000011815 LOC 5 INT 3	L2180383-3 10-OCT-18 14:20 24000011817 LOC 6 INT 2	L2180383-4 10-OCT-18 14:20 24000011818 LOC 6 INT 3	L2180383-5 10-OCT-18 14:40 24000011820 LOC 7 INT 2	L2180383-6 10-OCT-18 14:40 24000011821 LOC 7 INT 3
Acetone	ug/g	<0.75 DLHM	1.21	<0.75 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50
Benzene	ug/g	0.134 DLHM	<0.0068	0.040 DLHM	<0.010 DLHM	<0.014 DLHM	<0.0068
Bromodichloromethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Bromoform	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Bromomethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Carbon tetrachloride	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Chlorobenzene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Dibromochloromethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Chloroform	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,2-Dibromoethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,2-Dichlorobenzene	ug/g	<0.075 DLHM	<0.050	<0.11 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,3-Dichlorobenzene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,4-Dichlorobenzene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Dichlorodifluoromethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,1-Dichloroethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,2-Dichloroethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,1-Dichloroethylene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
cis-1,2-Dichloroethylene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
trans-1,2-Dichloroethylene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Methylene Chloride	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,2-Dichloropropane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
cis-1,3-Dichloropropene	ug/g	<0.045 DLHM	<0.030	<0.045 DLHM	<0.045 DLHM	<0.060 DLHM	<0.030
trans-1,3-Dichloropropene	ug/g	<0.045 DLHM	<0.030	<0.045 DLHM	<0.045 DLHM	<0.060 DLHM	<0.030
1,3-Dichloropropene (cis & trans)	ug/g	<0.064	<0.042	<0.064	<0.064	<0.085	<0.042
Ethylbenzene	ug/g	0.161 DLHM	<0.018	0.069 DLHM	<0.027 DLHM	<0.036 DLHM	<0.018
n-Hexane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Methyl Ethyl Ketone	ug/g	<0.75 DLHM	<0.55 DLHM	<0.75 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50
Methyl Isobutyl Ketone	ug/g	<0.75 DLHM	<0.50	<0.75 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50
MTBE	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Styrene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,1,1,2-Tetrachloroethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
1,1,2,2-Tetrachloroethane	ug/g	<0.11 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Tetrachloroethylene	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Toluene	ug/g	0.38 DLHM	<0.080	0.19 DLHM	<0.12 DLHM	0.17 DLHM	<0.080
1,1,1-Trichloroethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Acetone	ug/g	<1.0 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50	<1.5 DLHM	<1.5 DLHM
Benzene	ug/g	0.017 DLHM	<0.010 DLHM	<0.014 DLHM	<0.0068	<0.020 DLHM	<0.020 DLHM
Bromodichloromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Bromoform	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Bromomethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Carbon tetrachloride	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Chlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Dibromochloromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Chloroform	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,2-Dibromoethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,2-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,3-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,4-Dichlorobenzene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Dichlorodifluoromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,1-Dichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,2-Dichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,1-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
cis-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
trans-1,2-Dichloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Methylene Chloride	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,2-Dichloropropane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
cis-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.045 DLHM	<0.060 DLHM	<0.030	<0.090 DLHM	<0.090 DLHM
trans-1,3-Dichloropropene	ug/g	<0.060 DLHM	<0.045 DLHM	<0.060 DLHM	<0.030	<0.090 DLHM	<0.090 DLHM
1,3-Dichloropropene (cis & trans)	ug/g	<0.085	<0.064	<0.085	<0.042	<0.13	<0.13
Ethylbenzene	ug/g	<0.036 DLHM	<0.027 DLHM	<0.036 DLHM	<0.018	<0.054 DLHM	<0.054 DLHM
n-Hexane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Methyl Ethyl Ketone	ug/g	<1.0 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50	<1.5 DLHM	<1.5 DLHM
Methyl Isobutyl Ketone	ug/g	<1.0 DLHM	<0.75 DLHM	<1.0 DLHM	<0.50	<1.5 DLHM	<1.5 DLHM
MTBE	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Styrene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,1,1,2-Tetrachloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
1,1,2,2-Tetrachloroethane	ug/g	<0.21 DLVH	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Tetrachloroethylene	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Toluene	ug/g	<0.16 DLHM	<0.12 DLHM	<0.16 DLHM	<0.080	<0.24 DLHM	<0.24 DLHM
1,1,1-Trichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**		L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**	
Acetone	ug/g		<1.0	DLHM	<1.0	DLHM
Benzene	ug/g		<0.014	DLHM	<0.014	DLHM
Bromodichloromethane	ug/g		<0.10	DLHM	<0.10	DLHM
Bromoform	ug/g		<0.10	DLHM	<0.10	DLHM
Bromomethane	ug/g		<0.10	DLHM	<0.10	DLHM
Carbon tetrachloride	ug/g		<0.10	DLHM	<0.10	DLHM
Chlorobenzene	ug/g		<0.10	DLHM	<0.10	DLHM
Dibromochloromethane	ug/g		<0.10	DLHM	<0.10	DLHM
Chloroform	ug/g		<0.10	DLHM	<0.10	DLHM
1,2-Dibromoethane	ug/g		<0.10	DLHM	<0.10	DLHM
1,2-Dichlorobenzene	ug/g		<0.10	DLHM	<0.10	DLHM
1,3-Dichlorobenzene	ug/g		<0.10	DLHM	<0.10	DLHM
1,4-Dichlorobenzene	ug/g		<0.10	DLHM	<0.10	DLHM
Dichlorodifluoromethane	ug/g		<0.10	DLHM	<0.10	DLHM
1,1-Dichloroethane	ug/g		<0.10	DLHM	<0.10	DLHM
1,2-Dichloroethane	ug/g		<0.10	DLHM	<0.10	DLHM
1,1-Dichloroethylene	ug/g		<0.10	DLHM	<0.10	DLHM
cis-1,2-Dichloroethylene	ug/g		<0.10	DLHM	<0.10	DLHM
trans-1,2-Dichloroethylene	ug/g		<0.10	DLHM	<0.10	DLHM
Methylene Chloride	ug/g		<0.10	DLHM	<0.10	DLHM
1,2-Dichloropropane	ug/g		<0.10	DLHM	<0.10	DLHM
cis-1,3-Dichloropropene	ug/g		<0.060	DLHM	<0.060	DLHM
trans-1,3-Dichloropropene	ug/g		<0.060	DLHM	<0.060	DLHM
1,3-Dichloropropene (cis & trans)	ug/g		<0.085		<0.085	
Ethylbenzene	ug/g		<0.036	DLHM	<0.036	DLHM
n-Hexane	ug/g		<0.10	DLHM	<0.10	DLHM
Methyl Ethyl Ketone	ug/g		<1.0	DLHM	<1.0	DLHM
Methyl Isobutyl Ketone	ug/g		<1.0	DLHM	<1.0	DLHM
MTBE	ug/g		<0.10	DLHM	<0.10	DLHM
Styrene	ug/g		<0.10	DLHM	<0.10	DLHM
1,1,1,2-Tetrachloroethane	ug/g		<0.10	DLHM	<0.10	DLHM
1,1,2,2-Tetrachloroethane	ug/g		<0.10	DLHM	<0.10	DLHM
Tetrachloroethylene	ug/g		<0.10	DLHM	<0.10	DLHM
Toluene	ug/g		<0.16	DLHM	<0.16	DLHM
1,1,1-Trichloroethane	ug/g		<0.10	DLHM	<0.10	DLHM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180383-1	L2180383-2	L2180383-3	L2180383-4	L2180383-5	L2180383-6
ALS ID		L2180383-1	L2180383-2	L2180383-3	L2180383-4	L2180383-5	L2180383-6
Sampled Date		10-OCT-18	10-OCT-18	10-OCT-18	10-OCT-18	10-OCT-18	10-OCT-18
Sampled Time		10:00	10:00	14:20	14:20	14:40	14:40
Sample ID		**24000011814 LOC 5 INT 2**	**24000011815 LOC 5 INT 3**	**24000011817 LOC 6 INT 2**	**24000011818 LOC 6 INT 3**	**24000011820 LOC 7 INT 2**	**24000011821 LOC 7 INT 3**
1,1,2-Trichloroethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Trichloroethylene	ug/g	0.061 DLHM	<0.010	0.063 DLHM	<0.015 DLHM	<0.020 DLHM	<0.010
Trichlorofluoromethane	ug/g	<0.075 DLHM	<0.050	<0.075 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050
Vinyl chloride	ug/g	<0.030 DLHM	<0.020	<0.030 DLHM	<0.030 DLHM	<0.040 DLHM	<0.020
o-Xylene	ug/g	0.355 DLHM	<0.020	0.184 DLHM	<0.030 DLHM	0.159 DLHM	<0.020
m+p-Xylenes	ug/g	0.663 DLHM	<0.030	0.329 DLHM	<0.045 DLHM	0.253 DLHM	<0.030
Xylenes (Total)	ug/g	1.02	<0.050	0.513	<0.054	0.412	<0.050
Surrogate: 4-Bromofluorobenzene	%	85.5	69.4	78.4	85.5	84.7	94.0
Surrogate: 1,4-Difluorobenzene	%	93.2	90.8	84.9	89.2	89.0	95.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
1,1,2-Trichloroethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Trichloroethylene	ug/g	<0.020 DLHM	<0.015 DLHM	<0.020 DLHM	<0.010	<0.030 DLHM	<0.030 DLHM
Trichlorofluoromethane	ug/g	<0.10 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Vinyl chloride	ug/g	<0.040 DLHM	<0.030 DLHM	<0.040 DLHM	<0.020	<0.060 DLHM	<0.060 DLHM
o-Xylene	ug/g	0.138 DLHM	<0.030 DLHM	<0.040 DLHM	<0.020	<0.060 DLHM	<0.060 DLHM
m+p-Xylenes	ug/g	0.176 DLHM	<0.045 DLHM	<0.060 DLHM	<0.030	<0.090 DLHM	<0.090 DLHM
Xylenes (Total)	ug/g	0.314	<0.054	<0.072	<0.050	<0.11	<0.11
Surrogate: 4-Bromofluorobenzene	%	89.4	91.9	89.8	96.0	95.7	92.9
Surrogate: 1,4-Difluorobenzene	%	93.7	93.5	91.8	101.7	98.7	96.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**		L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**	
1,1,2-Trichloroethane	ug/g		<0.10	DLHM	<0.10	DLHM
Trichloroethylene	ug/g		<0.020	DLHM	<0.025	DLHM
Trichlorofluoromethane	ug/g		<0.10	DLHM	<0.10	DLHM
Vinyl chloride	ug/g		<0.040	DLHM	<0.040	DLHM
o-Xylene	ug/g		<0.040	DLHM	<0.040	DLHM
m+p-Xylenes	ug/g		<0.093	DLHM	<0.090	DLHM
Xylenes (Total)	ug/g		<0.10		<0.098	
Surrogate: 4-Bromofluorobenzene	%		89.5		87.2	
Surrogate: 1,4-Difluorobenzene	%		92.9		91.5	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID											
		L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**		L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**		L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**		L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**		L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**		L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
F1 (C6-C10)	ug/g	19.2	DLHM	<5.0		9.7	DLHM	<7.5	DLHM	14	DLHM	<5.0
F1-BTEX	ug/g	17.5		<5.0		8.9		<7.5		14		<5.0
F2 (C10-C16)	ug/g	138	DLHM	35		115	DLHM	78	DLHM	45	DLHM	21
F2-Naphth	ug/g	137		35		113		78		44		20
F3 (C16-C34)	ug/g	1760	DLHM	623		1790	DLHM	842	DLHM	530	DLHM	277
F3-PAH	ug/g	1740		617		1780		835		510		271
F4 (C34-C50)	ug/g	520	DLHM	173		654	DLHM	266	DLHM	140	DLHM	68
F4G-SG (GHH-Silica)	ug/g	1530		660		1920		850		<500		
Total Hydrocarbons (C6-C50)	ug/g	2440		830		2570		1180		720		365
Chrom. to baseline at nC50	No Unit	NO		NO		NO		NO		NO		YES
Surrogate: 2-Bromobenzotrifluoride	%	105.5		93.6		98.3		99.1		100.4		92.8
Surrogate: 3,4-Dichlorotoluene	%	55.6	SOL:MI	26.4	SOL:MI	52.0	SOL:MI	58.3	SURR-ND	59.6	SOL:MI	71.4

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
F1 (C6-C10)	ug/g	<15 DLHM	<7.5 DLHM	<10 DLHM	<5.0	<15 DLHM	<15 DLHM
F1-BTEX	ug/g	<15	<7.5	<10	<5.0	<15	<15
F2 (C10-C16)	ug/g	67 DLHM	23 DLHM	95 DLHM	<10	<30 DLHM	<30 DLHM
F2-Naphth	ug/g	67	23	95	<10	<30	<30
F3 (C16-C34)	ug/g	990 DLHM	411 DLHM	1690 DLHM	<50	770 DLHM	550 DLHM
F3-PAH	ug/g	980	409	1680	<50	760	540
F4 (C34-C50)	ug/g	200 DLHM	95 DLHM	350 DLHM	<50	280 DLHM	170 DLHM
F4G-SG (GHH-Silica)	ug/g	770				<750	
Total Hydrocarbons (C6-C50)	ug/g	1250	530	2130	<72	1050	720
Chrom. to baseline at nC50	No Unit	NO	YES	YES	YES	NO	YES
Surrogate: 2-Bromobenzotrifluoride	%	100.8	95.0	97.4	99.7	99.0	91.7
Surrogate: 3,4-Dichlorotoluene	%	64.6	66.9	69.9	69.9	71.1	69.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons (SOIL)

	ALS ID	L2180383-13		L2180383-14	
	Sampled Date	11-OCT-18		11-OCT-18	
	Sampled Time	13:18		09:40	
	Sample ID	**24000011843 LOC 15 INT 1**		**24000011855 QAQC LOT 1 INT 1**	
Analyte	Unit				
F1 (C6-C10)	ug/g	<10	DLHM	<10	DLHM
F1-BTEX	ug/g	<10		<10	
F2 (C10-C16)	ug/g	23	DLHM	37	DLHM
F2-Naphth	ug/g	23		37	
F3 (C16-C34)	ug/g	600	DLHM	830	DLHM
F3-PAH	ug/g	590		820	
F4 (C34-C50)	ug/g	170	DLHM	260	DLHM
F4G-SG (GHH-Silica)	ug/g				
Total Hydrocarbons (C6-C50)	ug/g	800		1130	
Chrom. to baseline at nC50	No Unit	YES		YES	
Surrogate: 2-Bromobenzotrifluoride	%	94.6		94.1	
Surrogate: 3,4-Dichlorotoluene	%	72.8		70.2	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2180383-1 10-OCT-18 10:00 24000011814 LOC 5 INT 2		L2180383-2 10-OCT-18 10:00 24000011815 LOC 5 INT 3		L2180383-3 10-OCT-18 14:20 24000011817 LOC 6 INT 2		L2180383-4 10-OCT-18 14:20 24000011818 LOC 6 INT 3		L2180383-5 10-OCT-18 14:40 24000011820 LOC 7 INT 2		L2180383-6 10-OCT-18 14:40 24000011821 LOC 7 INT 3	
Acenaphthene	ug/g	0.266	DLHM	<0.050		0.311	DLHM	<0.075	DLHM	0.30	DLHM	0.062	
Acenaphthylene	ug/g	0.102	DLHM	0.233		0.117	DLHM	0.195	DLHM	0.11	DLHM	0.132	
Anthracene	ug/g	0.420	DLHM	0.151		0.445	DLHM	0.175	DLHM	0.42	DLHM	0.141	
Benzo(a)anthracene	ug/g	1.18	DLHM	0.661		1.30	DLHM	0.736	DLHM	1.18	DLHM	0.523	
Benzo(a)pyrene	ug/g	1.19	DLHM	0.752		1.27	DLHM	0.820	DLHM	1.23	DLHM	0.628	
Benzo(b)fluoranthene	ug/g	1.38	DLHM	0.519		1.45	DLHM	0.650	DLHM	1.41	DLHM	0.481	
Benzo(g,h,i)perylene	ug/g	1.22	DLHM	0.661		1.32	DLHM	0.835	DLHM	1.29	DLHM	0.545	
Benzo(k)fluoranthene	ug/g	1.06	DLHM	0.619		1.16	DLHM	0.746	DLHM	1.16	DLHM	0.515	
Chrysene	ug/g	1.92	DLHM	0.828		2.09	DLHM	1.00	DLHM	1.97	DLHM	0.611	
Dibenzo(ah)anthracene	ug/g	0.370	DLHM	0.153		0.396	DLHM	0.202	DLHM	0.37	DLHM	0.125	
Fluoranthene	ug/g	2.98	DLHM	1.03		3.17	DLHM	1.28	DLHM	2.96	DLHM	0.952	
Fluorene	ug/g	0.578	DLHM	0.099		0.695	DLHM	0.099	DLHM	0.58	DLHM	0.080	
Indeno(1,2,3-cd)pyrene	ug/g	1.14	DLHM	0.551		1.19	DLHM	0.691	DLHM	1.03	DLHM	0.476	
1+2-Methylnaphthalenes	ug/g	2.55		0.247		3.07		0.133		2.52		<0.042	
1-Methylnaphthalene	ug/g	1.03	DLHM	0.102		1.25	DLHM	0.054	DLHM	1.03	DLHM	<0.030	
2-Methylnaphthalene	ug/g	1.52	DLHM	0.145		1.82	DLHM	0.080	DLHM	1.49	DLHM	0.036	
Naphthalene	ug/g	1.66	DLHM	0.153		1.96	DLHM	0.081	DLHM	1.54	DLHM	0.049	
Phenanthrene	ug/g	2.15	DLHM	0.331		2.42	DLHM	0.405	DLHM	2.02	DLHM	0.320	
Pyrene	ug/g	2.57	DLHM	1.27		2.83	DLHM	1.49	DLHM	2.71	DLHM	1.17	
Surrogate: 2-Fluorobiphenyl	%	73.6		74.8		73.0		75.1		75.5		73.7	
Surrogate: p-Terphenyl d14	%	75.0		74.8		73.5		73.1		74.6		73.3	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2180383-7 10-OCT-18 15:45 24000011823 LOC 8 INT 2	L2180383-8 10-OCT-18 15:45 24000011824 LOC 8 INT 3	L2180383-9 11-OCT-18 09:20 24000011826 LOC 9 INT 2	L2180383-10 11-OCT-18 09:20 24000011827 LOC 9 INT 3	L2180383-11 11-OCT-18 09:20 24000011825 LOC 9 INT 1	L2180383-12 11-OCT-18 12:02 24000011828 LOC 10 INT 1
Acenaphthene	ug/g	0.15 DLHM	<0.075 DLHM	<0.10 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Acenaphthylene	ug/g	0.16 DLHM	<0.075 DLHM	0.16 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Anthracene	ug/g	0.26 DLHM	<0.075 DLHM	0.20 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Benzo(a)anthracene	ug/g	0.92 DLHM	0.335 DLHM	0.72 DLHM	0.071	0.86 DLHM	0.86 DLHM
Benzo(a)pyrene	ug/g	1.02 DLHM	0.309 DLHM	0.86 DLHM	0.057	1.38 DLHM	1.27 DLHM
Benzo(b)fluoranthene	ug/g	1.22 DLHM	0.260 DLHM	0.83 DLHM	<0.050	2.24 DLHM	2.61 DLHM
Benzo(g,h,i)perylene	ug/g	1.11 DLHM	0.219 DLHM	0.99 DLHM	<0.050	1.28 DLHM	1.63 DLHM
Benzo(k)fluoranthene	ug/g	0.92 DLHM	0.298 DLHM	0.90 DLHM	0.075	1.59 DLHM	0.71 DLHM
Chrysene	ug/g	1.49 DLHM	0.305 DLHM	1.04 DLHM	0.055	1.85 DLHM	1.89 DLHM
Dibenzo(ah)anthracene	ug/g	0.29 DLHM	<0.075 DLHM	0.26 DLHM	<0.050	0.27 DLHM	0.28 DLHM
Fluoranthene	ug/g	2.17 DLHM	0.506 DLHM	1.38 DLHM	0.102	2.71 DLHM	2.81 DLHM
Fluorene	ug/g	0.32 DLHM	<0.075 DLHM	0.19 DLHM	<0.050	<0.15 DLHM	<0.15 DLHM
Indeno(1,2,3-cd)pyrene	ug/g	1.02 DLHM	0.195 DLHM	0.83 DLHM	<0.050	1.28 DLHM	1.36 DLHM
1+2-Methylnaphthalenes	ug/g	1.12	<0.064	0.497	<0.042	0.29	0.28
1-Methylnaphthalene	ug/g	0.450 DLHM	<0.045 DLHM	0.206 DLHM	<0.030	0.117 DLHM	0.114 DLHM
2-Methylnaphthalene	ug/g	0.668 DLHM	<0.045 DLHM	0.291 DLHM	<0.030	0.170 DLHM	0.162 DLHM
Naphthalene	ug/g	0.658 DLHM	0.028 R	0.290 DLHM	<0.013	0.157 DLHM	0.150 DLHM
Phenanthrene	ug/g	1.11 DLHM	0.119 DLHM	0.623 DLHM	<0.046	0.64 DLHM	0.60 DLHM
Pyrene	ug/g	2.13 DLHM	0.547 DLHM	1.53 DLHM	0.102	2.33 DLHM	2.39 DLHM
Surrogate: 2-Fluorobiphenyl	%	73.8	71.9	75.2	73.3	73.0	67.2
Surrogate: p-Terphenyl d14	%	72.2	71.8	71.9	69.5	69.6	72.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**
Acenaphthene	ug/g		<0.15 DLHM	<0.15 DLHM
Acenaphthylene	ug/g		<0.15 DLHM	<0.15 DLHM
Anthracene	ug/g		<0.15 DLHM	<0.15 DLHM
Benzo(a)anthracene	ug/g		0.80 DLHM	0.84 DLHM
Benzo(a)pyrene	ug/g		1.16 DLHM	1.25 DLHM
Benzo(b)fluoranthene	ug/g		2.48 DLHM	2.53 DLHM
Benzo(g,h,i)perylene	ug/g		1.44 DLHM	1.57 DLHM
Benzo(k)fluoranthene	ug/g		0.70 DLHM	0.89 DLHM
Chrysene	ug/g		1.69 DLHM	1.77 DLHM
Dibenzo(ah)anthracene	ug/g		0.27 DLHM	0.27 DLHM
Fluoranthene	ug/g		2.85 DLHM	2.58 DLHM
Fluorene	ug/g		<0.15 DLHM	<0.15 DLHM
Indeno(1,2,3-cd)pyrene	ug/g		1.19 DLHM	1.45 DLHM
1+2-Methylnaphthalenes	ug/g		0.30	0.26
1-Methylnaphthalene	ug/g		0.122 DLHM	0.107 DLHM
2-Methylnaphthalene	ug/g		0.176 DLHM	0.157 DLHM
Naphthalene	ug/g		0.160 DLHM	0.156 DLHM
Phenanthrene	ug/g		0.57 DLHM	0.61 DLHM
Pyrene	ug/g		2.50 DLHM	2.21 DLHM
Surrogate: 2-Fluorobiphenyl	%		68.7	65.8
Surrogate: p-Terphenyl d14	%		81.1	65.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-1 10-OCT-18 10:00 **24000011814 LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815 LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817 LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818 LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820 LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821 LOC 7 INT 3**
Aroclor 1242	mg/kg		<0.30 DLM	<0.020 DLM	<0.40 DLM	<0.0260 DLM	<0.310 DLM	<0.0250 DLM
Aroclor 1248	mg/kg		<0.015 DLHM	<0.010	<0.015 DLHM	<0.015 DLHM	<0.020 DLHM	<0.010
Aroclor 1254	mg/kg		0.421 PRAR	<0.0310 DLM	0.611 PRAR	<0.030 DLM	0.690 PRAR	<0.010
Aroclor 1260	mg/kg		<0.0650 DLM	<0.020 DLM	<0.110 DLM	<0.040 DLM	<0.120 DLM	<0.020 DLM
Total PCBs	mg/kg		0.421 DLM	<0.0450 DLM	0.611 DLM	<0.060 DLM	0.690 DLM	<0.0350 DLM
Surrogate: d14-Terphenyl	%		85.6	86.2	86.9	85.2	86.3	85.8

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-7 10-OCT-18 15:45 **24000011823 LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824 LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826 LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827 LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825 LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828 LOC 10 INT 1**
Aroclor 1242	mg/kg		<0.350 DLM	<0.0250 DLM	<0.0850 DLM	<0.010	<0.080 DLM	<0.0550 DLM
Aroclor 1248	mg/kg		<0.020 DLHM	<0.015 DLHM	<0.020 DLHM	<0.010	<0.030 DLHM	<0.030 DLHM
Aroclor 1254	mg/kg		0.479 PRAR	<0.015 DLHM	0.172 PRAR	<0.010	0.144 PRAR	0.141 PRAR
Aroclor 1260	mg/kg		<0.110 DLM	<0.020 DLM	<0.030 DLM	<0.010	<0.050 DLM	<0.0650 DLM
Total PCBs	mg/kg		0.479 DLHM	<0.040 DLM	0.172 DLM	<0.020	0.144 DLM	0.141 DLHM
Surrogate: d14-Terphenyl	%		86.2	84.4	86.0	84.9	86.5	90.4

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**
Aroclor 1242	mg/kg		<0.070 DLM	<0.080 DLM
Aroclor 1248	mg/kg		<0.020 DLHM	<0.030 DLHM
Aroclor 1254	mg/kg		0.162 PRAR	0.161 PRAR
Aroclor 1260	mg/kg		<0.050 DLM	<0.0450 DLM
Total PCBs	mg/kg		0.162 DLHM	0.161 DLM
Surrogate: d14-Terphenyl	%		88.5	87.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180383-1 10-OCT-18 10:00 **24000011814** **LOC 5 INT 2**	L2180383-2 10-OCT-18 10:00 **24000011815** **LOC 5 INT 3**	L2180383-3 10-OCT-18 14:20 **24000011817** **LOC 6 INT 2**	L2180383-4 10-OCT-18 14:20 **24000011818** **LOC 6 INT 3**	L2180383-5 10-OCT-18 14:40 **24000011820** **LOC 7 INT 2**	L2180383-6 10-OCT-18 14:40 **24000011821** **LOC 7 INT 3**
Aldrin	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
alpha-BHC	mg/kg	<0.090 DLM	<0.040 DLM	<0.090 DLQ	<0.060 DLM	<0.14 DLQ	<0.020
beta-BHC	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Lindane	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
delta-BHC	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.080 DLQ	<0.080 DLM	<0.020
a-chlordane	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
g-chlordane	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
op-DDD	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
pp-DDD	mg/kg	<0.060 DLM	<0.040 DLM	<0.090 DLQ	<0.060 DLM	<0.080 DLM	<0.020
o,p-DDE	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
pp-DDE	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Dieldrin	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
alpha-Endosulfan	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
beta-Endosulfan	mg/kg	<0.090 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Endosulfan Sulfate	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Endrin	mg/kg	<0.060 DLM	<0.040 DLM	<0.080 DLQ	<0.060 DLM	<0.080 DLM	<0.020
Endrin Aldehyde	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Heptachlor	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Heptachlor Epoxide	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Hexachlorobenzene	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020 DLM
Mirex	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Oxychlordane	mg/kg	<0.060 DLM	<0.040 DLM	<0.060 DLM	<0.060 DLM	<0.080 DLM	<0.020
Surrogate: 2-Fluorobiphenyl	%	81.4	76.6	77.0	79.2	81.8	78.2
Surrogate: d14-Terphenyl	%	67.2	62.8	61.8	64.0	62.2	67.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180383-7 10-OCT-18 15:45 **24000011823** **LOC 8 INT 2**	L2180383-8 10-OCT-18 15:45 **24000011824** **LOC 8 INT 3**	L2180383-9 11-OCT-18 09:20 **24000011826** **LOC 9 INT 2**	L2180383-10 11-OCT-18 09:20 **24000011827** **LOC 9 INT 3**	L2180383-11 11-OCT-18 09:20 **24000011825** **LOC 9 INT 1**	L2180383-12 11-OCT-18 12:02 **24000011828** **LOC 10 INT 1**
Aldrin	mg/kg	<0.080 DLM	<0.060 DLM	<0.090 DLQ	<0.020	<0.12 DLM	<0.12 DLM
alpha-BHC	mg/kg	<0.130 DLQ	<0.060 DLM	<0.160 DLQ	<0.020	<0.12 DLM	<0.12 DLM
beta-BHC	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Lindane	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
delta-BHC	mg/kg	<0.260 DLQ	<0.060 DLM	<0.210 DLQ	<0.020	<0.12 DLM	<0.12 DLM
a-chlordane	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
g-chlordane	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
op-DDD	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
pp-DDD	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
o,p-DDE	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
pp-DDE	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Dieldrin	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
alpha-Endosulfan	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
beta-Endosulfan	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Endosulfan Sulfate	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Endrin	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Endrin Aldehyde	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Heptachlor	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Heptachlor Epoxide	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Hexachlorobenzene	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020 DLM	<0.12 DLM	<0.12 DLM
Mirex	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.12 DLM	<0.12 DLM
Oxychlordane	mg/kg	<0.080 DLM	<0.060 DLM	<0.080 DLM	<0.020	<0.13 DLQ	<0.17 DLQ
Surrogate: 2-Fluorobiphenyl	%	76.8	87.6	77.8	82.4	75.8	74.0
Surrogate: d14-Terphenyl	%	60.0	75.0	61.4	68.1	60.8	63.8

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180383-13 11-OCT-18 13:18 **24000011843 LOC 15 INT 1**	L2180383-14 11-OCT-18 09:40 **24000011855 QAQC LOT 1 INT 1**
Aldrin	mg/kg		<0.080 DLM	<0.080 DLM
alpha-BHC	mg/kg		<0.080 DLM	<0.080 DLM
beta-BHC	mg/kg		<0.080 DLM	<0.080 DLM
Lindane	mg/kg		<0.080 DLM	<0.080 DLM
delta-BHC	mg/kg		<0.080 DLM	<0.080 DLM
a-chlordane	mg/kg		<0.080 DLM	<0.080 DLM
g-chlordane	mg/kg		<0.080 DLM	<0.080 DLM
op-DDD	mg/kg		<0.080 DLM	<0.080 DLM
pp-DDD	mg/kg		<0.080 DLM	<0.080 DLM
o,p-DDE	mg/kg		<0.080 DLM	<0.080 DLM
pp-DDE	mg/kg		<0.080 DLM	<0.080 DLM
Dieldrin	mg/kg		<0.080 DLM	<0.080 DLM
alpha-Endosulfan	mg/kg		<0.080 DLM	<0.080 DLM
beta-Endosulfan	mg/kg		<0.080 DLM	<0.080 DLM
Endosulfan Sulfate	mg/kg		<0.080 DLM	<0.080 DLM
Endrin	mg/kg		<0.080 DLM	<0.080 DLM
Endrin Aldehyde	mg/kg		<0.080 DLM	<0.080 DLM
Heptachlor	mg/kg		<0.080 DLM	<0.080 DLM
Heptachlor Epoxide	mg/kg		<0.080 DLM	<0.080 DLM
Hexachlorobenzene	mg/kg		<0.080 DLM	<0.080 DLM
Mirex	mg/kg		<0.080 DLM	<0.080 DLM
Oxychlordane	mg/kg		<0.130 DLQ	<0.140 DLQ
Surrogate: 2-Fluorobiphenyl	%		76.6	79.8
Surrogate: d14-Terphenyl	%		59.8	59.4

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be

Reference Information

unaffected.

R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DLVH	Detection Limit raised due to interference from Volatile Hydrocarbons on VOC method. Chromatographic elution of interfering peaks in

Reference Information

the same region as test analytes prevents a determination of whether VOC analyte is present or absent (above/below regular detection

Reference Information

	limits).
PRAR	PCB Pattern Most Closely Resembles Aroclor Reported
SOL:MI	Surrogate recovery outside acceptable limits due to matrix interference
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0

5 grams of dried soil is mixed with 10 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD

The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-SOLID-MF-WT	Soil	E. coli on sludge or solid	SM 9222D

A 1g biosolid sample is transferred into buffered dilution water blank. The sample is manually shaken and an aliquot of the sample is then filtered through the membrane filter. The filter is then placed on mFC-BCIG agar and incubated at 44.5 – 0.2 ”C for 24 – 2 hours. Method ID: WT-TM-1200. Results are reported on a dry weight basis. Moisture is required.

EC-WT	Soil	Conductivity (EC)	MOEE E3138

A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ETL-N-TOT-WT	Soil	Calculate from NO2 + NO3+TKN	CALCULATION
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Soil F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

FC-SOLID-MF-WT Soil Fecal Coliform on sludge or solid SM 9222D

HG-200.2-CVAA-WT Soil Mercury in Soil by CVAAS EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

NO2-WT	Soil	Nitrite in Soil	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

NO3-WT	Soil	Nitrate in Soil (NO3-N)	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PCB-WT	Soil	Polychlorinated Biphenyls	EPA 8082

A representative sub-sample of a soil sample is mixed with methanol and extracted with toluene using a shaker technique. An aliquot of the separated toluene is analyzed by GC/MSD.

PEST-OC-WT	Soil	Pesticides, Organochlorine	SW846 8270

A 5g representative sub-sample of the soil sample is mixed with methanol and extracted with toluene. An aliquot is taken and analyzed by GC/MSD.

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PO4-DO-COL-WT	Soil	Orthophosphate in Soil (PO4-P)	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a soil sample that has been extracted and filtered through a 0.45 micron membrane filter.

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

SOLIDS-TS-WT	Soil	Total Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids. Results are reported as the percentage of the total sample.

SOLIDS-VS-WT	Soil	Volatile Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids.
This residue is ignited to constant weight at 550°C. The remaining solids represent the fixed total solids while the weight lost on ignition is the volatile solids. Results are reported as Percent of the Total solids as Volatile.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.3.2

Soil is treated with excess acidic dichromate, which reacts with the organic carbon, oxidizing it to CO2. The residual dichromate is titrated with ferrous ammonium sulphate and TOC calculated by difference.

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

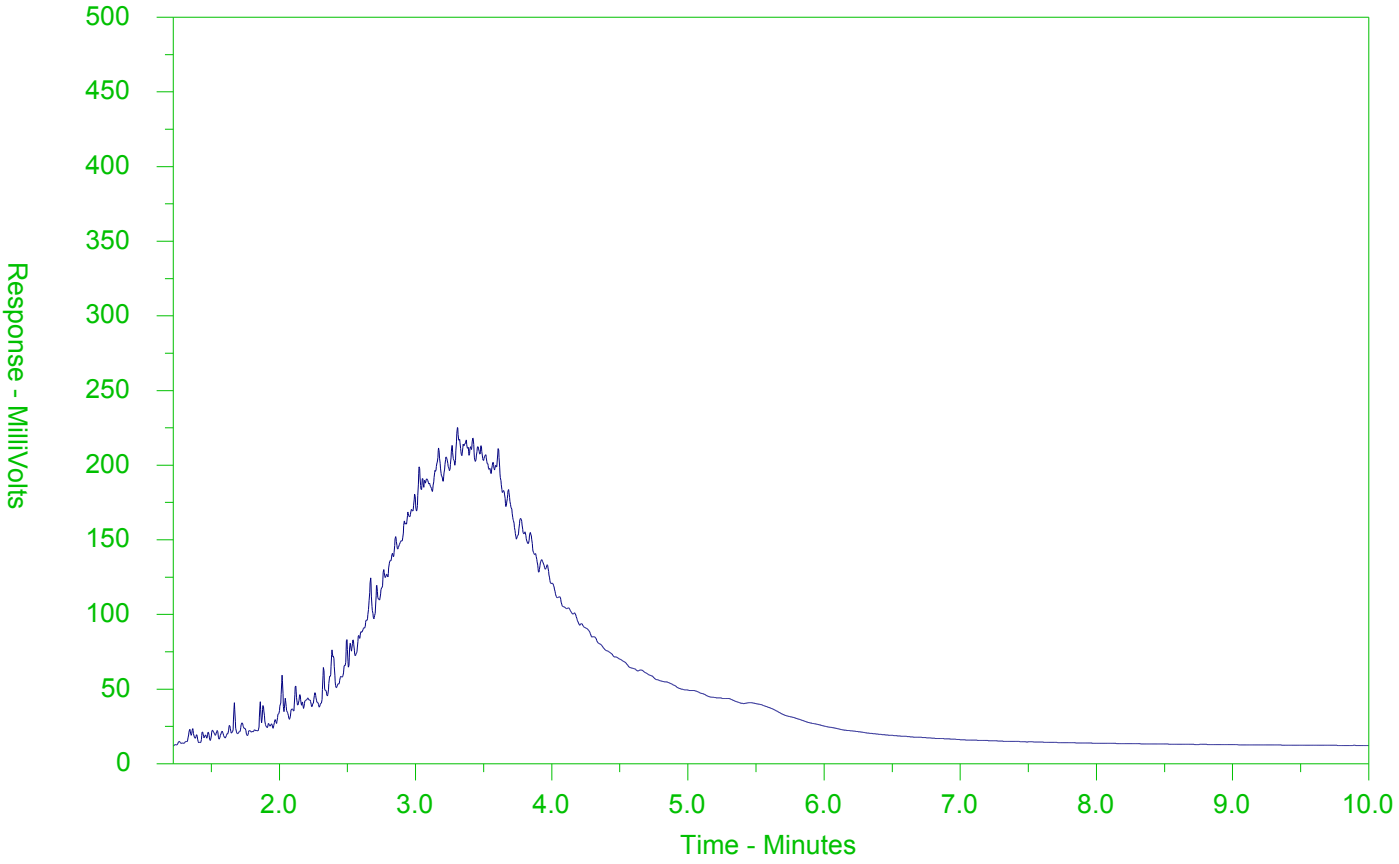
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-1
Client Sample ID: 24000011814 LOC 5 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

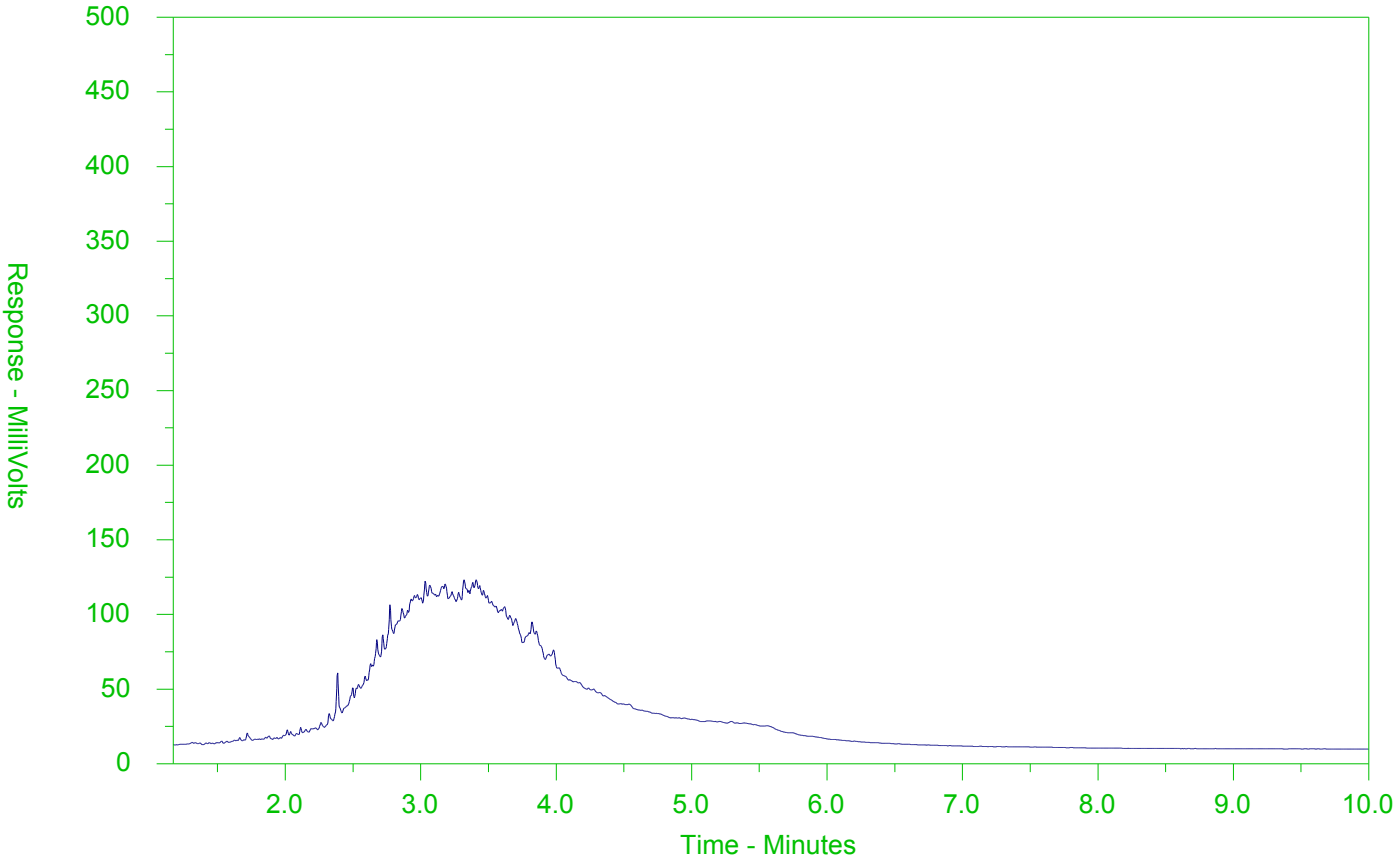
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-2
Client Sample ID: 24000011815 LOC 5 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

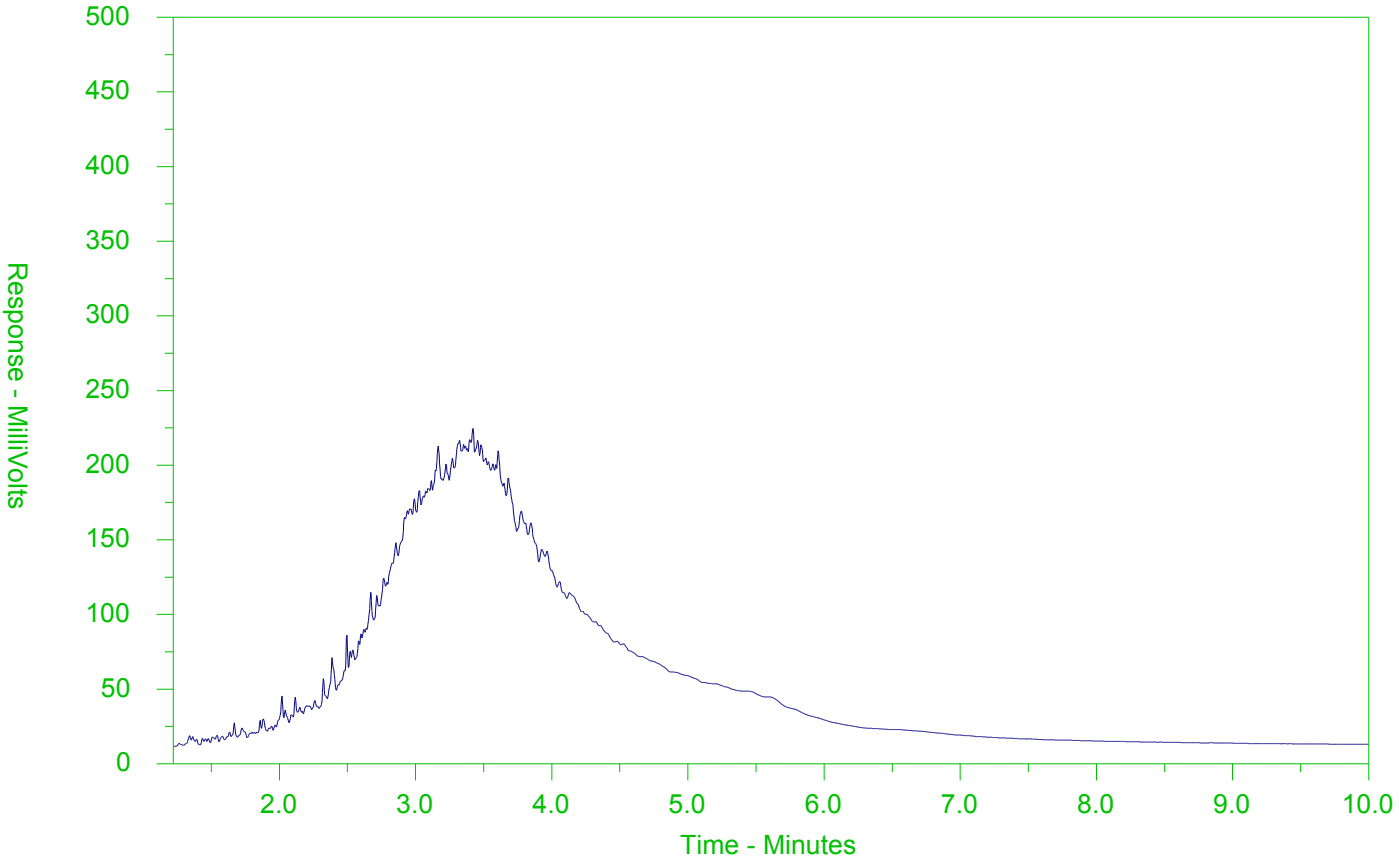
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-3
Client Sample ID: 24000011817 LOC 6 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

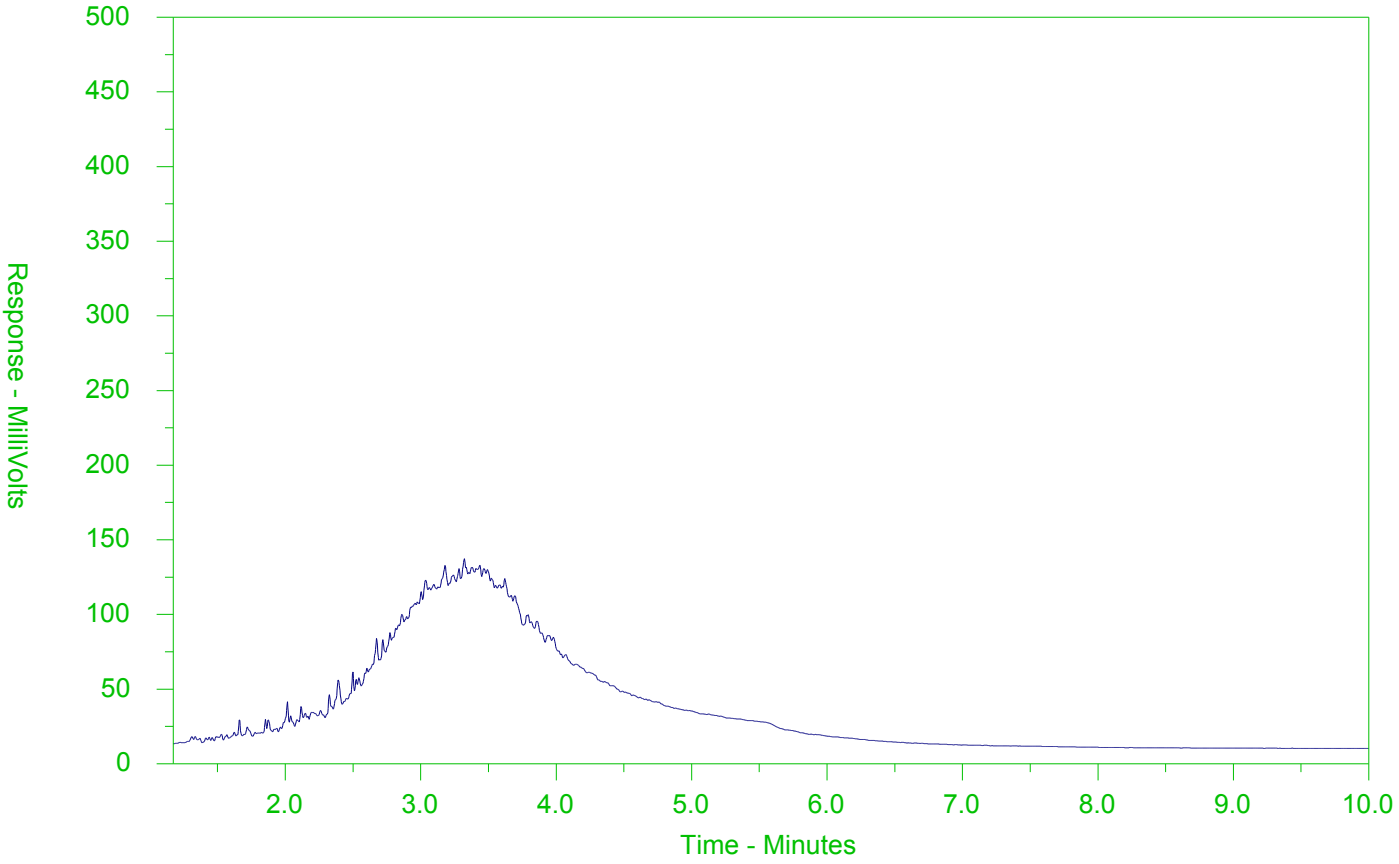
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-4
Client Sample ID: 24000011818 LOC 6 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

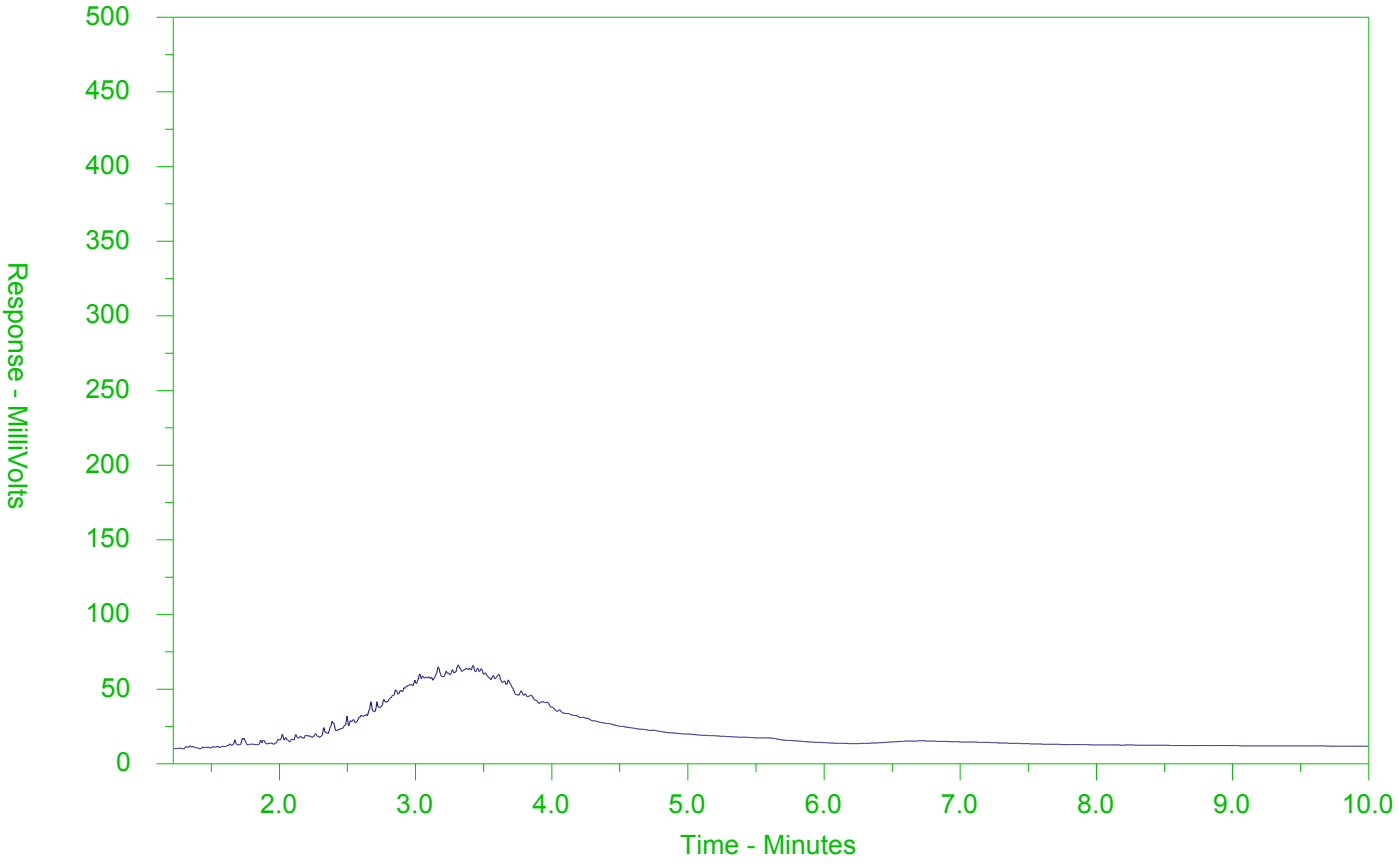
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-5
Client Sample ID: 24000011820 LOC 7 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

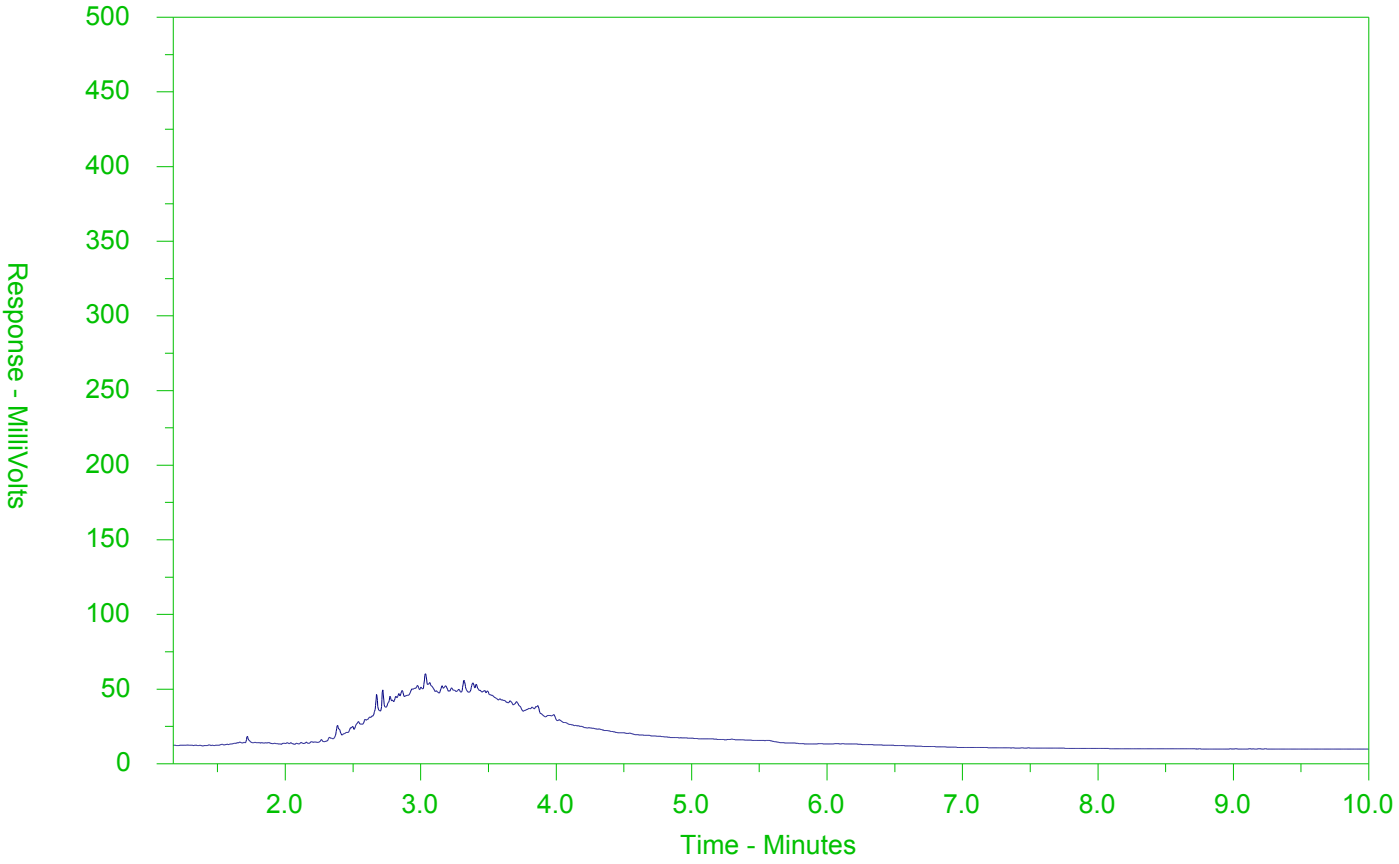
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-6
Client Sample ID: 24000011821 LOC 7 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

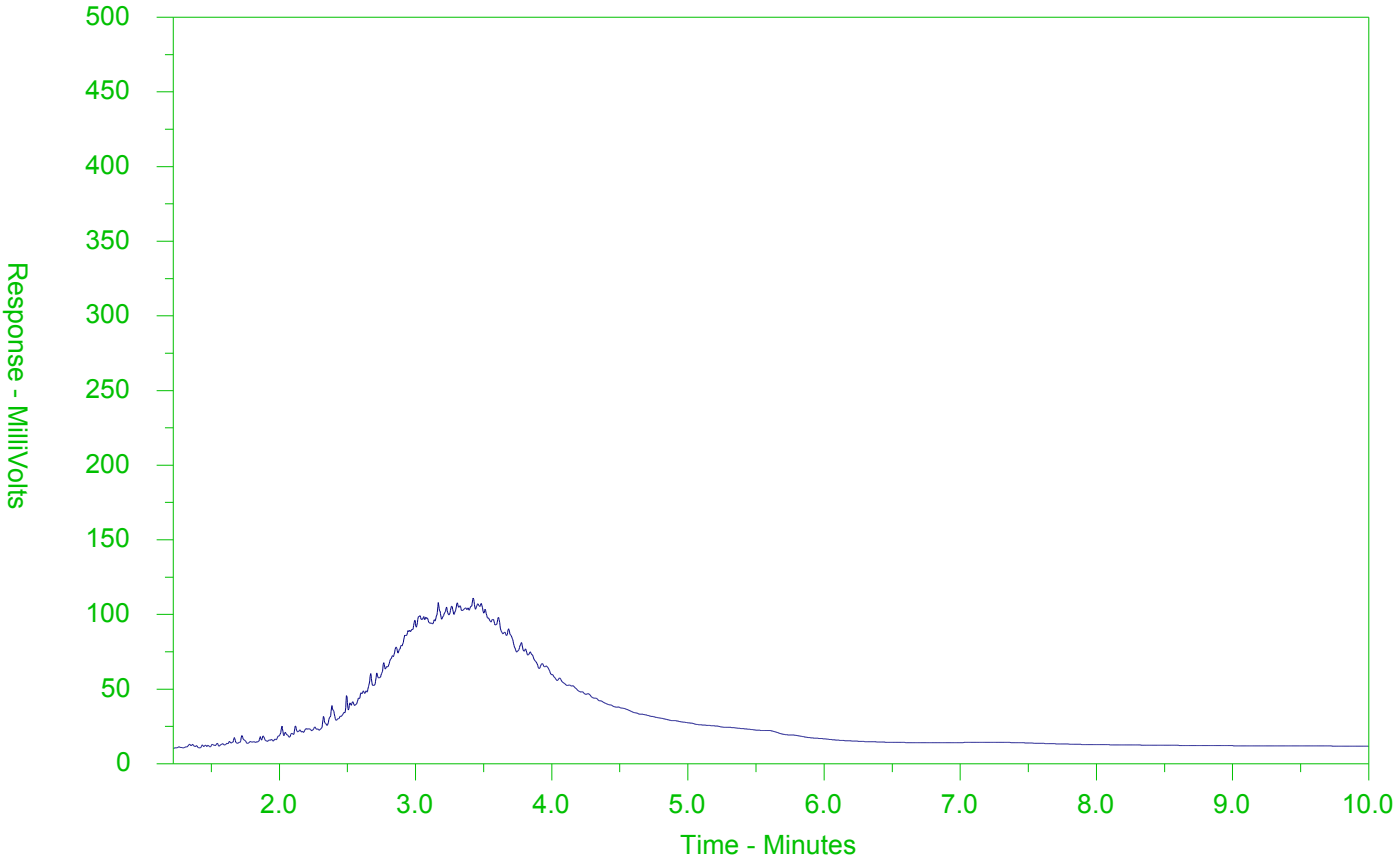
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-7
Client Sample ID: 24000011823 LOC 8 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

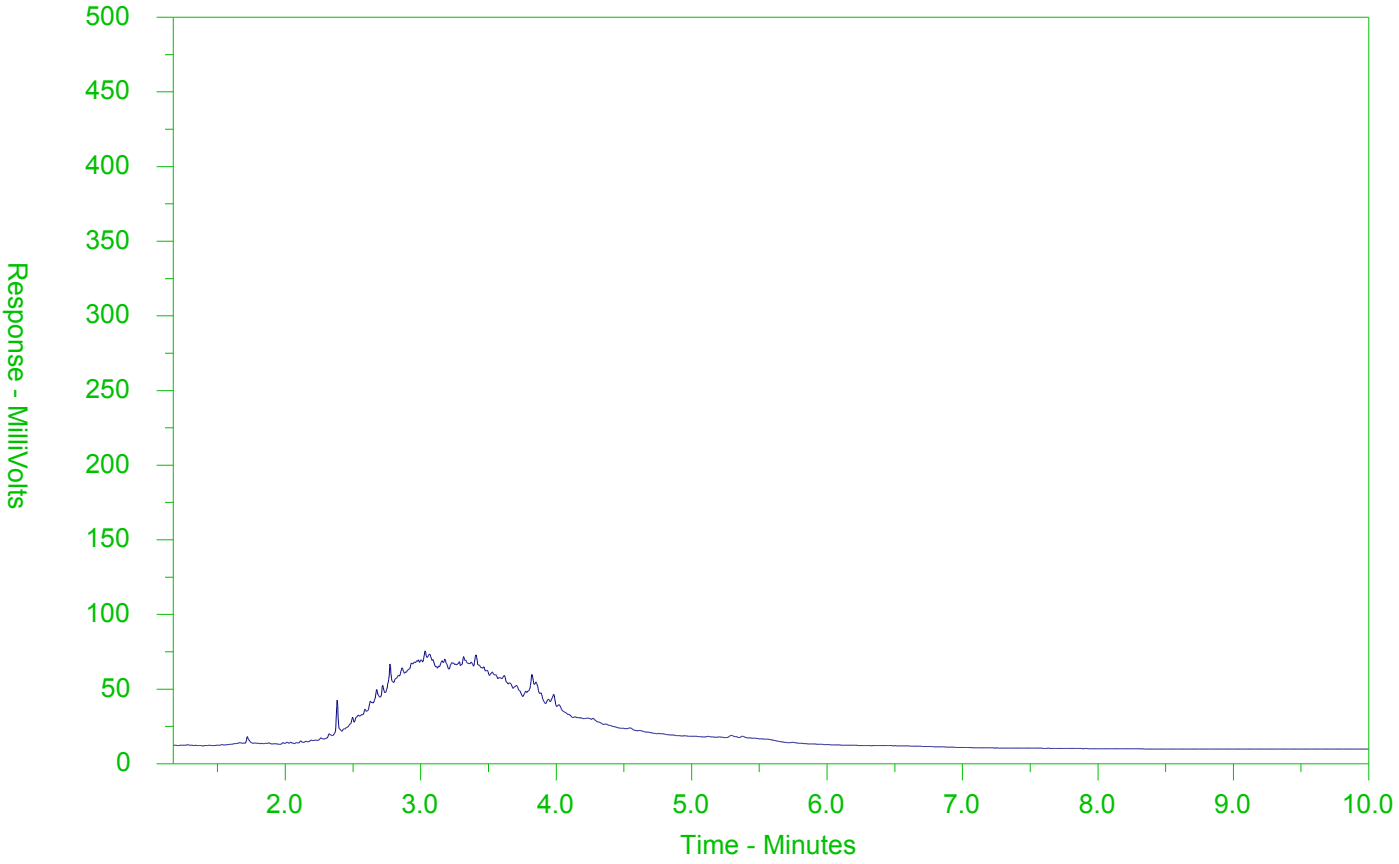
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-8
Client Sample ID: 24000011824 LOC 8 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

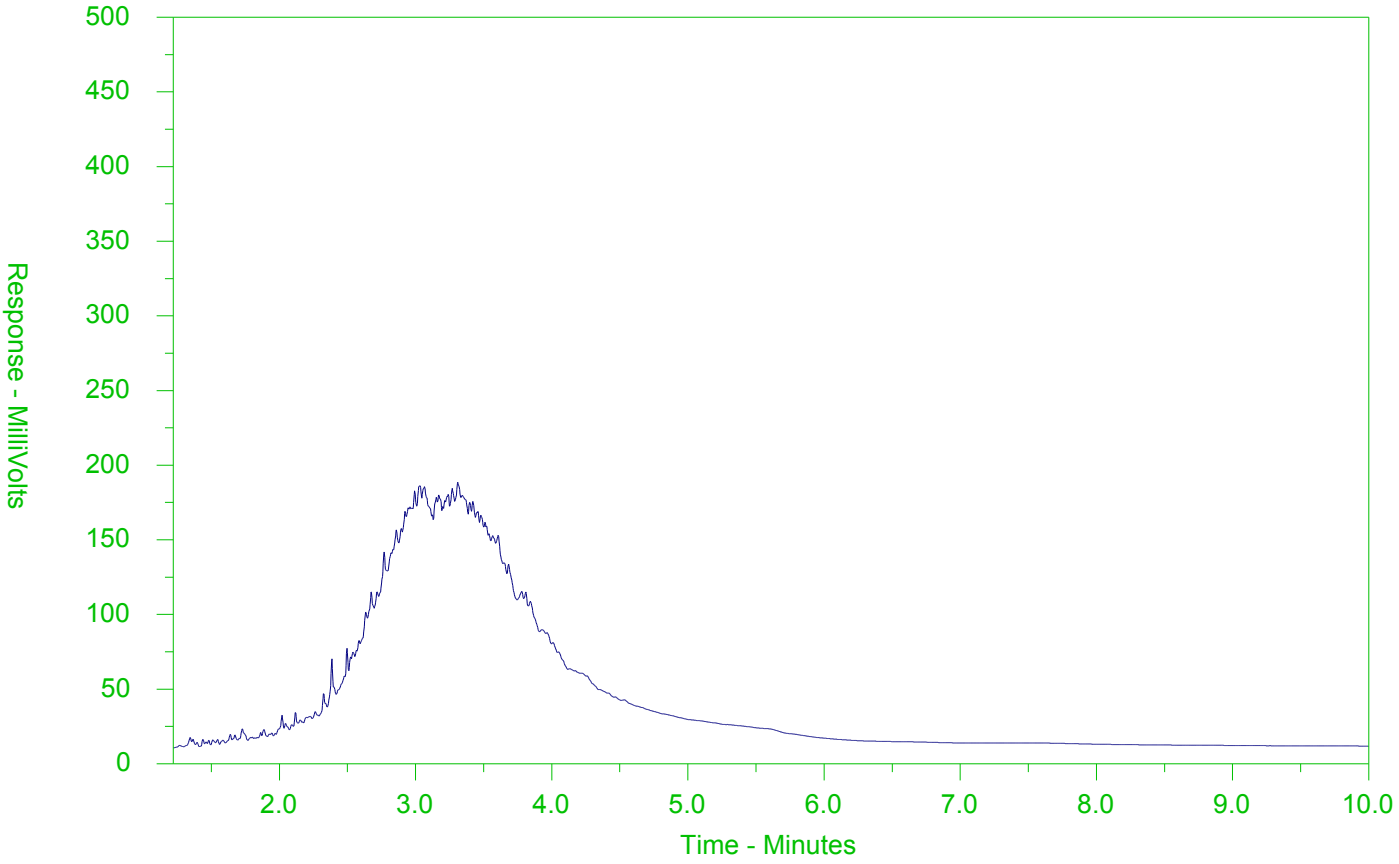
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-9
Client Sample ID: 24000011826 LOC 9 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

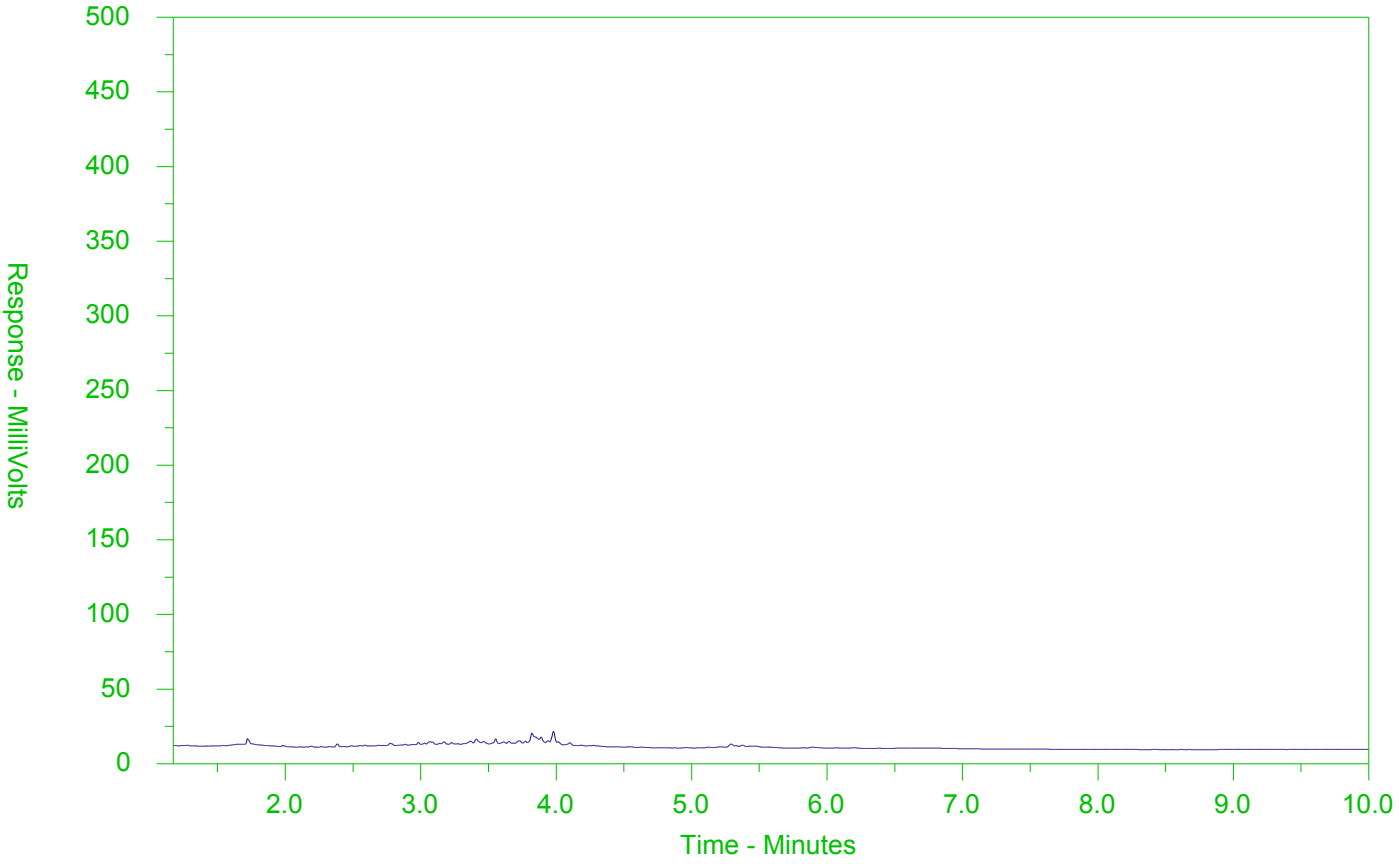
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-10
Client Sample ID: 24000011827 LOC 9 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

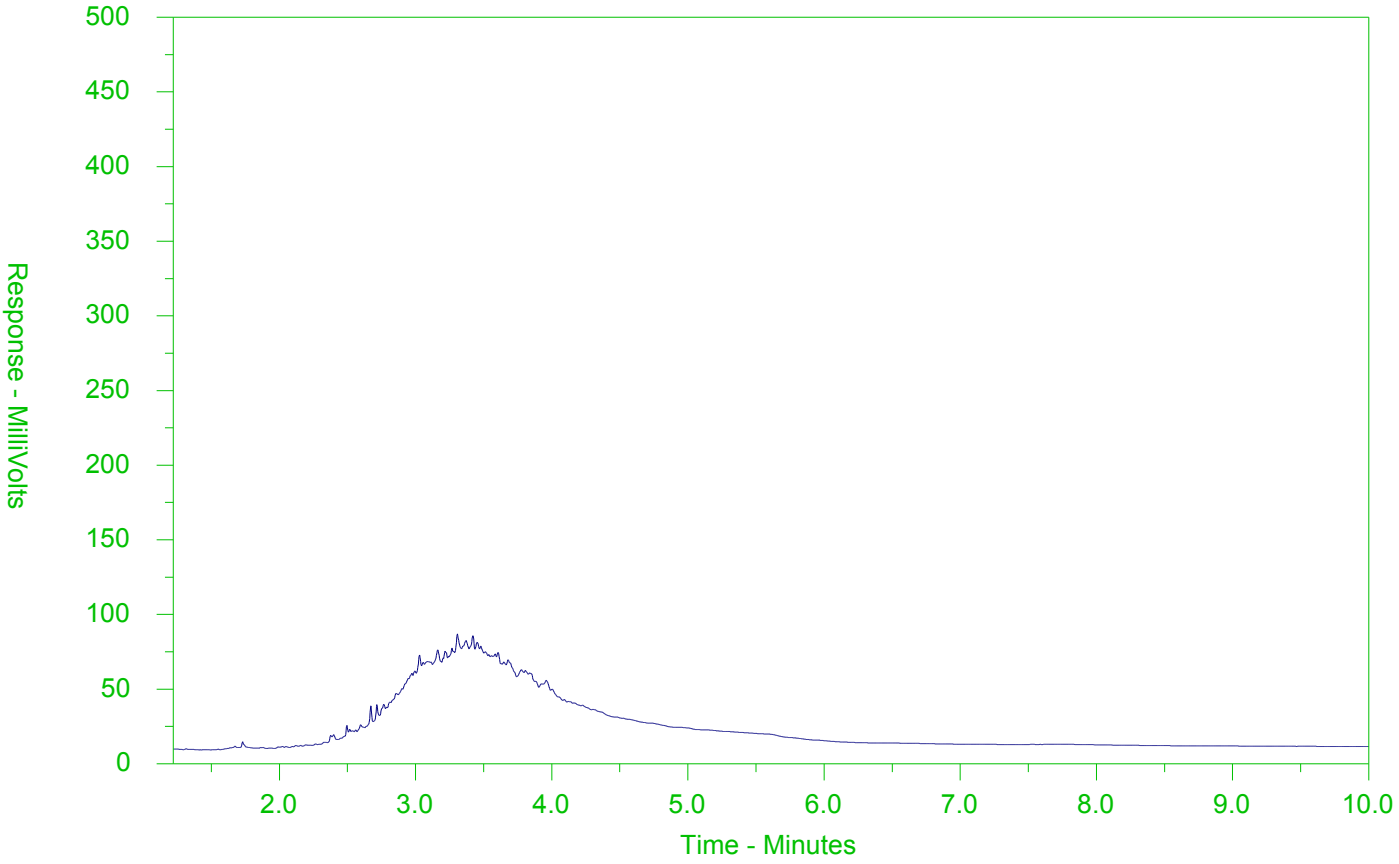
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-11
Client Sample ID: 24000011825 LOC 9 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

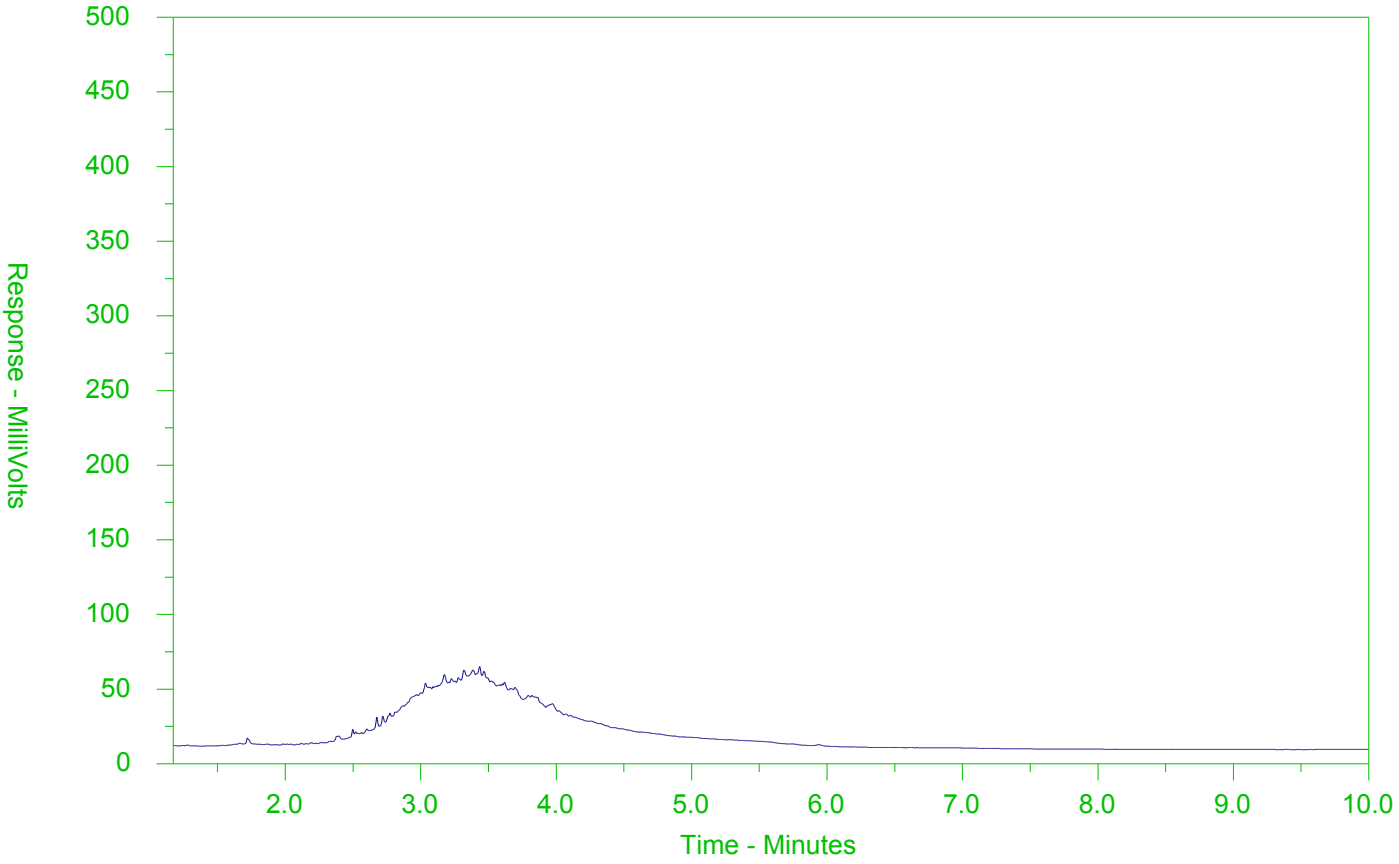
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-12
Client Sample ID: 24000011828 LOC 10 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

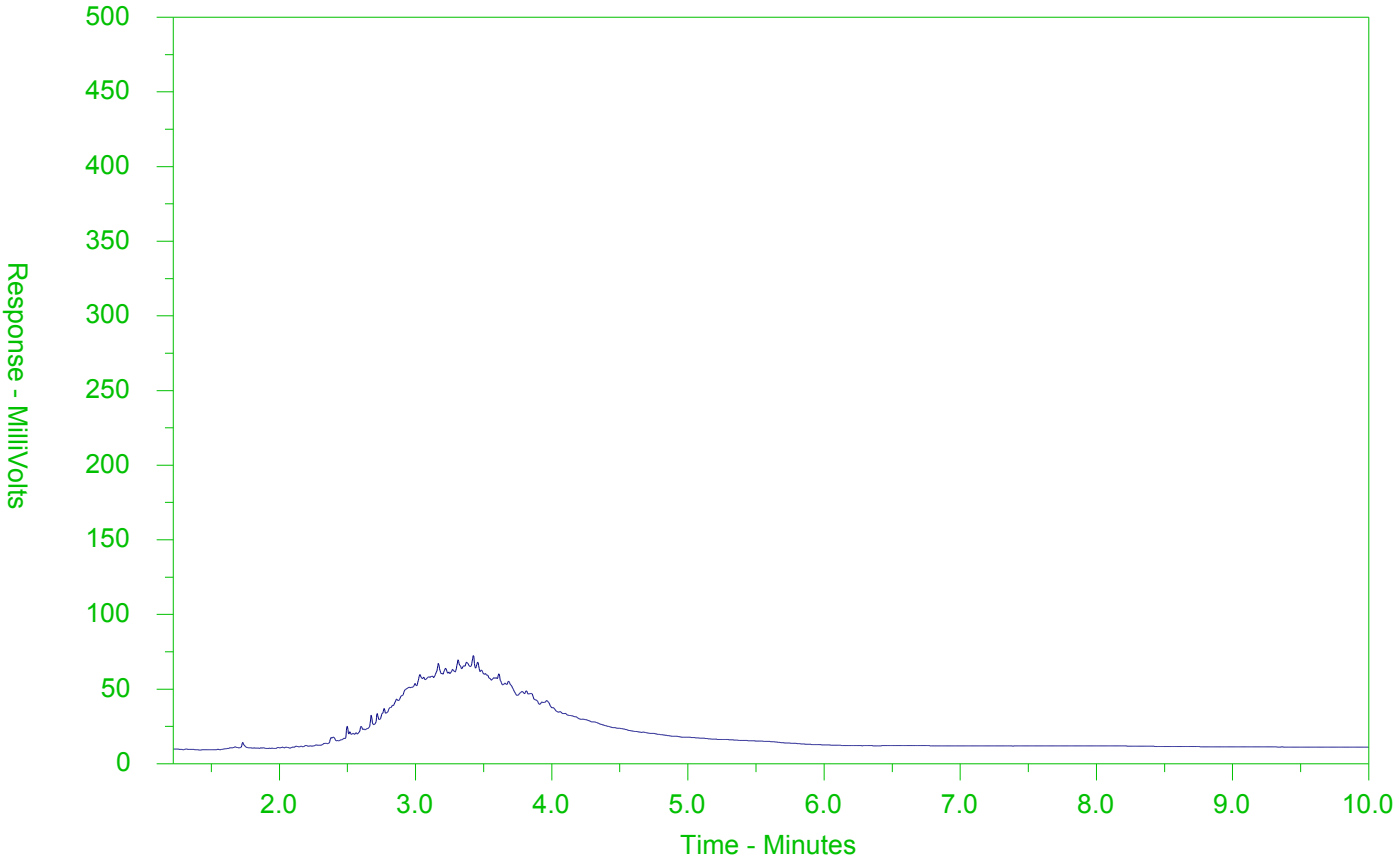
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-13
Client Sample ID: 24000011843 LOC 15 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

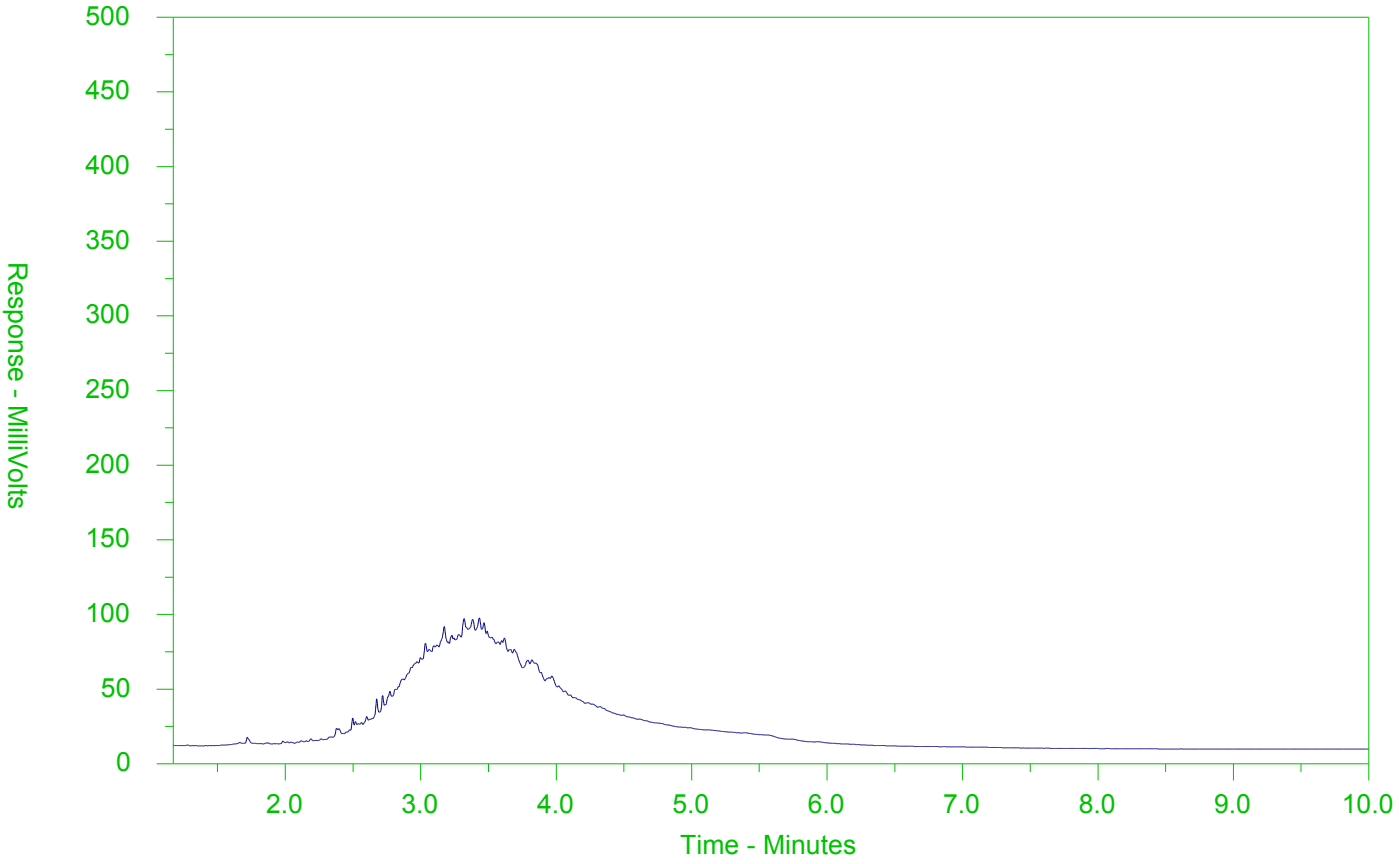
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180383-14
Client Sample ID: 24000011855 QAQC LOT 1 INT 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180383-COFC

COC Number: LON-181005

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL
Quality Control (QC) Report with Report	☑ Y ☐ N
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	bordi.m@aquaforbeech.com

Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: [illegible]

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2180383 18D.

ALS Contact: Gayle Sampler: Pollutech

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511, F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	2400011814 Loc 5 Int 2	10-10-18	10:00	Sediment	R	R	R	R	R	R	R	R	R	R					8
2	2400011815 Loc 5 Int 3	10-10-18	10:00	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
3	2400011817 Loc 6 Int 2	10-10-18	1420	Sediment	R	R	R	R	R	R	R	R	R	R					8
4	2400011818 Loc 6 Int 3	10-10-18	1420	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
5	2400011820 Loc 7 Int 2	10-10-18	1440	Sediment	R	R	R	R	R	R	R	R	R	R					8
6	2400011821 Loc 7 Int 3	10-10-18	1440	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
7	2400011823 Loc 8 Int 2	10-10-18	1545	Sediment	R	R	R	R	R	R	R	R	R	R					8
8	2400011824 Loc 8 Int 3	10-10-18	1545	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				3.6			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: NB	Date: 10.12.18	Time:	Received by:	Date:	Time:	Received by:	Date: OCT 12 2018	Time: 6:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180383-COFC

COC Number: LON-181005

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Project Information

ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Report Format / Distribution

Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL
Quality Control (QC) Report with Report	☑ Y ☐ N
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2180383 12D

ALS Contact: Gayle **Sampler:** Pollutech

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: [illegible]

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
9	2400001826 Loc 9 Int 2	11-10-18	0920	Sediment	R	R	R	R	R	R	R	R	R	R					8
10	2400001827 Loc 9 Int 3	11-10-18	0920	Sediment	R	R	R	R	R	R	R	R	R	R					8
11	2400001825 Loc 9 Int 1	11-10-18	0920	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
12	2400001828 Loc 10 Int 1	11-10-18	1202	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
13	2400001843 Loc 15 Int 1	11-10-18	1318	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
14	2400001855 QAQC Loc #1 Int 1	11-10-18	0940	Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8
				Sediment	R	R	R	R	R	R	R	R	R	R					8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				3.6			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
NB	10.12.18	

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	OCT 12 18	16:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF

AQUAFOR BEECH LIMITED
ATTN: Francios Poilly
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 15-OCT-18
Report Date: 25-OCT-18 14:23 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180838

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180838-1 13-OCT-18 12:01 **24000011811** **LOC 4 INT 2**	L2180838-2 13-OCT-18 12:01 **24000011812** **LOC 4 INT 3**
Grain Size Curve	No Unit		SEE ATTAC	SEE ATTAC

Particle Size (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180838-1 13-OCT-18 12:01 **24000011811** **LOC 4 INT 2**	L2180838-2 13-OCT-18 12:01 **24000011812** **LOC 4 INT 3**
Gravel (4.75mm - 3in.)	%		<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%		<1.0	2.9
Coarse Sand (2.0mm - 4.75mm)	%		<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%		20.9	12.4
Silt (0.005mm - 0.075mm)	%		55.5	51.0
Clay (<0.005mm)	%		22.4	32.8

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
GRAIN SIZE-HYD-SK	Soil	Grain Size by Hydrometer	ASTM D422-63

Particle size curve is generated from dry sieving (particles > 2 mm), wet sieving (particles 2 mm-75 um and hydrometer readings (particles < 75 um)

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

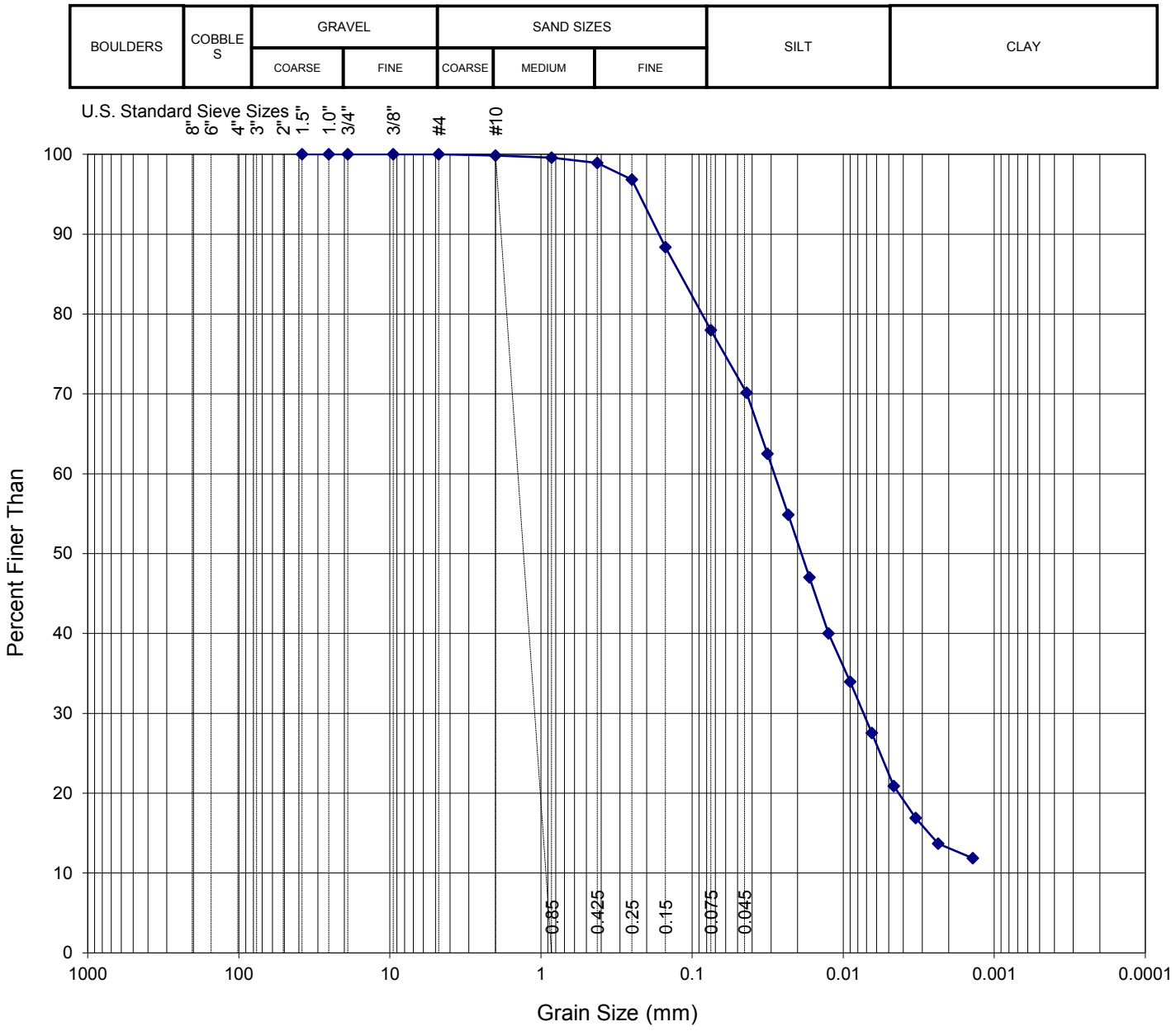
Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

ALS Laboratory Group

819-58th Street, Saskatoon,SK

PARTICLE SIZE DISTRIBUTION CURVE

Client Name:	AQUAFOR BEECH LIMITED
Project Number:	
Client Sample ID	24000011811 LOC 4 INT 2
Lab Sample ID	L2180838-1
Date Sample Received	15-Oct-18
Test Completion Date:	22-Oct-18
Analyst:	SHC



METHOD DESCRIPTION

Method Reference: ASTM D 422 - 63 (2002)

Dispersion method: Mechanical

Dispesion period: 1 minute cm/s

Soil classification system used: ASTM D422-63 Classification

DESCRIPTION OF SAND AND GRAVEL PARTICLES

Shape: Angular

Hardness: Hard

SUMMARY OF RESULTS

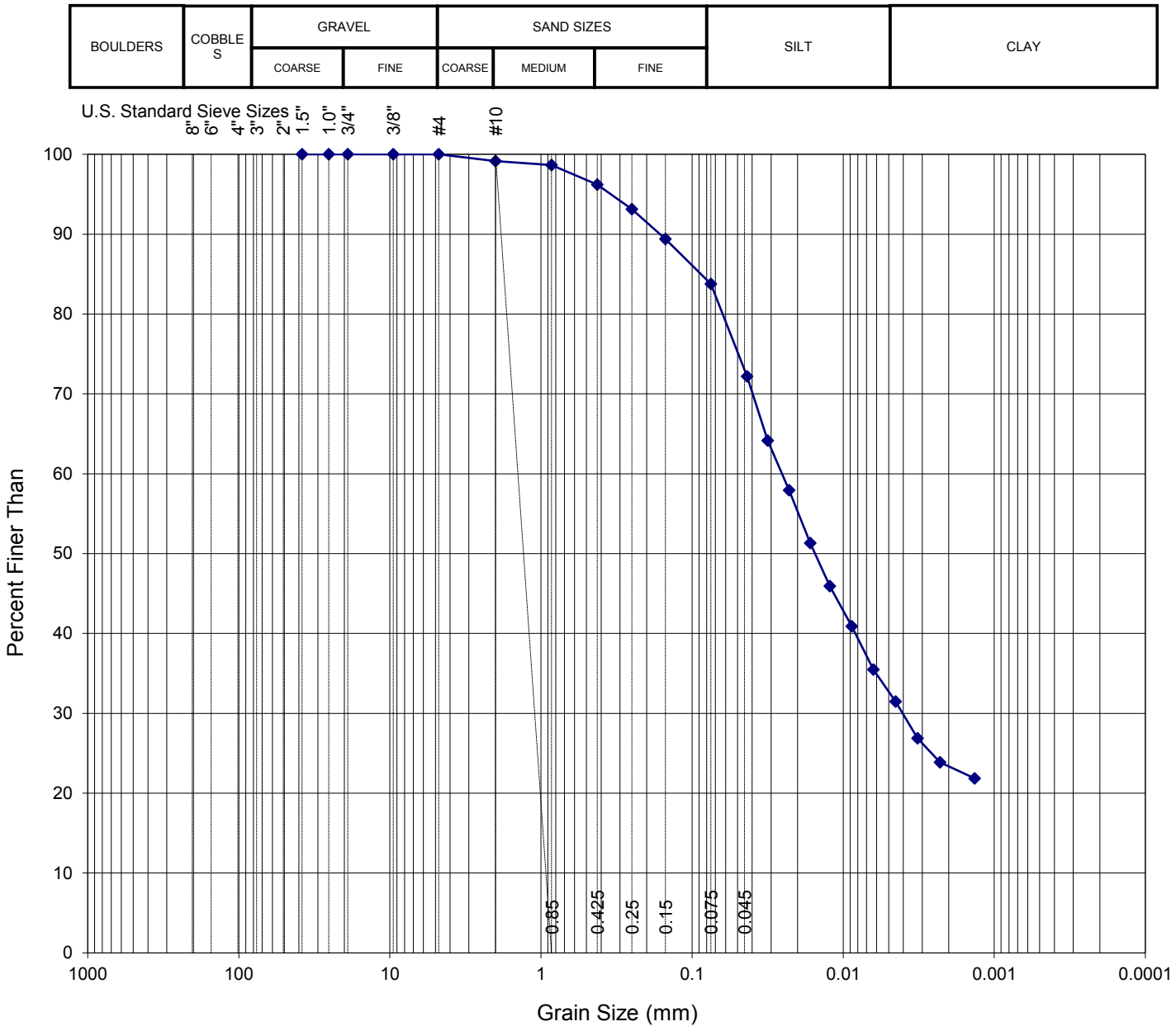
GRAIN SIZE	WT %	DIA. RANGE (mm)
% GRAVEL :	<1	> 4.75
% COARSE SAND :	<1	2.0 - 4.75
% MEDIUM SAND :	<1	0.425 - 2.0
% FINE SAND :	20.93	0.075 - 0.425
% SILT :	55.53	0.075 - 0.005
% CLAY :	22.44	< 0.005

ALS Laboratory Group

819-58th Street, Saskatoon,SK

PARTICLE SIZE DISTRIBUTION CURVE

Client Name:	AQUAFOR BEECH LIMITED
Project Number:	
Client Sample ID	24000011812 LOC 4 INT 3
Lab Sample ID	L2180838-2
Date Sample Received	15-Oct-18
Test Completion Date:	22-Oct-18
Analyst:	SHC



METHOD DESCRIPTION

Method Reference: ASTM D 422 - 63 (2002)

Dispersion method: Mechanical

Dispesion period: 1 minute cm/s

Soil classification system used: ASTM D422-63 Classification

DESCRIPTION OF SAND AND GRAVEL PARTICLES

Shape: Angular

Hardness: Hard

SUMMARY OF RESULTS

GRAIN SIZE	WT %	DIA. RANGE (mm)
% GRAVEL :	<1	> 4.75
% COARSE SAND :	<1	2.0 - 4.75
% MEDIUM SAND :	2.94	0.425 - 2.0
% FINE SAND :	12.43	0.075 - 0.425
% SILT :	51.01	0.075 - 0.005
% CLAY :	32.75	< 0.005

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2180838-COFC

COC Number: LON-181005

Grain Size

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6

Invoice To	
Same as Report To	☑ Y ☐ N
Copy of Invoice with Report	☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ Y ☐ N

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	
Email 2	

Project Information

ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	838
ALS Lab Work Order # (lab use only):	L2180780

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Gayle	Sampler: Pollutech

Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4-20%]	☐	1 Business day [E1 - 100%]	☐
3 day [P3-25%]	☐	Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	☐
2 day [P2-50%]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	2400001811 LOC 4 int 2	13-10-18	1201	Sediment	R	R	R	R	R	R	R	R	R	R								8
	2400001812 LOC 4 int 3	13-10-18	1201	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ Y ☐ N

Are samples for human consumption/ use?

☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	9.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: NB	Date: 10.14.18	Time:	Received by:	Date:	Time:	Received by: [signature]	Date: 15-OCT-18	Time: 800

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Francois Poilly
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 15-OCT-18
Report Date: 24-OCT-18 12:02 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180780

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: LON-181005
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Conductivity	mS/cm		0.983	0.821
% Moisture	%		42.2	33.5
pH	pH units		6.97	7.11
Volatile Solids	%		8.75	11.3
Total Solids	%		55.4	55.9

Leachable Anions & Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Chloride	ug/g		313	198
Total Kjeldahl Nitrogen	%		0.258 DLHC	0.260 DLHC
Total Nitrogen	ERROR		<1.0	<1.0
Orthophosphate-Dissolved (as P)	mg/kg		0.638	0.469

Anions and Nutrients (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Nitrate-N	mg/kg		<1.0	<1.0
Nitrite-N	mg/kg		<1.0	<1.0

Cyanides (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Cyanide, Weak Acid Diss	ug/g		<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organic / Inorganic Carbon (SOIL)

	ALS ID	L2180780-1	L2180780-2
	Sampled Date	13-OCT-18	13-OCT-18
	Sampled Time	12:01	12:01
	Sample ID	**24000011811 LOC4 INT 2**	**24000011812 LOC4 INT 3**
Analyte	Unit		
Fraction Organic Carbon	g/g	0.0645	0.0881
Total Organic Carbon	%	6.45	8.81

Saturated Paste Extractables (SOIL)

	ALS ID	L2180780-1	L2180780-2
	Sampled Date	13-OCT-18	13-OCT-18
	Sampled Time	12:01	12:01
	Sample ID	**24000011811 LOC4 INT 2**	**24000011812 LOC4 INT 3**
Analyte	Unit		
SAR	SAR	4.00	2.39
Calcium (Ca)	mg/L	36.4	34.9
Magnesium (Mg)	mg/L	5.9	7.7
Sodium (Na)	mg/L	98.7	59.9

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811 LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812 LOC4 INT 3**
Antimony (Sb)	ug/g		2.3	4.2
Arsenic (As)	ug/g		5.2	6.7
Barium (Ba)	ug/g		85.0	108
Beryllium (Be)	ug/g		<0.50	<0.50
Boron (B)	ug/g		7.4	9.7
Boron (B), Hot Water Ext.	ug/g		0.97	1.40
Cadmium (Cd)	ug/g		3.64	6.56
Chromium (Cr)	ug/g		32.8	41.0
Cobalt (Co)	ug/g		4.8	5.6
Copper (Cu)	ug/g		69.0	76.1
Lead (Pb)	ug/g		472	798
Mercury (Hg)	ug/g		0.282	0.418
Molybdenum (Mo)	ug/g		1.5	2.0
Nickel (Ni)	ug/g		15.7	20.8
Selenium (Se)	ug/g		<1.0	<1.0
Silver (Ag)	ug/g		0.50	0.89
Thallium (Tl)	ug/g		<0.50	<0.50
Uranium (U)	ug/g		<1.0	1.0
Vanadium (V)	ug/g		17.7	21.3
Zinc (Zn)	ug/g		652	1110

Speciated Metals (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811 LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812 LOC4 INT 3**
Chromium, Hexavalent	ug/g		<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Acetone	ug/g		<0.50	<0.50
Benzene	ug/g		0.0357	0.0831
Bromodichloromethane	ug/g		<0.050	<0.050
Bromoform	ug/g		<0.050	<0.050
Bromomethane	ug/g		<0.050	<0.050
Carbon tetrachloride	ug/g		<0.050	<0.050
Chlorobenzene	ug/g		<0.050	<0.050
Dibromochloromethane	ug/g		<0.050	<0.050
Chloroform	ug/g		<0.050	<0.050
1,2-Dibromoethane	ug/g		<0.050	<0.050
1,2-Dichlorobenzene	ug/g		<0.050	<0.80 DLI
1,3-Dichlorobenzene	ug/g		<0.050	<0.80 DLI
1,4-Dichlorobenzene	ug/g		<0.050	<0.80 DLI
Dichlorodifluoromethane	ug/g		<0.050	<0.050
1,1-Dichloroethane	ug/g		<0.050	<0.050
1,2-Dichloroethane	ug/g		<0.050	<0.050
1,1-Dichloroethylene	ug/g		<0.050	<0.050
cis-1,2-Dichloroethylene	ug/g		<0.050	<0.050
trans-1,2-Dichloroethylene	ug/g		<0.050	<0.050
Methylene Chloride	ug/g		<0.050	<0.050
1,2-Dichloropropane	ug/g		<0.050	<0.050
cis-1,3-Dichloropropene	ug/g		<0.030	<0.030
trans-1,3-Dichloropropene	ug/g		<0.030	<0.030
1,3-Dichloropropene (cis & trans)	ug/g		<0.042	<0.042
Ethylbenzene	ug/g		0.055	0.102
n-Hexane	ug/g		<0.050	<0.050
Methyl Ethyl Ketone	ug/g		<0.50	<0.50
Methyl Isobutyl Ketone	ug/g		<0.50	<0.50
MTBE	ug/g		<0.050	<0.050
Styrene	ug/g		<0.050	<0.050
1,1,1,2-Tetrachloroethane	ug/g		<0.050	<0.050
1,1,2,2-Tetrachloroethane	ug/g		<0.055 DLHM	<0.33 DLVH
Tetrachloroethylene	ug/g		<0.050	<0.050
Toluene	ug/g		0.209	0.369
1,1,1-Trichloroethane	ug/g		<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811 LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812 LOC4 INT 3**
1,1,2-Trichloroethane	ug/g		<0.050	<0.050
Trichloroethylene	ug/g		0.031	0.047
Trichlorofluoromethane	ug/g		<0.050	<0.050
Vinyl chloride	ug/g		<0.020	<0.020
o-Xylene	ug/g		0.163	0.310
m+p-Xylenes	ug/g		0.246	0.504
Xylenes (Total)	ug/g		0.410	0.814
Surrogate: 4-Bromofluorobenzene	%		83.9	85.3
Surrogate: 1,4-Difluorobenzene	%		89.5	92.3

Hydrocarbons (SOIL)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180780-1 13-OCT-18 12:01 **24000011811 LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812 LOC4 INT 3**	
F1 (C6-C10)	ug/g		14.3	22.9	
F1-BTEX	ug/g		13.5	21.5	
F2 (C10-C16)	ug/g		114	239	
F2-Naphth	ug/g		113	237	
F3 (C16-C34)	ug/g		1280	2730	
F3-PAH	ug/g		1260	2720	
F4 (C34-C50)	ug/g		457	882	
F4G-SG (GHH-Silica)	ug/g		1360	2740	
Total Hydrocarbons (C6-C50)	ug/g		1870	3880	
Chrom. to baseline at nC50	No Unit		NO	NO	
Surrogate: 2-Bromobenzotrifluoride	%		94.3	94.7	
Surrogate: 3,4-Dichlorotoluene	%		60.2	55.0	SOL:MI

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (SOIL)

Analyte	Unit	L2180780-1	L2180780-2
ALS ID		L2180780-1	L2180780-2
Sampled Date		13-OCT-18	13-OCT-18
Sampled Time		12:01	12:01
Sample ID		**24000011811 LOC4 INT 2**	**24000011812 LOC4 INT 3**
Acenaphthene	ug/g	0.356	0.373
Acenaphthylene	ug/g	0.096	0.083
Anthracene	ug/g	0.563	0.516
Benzo(a)anthracene	ug/g	2.10	1.32
Benzo(a)pyrene	ug/g	2.14	1.20
Benzo(b)fluoranthene	ug/g	2.42	1.37
Benzo(g,h,i)perylene	ug/g	1.77	0.971
Benzo(k)fluoranthene	ug/g	2.33	1.34
Chrysene	ug/g	3.05	1.85
Dibenzo(ah)anthracene	ug/g	0.372	0.202
Fluoranthene	ug/g	5.93	3.29
Fluorene	ug/g	0.632	0.717
Indeno(1,2,3-cd)pyrene	ug/g	1.23	0.599
1+2-Methylnaphthalenes	ug/g	2.08	3.34
1-Methylnaphthalene	ug/g	0.816	1.30
2-Methylnaphthalene	ug/g	1.27	2.04
Naphthalene	ug/g	1.27	2.09
Phenanthrene	ug/g	3.51	2.87
Pyrene	ug/g	4.95	2.95
Surrogate: 2-Fluorobiphenyl	%	76.9	74.2
Surrogate: p-Terphenyl d14	%	78.5	77.6

Polychlorinated Biphenyls (SOIL)

Analyte	Unit	L2180780-1	L2180780-2
ALS ID		L2180780-1	L2180780-2
Sampled Date		13-OCT-18	13-OCT-18
Sampled Time		12:01	12:01
Sample ID		**24000011811 LOC4 INT 2**	**24000011812 LOC4 INT 3**
Aroclor 1242	mg/kg	0.386	0.698
Aroclor 1248	mg/kg	<0.010	<0.010
Aroclor 1254	mg/kg	0.435	0.740
Aroclor 1260	mg/kg	<0.150 DLM	<0.150 DLM
Total PCBs	mg/kg	0.821	1.438
Surrogate: d14-Terphenyl	%	96.5	101.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (SOIL)

Analyte	Unit	L2180780-1 13-OCT-18 12:01 **24000011811** **LOC4 INT 2**	L2180780-2 13-OCT-18 12:01 **24000011812** **LOC4 INT 3**
Aldrin	mg/kg	<0.040 DLM	<0.040 DLM
alpha-BHC	mg/kg	<0.500 DLQ	<0.600 DLQ
beta-BHC	mg/kg	<0.040 DLM	<0.150 DLQ
Lindane	mg/kg	<0.040 DLM	<0.040 DLM
delta-BHC	mg/kg	<0.500 DLQ	<0.700 DLQ
a-chlordane	mg/kg	<0.040 DLM	<0.040 DLM
g-chlordane	mg/kg	<0.040 DLM	<0.040 DLM
op-DDD	mg/kg	<0.040 DLM	<0.040 DLM
pp-DDD	mg/kg	<0.040 DLM	<0.200 DLQ
o,p-DDE	mg/kg	<0.040 DLM	<0.040 DLM
pp-DDE	mg/kg	<0.040 DLM	<0.040 DLM
Dieldrin	mg/kg	<0.040 DLM	<0.040 DLM
alpha-Endosulfan	mg/kg	<0.040 DLM	<0.090 DLQ
beta-Endosulfan	mg/kg	<0.060 DLQ	<0.150 DLQ
Endosulfan Sulfate	mg/kg	<0.040 DLM	<0.040 DLM
Endrin	mg/kg	<0.040 DLM	<0.040 DLM
Endrin Aldehyde	mg/kg	<0.040 DLM	<0.040 DLM
Heptachlor	mg/kg	<0.040 DLM	<0.040 DLM
Heptachlor Epoxide	mg/kg	<0.040 DLM	<0.040 DLM
Hexachlorobenzene	mg/kg	<0.040 DLM	<0.040 DLM
Mirex	mg/kg	<0.040 DLM	<0.040 DLM
Oxychlordane	mg/kg	<0.040 DLM	<0.040 DLM
Surrogate: 2-Fluorobiphenyl	%	79.8	80.2
Surrogate: d14-Terphenyl	%	68.4	68.4

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DLVH	Detection Limit raised due to interference from Volatile Hydrocarbons on VOC method. Chromatographic elution of interfering peaks in

Reference Information

the same region as test analytes prevents a determination of whether VOC analyte is present or absent (above/below regular detection

Reference Information

limits).

DLI	Detection Limit Raised: Dilution required to address Internal Standard response problems caused by matrix interference.
SOL:MI	Surrogate recovery outside acceptable limits due to matrix interference
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0

5 grams of dried soil is mixed with 10 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD

The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-WT	Soil	Conductivity (EC)	MOEE E3138

A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ETL-N-TOT-WT	Soil	Calculate from NO2 + NO3+TKN	CALCULATION
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Soil F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-200.2-CVAA-WT Soil Mercury in Soil by CVAAS EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

METHYLNAPS-CALC-WT Soil ABN-Calculated Parameters SW846 8270

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

NO2-WT	Soil	Nitrite in Soil	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

NO3-WT	Soil	Nitrate in Soil (NO3-N)	EPA 300.0

5 grams of soil is mixed with 50 mL of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PCB-WT	Soil	Polychlorinated Biphenyls	EPA 8082

A representative sub-sample of a soil sample is mixed with methanol and extracted with toluene using a shaker technique. An aliquot of the separated toluene is analyzed by GC/MSD.

PEST-OC-WT	Soil	Pesticides, Organochlorine	SW846 8270

A 5g representative sub-sample of the soil sample is mixed with methanol and extracted with toluene. An aliquot is taken and analyzed by GC/MSD.

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PO4-DO-COL-WT	Soil	Orthophosphate in Soil (PO4-P)	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a soil sample that has been extracted and filtered through a 0.45 micron membrane filter.

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

SOLIDS-TS-WT	Soil	Total Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids. Results are reported as the percentage of the total sample.

SOLIDS-VS-WT	Soil	Volatile Solids on Solid Matrix	APHA 2540B

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105°C. The increase in weight over that of the empty dish represents the total solids.
This residue is ignited to constant weight at 550°C. The remaining solids represent the fixed total solids while the weight lost on ignition is the volatile solids. Results are reported as Percent of the Total solids as Volatile.

TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.3.2

Soil is treated with excess acidic dichromate, which reacts with the organic carbon, oxidizing it to CO2. The residual dichromate is titrated with ferrous ammonium sulphate and TOC calculated by difference.

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

LON-181005

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

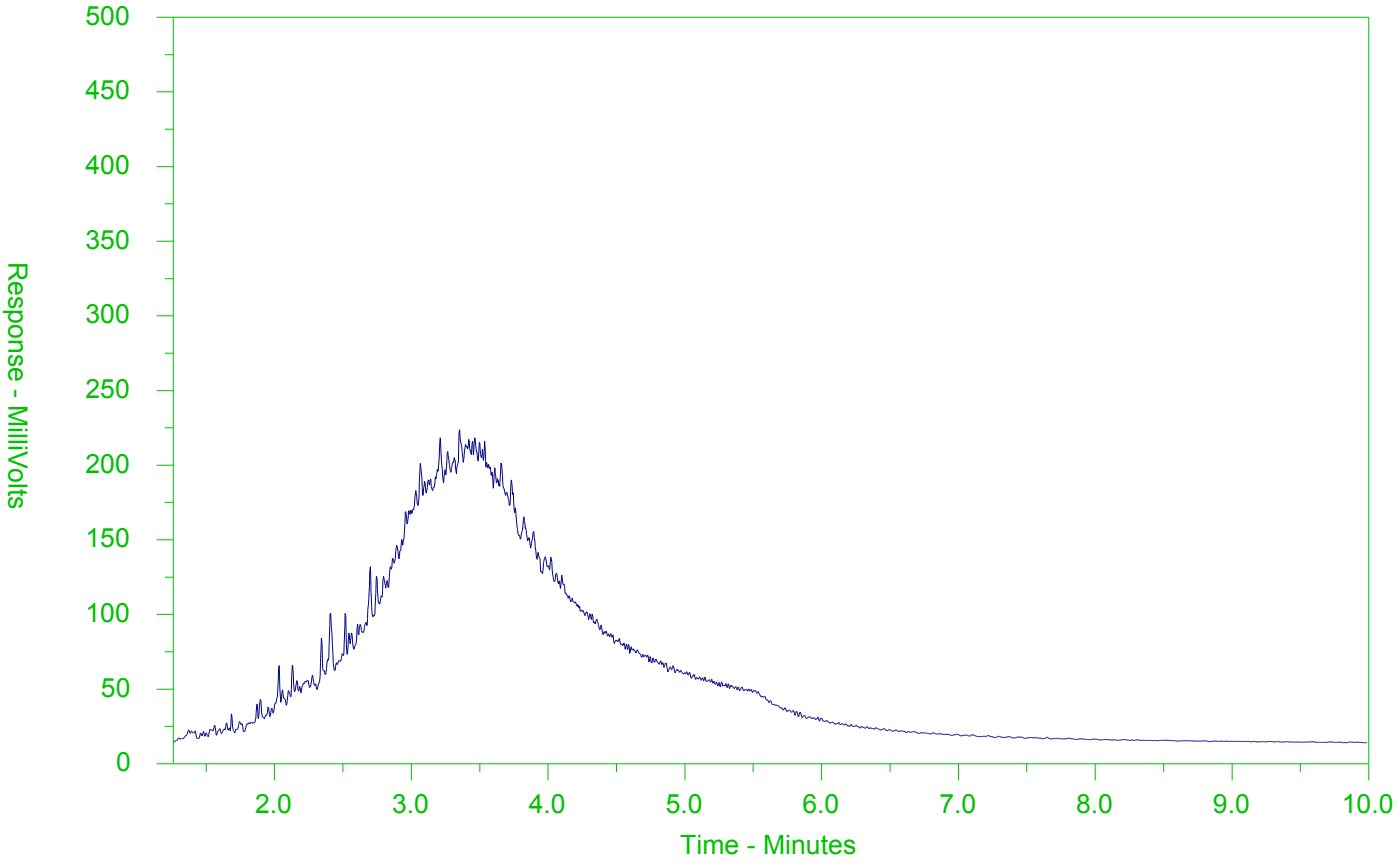
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180780-1
Client Sample ID: 24000011811 LOC4 INT 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

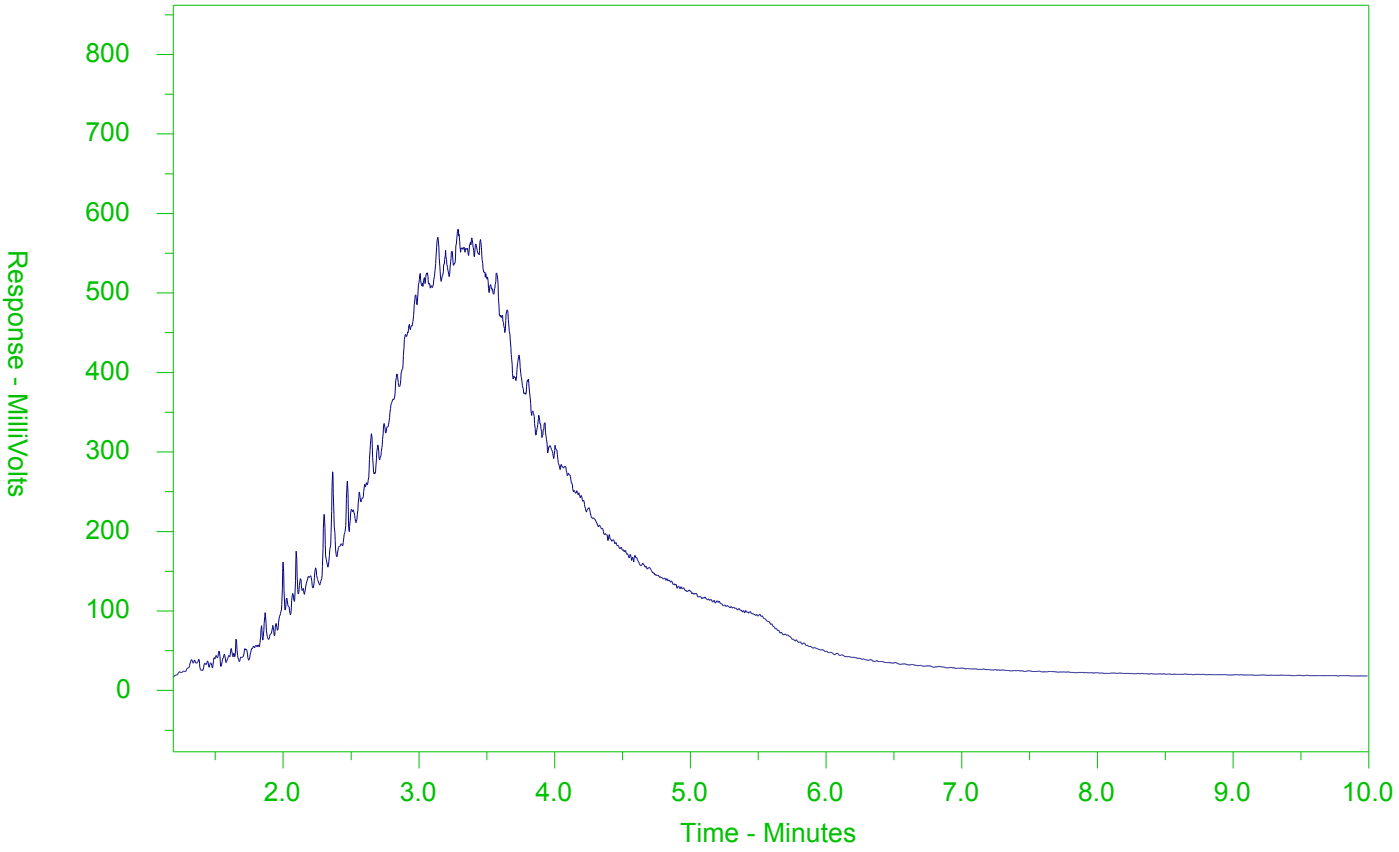
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180780-2
Client Sample ID: 24000011812 LOC4 INT 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

(ALS) Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2180780-COFC

COC Number: LON-181005

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY
Phone:	416-894-4216
	Company address below will appear on the final report
Street:	55 REGAL ROAD
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☑ Y ☐ N
Company:	AQUAFOR BEECH
Contact:	FRANCOIS POILLY

Report Format / D

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ Y ☐ N

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	bordi.m@aquaforbeech.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

ontact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	Q67865
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2180780

ALS Contact: Gayle

Sampler: Pollutech

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-R511-WT, NO2-WT, NO3-WT	ETL-N-TOT-WT	GRAIN SIZE	N-TOTKJ-COL-SK	PAH-511-WT, PCB-WT, PEST-OC-WT	PO4-DO-COL-WT	R511-INORGANICS-P-WT	SOLIDS-VS-P-WT	TOC-WT	VOC-R511,F1-F4-P-WT	EC-SOLIDS-MF-WT	FC-SOLID-MF-WT				SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	24000011811 LOC 4 int 2	13-10-18	1201	Sediment	R	R	R	R	R	R	R	R	R	R								8
	24000011812 LOC 4 int 3	13-10-18	1201	Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8
				Sediment	R	R	R	R	R	R	R	R	R	R								8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Y ☐ N

Are samples for human consumption/ use? ☐ Y ☐ N

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

also email: poilly.f@aquaforbeech.com

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 9.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: NB	Date: 10.14.18	Time:	Received by:	Date:	Time:	Received by: 84	Date: 15-OCT-18	Time: 800

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Appendix F-3 – Lead 210 Technical Memo

March 4th, 2019

MEMORANDUM

ABL Reference: 66314

To: Will Cowlin, Dave Maunder

Prepared By: Roger Phillips

ABL Staff Copied: Darcy Laframboise, Meagan Bordi, Meaghan Dustin

RE: City of Brantford, Mohawk Lake – Lead-210 Dating of Sediment Core

This inter-office memorandum is to communicate the results of lead-210 (Pb-210 here forward) dating on a sediment core collected from Mohawk Lake in the City of Brantford.

Sediment Core Sampling

Two sediment cores were collected from bottom sediment of Mohawk Lake at locations 8 and 14 on October 12th, 2018 by staff from Pollutech EnviroQuatics Limited (**Figure 1**). Both cores were documented to represent a bottom sediment thickness of about 2 metres, with recovery lengths of 1.2 metres (i.e., ~40% compaction of 2 m long cores). The two recovered cores were each sectioned into 50 sub-samples of 2 cm thicknesses continuously from 0 to 80 cm (40 samples), and then skipping 2 cm sections every second sample from 80 to 120 cm (10 samples). This total of 100 samples from the two cores was shipped by ALS Environmental to Flett Research Limited for Pb-210 dating. The remaining sections between 80-120 cm have been retained in storage, with the exception of a sample which was sent to Beta Analytic for radiocarbon ^{14}C dating. This memo currently documents the Pb-210 results from Location 14.

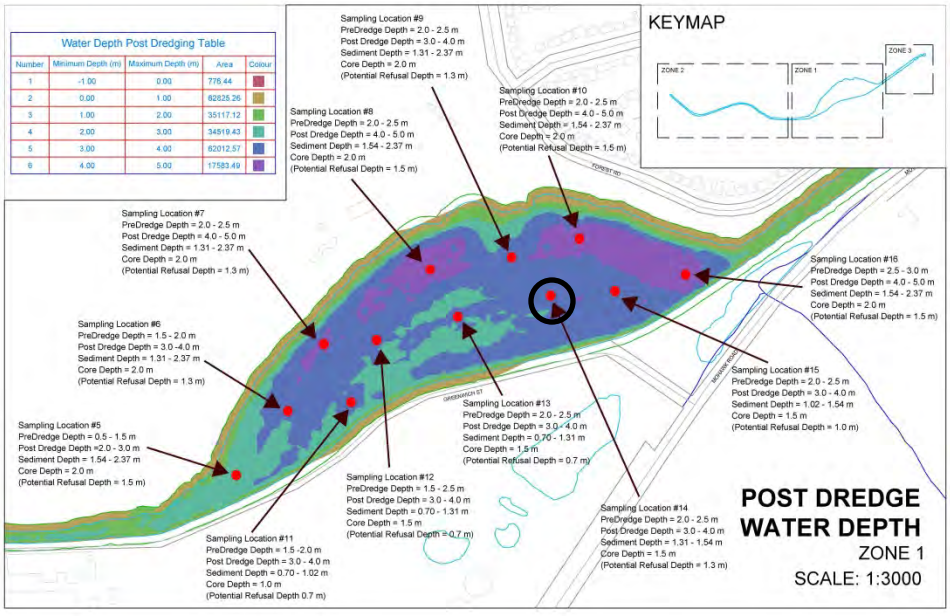


Figure 1: Core sampling locations for Mohawk Lake. Pb-210 results are for location 14.

March 4th, 2019

Geochronology Tools – Lead-210 Dating

The following provides an background understanding of the Pb-210 dating method from the Flett Research Ltd. laboratory website: http://www.flettresearch.ca/. To validate the Pb-210 analysis, supporting laboratory measurements were required using radium-226 (Ra-226), cesium-137 (Cs-137), and radiocarbon (^{14}C) analyses.

Understanding Lead-210 Dating

The dating of sediment cores by the Pb-210 method can be used to determine the sediment accumulation rate for a body of water and the age of the sediments at a particular depth can be inferred. The age of sediments at different depths can be used to document historical contamination. In a typical application, the average accumulation rate over a period of 100–200 years may be obtained. Pb-210 is a naturally occurring radioactive element that is part of the uranium-238 radioactive decay series.

Also in the series, radium-226 is found in soils everywhere and through radioactive decay to radon-222 gas is released to the atmosphere. Further radioactive decay results in the production of Pb-210 (half-life 22.3 yr) which falls from the atmosphere and is deposited in water bodies fixed to sediments. The amount of radioactive Pb-210 in the sediment, which is actually measured based on the alpha emissions of Po-210, allows for an estimate of the age deposition, assuming a known constant input of Pb-210 from the atmosphere.

Source: https://geoinfo.nmt.edu/resources/uranium/what.html

For example, Pb-210 that was incorporated into the sediments 22.3 years ago will be only half as radioactive as when initially deposited. This logic can be extended to calculate the age of sediments at other depths in the sediment column and/or the rate of sediment accumulation. When applying the Pb-210 dating technique, it is assumed that the lake sediments are receiving a constant input of Pb-210 from the atmosphere. Typically, Ra-226 measurements from several sample depths are used to positively determine the Pb-210 background level throughout the core length.

There are two primary analysis methods used to analyze Pb-210 data:

1. The slope regression method; and
2. The constant rate of supply (CRS) method.

The above excerpts have been adapted from online information by Flett Research Ltd.
See the website for further information: http://www.flettresearch.ca/

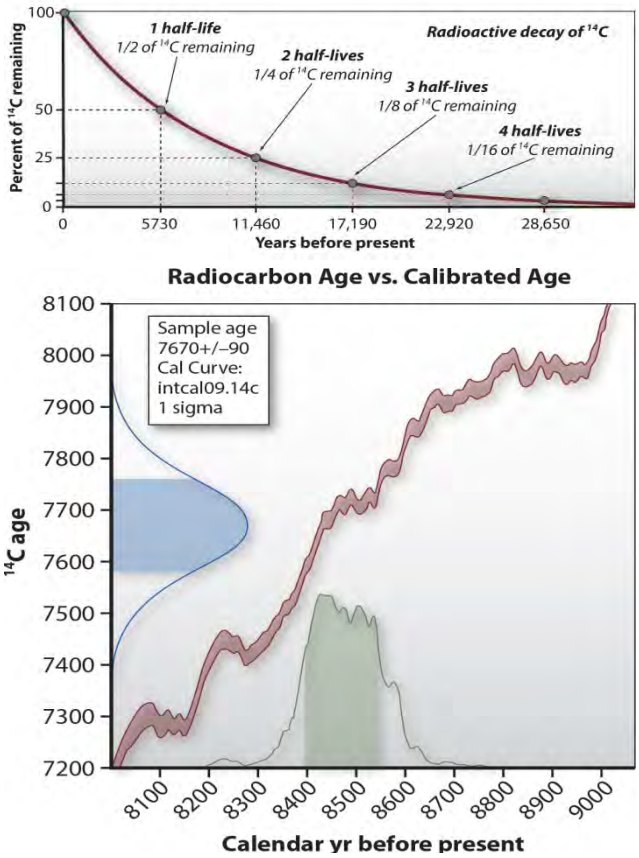
Cesium-137 Validation

Cesium-137 (Cs-137) is used as an independent tracer to validate the Pb-210 chronology. The Cs-137 data are typically interpreted on the basis of the 1963 major input peak due to nuclear bomb testing, or 1966 maximum inventory of the isotope in the northern hemisphere. Correctly predicting Cs-137 peak input in 1963 (or the maximum inventory of 1966) based on an independent Pb-210 age model adds confidence to the results. A plot of Cs-137 activity vs. depth (cm) is supplied with the Pb-210 results. Adapted from http://www.flettresearch.ca/.

Radiocarbon ^{14}C Validation

Radiocarbon dating can also be used to validate Pb-210 methods for cores with sediment ages which overlap the methods between 100 – 200 years. The oldest radiocarbon dates go back to about 50,000 years. Excerpts below are from Beta Analytic (https://www.radiocarbon.com/).

Radiocarbon, or carbon-14 (^{14}C), is an isotope of the element carbon that is unstable and weakly radioactive (half-life 5730 ± 40 years). Radiocarbon is a method that provides objective age estimates for carbon-based materials that originated from living organisms. Carbon-14 is continually being formed in the upper atmosphere by the effect of cosmic ray neutrons on nitrogen-14 atoms. Plants and animals assimilate carbon-14 from carbon dioxide throughout their lifetimes. When they die, they stop exchanging carbon with the biosphere and their carbon-14 content then starts to decrease at a rate determined by the law of radioactive decay. An age can be estimated by measuring the amount of carbon-14 remaining in the sample, but calendar age calibrations are required because atmospheric ^{14}C production rates are not constant. Calibrations of radiocarbon age determinations up to 12,000 BP are based on known-age tree rings (INTCAL13 database) and are applied to convert the Conventional Radiocarbon Age (^{14}C years BP) to calendar years. To deal with the uncertainty in the calibration, a high-probability density (HPD) range method is used.



Examples for (upper) radiocarbon decay half-life, and (lower) calibrated calendar age (high-probability density (HPD) range).
Source: Bierman and Montgomery, 2013. Key Concepts in Geomorphology.

Results: *Lead-210 Dating Results for Mohawk Lake, Brantford*

The following Pb-210 results presented are for the sediment core collected from Mohawk Lake at Location 14, and include the following key conclusions:

- Top 30 centimetres of sediment (~20 cm core depth) deposited in the last 55 years;
- Top 40 – 50 centimetres of sediments (~30 cm core depth) deposited in the last 90 years;
- Pb-210 sedimentation rate is in the range of 0.3 to 0.5 cm/yr (0.1 - 0.2 g cm^{-2} yr^{-1});
- Radiocarbon (^{14}C) sedimentation rate is about 0.65 cm/yr for the last ~300 years; and
- Recommend average sedimentation rate is about 0.5 ± 0.1 cm/yr (~0.2 g cm^{-2} yr^{-1}).

The main Pb-210 analysis results are summarized in **Table 1** and the core age profile is presented in **Figure 2** , including age models from the Pb-210, Cs-137, and ^{14}C analyses. The detailed Pb-210 results from Flett Research Ltd. are provided in **Appendix A**.

Ra-226 Background Radioactivity

The Ra-226 background levels were measured in three sections as summarized in **Table 1**, with the radioactivity ranging from 1.20 to 1.95 DPM/g (disintegrations per minute per gram). Of particular significance is that the Pb-210 activity in the 48–50 cm section (sample core recovery depth, **Table 1**) barely exceeds the Ra-226 activity measured in the same section, indicating that the background level of Pb-210 has been achieved in this core and that the Pb-210 age model cannot be extended below this depth.

Cesium-137 Validation

Cs-137 was measured in 6 sections in the 6 to 22 cm core interval (**Appendix A**, pages 14 to 18). Activities in the 14–20 cm portion of the core are significantly above background, ranging between 1.00 – 1.98 DPM/g. The peak Cesium-137 activity of 1.98 DPM/g was found in the 18–20 cm section, which is assumed to represent peak atmospheric input of Cs-137 in 1963, or 55 years before sample collection in 2018. Given that the Pb-210 CRS age model predicts an age of 50 years at 19 cm, the independent Cs-137 prediction within 5 years is considered acceptable and gives some additional confidence in the results.

Radiocarbon Dating

Radiocarbon dating was also used to validate the Pb-210 results, specifically considering that the Pb-210 results were only able to date the top 25% of the sediment core. Woody plant material was identified in the 112–114 cm section of the core from Location 14, and was sent to Beta Analytic for ^{14}C radiocarbon dating by atomic mass spectroscopy (AMS). The detailed results of the radiocarbon analysis as presented in **Appendix B** provide a date of 140 ± 30 ^{14}C years BP, with the highest probability for the calendar age between 1669 and 1780 cal AD. From this radiocarbon result, the recommended age for the 112–114 cm section is 294 ± 56 calendar years before 2018. This result is presented in **Figure 2** with the Pb-210 results. Assuming a linear extrapolation to "decompacted" the core as presented in **Table 1**, the sedimentation rate has been calculated to be ~0.65 cm/yr based on 190 cm over 294 years.

Limitations and Conclusions

Some substantive limitations and uncertainties in the Pb-210 analysis are outlined by Flett Research Ltd. in **Appendix A**, and cannot be fully resolved. Specifically, the uncertainties may be due to irregularities in the sedimentation rate, including the possibility of unconformities due to lake dredging that have not been accounted for.

However, the Pb-210 CRS age model results reported for top ~50 cm of the core are supported by two independent verification methods, including:

1) The peak Cs-137 measurement for 1963 is within 5 years of the CRS date in same section of the core; and
2) The radiocarbon ^{14}C date near the bottom of the core provides a closely matching sediment accumulation rate (~0.65 cm/yr) compared to the CRS model (0.3 – 0.5 cm/yr).

Overall, the Pb-210 analysis for the Mohawk Lake sediments is complex, with uncertainties that cannot be fully resolved but are mitigated using Cs-137 and ^{14}C validation methods. The matching of Pb-210 activity with background Ra-226 radioactivity within the top 50 cm of the core, along with some unexplained regularities in the Pb-210 results, may limit the value of the method for Mohawk Lake if applied on its own. However, with the application of other independent dating methods, the Pb-210 age models and sedimentation rates for Location 14 are considered reliable.

Mohawk Lake Characterization Study – Next Steps for the Pb-210 Analysis

The sediment cores at locations 8 and 14 were collected as part of the Mohawk Lake characterization study, with the intention of providing the Pb-210 results as supplementary data at a later date. With the summary Pb-210 results presented in this study—including age models and sediment accumulation rates—the next steps include the following considerations:

- This memo provides a draft deliverable for submission to the City of Brantford;
- The Pb-210 results may be provided as an addendum to the characterization study and/or may be integrated into subsequent phases of the study; and
- A decision is needed to direct Flett Research regarding if they should proceed with Pb-210 analysis for the sediment core collected at Location 8.

The reliability of the Pb-210 results at Location 14 may be sufficient to inform the overall study, but analysis of the second core would likely strengthen the results and/or provide some additional knowledge regarding the spatial variability of sedimentation rates.

AQUAFOR BEECH LIMITED

Roger TJ Phillips, Ph.D., P.Geo.
Geomorphologist | Aquafor Beech Ltd.

Table 1: Summary of Pb-210 results for Mohawk Lake sediment core location 14.

Sample Core Recovery Depth (cm)	Dry Bulk Density (g/cm^3)	Po-210 Total Activity ± 1 S.D. (DPM/g)	Pb-210 Unsupported Activity (DPM/g)	Ra-226 Activity ± 1 S.D. (DPM/g)	LRM Age[1] (Years)	CRS Age Model			Decompacted Sediment Depth[3] (cm)
						CRS Age[2] (Years)	Sediment Accumulation Rate (g/cm2/yr)	Year	
0 - 2	0.396	13.94 ± 0.41	12.74		7.25	5.78	0.21	2012.2	3
4 - 6	0.533	12.45 ± 0.36	11.25		20.27	17.82	0.18	2000.2	10
8 - 10	0.428	11.46 ± 0.42	10.27	1.20 ± 0.04	30.72	30.81	0.13	1987.2	17
12 - 14	0.450	6.23 ± 0.25	5.03		41.71	40.35	0.19	1977.6	23
16 - 18	0.416	5.36 ± 0.24	4.16		51.88	50.22	0.17	1967.8	30
20 - 22	0.363	5.04 ± 0.28	3.85		60.76	61.22	0.13	1956.8	37
24 - 26	0.400	3.35 ± 0.20	2.15		70.53	70.51	0.17	1947.5	43
28 - 30	0.345	2.81 ± 0.20	1.62		83.18	83.20	0.16	1934.8	50
36 - 38	0.423	3.22 ± 0.18	Po-210 activity nearly equivalent to Ra-226 below this depth						62
48 - 50	0.542	**2.07 ± 0.14**		**1.95 ± 0.04**					83
66 - 68	0.738	2.75 ± 0.17							113
82 - 84	0.628	1.77 ± 0.14							140
98 - 100	0.637	1.61 ± 0.12							167
118 - 120	0.979	1.34 ± 0.11		1.56 ± 0.04					200

1. LRM – Linear regression model age at bottom of section.
2. CRS – Constant rate of supply model age at bottom of section.
3. Depth for bottom of sample assuming linear extrapolation of compacted sediment core from 1.2 m recovery length to 2 m length *in situ*.

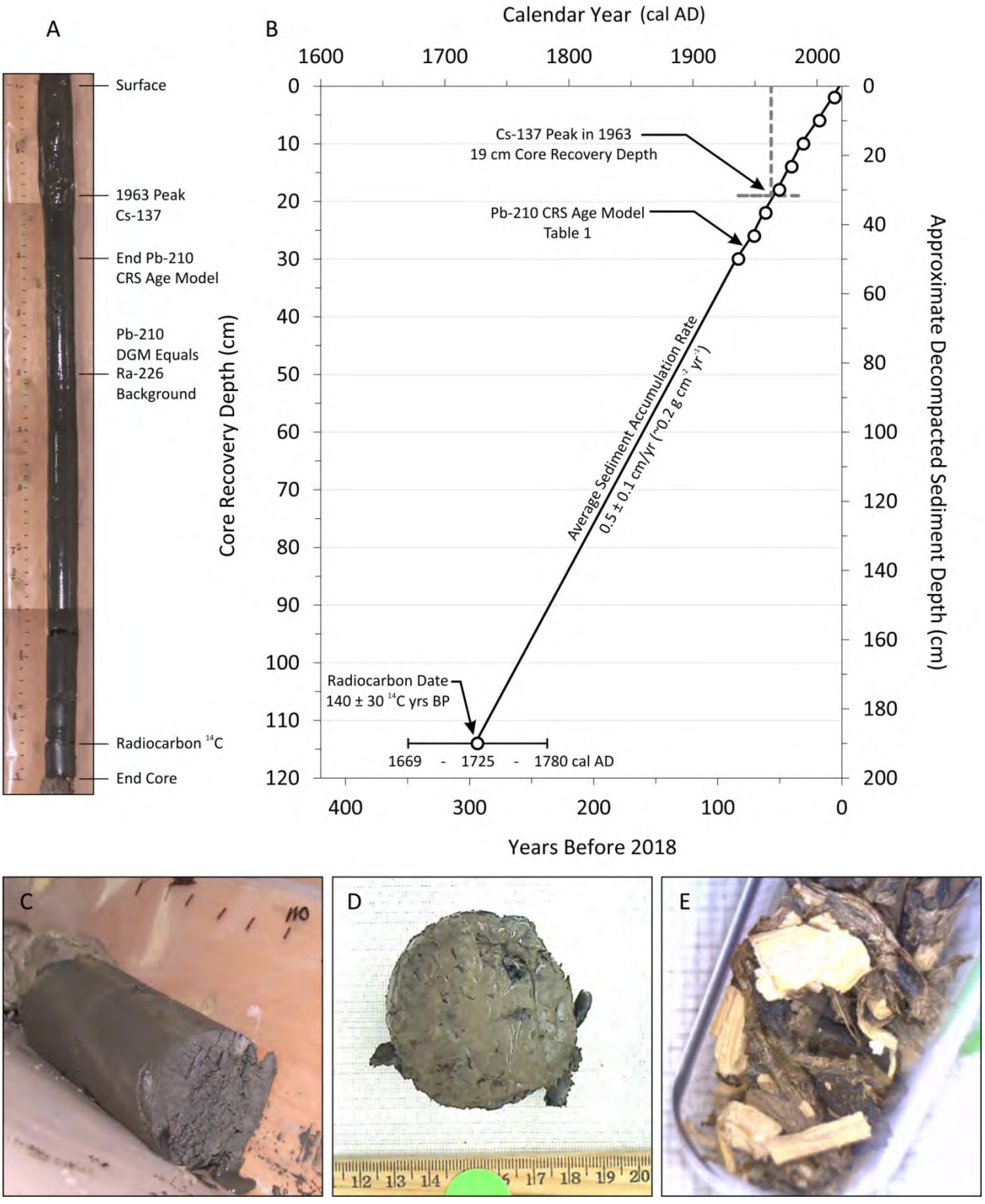


Figure 2: Location 14 Mohawk Lake sediment dating results. **A)** Location 14 sediment core photographs. **B)** Age model results for Pb-210, Cs-137, and radiocarbon ^{14}C. **C)** Core sections 110 – 120 cm. **D and E)** Radiocarbon sample section 112 – 114 cm and woody plant material.

Appendix A

Pb-210 Dating Results

Flett Research Ltd.

Interpretation of Pb-210, Ra-226 and Cs-137 Results

Flett Research Ltd.
440 DeSalaberry Ave. Winnipeg, MB R2L 0Y7
Fax/Phone: (204) 667-2505
Email: flett@flettresearch.ca Webpage: http://www.flettresearch.ca

Client: Phillips, Roger

Address:	Aquafor Beech Ltd., 2600 Skymark Avenue, Suite 202, Building 6, Mississauga, Ontario, L4W 5B2
Core ID:	**Mohawk Lake location 14**
Transaction ID:	873
PO/Contract No.:	Project ref#: 66314
Date Received:	23-Oct-18
Analysis Dates:	November 29, 2018 - January 23, 2019
Analysts:	L. Hesketh-Jost; X. Hu
Sampling Date:	12-Oct-18
Project:	Project Ref# 66314

Results authorized by Dr. Robert J. Flett, Chief Scientist

INTERPRETATION

Observations:

The Pb-210 activity profile of this core shows an irregular but approximately exponential decrease as a function of depth. The maximum activity of 13.94 DPM/g observed in section 1 (extrapolated depth 0 - 3 cm) is about 10 times the lowest activity of 1.34 DPM/g in the bottom section (extrapolated depth 109 - 120 cm) (Pages 2 & 3).

The dry bulk densities vary between 0.345 g/cm^2 and 0.533 g/cm^2 in the upper 43 cm (extrapolated depth) of the core. Below 43 cm, the dry bulk densities generally increase with depth, ranging between 0.542 g/cm^2 and 0.979 g/cm^2 (Page 4).

Ra-226 was measured at 1.20, 1.95, and 1.56 DPM/g in sections 8 - 10 cm, 48 - 50 cm, and 118 - 120 cm, respectively (Pages 10 - 13). Net unsupported Pb-210 (column AH on Page 2) in sections 1 - 15 (extrapolated depth 0 - 33 cm) was calculated by subtracting the Ra-226 measurement at 8 - 10 cm from each total Pb-210 value in the same core interval. The Pb-210 activitity in the 48 - 50 cm section barely exceeds the Ra-226 activity measured in the same section, indicating that the background level of Pb-210 has been achieved in this core.

Cs-137 was measured in 6 sections in the 6 - 22 cm core interval. Activities in the 14 - 20 cm portion of the core are significantly above background, ranging between 1.00 - 1.98 DPM/g (Pages 14 & 18). After dry bulk density measurement and Pb-210 analysis, section 20 - 22 cm had only approximately 400 mg of dried sample material remaining for Cs-137 analysis. It is possible that with more sample material this section may have shown detectable Cs-137 activity. Section 22 - 24 cm was not counted for Cs-137 because it also lacked sufficient dry sample material.

Regression model of Unsupported Pb-210 activity vs. Cumulative Dry Weight (g/cm ^{2}):

When applying the linear regression model, it is assumed that the input of Pb-210 and the sediment accumulation rate are constant. Although variation in the sediment accumulation rate is apparent, the linear regression model was applied to sections 0 - 15 (extrapolated depth 0 - 33 cm), because it appears that the average sediment accumulation rate in this core interval will be reasonably estimated and this estimate of sediment accumulation rate is used to calibrate the CRS model in the same core interval.

The regression results are seen on Pages 5 and 6. The regression model predicts (R^2 = 0.9533) an average sediment accumulation rate of 0.1637 g/cm^2/yr when a Pb-210 background of 1.1995 DPM/g (closest to the Ra-226 activity of 1.20 DPM/g measured in the 8 - 10 cm section) is chosen from the regression table. The age at the bottom of any core section can be estimated by dividing the cumulative dry weight/cm^2 by the accumulation rate. For example, the age at the bottom of section 9 (extrapolated depth 19 cm) is calculated as: 8.494 / 0.1637 = 51.9 yr. The age estimate at the bottom of each section in core interval of 0 - 33 cm is shown on Pages 2 (column AM) & 7.

CRS model of Age at bottom of Extrapolated section in years vs. Depth of bottom edge of current section in cm:

The CRS model assumes constant input of Pb-210 and a core that is long enough to include all of the measurable atmospheric source Pb-210, i.e. it contains a complete Pb-210 inventory. The facts that 1) the Pb-210 activity in section 19 (extrapolated depth 33 - 43 cm) is higher than the Pb-210 activity in section 15 (extrapolated depth 27 - 33 cm), 2) the suspicious sudden termination in exponential decay of the Pb-210 profile in section 25 (extrapolated depth 43 - 58 cm), are possible causes for us to discard the deeper portion of the core (i.e. truncate the core) due to the increasing uncertainty of the sedimentation process.

The Ra-226 activity indicates that the background Pb-210 activity level has not been achieved at 33 cm (extrapolated depth), leaving us with an incomplete truncated core that normally cannot be processed by the CRS model. In order to allow use of the CRS model, an artificial Pb-210 inventory of 91.970 DPM/cm^2 has been chosen such that the CRS model predicted exactly the same average sediment accumulation rate (0.1637 g/cm^2/yr) as the linear regression model over the 0 - 33 cm (extrapolated depth) segment of the core. With the CRS model calibrated, it has been used to calculate ages for the core interval of 0 - 33 cm (extrapolated depth).

The measured total activity results (DPM/g) are shown in column AF of the main data table on Page 2. The estimated age at the bottom of each section is shown in column AI, also shown on Page 2. The average sediment accumulation rate, from core surface to the extrapolated bottom depth of any section, can be calculated by dividing the cumulative dry mass at the bottom of the extrapolated section by the calculated age at that depth. For example, the average sediment accumulation rate, from the core surface to the bottom of section 9 (extrapolated depth 19 cm) can be calculated as: 8.494 / 50.2 = 0.1692 g/cm^2/yr. The individual sedimentation rate for each section is shown in column AL in the data sheet. Plots of age vs. depth, sediment accumulation rate vs. depth and sediment accumulation rate vs. age are seen in Pages 7, 8 and 9, respectively.

Conclusion:

Throughout the modeled core (0 - 33 cm, extrapolated depth), the sediment accumulation rates vary between 0.1317 - 0.2054 g/cm^2/yr (by the CRS model and the shape of Pb-210 activity profile) (Pages 2, 3 & 8).

It is assumed that the peak input of atmospheric Cs-137 has been recorded in section 18 - 20 cm, and the midpoint depth of this section (19 cm) represents the date of 1963, 55 years before the core was obtained. To have confidence that the Pb-210 models are functioning correctly, we typically hope to see the ages predicted for the Cs-137 peak be within 5 years of its known 1963 deposition. In this core, the CRS model indicates an age of 50 yr at 19 cm extrapolated depth. Therefore, the CRS results are considered compatible with the Cs-137 results, and, it is concluded that the CRS model is providing reasonable estimates of age in this core.

Over the core interval of 0 - 33 cm (extrapolated depth), the average sediment accumulation rate estimated by the CRS model has been forced to exactly coincide with the linear regression estimate of 0.1637 g/cm^2/yr. Although the CRS calculated ages depend upon the results of the linear regression model, the CRS model is to be preferred because it should provide accurate age predictions at the bottom of each section even though the sediment accumulation rate is changing with time.

Overall, the analytical quality of radioisotope data (based upon the results of repeat analyses, CRM recoveries and blanks) is considered good.

It should be cautioned that the linear regression and CRS model age calculations and sediment accumulation rates are entirely dependent upon the assumption that the lake basin was not dredged. If this assumption is incorrect then, the CRS model would no longer be valid, due to an unknown quantity of sediment missing and therefore an incomplete Pb-210 inventory.

In the event that dredging did occur in the lake basin then the conclusions that can be made regarding this core are limited. Both the CRS and linear regression models must be disregarded. However, we can say with confidence that the sediments below 48 cm are greater than 90 years old. Additionally, we can conclude that the sections above 22 cm are post 1963 accumulation.

Results of Pb-210 by Po-210 Analysis

Flett Research Ltd.

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E-mail: flett@flettresearch.ca Webpage: http://www.flettresearch.ca

Client: Phillips, Roger

Address: Aquafor Beech Ltd., 2600 Skymark Avenue, Suite 202, Building 6, Mississauga, Ontario, L4W 5B2

Core ID: Mohawk Lake location 14

Date Received: 23-Oct-18

Sampling Date: 12-Oct-18

Project: Project Ref# 66314

Transaction ID: 873

PO/Contract No.: Project ref#: 66314

Analysis Dates: November 29 - January 3, 2019

Analysts: L. Hesketh-Jost

Salt correction applied? No

Analytical Method: N20110 Determination of Lead-210 in Sediment, Soil and Peat by Alpha Spectrometry (Version 4)

Deviations from Method:

Comments:

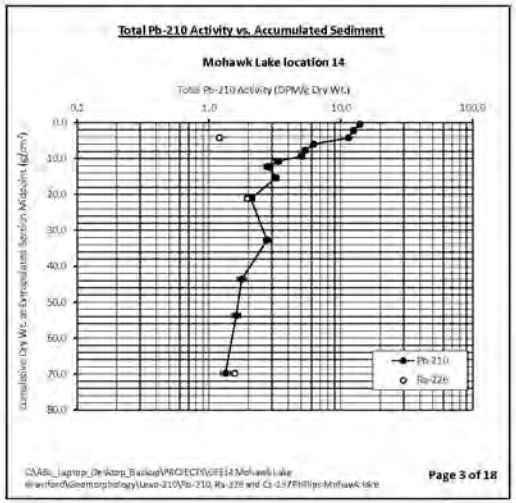
Detection Limit: The method detection limit (MDL) for 0.25 - 0.5 g (dry wt.) sample is between 0.05 - 0.1 DPM Po-210/g dry sample at a 95% confidence level for 60,000 second counting time, and is based on greater than 20 method blanks. This can vary slightly and depends upon the amount of sample, detector and recovery efficiency of each sample.

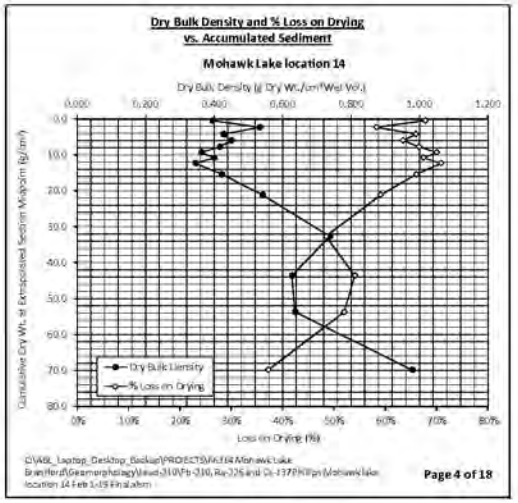
Estimated Uncertainty: The estimated uncertainty for samples analyzed by this method (acid extraction) has been determined to be ± 11% at concentrations between 0.6 and 40 DPM/g at 95% confidence.

Results authorized by Dr. Robert J. Flett, Chief Scientist

Section Number	Sample ID	Upper Depth (cm)	Lower Depth (cm)	Extrapolated Upper Section Depth (cm)	Extrapolated Lower Section Depth (cm)	Dry Bulk Density (Dry wt/Wet vol.) (g/cm3)	% Loss on Drying	Mass in Extrapolated Section (g/cm2)	Cumulative Mass to Bottom of Current Section (g/cm2)	Midpoint of Cumulative Mass in Current Section (g/cm2)	Po-209 Counts Less Detector Background	Po-210 Counts Less Detector Background and Po-209 Spike+ Standard Blank	Weight of Sample Counted (g)	Count Time (sec)	Po-210 Total Activity (DPM/g)	Error Po-210 +/- 1 s.d. (DPM/g)	Po-210 Unsupported Activity (DPM/g)	Age at Bottom of Extrapolated Section in Years (CRS Model Estimate)	Depth of Bottom Edge of Current Section (cm)	(DPM/cm²) in Section - Unsupported	CRS Sediment Accumulation Rate (g/cm²/yr)	Age at Bottom of Extrapolated Section in Years (Linear Regression Model Estimate)	Ra-226 Activity (DPM/g dry wt.)	Error Ra-226 +/- 1 s.d. (DPM/g dry wt.)	Year at Bottom of Extrapolated Section (By CRS Age Calculations)
																								Raw data were recorded in 'Ra-226 Summary' and each individual Ra-226 sheet.		
1	2400001-18-61	0.0	2.0	0.00	3.00	0.386	67.73%	1.182	1.182	0.591	2194	1193	0.376	60000	**13.94**	0.61	12.74	**5.8**	3.00	15.119	0.2054	**7.2**			**2012.2**
3	2400001-18-63	4.0	6.0	3.00	7.00	0.553	58.22%	2.133	3.315	2.248	1766	1189	0.525	60000	**12.45**	0.56	11.25	**17.8**	7.00	23.399	0.1771	**20.3**			**2000.2**
5	2400001-18-65	8.0	10.0	7.00	11.00	0.428	65.97%	1.711	5.030	4.175	1551	761	0.416	60000	**11.46**	0.42	10.27	**30.8**	11.00	37.562	0.1317	**30.7**	1.20	0.04	**1987.2**
7	2400001-18-67	12.0	14.0	11.00	15.00	0.450	63.46%	1.799	6.829	5.930	2299	658	0.447	60000	**6.25**	0.25	5.03	**40.4**	15.00	9.038	0.1886	**41.7**			**1977.6**
9	2400001-18-69	16.0	18.0	15.00	19.00	0.416	66.55%	1.665	8.494	7.662					**5.36**	0.24	4.16	**50.2**	19.00	6.930	0.1687	**51.9**			**1967.8**
13	2400001-18-71	20.0	22.0	19.00	23.00	0.363	69.95%	1.454	9.948	9.221	1977	560	0.351	60000	**5.04**	0.28	3.85	**61.2**	23.00	5.593	0.1321	**60.8**			**1956.8**
13	2400001-18-73	24.0	26.0	23.00	27.00	0.400	67.38%	1.598	11.546	10.747	2167	289	0.388	60000	**3.35**	0.20	2.15	**70.5**	27.00	3.438	0.1723	**70.5**			**1947.5**
15	2400001-18-75	28.0	30.0	27.60	31.00	0.345	70.87%	2.072	13.618	12.237	2152	222	0.332	60000	**2.81**	0.20	1.67	**88.2**	31.00	3.844	0.1653	**88.2**			**1934.8**
18	2400001-18-79	36.0	38.0	33.00	43.00	0.423	66.02%	4.227	17.845	15.809	2502	381	0.400	60000	**3.22**	0.18			43.00						
25	2400001-18-85	48.0	50.0	43.00	58.00	0.541	50.12%	8.135	25.980	21.005					**2.07**	0.14			58.00				1.85	0.04	
34	2400001-18-94	66.0	68.0	58.00	75.00	0.738	48.42%	12.545	38.526	32.612	2557	285	0.394	60000	**2.75**	0.17			75.00						
40	2400001-18-101	82.0	84.0	75.00	91.00	0.628	54.04%	10.040	48.566	43.538	2600	172	0.361	60000	**1.77**	0.14			91.00						
45	2400001-18-106	98.0	101.0	91.00	109.00	0.637	52.01%	11.458	60.024	53.648	2217	203	0.554	60000	**1.61**	0.12			109.00						
50	2400001-18-110	118.0	120.0	109.00	120.00	0.979	37.14%	10.788	70.782	64.803	2545	154	0.440	60000	**1.34**	0.11			120.00				0.38	0.04	
Blank	Blank w/o Po-209 spike										8	-3													
Blank	Blank w/ Po-209 spike										2565	4													
Blank	Blank w/o Po-209 spike										5	5													
Blank	Blank w/ Po-209 spike										2966	5													
25	2400001-18-85	48.0	50.0			0.550	58.77%				2037	196	0.483	60000	**2.02**	0.13									
25 Dup	2400001-18-85 Duplicate	48.0	50.0			0.583	56.47%				2157	253	0.538	60000	**2.42**	0.14									
9	2400001-18-69	16.0	18.0			0.419	66.29%				2278	489	0.391	60000	**5.34**	0.24									
9 Dup	2400001-18-69 Duplicate	16.0	18.0			0.414	66.80%				2406	513	0.386	60000	**5.57**	0.24									
CRM	**IAEA 447**										2054	1508	0.396	60000	**18.18**	0.47			**Po-210 in CRM on counting date (DPM/g):**				**19.14**	**Recovery:**	**94.98%**	
																			Core truncated?	Yes					
																			Total DPM/cm2 in core	85.043					
																			Total DPM/cm2 in core (Activity):	91.970					
																			Average Sediment Accumulation Rate in Sections 1-15 (g/cm²/year) by CRS model:	0.1637					

Dup (duplicate): Two subsamples of the same sample were carried through the analytical procedure in an identical manner. Rep (replicate): Three or more subsamples of the same sample were carried through the analytical procedure in an identical manner.





R^2 fit as a function of background subtracted

Background (DPM/g)	R^2	Sediment Accumulation Rate (g/cm²/yr)	Slope fit*	Y Intercept fit*
0.0000	0.9587	0.2085	-6.707	19.122
0.0995	0.9589	0.2050	-6.565	18.792
0.1995	0.9584	0.2014	-6.418	18.460
0.2995	0.9582	0.1979	-6.365	18.127
0.3995	0.9581	0.1942	-6.249	17.793
0.4995	0.9577	0.1906	-6.132	17.459
0.5995	0.9575	0.1869	-6.013	17.124
0.6995	0.9574	0.1832	-5.893	16.788
0.7995	0.9564	0.1794	-5.771	16.450
0.8995	0.9558	0.1756	-5.648	16.112
0.9995	0.9552	0.1717	-5.523	15.771
1.0995	0.9542	0.1677	-5.396	15.429
1.1995	0.9533	0.1637	-5.267	15.080
1.2995	0.9522	0.1596	-5.136	14.738
1.3995	0.9509	0.1554	-5.003	14.389
1.4995	0.9493	0.1512	-4.864	14.035
1.5995	0.9475	0.1468	-4.725	13.678
1.6995	0.9453	0.1423	-4.577	13.316
1.7995	0.9428	0.1376	-4.427	12.948
1.8995	0.9396	0.1328	-4.275	12.574
1.9995	0.9359	0.1277	-4.109	12.191

Note: Load column BF for background subtraction.

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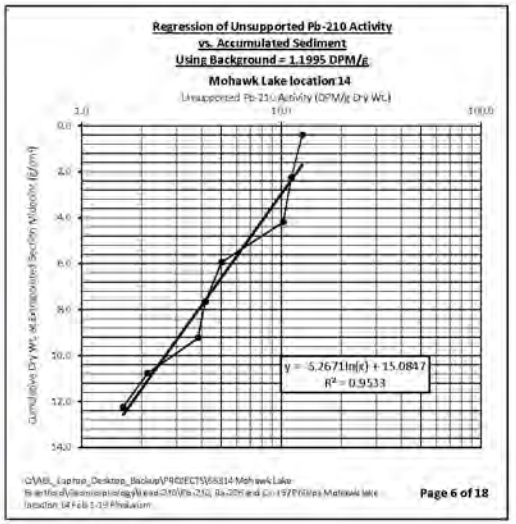
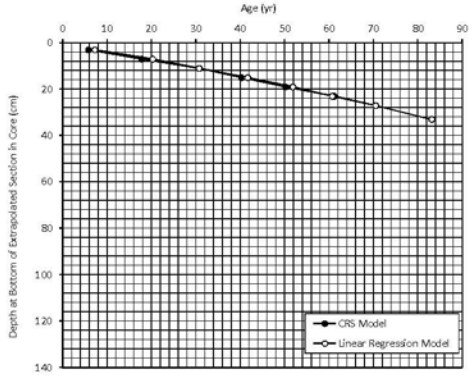
Page 5 of 18



Age (yr) vs. Depth (cm)
CRS Model vs. Linear Regression Model

Mohawk Lake location 14



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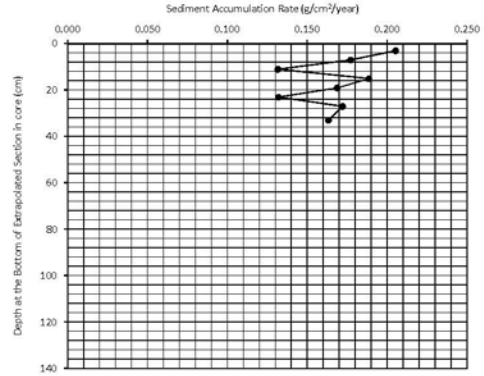
CRS Sediment Accumulation Rate (g/cm^2/year)
vs. Depth at the Bottom of Extrapolated Section in Core (cm)

Mohawk Lake location 14



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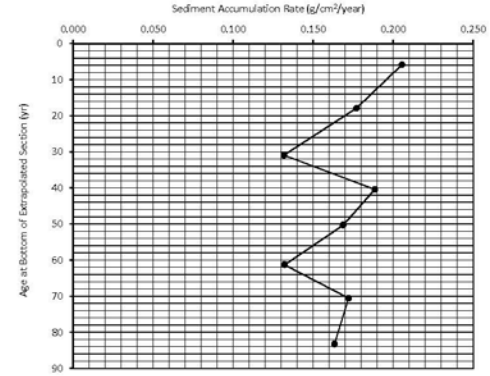
CRS Sediment Accumulation Rate (g/cm^2/year)
vs. Age at Bottom of Extrapolated Section (yr)

Mohawk Lake location 14



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Results of Cs-137 Analysis

Flett Research Ltd.

440 DeSalaberry Ave. Winnipeg, MB R2L 0Y7

Fax / Phone: (204) 667-2505

Email: flett@flettresearch.ca Webpage: http://www.flettresearch.ca

Client: Phillips, Roger

Address: Aquafor Beech Ltd., 2600 Skymark Avenue, Suite 202, Building 6, Mississauga, Ontario, L4W 5B2

Core ID: Mohawk Lake location 1
Date Received: 23-Oct-18
Sampling Date: 12-Oct-18
Project: Project Ref# 66314

Transaction ID: 873
PO/Contract No.: Project ref#: 66314
Analysis Dates: January 21 - 23, 2019
Analysts: X. Hu

Salt Correction? No

Analytical Method: N30120 Measurement of Gamma-Ray Emitting Radionuclides in Sediment/Soil Samples by Gamma Spectrometry Using HPGe Detectors (Version J)

Deviation from Method:

Comments: <2SD: The measured Cs-137 activity is less than 2 counting errors (i.e. 2 SD), suggesting no significant presence of Cs-137 in this sample.

trace: There is an apparent peak properly positioned at the known energy level of 661.6 KeV of Cs-137, suggesting possible presence of trace amount of Cs-137.

Detection Limit: The method detection limit (MDL) is 0.3 DPM/g for an 80,000 seconds counting period when measuring a 9 g of dry sample at a 95% confidence level. The method detection limit can be decreased to 0.1 DPM/g if 32 g of sample is used.

Estimated Uncertainty: The estimated uncertainty of this method has been determined to be ± 10% at 95% confidence for samples with activities between 0.5 and 20 DPM/g, counting time 80,000 seconds and sample weights ranging from 9 to 32 grams. Method uncertainty can increase to 85% for samples with activities near detection limit (0.1 - 0.3 DPM/g).

Results authorized by Dr. Robert J. Flett, Chief Scientist

Sample ID	Upper Depth (cm)	Lower Depth (cm)	Day Sample Counted	Month Sample Counted	Year Sample Counted	Integral NET Cs-137 Peak	Counting Error 1 SD (Counts)	Count Time (seconds)	Dry Sample Weight (g)	Sample Thickness (mm)	CPM/g	Efficiency for Gammas Fractional	Gammas per min. per gram	Activity DPM/g (dry wt.) on Counting Date	Approx. Error DPM/g	Activity DPM/g (dry wt.) on Sampling Date	Approx. Error DPM/g	Activity pCi/g (dry wt.) on Sampling Date	Approx. Error pCi/g	Activity mBq/g (dry wt.) on Sampling Date	Approx. Error mBq/g	Detector Used	Comments Code for Cs-137 Analysis
2400001-18-64	6	8	22	1	2019	56	55	80000	3.155	1.98	0.0133	0.0302	0.4401	0.52	0.51	0.52	0.51	0.23	0.23	8.67	8.51	GMX	<2SD
2400001-18-66	10	12	21	1	2019	60	56	80000	6.669	4.43	0.0067	0.0278	0.2425	0.28	0.27	0.29	0.27	0.13	0.12	4.77	4.46	GMX	<2SD; trace
2400001-18-68	14	16	21	1	2019	132	31	80000	2.626	1.80	0.0377	0.0442	0.8521	1.00	0.24	1.01	0.24	0.45	0.11	16.78	3.99	Canberra	
2400001-18-69	16	18	22	1	2019	268	38	80000	7.000	4.75	0.0287	0.0248	1.1569	1.36	0.19	1.37	0.19	0.62	0.09	22.78	3.23	GEM	
2400001-18-70	18	20	21	1	2019	388	44	80000	7.031	5.05	0.0414	0.0246	1.6836	1.98	0.22	1.99	0.23	0.90	0.10	33.14	3.76	GEM	
2400001-18-71	20	22	22	1	2019	4	32	80000	0.439	0.70	0.0068	0.0456	0.1499	0.18	1.42	0.18	1.43	0.08	0.64	2.95	23.84	Canberra	<2SD
Cs-137 Standards																							
GMX 32g 10 mm			18	1	2019	20063	143	5000	32.00	10.0	7.5236	0.0237	317.2776	372.39	2.65	957.04							
GMX 24g 7.5mm			17	1	2019	16186	128	5000	24.00	7.5	8.0930	0.0255	317.2976	372.42	2.95	957.04							
GMX 15g 5mm			17	1	2019	10872	105	5000	15.00	5.0	8.6976	0.0274	317.2976	372.42	3.60	957.04							
GMX 9g 3mm			21	1	2019	6873	84	5000	9.00	3.0	9.1640	0.0289	317.2176	372.32	4.55	957.04							
GMX 2.85g 0.8mm			21	1	2019	2380	50	5000	2.854	0.8	10.0491	0.0317	317.2176	372.32	7.79	957.04							
GEM 32g 10 mm			17	1	2019	18016	137	5000	32.00	10.0	6.7568	0.0213	317.2976	372.42	2.83	957.04							
GEM 24g 7.5mm			17	1	2019	14459	123	5000	24.00	7.5	7.2295	0.0228	317.2976	372.42	3.17	957.04							
GEM 15g 5mm			17	1	2019	9786	102	5000	15.00	5.0	7.8788	0.0247	317.2976	372.42	3.88	957.04							
GEM 9g 3mm			18	1	2019	6245	81	5000	9.00	3.0	8.3267	0.0262	317.2776	372.39	4.83	957.04							
GEM 2.85g 0.8mm			21	1	2019	2139	48	5000	2.854	0.8	8.9937	0.0284	317.2176	372.32	8.36	957.04							
Canberra 32g 10 mm			18	1	2019	29881	173	5000	32.00	10.0	11.2054	0.0353	317.2776	372.39	2.16	957.04							
Canberra 24g 7.5mm			17	1	2019	23725	154	5000	24.00	7.5	11.8625	0.0374	317.2976	372.42	2.42	957.04							
Canberra 15g 5mm			17	1	2019	16131	127	5000	15.00	5.0	12.9048	0.0407	317.2976	372.42	2.94	957.04							
Canberra 9g 3mm			17	1	2019	10222	102	5000	9.00	3.0	13.6293	0.0430	317.2976	372.42	3.77	957.04							
Canberra 2.85g 0.8mm			17	1	2019	3423	60	5000	2.854	0.8	14.3924	0.0454	317.2976	372.42	6.48	957.04							

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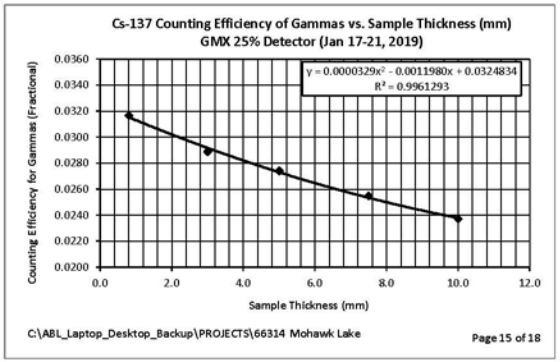
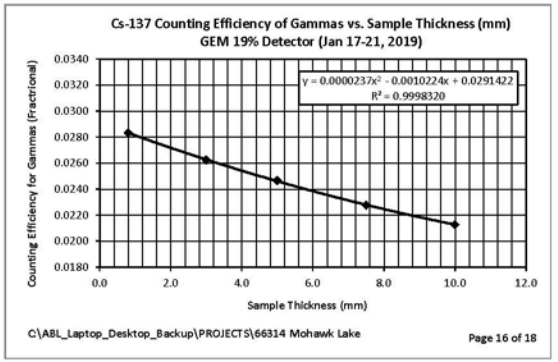
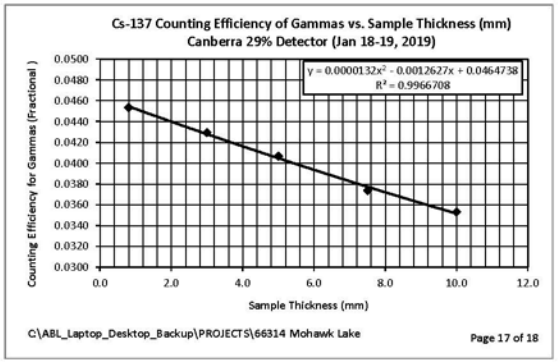
Duplicate: Two subsamples of the same sample were carried through the analytical procedure in an identical manner.

Re-count: The entire available dry sample material was used for making the sample pancake, and then this sample pancake was counted twice on a HPGe detector. Repeat counting was chosen over duplicate analysis due to insufficient sample material provided.

Note: Results relate only to the items tested.

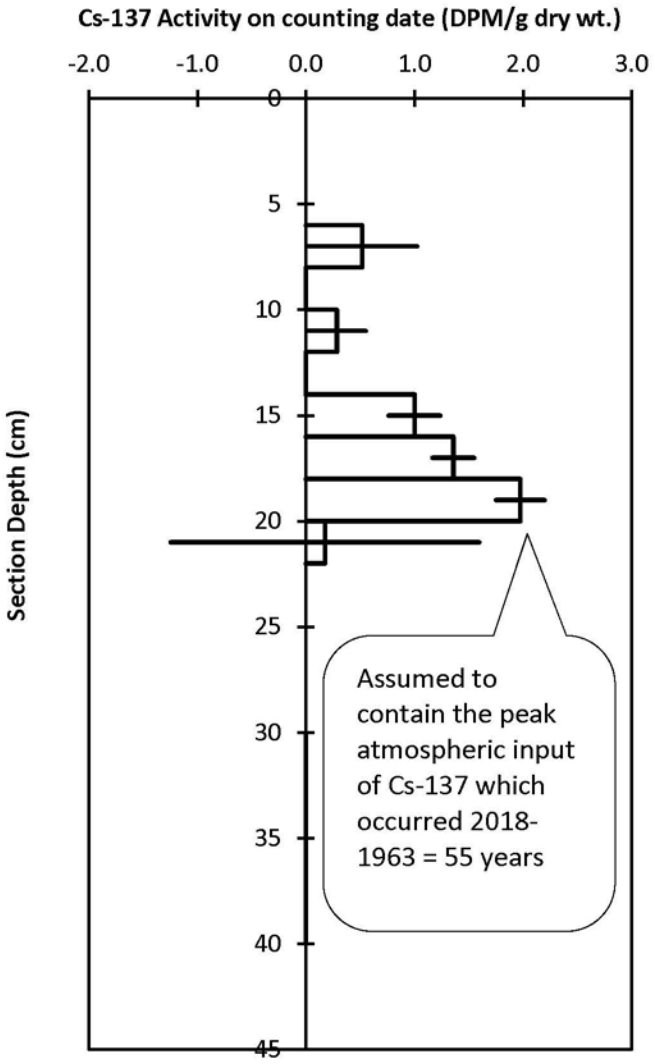

Cs-137 Counting Efficiency of Gammas vs. Sample Thickness (mm)
GMX 25% Detector (Jan 17-21, 2019)
y = 0.0000329x² - 0.0011980x + 0.0324834
R² = 0.9961293
Counting Efficiency for Gammas (Fractional)
Sample Thickness (mm)
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0
2.0
4.0
6.0
8.0
10.0
12.0


Cs-137 Counting Efficiency of Gammas vs. Sample Thickness (mm)
GEM 19% Detector (Jan 17-21, 2019)
y = 0.0000237x² - 0.0010224x + 0.0291422
R² = 0.9998320
Counting Efficiency for Gammas (Fractional)
Sample Thickness (mm)
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0
2.0
4.0
6.0
8.0
10.0
12.0


Cs-137 Counting Efficiency of Gammas vs. Sample Thickness (mm)
Canberra 29% Detector (Jan 18-19, 2019)
y = 0.0000132x² - 0.0012627x + 0.0464738
R² = 0.9966708
Counting Efficiency for Gammas (Fractional)
Sample Thickness (mm)
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0
2.0
4.0
6.0
8.0
10.0
12.0

Cs-137 in Sediments

Mohawk Lake location 14



Note: The bar plotted at the midpoint depth of each section represents +/- 1 standard deviation of the Cs-137 counting error.

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Appendix B

Radiocarbon ^{14}C Dating Results

Beta Analytic Inc.

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

February 07, 2019

Dr. Roger Phillips
Aquafor Beech Limited
2600 Skymark Avenue Bldg. 6
Suite 202
Mississauga, L4W 5B2
Canada

RE: Radiocarbon Dating Results

Dear Mr. Phillips,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Digital signature on file

Ronald E. Hatfield Director

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Roger Phillips

Aquafor Beech Limited

Report Date: February 07, 2019

Material Received: January 23, 2019

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 516589	**Mohawk Lake - Location 14 - 112-114 cm**	**140 +/- 30 BP**	IRMS δ13C: -27.3 o/oo
(43.1%)	**1669 - 1780 cal AD**	**(281 - 170 cal BP)**	
(36.8%)	**1798 - 1891 cal AD**	**(152 - 59 cal BP)**	
(15.5%)	**1908 - 1944 cal AD**	**(42 - 6 cal BP)**	

Submitter Material: Woody Material
Pretreatment: (plant material) acid/alkali/acid
Analyzed Material: Plant material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 98.27 +/- 0.37 pMC
Fraction Modern Carbon: 0.9827 +/- 0.0037
D14C: -17.28 +/- 3.67 o/oo
Δ14C: -25.45 +/- 3.67 o/oo(1950:2,019.00)
Measured Radiocarbon Age: (without d13C correction): 180 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Calibration of Radiocarbon Age to Calendar Years

(highest probability ranges: INTCAL13)

(Variables: d13C = -27.3 o/oo)

Laboratory number **Beta-516589**

Conventional radiocarbon age **140 ± 30 BP**

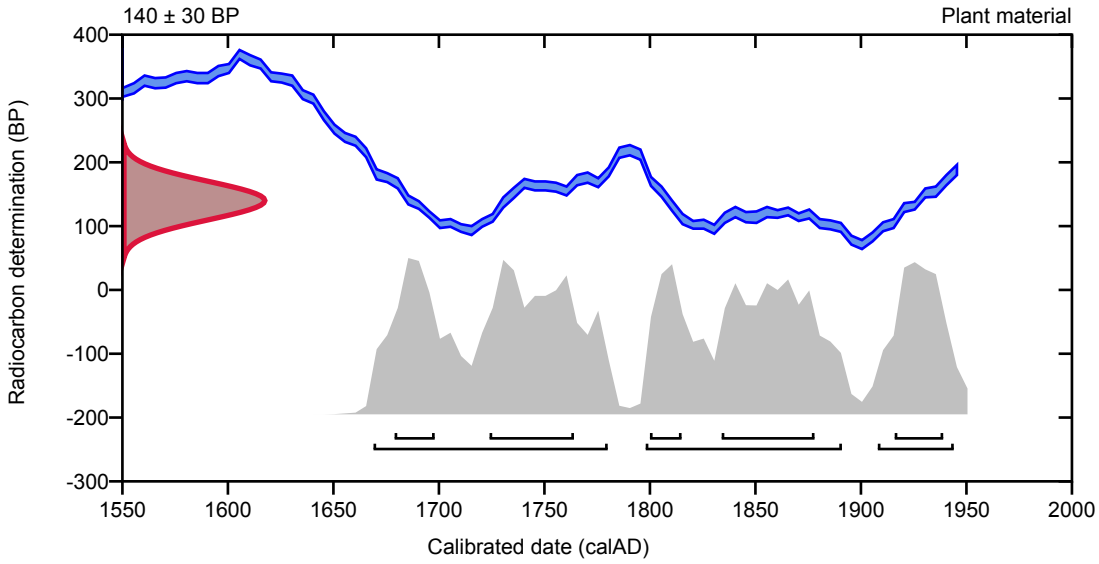
95.4% probability

(43.1%)	1669 - 1780 cal AD	(281 - 170 cal BP)
(36.8%)	1798 - 1891 cal AD	(152 - 59 cal BP)
(15.5%)	1908 - 1944 cal AD	(42 - 6 cal BP)

68.2% probability

(19.8%)	1834 - 1878 cal AD	(116 - 72 cal BP)
(19.5%)	1724 - 1764 cal AD	(226 - 186 cal BP)
(12%)	1916 - 1939 cal AD	(34 - 11 cal BP)
(9.6%)	1679 - 1698 cal AD	(271 - 252 cal BP)
(7.3%)	1800 - 1815 cal AD	(150 - 135 cal BP)

Mohawk Lake - Location 14 - 112-114 cm



Database used

INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • Email: beta@radiocarbon.com

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2005-Accredited Testing Laboratory

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990B and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date: February 08, 2019
Submitter: Dr. Roger Phillips

QA MEASUREMENTS

Reference 1	
Expected Value:	0.51 +/-0.04
Measured Value:	0.50 +/- 0.03 pMC
Agreement:	Accepted
Reference 2	
Expected Value:	129.41 +/- 0.06 pMC
Measured Value:	129.43 +/- 0.35 pMC
Agreement:	Accepted
Reference 3	
Expected Value:	96.69 +/- 0.50 pMC
Measured Value:	96.63 +/- 0.28 pMC
Agreement:	Accepted

COMMENT: All measurements passed acceptance tests.

Validation: Digital signature on file

Date: February 08, 2019

Appendix G – Lab Reports for Water Quality and Pollution Monitoring

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 18-JUL-18
Report Date: 30-JUL-18 11:20 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2131785

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2131785-1	PC-1	Anions and Nutrients	Phosphorus, Total	0.0198	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	<0.050	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	<0.030	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.015	0.008	ug/L
L2131785-2	PC-2	Anions and Nutrients	Phosphorus, Total	0.121	0.01	mg/L
		Bacteriological Tests	E. Coli	137	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.025	0.015	mg/L
			Copper (Cu)-Total	0.0028	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.018	0.008	ug/L
L2131785-3	PC-3	Anions and Nutrients	Phosphorus, Total	0.0946	0.01	mg/L
		Bacteriological Tests	E. Coli	148	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.060	0.015	mg/L
			Copper (Cu)-Total	0.0021	0.001	mg/L
			Iron (Fe)-Total	1.01	0.3	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2131785-3	PC-3	Polycyclic Aromatic Hydrocarbons	Fluoranthene	<0.010	0.008	ug/L
L2131785-4	PC-4	Anions and Nutrients	Phosphorus, Total	0.0659	0.01	mg/L
		Bacteriological Tests	E. Coli	219	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.037	0.015	mg/L
			Copper (Cu)-Total	0.0026	0.001	mg/L
			Iron (Fe)-Total	0.359	0.3	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.017	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.063	0.008	ug/L
			Phenanthrene	0.034	0.03	ug/L
L2131785-5	PC-5	Anions and Nutrients	Phosphorus, Total	0.0120	0.01	mg/L
		Bacteriological Tests	E. Coli	182	100	CFU/100mL
		Total Metals	Copper (Cu)-Total	0.0016	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2131785-6	PC-6	Anions and Nutrients	Phosphorus, Total	0.154	0.01	mg/L
		Bacteriological Tests	E. Coli	137	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.458	0.015	mg/L
			Copper (Cu)-Total	0.0133	0.001	mg/L
			Iron (Fe)-Total	1.06	0.3	mg/L
			Lead (Pb)-Total	0.00673	0.001	mg/L
			Zinc (Zn)-Total	0.0697	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.042	0.0004	ug/L
			Benzo(g,h,i)perylene	0.045	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2131785-6	PC-6	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	0.030	0.0002	ug/L
			Chrysene	0.106	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.240	0.008	ug/L
			Phenanthrene	0.093	0.03	ug/L
L2131785-7	PC-7	Anions and Nutrients	Phosphorus, Total	0.0432	0.01	mg/L
		Bacteriological Tests	E. Coli	224	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.046	0.015	mg/L
			Copper (Cu)-Total	0.0045	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.043	0.008	ug/L
			Phenanthrene	0.073	0.03	ug/L
L2131785-8	PC-8	Anions and Nutrients	Phosphorus, Total	0.161	0.01	mg/L
		Bacteriological Tests	E. Coli	229	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	<0.050	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	<0.030	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.092	0.008	ug/L
L2131785-9	WQ-1	Anions and Nutrients	Phosphorus, Total	0.0835	0.01	mg/L
		Bacteriological Tests	E. Coli	117	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.142	0.015	mg/L
			Copper (Cu)-Total	0.0019	0.001	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2131785-9	WQ-1	Total Metals	Iron (Fe)-Total	0.463	0.3	mg/L
			Lead (Pb)-Total	0.00220	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.029	0.008	ug/L
L2131785-10	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0701	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.098	0.015	mg/L
			Copper (Cu)-Total	0.0018	0.001	mg/L
			Iron (Fe)-Total	0.420	0.3	mg/L
			Lead (Pb)-Total	0.00283	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.013	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.031	0.008	ug/L
L2131785-11	WQ-3	Anions and Nutrients	Phosphorus, Total	0.0859	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.162	0.015	mg/L
			Copper (Cu)-Total	0.0033	0.001	mg/L
			Iron (Fe)-Total	0.799	0.3	mg/L
			Lead (Pb)-Total	0.00388	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.021	0.0004	ug/L
			Benzo(g,h,i)perylene	0.024	0.00002	ug/L
			Benzo(k)fluoranthene	0.015	0.0002	ug/L
			Chrysene	0.047	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.140	0.008	ug/L
			Phenanthrene	0.066	0.03	ug/L
L2131785-12	WQ-4	Anions and Nutrients	Phosphorus, Total	0.0295	0.01	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2131785-12	WQ-4	Bacteriological Tests	E. Coli	141	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.046	0.015	mg/L
			Copper (Cu)-Total	0.0024	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.019	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.074	0.008	ug/L
			Phenanthrene	0.040	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Conductivity	umhos/cm	-	-		2690	1660	1900	1820	1790	646	1770	5850	1240
Hardness (as CaCO3)	mg/L	-	-		422 HTC	349 HTC	425 HTC	417 HTC	406 HTC	147 HTC	346 HTC	618 HTC	214 HTC
pH	pH units	6.5-8.5	-		8.26	8.20	8.14	8.01	8.09	7.57	8.01	8.05	8.09
Total Suspended Solids	mg/L	-	-		<2.0	3.5	17.0	4.1	<2.0	48.0	4.5	3.9	27.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2131785-10 / Sample Date: 18-JUL-18 / Sample ID: WQ-2	Lab ID: L2131785-11 / Sample Date: 18-JUL-18 / Sample ID: WQ-3	Lab ID: L2131785-12 / Sample Date: 18-JUL-18 / Sample ID: WQ-4
Conductivity	umhos/cm	-	-	1270	1520	1570
Hardness (as CaCO3)	mg/L	-	-	214 HTC	303 HTC	354 HTC
pH	pH units	6.5-8.5	-	8.11	8.00	8.26
Total Suspended Solids	mg/L	-	-	23.4	24.3	23.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Chloride (Cl)	mg/L	-	-		752 DLHC	372 DLHC	447 DLHC	406 DLHC	374 DLHC	119	436 DLHC	1820 DLHC	299 DLHC
Nitrate (as N)	mg/L	-	-		4.97 DLHC	2.19 DLHC	4.38 DLHC	2.89 DLHC	5.27 DLHC	0.430	3.70 DLHC	5.99 DLHC	<0.10 DLHC
Nitrite (as N)	mg/L	-	-		<0.050 DLHC	<0.050 DLHC	<0.050 DLHC	0.063 DLHC	<0.050 DLHC	0.214	<0.050 DLHC	0.057 DLHC	<0.050 DLHC
Total Kjeldahl Nitrogen	mg/L	-	-		0.30 TKNI	0.53	0.77	1.27	2.36	4.16	1.81	2.51	1.69
Total Nitrogen	mg/L	-	-		5.27	2.72	5.15	4.22	7.63	4.80	5.51	8.56	1.69
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0134	0.120	0.0209	0.0322	0.0213 DTC	0.0736	0.0092	0.127	0.0139
Phosphorus, Total	mg/L	0.01	-		0.0198	0.121	0.0946	0.0659	0.0120	0.154	0.0432	0.161	0.0835

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-10	L2131785-11	L2131785-12
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	WQ-2	WQ-3	WQ-4
Chloride (Cl)	mg/L	-	-		321 DLHC	363 DLHC	359 DLHC
Nitrate (as N)	mg/L	-	-		<0.10 DLHC	0.98 DLHC	3.29 DLHC
Nitrite (as N)	mg/L	-	-		<0.050 DLHC	<0.050 DLHC	0.068 DLHC
Total Kjeldahl Nitrogen	mg/L	-	-		1.61	1.57	0.96
Total Nitrogen	mg/L	-	-		1.61	2.55	4.32
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0145	0.0197	0.0208
Phosphorus, Total	mg/L	0.01	-		0.0701	0.0859	0.0295

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits									
				Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Analyte	Unit	#1	#2										
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2131785-10	L2131785-11	L2131785-12
				18-JUL-18	18-JUL-18	18-JUL-18
				WQ-2	WQ-3	WQ-4
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2131785-1	18-JUL-18	PC-1
				L2131785-2	18-JUL-18	PC-2
				L2131785-3	18-JUL-18	PC-3
				L2131785-4	18-JUL-18	PC-4
				L2131785-5	18-JUL-18	PC-5
				L2131785-6	18-JUL-18	PC-6
				L2131785-7	18-JUL-18	PC-7
				L2131785-8	18-JUL-18	PC-8
				L2131785-9	18-JUL-18	WQ-1
E. Coli	CFU/100mL	100	-	51	137	148	219	182	137	224	229	117
Total Coliforms	CFU/100mL	-	-	12800 DLM	8700 DLM	6100 DLM	12100 DLM	970 DLM	5400 DLM	12200 DLM	11100 DLM	1500 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits				
Lab ID				L2131785-10	L2131785-11	L2131785-12
Sample Date				18-JUL-18	18-JUL-18	18-JUL-18
Sample ID				WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**			
E. Coli	CFU/100mL	100	-	7	96	141
Total Coliforms	CFU/100mL	-	-	130 DLM	1030 DLM	5400 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

				Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
		Guide Limits											
Analyte	Unit	#1	#2										
Sodium Adsorption Ratio	SAR	-	-		9.11	5.19	5.08	4.82	4.89	2.39	5.38	18.5	5.09

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2131785-10	18-JUL-18	WQ-2
				L2131785-11	18-JUL-18	WQ-3
				L2131785-12	18-JUL-18	WQ-4
Sodium Adsorption Ratio	SAR	-	-	5.09	4.78	4.05

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Aluminum (Al)-Total	mg/L	0.015	-		<0.050 DLHC	0.025	0.060	0.037	<0.010	0.458	0.046	<0.050 DLHC	0.142
Antimony (Sb)-Total	mg/L	0.02	-		<0.0010 DLHC	0.00035	0.00018	0.00025	0.00013	0.00103	0.00039	<0.0010 DLHC	0.00056
Arsenic (As)-Total	mg/L	0.005	-		<0.0010 DLHC	0.00179	0.00120	0.00042	0.00018	0.00069	0.00041	0.0023 DLHC	0.00126
Barium (Ba)-Total	mg/L	-	-		0.0704 DLHC	0.0599	0.0462	0.105	0.109	0.0416	0.0893	0.122 DLHC	0.0645
Beryllium (Be)-Total	mg/L	0.011	-		<0.0010 DLHC	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010 DLHC	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.00050 DLHC	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050 DLHC	<0.000050
Boron (B)-Total	mg/L	0.2	-		<0.10 DLHC	0.041	0.033	0.056	0.050	0.025	0.044	<0.10 DLHC	0.049
Cadmium (Cd)-Total	mg/L	0.0001	-		<0.000050 DLHC	0.000021	0.000017	0.000013	0.000015	0.000059	0.000022	0.000053 DLHC	0.000011
Calcium (Ca)-Total	mg/L	-	-		120 DLHC	103	131	121	116	43.2	98.6	163 DLHC	51.9
Cesium (Cs)-Total	mg/L	-	-		<0.00010 DLHC	<0.000010	<0.000010	<0.000010	<0.000010	0.000053	0.000012	<0.00010 DLHC	0.000015
Chromium (Cr)-Total	mg/L	-	-		<0.0050 DLHC	<0.00050	0.00057	0.00054	<0.00050	0.00647	0.00172	<0.0050 DLHC	0.00059
Cobalt (Co)-Total	mg/L	0.0009	-		<0.0010 DLHC	<0.00010	0.00013	0.00020	<0.00010	0.00047	0.00015	<0.0010 DLHC	0.00013
Copper (Cu)-Total	mg/L	0.001	-		<0.010 DLHC	0.0028	0.0021	0.0026	0.0016	0.0133	0.0045	<0.010 DLHC	0.0019
Iron (Fe)-Total	mg/L	0.3	-		<0.10 DLHC	0.073	1.01	0.359	<0.050	1.06	0.293	0.15 DLHC	0.463
Lead (Pb)-Total	mg/L	0.001	-		<0.00050 DLHC	0.00023	0.00037	0.00073	<0.00010	0.00673	0.00044	0.00051 DLHC	0.00220
Magnesium (Mg)-Total	mg/L	-	-		29.7 DLHC	22.3	23.9	28.1	28.2	9.40	24.2	51.2 DLHC	20.5
Manganese (Mn)-Total	mg/L	-	-		0.0114 DLHC	0.0145	0.0341	0.129	0.0218	0.138	0.0597	0.0214 DLHC	0.0916
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.00068 DLHC	0.000899	0.000500	0.000861	0.000473	0.00155	0.00106	0.00280 DLHC	0.000882
Nickel (Ni)-Total	mg/L	0.025	-		<0.0050 DLHC	0.00087	0.00070	0.00092	0.00058	0.00261	0.00096	<0.0050 DLHC	0.00095
Potassium (K)-Total	mg/L	-	-		4.10 DLHC	4.45	3.25	3.86	4.29	3.45	4.72	17.0 DLHC	3.21
Rubidium (Rb)-Total	mg/L	-	-		<0.0020 DLHC	0.00118	0.00060	0.00108	0.00072	0.00271	0.00198	0.0052 DLHC	0.00135
Selenium (Se)-Total	mg/L	0.1	-		0.00071 DLHC	0.000505	0.000890	0.000873	0.00137	0.000351	0.00113	0.00187 DLHC	0.000511
Silicon (Si)-Total	mg/L	-	-		5.7 DLHC	6.03	4.71	5.10	5.10	2.85	5.30	5.0 DLHC	4.87
Silver (Ag)-Total	mg/L	0.0001	-		<0.00050 DLHC	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050 DLHC	<0.000050
Sodium (Na)-Total	mg/L	-	-		430 DLHC	223 DLHC	241 DLHC	226 DLHC	226 DLHC	66.6	230 DLHC	1050 DLHC	171 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.418 DLHC	0.480	0.361	0.467	0.401	0.219	0.371	0.707 DLHC	0.291
Sulfur (S)-Total	mg/L	-	-		21.5 DLHC	13.4	13.9	20.8	19.0	7.47	19.9	40.6 DLHC	12.7
Tellurium (Te)-Total	mg/L	-	-		<0.0020 DLHC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020 DLHC	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.00010 DLHC	<0.000010	<0.000010	<0.000010	0.000011	0.000014	<0.000010	<0.00010 DLHC	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-10	L2131785-11	L2131785-12
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	WQ-2	WQ-3	WQ-4
Aluminum (Al)-Total	mg/L	0.015	-		0.098	0.162	0.046
Antimony (Sb)-Total	mg/L	0.02	-		0.00055	0.00062	0.00032
Arsenic (As)-Total	mg/L	0.005	-		0.00123	0.00100	0.00043
Barium (Ba)-Total	mg/L	-	-		0.0623	0.0850	0.0802
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.047	0.052	0.045
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000012	0.000028	0.000011
Calcium (Ca)-Total	mg/L	-	-		52.8	82.1	98.8
Cesium (Cs)-Total	mg/L	-	-		0.000012	0.000019	<0.000010
Chromium (Cr)-Total	mg/L	-	-		<0.00050	0.00128	0.00121
Cobalt (Co)-Total	mg/L	0.0009	-		0.00011	0.00017	0.00013
Copper (Cu)-Total	mg/L	0.001	-		0.0018	0.0033	0.0024
Iron (Fe)-Total	mg/L	0.3	-		0.420	0.799	0.275
Lead (Pb)-Total	mg/L	0.001	-		0.00283	0.00388	0.00083
Magnesium (Mg)-Total	mg/L	-	-		19.9	23.8	26.2
Manganese (Mn)-Total	mg/L	-	-		0.122	0.0975	0.0369
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000865	0.000916	0.000944
Nickel (Ni)-Total	mg/L	0.025	-		0.00097	0.00126	0.00112
Potassium (K)-Total	mg/L	-	-		3.20	3.67	3.70
Rubidium (Rb)-Total	mg/L	-	-		0.00137	0.00144	0.00110
Selenium (Se)-Total	mg/L	0.1	-		0.000559	0.000770	0.000925
Silicon (Si)-Total	mg/L	-	-		4.81	4.86	4.21
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		171 DLHC	191 DLHC	175 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.294	0.354	0.414
Sulfur (S)-Total	mg/L	-	-		12.8	16.7	21.6
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
				Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Thorium (Th)-Total	mg/L	-	-		<0.0010 DLHC	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010 DLHC	<0.00010
Tin (Sn)-Total	mg/L	-	-		<0.0010 DLHC	0.00152	0.00045	0.00015	<0.00010	0.00051	0.00016	0.0021 DLHC	0.00019
Titanium (Ti)-Total	mg/L	-	-		<0.0030 DLHC	0.00075	0.00195	<0.0020 DLUI	<0.00030	0.0164	<0.0030 DLUI	<0.0030 DLHC	0.00416
Tungsten (W)-Total	mg/L	0.03	-		<0.0010 DLHC	<0.00010	<0.00010	<0.00010	<0.00010	0.00029	<0.00010	<0.0010 DLHC	0.00041
Uranium (U)-Total	mg/L	0.005	-		0.00097 DLHC	0.000499	0.000594	0.00185	0.00202	0.000326	0.00112	0.00077 DLHC	0.000905
Vanadium (V)-Total	mg/L	0.006	-		<0.0050 DLHC	0.00108	0.00091	0.00066	<0.00050	0.00346	0.00095	<0.0050 DLHC	0.00166
Zinc (Zn)-Total	mg/L	0.02	-		<0.030 DLHC	0.0082	0.0119	0.0096	0.0050	0.0697	0.0195	<0.030 DLHC	0.0044
Zirconium (Zr)-Total	mg/L	0.004	-		<0.0030 DLHC	<0.00030	<0.00030	<0.00030	<0.00030	0.00053	<0.00030	<0.0030 DLHC	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

			Lab ID	L2131785-10	L2131785-11	L2131785-12
			Sample Date	18-JUL-18	18-JUL-18	18-JUL-18
			Sample ID	WQ-2	WQ-3	WQ-4
		Guide Limits				
Analyte	Unit	#1	#2			
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00027	0.00023	0.00018
Titanium (Ti)-Total	mg/L	-	-	0.00296	0.00514	0.00130
Tungsten (W)-Total	mg/L	0.03	-	0.00042	0.00032	<0.00010
Uranium (U)-Total	mg/L	0.005	-	0.000960	0.00125	0.00110
Vanadium (V)-Total	mg/L	0.006	-	0.00130	0.00179	0.00075
Zinc (Zn)-Total	mg/L	0.02	-	0.0052	0.0119	0.0062
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2131785-1	L2131785-2	L2131785-3	L2131785-4	L2131785-5	L2131785-6	L2131785-7	L2131785-8	L2131785-9
			Sample Date	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18	18-JUL-18
			Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	WQ-1
Analyte	Unit	Guide Limits #1	#2									
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.072	0.415	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.033	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.042	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.043	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.103	<0.020	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.030	<0.010	<0.010	<0.010
Chrysene	ug/L	0.0001	-	<0.010	<0.010	<0.010	0.017	<0.010	0.106	<0.010	<0.010	<0.010
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.015	0.018	<0.010	0.063	<0.010	0.240	0.043	0.092	0.029
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.054	0.031	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.054	<0.020	<0.020	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	<0.020	0.034	<0.020	0.093	0.073	<0.020	<0.020
Pyrene	ug/L	-	-	<0.020	<0.020	<0.020	0.034	<0.020	0.176	0.026	0.107	<0.020
Surrogate: d10-Acenaphthene	%	-	-	99.5	97.6	91.9	105.9	92.5	100.2	97.2	97.8	97.0
Surrogate: d12-Chrysene	%	-	-	103.4	102.0	96.2	116.6	102.7	100.9	102.3	98.1	100.2
Surrogate: d8-Naphthalene	%	-	-	110.3	106.8	101.6	116.5	101.4	109.7	105.2	107.1	108.2
Surrogate: d10-Phenanthrene	%	-	-	103.6	101.3	95.8	109.7	97.3	104.2	102.7	101.8	100.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits				
Lab ID				L2131785-10	L2131785-11	L2131785-12
Sample Date				18-JUL-18	18-JUL-18	18-JUL-18
Sample ID				WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**			
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	0.021	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	0.020	<0.010
Benzo(b)fluoranthene	ug/L	-	-	<0.020	0.050	0.022
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	0.024	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	0.015	<0.010
Chrysene	ug/L	0.0001	-	0.013	0.047	0.019
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.031	0.140	0.074
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	0.028	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	0.066	0.040
Pyrene	ug/L	-	-	0.020	0.088	0.042
Surrogate: d10-Acenaphthene	%	-	-	90.6	100.2	94.3
Surrogate: d12-Chrysene	%	-	-	95.8	103.9	102.9
Surrogate: d8-Naphthalene	%	-	-	98.1	108.1	103.1
Surrogate: d10-Phenanthrene	%	-	-	93.8	103.6	98.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2131785 Report Date: 30-JUL-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4138991								
WG2829508-10 DUP		**WG2829508-8**						
Chloride (Cl)		17.0	17.0		mg/L	0.0	20	22-JUL-18
WG2829508-7 LCS								
Chloride (Cl)			99.5		%		90-110	22-JUL-18
WG2829508-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	22-JUL-18
WG2829508-9 MS		**WG2829508-8**						
Chloride (Cl)			96.9		%		75-125	22-JUL-18
CN-FREE-CFA-WT	**Water**							
Batch R4139915								
WG2830881-3 DUP		**L2131785-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	24-JUL-18
WG2830881-2 LCS								
Cyanide, Free			94.1		%		80-120	24-JUL-18
WG2830881-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	24-JUL-18
WG2830881-4 MS		**L2131785-1**						
Cyanide, Free			88.9		%		75-125	24-JUL-18
EC-MF-WT	**Water**							
Batch R4133751								
WG2826579-3 DUP		**L2131634-1**						
E. Coli		0	0		CFU/100mL	0.0	65	20-JUL-18
WG2826579-1 MB								
E. Coli			0		CFU/100mL		1	20-JUL-18
EC-WT	**Water**							
Batch R4133598								
WG2826450-8 DUP		**WG2826450-7**						
Conductivity		3370	3350		umhos/cm	0.6	10	19-JUL-18
WG2826450-6 LCS								
Conductivity			99.0		%		90-110	19-JUL-18
WG2826450-5 MB								
Conductivity			<3.0		umhos/cm		3	19-JUL-18
HG-T-CVAA-WT	**Water**							
Batch R4134000								
WG2827992-3 DUP		**L2131286-9**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2827992-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4134000								
WG2827992-2 LCS								
Mercury (Hg)-Total			103.0		%		80-120	20-JUL-18
WG2827992-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	20-JUL-18
WG2827992-4 MS		**L2131286-10**						
Mercury (Hg)-Total			101.2		%		70-130	20-JUL-18
MET-T-CCMS-WT	**Water**							
Batch R4134016								
WG2827670-4 DUP		**WG2827670-3**						
Aluminum (Al)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-JUL-18
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-JUL-18
Arsenic (As)-Total		0.00073	0.00077		mg/L	5.2	20	20-JUL-18
Barium (Ba)-Total		0.267	0.273		mg/L	1.9	20	20-JUL-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-JUL-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-JUL-18
Boron (B)-Total		0.015	0.015		mg/L	1.0	20	20-JUL-18
Cadmium (Cd)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	20-JUL-18
Calcium (Ca)-Total		56.2	55.0		mg/L	2.1	20	20-JUL-18
Chromium (Cr)-Total		0.00333	0.00351		mg/L	5.1	20	20-JUL-18
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-JUL-18
Cobalt (Co)-Total		0.00018	0.00018		mg/L	1.6	20	20-JUL-18
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	20-JUL-18
Iron (Fe)-Total		0.083	0.085		mg/L	2.2	20	20-JUL-18
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-JUL-18
Magnesium (Mg)-Total		24.6	24.7		mg/L	0.2	20	20-JUL-18
Manganese (Mn)-Total		0.00556	0.00569		mg/L	2.4	20	20-JUL-18
Molybdenum (Mo)-Total		0.00169	0.00167		mg/L	1.1	20	20-JUL-18
Nickel (Ni)-Total		0.00373	0.00400		mg/L	6.9	20	20-JUL-18
Potassium (K)-Total		0.960	0.992		mg/L	3.3	20	20-JUL-18
Rubidium (Rb)-Total		0.00099	0.00094		mg/L	4.9	20	20-JUL-18
Selenium (Se)-Total		0.000240	0.000187	J	mg/L	0.000053	0.0001	20-JUL-18
Silicon (Si)-Total		3.50	3.51		mg/L	0.3	20	20-JUL-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	20-JUL-18
Sodium (Na)-Total		3.21	3.39		mg/L	5.3	20	20-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4134016								
WG2827670-4 DUP		**WG2827670-3**						
Strontium (Sr)-Total		1.07	1.08		mg/L	0.3	20	20-JUL-18
Sulfur (S)-Total		6.57	6.66		mg/L	1.4	25	20-JUL-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-JUL-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	20-JUL-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	20-JUL-18
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-JUL-18
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	20-JUL-18
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	20-JUL-18
Uranium (U)-Total		0.000633	0.000617		mg/L	2.6	20	20-JUL-18
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	20-JUL-18
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	20-JUL-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2827670-2 LCS								
Aluminum (Al)-Total			100.5		%		80-120	20-JUL-18
Antimony (Sb)-Total			107.3		%		80-120	20-JUL-18
Arsenic (As)-Total			100.7		%		80-120	20-JUL-18
Barium (Ba)-Total			95.6		%		80-120	20-JUL-18
Beryllium (Be)-Total			94.4		%		80-120	20-JUL-18
Bismuth (Bi)-Total			103.3		%		80-120	20-JUL-18
Boron (B)-Total			90.1		%		80-120	20-JUL-18
Cadmium (Cd)-Total			99.1		%		80-120	20-JUL-18
Calcium (Ca)-Total			95.7		%		80-120	20-JUL-18
Chromium (Cr)-Total			98.8		%		80-120	20-JUL-18
Cesium (Cs)-Total			102.4		%		80-120	20-JUL-18
Cobalt (Co)-Total			101.3		%		80-120	20-JUL-18
Copper (Cu)-Total			101.3		%		80-120	20-JUL-18
Iron (Fe)-Total			100.4		%		80-120	20-JUL-18
Lead (Pb)-Total			103.9		%		80-120	20-JUL-18
Magnesium (Mg)-Total			101.9		%		80-120	20-JUL-18
Manganese (Mn)-Total			99.0		%		80-120	20-JUL-18
Molybdenum (Mo)-Total			99.3		%		80-120	20-JUL-18
Nickel (Ni)-Total			101.9		%		80-120	20-JUL-18
Potassium (K)-Total			98.2		%		80-120	20-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4134016								
WG2827670-2 LCS								
Rubidium (Rb)-Total			105.3		%		80-120	20-JUL-18
Selenium (Se)-Total			100.1		%		80-120	20-JUL-18
Silicon (Si)-Total			97.1		%		60-140	20-JUL-18
Silver (Ag)-Total			102.1		%		80-120	20-JUL-18
Sodium (Na)-Total			101.3		%		80-120	20-JUL-18
Strontium (Sr)-Total			102.5		%		80-120	20-JUL-18
Sulfur (S)-Total			91.5		%		80-120	20-JUL-18
Thallium (Tl)-Total			102.2		%		80-120	20-JUL-18
Tellurium (Te)-Total			99.2		%		80-120	20-JUL-18
Thorium (Th)-Total			101.1		%		70-130	20-JUL-18
Tin (Sn)-Total			98.6		%		80-120	20-JUL-18
Titanium (Ti)-Total			99.4		%		80-120	20-JUL-18
Tungsten (W)-Total			104.8		%		80-120	20-JUL-18
Uranium (U)-Total			109.8		%		80-120	20-JUL-18
Vanadium (V)-Total			103.2		%		80-120	20-JUL-18
Zinc (Zn)-Total			96.1		%		80-120	20-JUL-18
Zirconium (Zr)-Total			96.9		%		80-120	20-JUL-18
WG2827670-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	20-JUL-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-JUL-18
Boron (B)-Total			<0.010		mg/L		0.01	20-JUL-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	20-JUL-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-JUL-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	20-JUL-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	20-JUL-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	20-JUL-18
Iron (Fe)-Total			<0.010		mg/L		0.01	20-JUL-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-JUL-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4134016								
WG2827670-1 MB								
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	20-JUL-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-JUL-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-JUL-18
Potassium (K)-Total			<0.050		mg/L		0.05	20-JUL-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	20-JUL-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-JUL-18
Silicon (Si)-Total			<0.10		mg/L		0.1	20-JUL-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	20-JUL-18
Sodium (Na)-Total			<0.050		mg/L		0.05	20-JUL-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	20-JUL-18
Sulfur (S)-Total			<0.50		mg/L		0.5	20-JUL-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-JUL-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	20-JUL-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-JUL-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	20-JUL-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-JUL-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-JUL-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-JUL-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	20-JUL-18
WG2827670-5 MS		**WG2827670-3**						
Aluminum (Al)-Total			97.2		%		70-130	20-JUL-18
Antimony (Sb)-Total			105.5		%		70-130	20-JUL-18
Arsenic (As)-Total			101.5		%		70-130	20-JUL-18
Barium (Ba)-Total			N/A	MS-B	%		-	20-JUL-18
Beryllium (Be)-Total			93.8		%		70-130	20-JUL-18
Bismuth (Bi)-Total			101.5		%		70-130	20-JUL-18
Boron (B)-Total			86.6		%		70-130	20-JUL-18
Cadmium (Cd)-Total			101.7		%		70-130	20-JUL-18
Calcium (Ca)-Total			N/A	MS-B	%		-	20-JUL-18
Chromium (Cr)-Total			104.3		%		70-130	20-JUL-18
Cesium (Cs)-Total			106.1		%		70-130	20-JUL-18
Cobalt (Co)-Total			98.6		%		70-130	20-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4134016								
WG2827670-5 MS		**WG2827670-3**						
Copper (Cu)-Total			98.8		%		70-130	20-JUL-18
Iron (Fe)-Total			N/A	MS-B	%		-	20-JUL-18
Lead (Pb)-Total			98.4		%		70-130	20-JUL-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	20-JUL-18
Manganese (Mn)-Total			96.7		%		70-130	20-JUL-18
Molybdenum (Mo)-Total			100.7		%		70-130	20-JUL-18
Nickel (Ni)-Total			99.8		%		70-130	20-JUL-18
Potassium (K)-Total			102.1		%		70-130	20-JUL-18
Rubidium (Rb)-Total			100.1		%		70-130	20-JUL-18
Selenium (Se)-Total			102.1		%		70-130	20-JUL-18
Silicon (Si)-Total			N/A	MS-B	%		-	20-JUL-18
Silver (Ag)-Total			101.0		%		70-130	20-JUL-18
Sodium (Na)-Total			N/A	MS-B	%		-	20-JUL-18
Strontium (Sr)-Total			N/A	MS-B	%		-	20-JUL-18
Sulfur (S)-Total			N/A	MS-B	%		-	20-JUL-18
Thallium (Tl)-Total			98.3		%		70-130	20-JUL-18
Tellurium (Te)-Total			95.2		%		70-130	20-JUL-18
Thorium (Th)-Total			99.0		%		70-130	20-JUL-18
Tin (Sn)-Total			101.8		%		70-130	20-JUL-18
Titanium (Ti)-Total			100.6		%		70-130	20-JUL-18
Tungsten (W)-Total			100.6		%		70-130	20-JUL-18
Uranium (U)-Total			N/A	MS-B	%		-	20-JUL-18
Vanadium (V)-Total			103.6		%		70-130	20-JUL-18
Zinc (Zn)-Total			98.0		%		70-130	20-JUL-18
Zirconium (Zr)-Total			99.2		%		70-130	20-JUL-18
NO2-IC-WT	**Water**							
Batch R4138991								
WG2829508-10 DUP		**WG2829508-8**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	22-JUL-18
WG2829508-7 LCS								
Nitrite (as N)			100.0		%		70-130	22-JUL-18
WG2829508-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	22-JUL-18
WG2829508-9 MS		**WG2829508-8**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4138991								
WG2829508-9 MS		**WG2829508-8**						
Nitrite (as N)			90.0		%		70-130	22-JUL-18
NO3-IC-WT	**Water**							
Batch R4138991								
WG2829508-10 DUP		**WG2829508-8**						
Nitrate (as N)		0.050	0.044		mg/L	14	25	22-JUL-18
WG2829508-7 LCS								
Nitrate (as N)			99.6		%		70-130	22-JUL-18
WG2829508-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	22-JUL-18
WG2829508-9 MS		**WG2829508-8**						
Nitrate (as N)			94.2		%		70-130	22-JUL-18
P-T-COL-WT	**Water**							
Batch R4138616								
WG2828639-3 DUP		**L2131855-1**						
Phosphorus, Total		7.38	7.39		mg/L	0.1	20	24-JUL-18
WG2828639-2 LCS								
Phosphorus, Total			94.2		%		80-120	23-JUL-18
WG2828639-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	23-JUL-18
WG2828639-4 MS		**L2131855-1**						
Phosphorus, Total			N/A	MS-B	%		-	24-JUL-18
P-TD-COL-WT	**Water**							
Batch R4138617								
WG2828642-3 DUP		**L2132096-3**						
Phosphorus (P)-Total Dissolved		0.0195	0.0189		mg/L	3.3	20	24-JUL-18
WG2828642-2 LCS								
Phosphorus (P)-Total Dissolved			94.3		%		80-120	23-JUL-18
WG2828642-1 MB								
Phosphorus (P)-Total Dissolved			<0.0030		mg/L		0.003	24-JUL-18
WG2828642-4 MS		**L2132096-3**						
Phosphorus (P)-Total Dissolved			98.8		%		70-130	23-JUL-18
PAH-PWQO-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4139260								
WG2829977-2 LCS								
1-Methylnaphthalene			91.9		%		50-150	24-JUL-18
2-Methylnaphthalene			89.5		%		50-150	24-JUL-18
Acenaphthene			95.3		%		50-150	24-JUL-18
Acenaphthylene			99.4		%		50-150	24-JUL-18
Anthracene			116.9		%		60-130	24-JUL-18
Benzo(a)anthracene			113.0		%		60-130	24-JUL-18
Benzo(a)pyrene			102.0		%		50-150	24-JUL-18
Benzo(b)fluoranthene			93.9		%		50-150	24-JUL-18
Benzo(g,h,i)perylene			103.2		%		60-130	24-JUL-18
Benzo(k)fluoranthene			96.0		%		60-130	24-JUL-18
Chrysene			126.1		%		60-130	24-JUL-18
Dibenzo(ah)anthracene			103.8		%		60-130	24-JUL-18
Fluoranthene			103.8		%		60-130	24-JUL-18
Fluorene			103.9		%		50-150	24-JUL-18
Indeno(1,2,3-cd)pyrene			116.2		%		50-150	24-JUL-18
Naphthalene			93.2		%		50-150	24-JUL-18
Phenanthrene			104.2		%		50-150	24-JUL-18
Pyrene			102.6		%		50-150	24-JUL-18
WG2829977-3 LCSD		**WG2829977-2**						
1-Methylnaphthalene		91.9	90.8		%	1.2	50	24-JUL-18
2-Methylnaphthalene		89.5	86.9		%	3.0	50	24-JUL-18
Acenaphthene		95.3	93.3		%	2.1	50	24-JUL-18
Acenaphthylene		99.4	98.2		%	1.2	50	24-JUL-18
Anthracene		116.9	115.0		%	1.7	50	24-JUL-18
Benzo(a)anthracene		113.0	116.3		%	2.9	50	24-JUL-18
Benzo(a)pyrene		102.0	100.1		%	1.9	50	24-JUL-18
Benzo(b)fluoranthene		93.9	92.0		%	2.1	50	24-JUL-18
Benzo(g,h,i)perylene		103.2	101.7		%	1.5	50	24-JUL-18
Benzo(k)fluoranthene		96.0	96.7		%	0.7	50	24-JUL-18
Chrysene		126.1	128.2		%	1.6	50	24-JUL-18
Dibenzo(ah)anthracene		103.8	100.6		%	3.1	50	24-JUL-18
Fluoranthene		103.8	102.8		%	1.0	50	24-JUL-18
Fluorene		103.9	101.6		%	2.3	50	24-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4139260								
WG2829977-3 LCSD		**WG2829977-2**						
Indeno(1,2,3-cd)pyrene		116.2	114.6		%	1.4	50	24-JUL-18
Naphthalene		93.2	94.3		%	1.2	50	24-JUL-18
Phenanthrene		104.2	103.0		%	1.2	50	24-JUL-18
Pyrene		102.6	101.9		%	0.6	50	24-JUL-18
WG2829977-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	24-JUL-18
2-Methylnaphthalene			<0.020		ug/L		0.02	24-JUL-18
Acenaphthene			<0.020		ug/L		0.02	24-JUL-18
Acenaphthylene			<0.020		ug/L		0.02	24-JUL-18
Anthracene			<0.010		ug/L		0.01	24-JUL-18
Benzo(a)anthracene			<0.020		ug/L		0.02	24-JUL-18
Benzo(a)pyrene			<0.010		ug/L		0.01	24-JUL-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	24-JUL-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	24-JUL-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	24-JUL-18
Chrysene			<0.010		ug/L		0.01	24-JUL-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	24-JUL-18
Fluoranthene			<0.010		ug/L		0.01	24-JUL-18
Fluorene			<0.020		ug/L		0.02	24-JUL-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	24-JUL-18
Naphthalene			<0.050		ug/L		0.05	24-JUL-18
Phenanthrene			<0.020		ug/L		0.02	24-JUL-18
Pyrene			<0.020		ug/L		0.02	24-JUL-18
Surrogate: d8-Naphthalene			101.3		%		40-130	24-JUL-18
Surrogate: d10-Phenanthrene			98.3		%		40-130	24-JUL-18
Surrogate: d12-Chrysene			102.1		%		40-130	24-JUL-18
Surrogate: d10-Acenaphthene			92.7		%		40-130	24-JUL-18
PH-WT	**Water**							
Batch R4133598								
WG2826450-8 DUP		**WG2826450-7**						
pH		7.74	7.78	J	pH units	0.04	0.2	19-JUL-18
WG2826450-6 LCS								
pH			7.00		pH units		6.9-7.1	19-JUL-18
SOLIDS-TSS-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4137090								
WG2827795-3 DUP		**L2131890-1**						
Total Suspended Solids		188	197		mg/L	4.7	20	23-JUL-18
WG2827795-2 LCS								
Total Suspended Solids			101.0		%		85-115	23-JUL-18
WG2827795-1 MB								
Total Suspended Solids			<2.0		mg/L		2	23-JUL-18
TC-MF-WT	**Water**							
Batch R4133738								
WG2826578-3 DUP		**L2131713-1**						
Total Coliforms		0	0		CFU/100mL	0.0	65	20-JUL-18
WG2826578-1 MB								
Total Coliforms			0		CFU/100mL		1	20-JUL-18
TKN-WT	**Water**							
Batch R4144056								
WG2832134-3 DUP		**L2131785-1**						
Total Kjeldahl Nitrogen		0.30	0.34		mg/L	12	20	26-JUL-18
WG2832134-2 LCS								
Total Kjeldahl Nitrogen			102.2		%		75-125	26-JUL-18
WG2832134-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	26-JUL-18
WG2832134-4 MS		**L2131785-1**						
Total Kjeldahl Nitrogen			103.2		%		70-130	26-JUL-18
Batch R4145301								
WG2834278-3 DUP		**L2132625-1**						
Total Kjeldahl Nitrogen		0.63	0.66		mg/L	4.7	20	27-JUL-18
WG2834278-2 LCS								
Total Kjeldahl Nitrogen			106.9		%		75-125	27-JUL-18
WG2834278-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	27-JUL-18
WG2834278-4 MS		**L2132625-1**						
Total Kjeldahl Nitrogen			104.2		%		70-130	27-JUL-18

Quality Control Report

Workorder: L2131785 Report Date: 30-JUL-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (C Request

L2131785-COFC

e label here (v)

Canada Toll Free: 1

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only):	L2131785 RU 18B

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Gayle	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4-20%] ☐		1 Business day [E1 - 100%] ☐
	3 day [P3-25%] ☐		Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	2 day [P2-50%] ☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT, P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	PC-1	18-Jul-18	10:20	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
2	PC-2	18-Jul-18	~~10:24~~ 10:30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
3	PC-3		~~10:56~~ 11:30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
4	PC-4		~~10:55~~ 12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
5	PC-5		~~11:30~~ 13:00																
6	PC-6		~~11:50~~ 15:20																
7	PC-7		13:40																
8	PC-8		14:00																
9	WQ-1		11:20																
10	WQ-2		11:45																
11	WQ-3		12:00 PM																
12	WQ-4		12:15																

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	check bottles for sample time
Are samples for human consumption/ use? ☐ YES ☒ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☒ Ice Cubes ☐	Custody seal intact	Yes ☐	No	☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	18.3 16.3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: Jul 18/18	Time: 16:20	Received by:	Date:	Time:	Received by:	Date: Jul 18/18	Time: 16:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 18-SEP-18
Report Date: 03-OCT-18 10:12 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2166325

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 25-SEP-18 14:43

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2166325-1	PC-9	Anions and Nutrients	Phosphorus, Total	0.0120	0.01	mg/L
		Bacteriological Tests	E. Coli	870	100	CFU/100mL
		Total Metals	Copper (Cu)-Total	0.0014	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2166325-2	PC-10	Anions and Nutrients	Phosphorus, Total	8.20	0.01	mg/L
		Bacteriological Tests	E. Coli	197000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.272	0.015	mg/L
			Boron (B)-Total	0.21	0.2	mg/L
			Cadmium (Cd)-Total	0.000140	0.0001	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	0.152	0.001	mg/L
			Iron (Fe)-Total	0.90	0.3	mg/L
			Lead (Pb)-Total	0.00648	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	0.105	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.013	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.068	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.011	0.0001	ug/L
			Dibenzo(ah)anthracene	0.048	0.002	ug/L
			Fluoranthene	0.068	0.008	ug/L
			Phenanthrene	0.189	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2166325-1 / Sample Date: 18-SEP-18 / Sample ID: PC-9	Lab ID: L2166325-2 / Sample Date: 18-SEP-18 / Sample ID: PC-10
Conductivity	umhos/cm	-	-	1550	1200
Hardness (as CaCO3)	mg/L	-	-	421 HTC	248 HTC
pH	pH units	6.5-8.5	-	8.20	7.63
Total Suspended Solids	mg/L	-	-	<2.0	313

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2166325-1	L2166325-2
			Sample Date	18-SEP-18	18-SEP-18
			Sample ID	PC-9	PC-10
Analyte	Unit	Guide Limits #1	#2		
Chloride (Cl)	mg/L	-	-	334	166
Nitrate (as N)	mg/L	-	-	4.84	<0.020
Nitrite (as N)	mg/L	-	-	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-	0.76	70.4 DLM
Total Nitrogen	mg/L	-	-	5.60	70.4
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0082	4.60 DLHC
Phosphorus, Total	mg/L	0.01	-	0.0120	8.20 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits			
				Lab ID	L2166325-1	L2166325-2
				Sample Date	18-SEP-18	18-SEP-18
				Sample ID	PC-9	PC-10
Analyte	Unit	#1	#2		
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

			Lab ID	L2166325-1	L2166325-2
			Sample Date	18-SEP-18	18-SEP-18
			Sample ID	PC-9	PC-10
Analyte	Unit	Guide Limits #1	#2		
E. Coli	CFU/100mL	100	-	870 DLM	197000 DLM
Total Coliforms	CFU/100mL	-	-	2800 DLM	>200000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

		Guide Limits			
Lab ID				L2166325-1	L2166325-2
Sample Date				18-SEP-18	18-SEP-18
Sample ID				PC-9	PC-10
Analyte	**Unit**	**#1**	**#2**		
Sodium Adsorption Ratio	SAR	-	-	3.67	3.13

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2166325-1 / Sample Date 18-SEP-18 / Sample ID PC-9	Lab ID L2166325-2 / Sample Date 18-SEP-18 / Sample ID PC-10
Aluminum (Al)-Total	mg/L	0.015	-	<0.010	0.272 DLHC
Antimony (Sb)-Total	mg/L	0.02	-	0.00012	<0.0010 DLHC
Arsenic (As)-Total	mg/L	0.005	-	0.00032	<0.0010 DLHC
Barium (Ba)-Total	mg/L	-	-	0.109	0.0390 DLHC
Beryllium (Be)-Total	mg/L	0.011	-	<0.00010	<0.0010 DLHC
Bismuth (Bi)-Total	mg/L	-	-	<0.000050	0.00980 DLHC
Boron (B)-Total	mg/L	0.2	-	0.045	0.21 DLHC
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000012	0.000140 DLHC
Calcium (Ca)-Total	mg/L	-	-	125	62.5 DLHC
Cesium (Cs)-Total	mg/L	-	-	<0.000010	<0.00010 DLHC
Chromium (Cr)-Total	mg/L	-	-	0.00068	<0.0050 DLHC
Cobalt (Co)-Total	mg/L	0.0009	-	<0.00010	<0.0010 DLHC
Copper (Cu)-Total	mg/L	0.001	-	0.0014	0.152 DLHC
Iron (Fe)-Total	mg/L	0.3	-	0.196	0.90 DLHC
Lead (Pb)-Total	mg/L	0.001	-	0.00019	0.00648 DLHC
Magnesium (Mg)-Total	mg/L	-	-	26.5	22.4 DLHC
Manganese (Mn)-Total	mg/L	-	-	0.0529	0.0327 DLHC
Mercury (Hg)-Total	mg/L	0.0002	-	<0.000010	<0.00010 DLM
Molybdenum (Mo)-Total	mg/L	0.04	-	0.000463	0.00266 DLHC
Nickel (Ni)-Total	mg/L	0.025	-	<0.00050	<0.0050 DLHC
Potassium (K)-Total	mg/L	-	-	3.61	19.6 DLHC
Rubidium (Rb)-Total	mg/L	-	-	0.00074	0.0166 DLHC
Selenium (Se)-Total	mg/L	0.1	-	0.00100	<0.00050 DLHC
Silicon (Si)-Total	mg/L	-	-	6.45	1.6 DLHC
Silver (Ag)-Total	mg/L	0.0001	-	<0.000050	<0.00050 DLHC
Sodium (Na)-Total	mg/L	-	-	173 DLHC	113 DLHC
Strontium (Sr)-Total	mg/L	-	-	0.318	0.546 DLHC
Sulfur (S)-Total	mg/L	-	-	19.7	32.3 DLHC
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.0020 DLHC
Thallium (Tl)-Total	mg/L	0.0003	-	0.000011	<0.00010 DLHC

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2166325-1 / Sample Date 18-SEP-18 / Sample ID PC-9	Lab ID L2166325-2 / Sample Date 18-SEP-18 / Sample ID PC-10
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.0010 DLHC
Tin (Sn)-Total	mg/L	-	-	<0.00010	<0.0010 DLHC
Titanium (Ti)-Total	mg/L	-	-	<0.00040 DLUI	<0.0060 DLUI
Tungsten (W)-Total	mg/L	0.03	-	<0.00010	<0.0010 DLHC
Uranium (U)-Total	mg/L	0.005	-	0.00139	0.00028 DLHC
Vanadium (V)-Total	mg/L	0.006	-	<0.00050	<0.0050 DLHC
Zinc (Zn)-Total	mg/L	0.02	-	0.0039	0.105 DLHC
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.0030 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits			
Lab ID				L2166325-1	L2166325-2
Sample Date				18-SEP-18	18-SEP-18
Sample ID				PC-9	PC-10
Analyte	**Unit**	**#1**	**#2**		
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2166325-1	L2166325-2
				Sample Date	18-SEP-18	18-SEP-18
				Sample ID	PC-9	PC-10
Analyte	Unit	Guide Limits #1	#2			
Acetone	ug/L	-	-	<30 VTHS	35 VTHS	
Benzene	ug/L	100	-	<0.50 VTHS	<0.50 VTHS	
Bromodichloromethane	ug/L	200	-	<2.0 VTHS	2.5 VTHS	
Bromoform	ug/L	60	-	<5.0 VTHS	<5.0 VTHS	
Bromomethane	ug/L	-	-	<0.50 VTHS	<0.50 VTHS	
Carbon tetrachloride	ug/L	-	-	<0.20 VTHS	<0.20 VTHS	
Chlorobenzene	ug/L	15	-	<0.50 VTHS	<0.50 VTHS	
Dibromochloromethane	ug/L	40	-	<2.0 VTHS	3.4 VTHS	
Chloroform	ug/L	-	-	<1.0 VTHS	2.4 VTHS	
1,2-Dibromoethane	ug/L	5	-	<0.20 VTHS	<0.20 VTHS	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	<0.50 VTHS	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	<0.50 VTHS	
1,4-Dichlorobenzene	ug/L	4	-	<0.50 VTHS	<0.50 VTHS	
Dichlorodifluoromethane	ug/L	-	-	<2.0 VTHS	<2.0 VTHS	
1,1-Dichloroethane	ug/L	200	-	<0.50 VTHS	<0.50 VTHS	
1,2-Dichloroethane	ug/L	100	-	<0.50 VTHS	<0.50 VTHS	
1,1-Dichloroethylene	ug/L	40	-	<0.50 VTHS	<0.50 VTHS	
cis-1,2-Dichloroethylene	ug/L	-	-	9.99 VTHS	<0.50 VTHS	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 VTHS	<0.50 VTHS	
Methylene Chloride	ug/L	100	-	<5.0 VTHS	<5.0 VTHS	
1,2-Dichloropropane	ug/L	0.7	-	<0.50 VTHS	<0.50 VTHS	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 VTHS	<0.30 VTHS	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30 VTHS	<0.30 VTHS	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	
Ethylbenzene	ug/L	8	-	<0.50 VTHS	<0.50 VTHS	
n-Hexane	ug/L	-	-	<0.50 VTHS	<0.50 VTHS	
Methyl Ethyl Ketone	ug/L	400	-	<20 VTHS	<20 VTHS	
Methyl Isobutyl Ketone	ug/L	-	-	<20 VTHS	<20 VTHS	
MTBE	ug/L	-	-	<2.0 VTHS	<2.0 VTHS	
Styrene	ug/L	4	-	<0.50 VTHS	<0.50 VTHS	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2166325-1	L2166325-2
				Sample Date	18-SEP-18	18-SEP-18
				Sample ID	PC-9	PC-10
		Guide Limits				
Analyte	Unit	#1	#2			
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50 VTHS	<0.50 VTHS
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50 VTHS	<0.50 VTHS
Tetrachloroethylene	ug/L	50	-	<0.50 VTHS	<0.50 VTHS
Toluene	ug/L	0.8	-	<0.50 VTHS	<0.50 VTHS
1,1,1-Trichloroethane	ug/L	10	-	<0.50 VTHS	<0.50 VTHS
1,1,2-Trichloroethane	ug/L	800	-	<0.50 VTHS	<0.50 VTHS
Trichloroethylene	ug/L	20	-	1.19 VTHS	<0.50 VTHS
Trichlorofluoromethane	ug/L	-	-	<5.0 VTHS	<5.0 VTHS
Vinyl chloride	ug/L	600	-	<0.50 VTHS	<0.50 VTHS
o-Xylene	ug/L	40	-	<0.30 VTHS	<0.30 VTHS
m+p-Xylenes	ug/L	2	-	<0.40 VTHS	<0.40 VTHS
Xylenes (Total)	ug/L	-	-	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	91.8	89.1
Surrogate: 1,4-Difluorobenzene	%	-	-	98.5	97.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

				Lab ID	L2166325-1	L2166325-2
				Sample Date	18-SEP-18	18-SEP-18
				Sample ID	PC-9	PC-10
		Guide Limits				
Analyte	Unit	#1	#2			
F1 (C6-C10)	ug/L	-	-		<25 VTHS	<25
F1-BTEX	ug/L	-	-		<25	<25
F2 (C10-C16)	ug/L	-	-		<100	120
F2-Naphth	ug/L	-	-		<100	120
F3 (C16-C34)	ug/L	-	-		<250	2440
F3-PAH	ug/L	-	-		<250	2440
F4 (C34-C50)	ug/L	-	-		<250	2330
Total Hydrocarbons (C6-C50)	ug/L	-	-		<370	4890
Chrom. to baseline at nC50		-	-		YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-		102.6	99.9
Surrogate: 3,4-Dichlorotoluene	%	-	-		76.9	61.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits			
Lab ID				L2166325-1	L2166325-2
Sample Date				18-SEP-18	18-SEP-18
Sample ID				PC-9	PC-10
Analyte	**Unit**	**#1**	**#2**		
Acenaphthene	ug/L	-	-	<0.020	0.033
Acenaphthylene	ug/L	-	-	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	0.013
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	0.024
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	0.068
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010
Chrysene	ug/L	0.0001	-	<0.010	0.011
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	0.048
Fluoranthene	ug/L	0.008	-	<0.010	0.068 R
Fluorene	ug/L	0.2	-	<0.020	0.117 R
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	0.634
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	0.145
Phenanthrene	ug/L	0.03	-	<0.020	0.189
Pyrene	ug/L	-	-	<0.020	0.049
Surrogate: d10-Acenaphthene	%	-	-	93.8	89.5
Surrogate: d12-Chrysene	%	-	-	99.3	93.0
Surrogate: d8-Naphthalene	%	-	-	99.4	152.3 SOL:MI
Surrogate: d10-Phenanthrene	%	-	-	98.3	103.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
VTHS	Volatile test was conducted on sample with headspace. Results may be biased low.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
SOL:MI	Surrogate recovery outside acceptable limits due to matrix interference
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Water F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Water F2-F4-O.Reg 153/04 (July 2011) EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT Water Hardness APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT Water Total P in Water by Colour APHA 4500-P PHOSPHORUS

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TC-MF-WT	Water	Total Coliforms	SM 9222B
A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
Liquid samples are analyzed by headspace GC/MSD.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).			
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Total xylenes represents the sum of o-xylene and m&p-xylene.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

Reference Information

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2166325 Report Date: 03-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4232667								
WG2881713-4 DUP		**L2166278-2**						
Chloride (Cl)		0.52	0.52		mg/L	0.4	20	20-SEP-18
WG2881713-2 LCS								
Chloride (Cl)			99.6		%		90-110	20-SEP-18
WG2881713-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	20-SEP-18
WG2881713-5 MS		**L2166278-2**						
Chloride (Cl)			106.3		%		75-125	20-SEP-18
CN-FREE-CFA-WT	**Water**							
Batch R4226207								
WG2880592-3 DUP		**L2166325-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	19-SEP-18
WG2880592-2 LCS								
Cyanide, Free			102.0		%		80-120	19-SEP-18
WG2880592-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	19-SEP-18
WG2880592-4 MS		**L2166325-1**						
Cyanide, Free			96.0		%		75-125	19-SEP-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4251082								
WG2889578-9 DUP		**WG2889578-8**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	28-SEP-18
WG2889578-7 LCS								
Chromium, Hexavalent			99.5		%		80-120	28-SEP-18
WG2889578-6 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	28-SEP-18
WG2889578-10 MS		**WG2889578-8**						
Chromium, Hexavalent			95.9		%		70-130	28-SEP-18
EC-MF-WT	**Water**							
Batch R4228389								
WG2880912-3 DUP		**L2166313-9**						
E. Coli		200	150		CFU/100mL	29	65	20-SEP-18
WG2880912-4 DUP		**L2166313-3**						
E. Coli		670	530		CFU/100mL	23	65	20-SEP-18
WG2880912-1 MB								
E. Coli			0		CFU/100mL		1	20-SEP-18
WG2880912-2 MB								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-MF-WT	**Water**							
Batch R4228389								
WG2880912-2 MB								
E. Coli			0		CFU/100mL		1	20-SEP-18
EC-WT	**Water**							
Batch R4225980								
WG2880322-14 LCS								
Conductivity			99.1		%		90-110	19-SEP-18
WG2880322-13 MB								
Conductivity			<3.0		umhos/cm		3	19-SEP-18
F1-HS-511-WT	**Water**							
Batch R4256067								
WG2889500-4 DUP		**WG2889500-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	02-OCT-18
WG2889500-1 LCS								
F1 (C6-C10)			102.9		%		80-120	02-OCT-18
WG2889500-2 MB								
F1 (C6-C10)			<25		ug/L		25	02-OCT-18
Surrogate: 3,4-Dichlorotoluene			84.6		%		60-140	02-OCT-18
WG2889500-5 MS		**WG2889500-3**						
F1 (C6-C10)			90.5		%		60-140	02-OCT-18
Batch R4258029								
WG2889485-1 LCS								
F1 (C6-C10)			108.6		%		80-120	03-OCT-18
WG2889485-2 MB								
F1 (C6-C10)			<25		ug/L		25	03-OCT-18
Surrogate: 3,4-Dichlorotoluene			86.3		%		60-140	03-OCT-18
F2-F4-511-WT	**Water**							
Batch R4250131								
WG2886986-2 LCS								
F2 (C10-C16)			102.9		%		70-130	27-SEP-18
F3 (C16-C34)			107.9		%		70-130	27-SEP-18
F4 (C34-C50)			116.5		%		70-130	27-SEP-18
WG2886986-3 LCSD		**WG2886986-2**						
F2 (C10-C16)		102.9	97.9		%	5.0	50	28-SEP-18
F3 (C16-C34)		107.9	101.7		%	5.8	50	28-SEP-18
F4 (C34-C50)		116.5	111.4		%	4.4	50	28-SEP-18
WG2886986-1 MB								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT	**Water**							
Batch R4250131								
WG2886986-1 MB								
F2 (C10-C16)			<100		ug/L		100	27-SEP-18
F3 (C16-C34)			<250		ug/L		250	27-SEP-18
F4 (C34-C50)			<250		ug/L		250	27-SEP-18
Surrogate: 2-Bromobenzotrifluoride			83.3		%		60-140	27-SEP-18
HG-T-CVAA-WT	**Water**							
Batch R4227227								
WG2881709-3 DUP		**L2166411-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-SEP-18
WG2881709-2 LCS								
Mercury (Hg)-Total			102.0		%		80-120	20-SEP-18
WG2881709-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	20-SEP-18
WG2881709-4 MS		**L2166455-1**						
Mercury (Hg)-Total			88.3		%		70-130	20-SEP-18
MET-T-CCMS-WT	**Water**							
Batch R4222489								
WG2880247-4 DUP		**WG2880247-3**						
Aluminum (Al)-Total		0.0106	0.0077	J	mg/L	0.0028	0.01	19-SEP-18
Antimony (Sb)-Total		0.00017	0.00016		mg/L	5.1	20	19-SEP-18
Arsenic (As)-Total		0.00065	0.00064		mg/L	1.6	20	19-SEP-18
Barium (Ba)-Total		0.0252	0.0256		mg/L	1.7	20	19-SEP-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-SEP-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-SEP-18
Boron (B)-Total		0.022	0.022		mg/L	0.5	20	19-SEP-18
Cadmium (Cd)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	19-SEP-18
Calcium (Ca)-Total		32.3	32.5		mg/L	0.5	20	19-SEP-18
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	19-SEP-18
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-SEP-18
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-SEP-18
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	19-SEP-18
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	19-SEP-18
Lead (Pb)-Total		0.000225	0.000227		mg/L	0.9	20	19-SEP-18
Magnesium (Mg)-Total		7.32	7.44		mg/L	1.6	20	19-SEP-18
Manganese (Mn)-Total		0.00833	0.00841		mg/L	1.0	20	19-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4222489								
WG2880247-4 DUP		**WG2880247-3**						
Molybdenum (Mo)-Total		0.000319	0.000319		mg/L	0.2	20	19-SEP-18
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	19-SEP-18
Potassium (K)-Total		2.48	2.48		mg/L	0.2	20	19-SEP-18
Rubidium (Rb)-Total		0.00121	0.00128		mg/L	5.6	20	19-SEP-18
Selenium (Se)-Total		0.000062	0.000059		mg/L	5.3	20	19-SEP-18
Silicon (Si)-Total		0.27	0.28		mg/L	1.9	20	19-SEP-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-SEP-18
Sodium (Na)-Total		101	102		mg/L	1.3	20	19-SEP-18
Strontium (Sr)-Total		0.164	0.163		mg/L	0.6	20	19-SEP-18
Sulfur (S)-Total		6.62	6.65		mg/L	0.4	25	19-SEP-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-SEP-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	19-SEP-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	19-SEP-18
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-SEP-18
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	19-SEP-18
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-SEP-18
Uranium (U)-Total		0.000262	0.000269		mg/L	2.5	20	19-SEP-18
Vanadium (V)-Total		0.00051	0.00052		mg/L	1.2	20	19-SEP-18
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	19-SEP-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	19-SEP-18
WG2880247-2 LCS								
Aluminum (Al)-Total			107.4		%		80-120	19-SEP-18
Antimony (Sb)-Total			102.5		%		80-120	19-SEP-18
Arsenic (As)-Total			101.6		%		80-120	19-SEP-18
Barium (Ba)-Total			108.4		%		80-120	19-SEP-18
Beryllium (Be)-Total			101.9		%		80-120	19-SEP-18
Bismuth (Bi)-Total			95.5		%		80-120	19-SEP-18
Boron (B)-Total			94.3		%		80-120	19-SEP-18
Cadmium (Cd)-Total			97.9		%		80-120	19-SEP-18
Calcium (Ca)-Total			102.5		%		80-120	19-SEP-18
Chromium (Cr)-Total			101.8		%		80-120	19-SEP-18
Cesium (Cs)-Total			106.8		%		80-120	19-SEP-18
Cobalt (Co)-Total			99.9		%		80-120	19-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4222489								
WG2880247-2 LCS								
Copper (Cu)-Total			96.7		%		80-120	19-SEP-18
Iron (Fe)-Total			101.5		%		80-120	19-SEP-18
Lead (Pb)-Total			98.4		%		80-120	19-SEP-18
Magnesium (Mg)-Total			101.6		%		80-120	19-SEP-18
Manganese (Mn)-Total			103.4		%		80-120	19-SEP-18
Molybdenum (Mo)-Total			100.5		%		80-120	19-SEP-18
Nickel (Ni)-Total			97.3		%		80-120	19-SEP-18
Potassium (K)-Total			111.5		%		80-120	19-SEP-18
Rubidium (Rb)-Total			105.4		%		80-120	19-SEP-18
Selenium (Se)-Total			99.3		%		80-120	19-SEP-18
Silicon (Si)-Total			102.7		%		60-140	19-SEP-18
Silver (Ag)-Total			104.7		%		80-120	19-SEP-18
Sodium (Na)-Total			104.0		%		80-120	19-SEP-18
Strontium (Sr)-Total			106.5		%		80-120	19-SEP-18
Sulfur (S)-Total			104.4		%		80-120	19-SEP-18
Thallium (Tl)-Total			99.4		%		80-120	19-SEP-18
Tellurium (Te)-Total			102.0		%		80-120	19-SEP-18
Thorium (Th)-Total			92.3		%		70-130	19-SEP-18
Tin (Sn)-Total			100.8		%		80-120	19-SEP-18
Titanium (Ti)-Total			99.5		%		80-120	19-SEP-18
Tungsten (W)-Total			101.0		%		80-120	19-SEP-18
Uranium (U)-Total			99.6		%		80-120	19-SEP-18
Vanadium (V)-Total			104.8		%		80-120	19-SEP-18
Zinc (Zn)-Total			96.0		%		80-120	19-SEP-18
Zirconium (Zr)-Total			115.7		%		80-120	19-SEP-18
WG2880247-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	19-SEP-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Total			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	19-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4222489								
WG2880247-1 MB								
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-SEP-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	19-SEP-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	19-SEP-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	19-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	19-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	19-SEP-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	19-SEP-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	19-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	19-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	19-SEP-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-SEP-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	19-SEP-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-SEP-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	19-SEP-18
WG2880247-5 MS		**WG2880247-6**						
Aluminum (Al)-Total			108.0		%		70-130	19-SEP-18
Antimony (Sb)-Total			101.0		%		70-130	19-SEP-18
Arsenic (As)-Total			101.8		%		70-130	19-SEP-18
Barium (Ba)-Total			N/A	MS-B	%		-	19-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4222489								
WG2880247-5 MS		**WG2880247-6**						
Beryllium (Be)-Total			101.1		%		70-130	19-SEP-18
Bismuth (Bi)-Total			93.8		%		70-130	19-SEP-18
Boron (B)-Total			87.8		%		70-130	19-SEP-18
Cadmium (Cd)-Total			93.4		%		70-130	19-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	19-SEP-18
Chromium (Cr)-Total			102.3		%		70-130	19-SEP-18
Cesium (Cs)-Total			105.1		%		70-130	19-SEP-18
Cobalt (Co)-Total			98.9		%		70-130	19-SEP-18
Copper (Cu)-Total			93.9		%		70-130	19-SEP-18
Iron (Fe)-Total			109.6		%		70-130	19-SEP-18
Lead (Pb)-Total			96.7		%		70-130	19-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	19-SEP-18
Manganese (Mn)-Total			N/A	MS-B	%		-	19-SEP-18
Molybdenum (Mo)-Total			101.9		%		70-130	19-SEP-18
Nickel (Ni)-Total			95.2		%		70-130	19-SEP-18
Potassium (K)-Total			N/A	MS-B	%		-	19-SEP-18
Rubidium (Rb)-Total			105.5		%		70-130	19-SEP-18
Silicon (Si)-Total			N/A	MS-B	%		-	19-SEP-18
Silver (Ag)-Total			97.9		%		70-130	19-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	19-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	19-SEP-18
Sulfur (S)-Total			N/A	MS-B	%		-	19-SEP-18
Thallium (Tl)-Total			94.9		%		70-130	19-SEP-18
Thorium (Th)-Total			89.9		%		70-130	19-SEP-18
Tin (Sn)-Total			96.4		%		70-130	19-SEP-18
Titanium (Ti)-Total			102.2		%		70-130	19-SEP-18
Tungsten (W)-Total			100.5		%		70-130	19-SEP-18
Uranium (U)-Total			95.5		%		70-130	19-SEP-18
Vanadium (V)-Total			107.9		%		70-130	19-SEP-18
Zinc (Zn)-Total			93.3		%		70-130	19-SEP-18
Zirconium (Zr)-Total			89.6		%		70-130	19-SEP-18
NO2-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4232667								
WG2881713-4 DUP		**L2166278-2**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	20-SEP-18
WG2881713-2 LCS								
Nitrite (as N)			99.3		%		70-130	20-SEP-18
WG2881713-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	20-SEP-18
WG2881713-5 MS		**L2166278-2**						
Nitrite (as N)			105.4		%		70-130	20-SEP-18
NO3-IC-WT	**Water**							
Batch R4232667								
WG2881713-4 DUP		**L2166278-2**						
Nitrate (as N)		0.023	0.025		mg/L	5.0	25	20-SEP-18
WG2881713-2 LCS								
Nitrate (as N)			100.3		%		70-130	20-SEP-18
WG2881713-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	20-SEP-18
WG2881713-5 MS		**L2166278-2**						
Nitrate (as N)			105.0		%		70-130	20-SEP-18
P-T-COL-WT	**Water**							
Batch R4229460								
WG2881964-3 DUP		**L2166293-6**						
Phosphorus, Total		0.0120	0.0113		mg/L	5.7	20	21-SEP-18
WG2881964-2 LCS								
Phosphorus, Total			95.8		%		80-120	21-SEP-18
WG2881964-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	21-SEP-18
WG2881964-4 MS		**L2166293-6**						
Phosphorus, Total			89.3		%		70-130	21-SEP-18
P-TD-COL-WT	**Water**							
Batch R4225551								
WG2881270-3 DUP		**L2165621-1**						
Phosphorus (P)-Total	Dissolved	0.0203	0.0175		mg/L	14	20	20-SEP-18
WG2881270-2 LCS								
Phosphorus (P)-Total	Dissolved		90.5		%		80-120	20-SEP-18
WG2881270-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	20-SEP-18
WG2881270-4 MS		**L2165621-1**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4225551								
WG2881270-4 MS		**L2165621-1**						
Phosphorus (P)-Total	Dissolved		93.7		%		70-130	20-SEP-18
PAH-PWQO-WT	**Water**							
Batch R4230688								
WG2881488-2 LCS								
1-Methylnaphthalene			87.8		%		50-150	21-SEP-18
2-Methylnaphthalene			86.6		%		50-150	21-SEP-18
Acenaphthene			88.1		%		50-150	21-SEP-18
Acenaphthylene			90.4		%		50-150	21-SEP-18
Anthracene			98.3		%		60-130	21-SEP-18
Benzo(a)anthracene			109.6		%		60-130	21-SEP-18
Benzo(a)pyrene			89.3		%		50-150	21-SEP-18
Benzo(b)fluoranthene			82.5		%		50-150	21-SEP-18
Benzo(g,h,i)perylene			88.5		%		60-130	21-SEP-18
Benzo(k)fluoranthene			87.5		%		60-130	21-SEP-18
Chrysene			106.2		%		60-130	21-SEP-18
Dibenzo(ah)anthracene			95.2		%		60-130	21-SEP-18
Fluoranthene			95.9		%		60-130	21-SEP-18
Fluorene			91.8		%		50-150	21-SEP-18
Indeno(1,2,3-cd)pyrene			107.4		%		50-150	21-SEP-18
Naphthalene			89.9		%		50-150	21-SEP-18
Phenanthrene			95.9		%		50-150	21-SEP-18
Pyrene			95.4		%		50-150	21-SEP-18
WG2881488-3 LCSD		**WG2881488-2**						
1-Methylnaphthalene		87.8	85.6		%	2.5	50	21-SEP-18
2-Methylnaphthalene		86.6	83.7		%	3.4	50	21-SEP-18
Acenaphthene		88.1	85.2		%	3.3	50	21-SEP-18
Acenaphthylene		90.4	87.5		%	3.2	50	21-SEP-18
Anthracene		98.3	93.8		%	4.7	50	21-SEP-18
Benzo(a)anthracene		109.6	104.7		%	4.6	50	21-SEP-18
Benzo(a)pyrene		89.3	84.8		%	5.1	50	21-SEP-18
Benzo(b)fluoranthene		82.5	78.5		%	5.0	50	21-SEP-18
Benzo(g,h,i)perylene		88.5	85.6		%	3.3	50	21-SEP-18
Benzo(k)fluoranthene		87.5	82.6		%	5.7	50	21-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4230688								
WG2881488-3 LCSD		**WG2881488-2**						
Chrysene		106.2	102.5		%	3.5	50	21-SEP-18
Dibenzo(ah)anthracene		95.2	93.5		%	1.8	50	21-SEP-18
Fluoranthene		95.9	91.8		%	4.3	50	21-SEP-18
Fluorene		91.8	88.9		%	3.3	50	21-SEP-18
Indeno(1,2,3-cd)pyrene		107.4	102.4		%	4.7	50	21-SEP-18
Naphthalene		89.9	87.8		%	2.3	50	21-SEP-18
Phenanthrene		95.9	92.2		%	4.0	50	21-SEP-18
Pyrene		95.4	90.9		%	4.8	50	21-SEP-18
WG2881488-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	21-SEP-18
2-Methylnaphthalene			<0.020		ug/L		0.02	21-SEP-18
Acenaphthene			<0.020		ug/L		0.02	21-SEP-18
Acenaphthylene			<0.020		ug/L		0.02	21-SEP-18
Anthracene			<0.010		ug/L		0.01	21-SEP-18
Benzo(a)anthracene			<0.020		ug/L		0.02	21-SEP-18
Benzo(a)pyrene			<0.010		ug/L		0.01	21-SEP-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	21-SEP-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	21-SEP-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	21-SEP-18
Chrysene			<0.010		ug/L		0.01	21-SEP-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	21-SEP-18
Fluoranthene			<0.010		ug/L		0.01	21-SEP-18
Fluorene			<0.020		ug/L		0.02	21-SEP-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	21-SEP-18
Naphthalene			<0.050		ug/L		0.05	21-SEP-18
Phenanthrene			<0.020		ug/L		0.02	21-SEP-18
Pyrene			<0.020		ug/L		0.02	21-SEP-18
Surrogate: d8-Naphthalene			94.4		%		40-130	21-SEP-18
Surrogate: d10-Phenanthrene			101.0		%		40-130	21-SEP-18
Surrogate: d12-Chrysene			97.5		%		40-130	21-SEP-18
Surrogate: d10-Acenaphthene			93.2		%		40-130	21-SEP-18
PH-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R4225980								
WG2880322-14 LCS								
pH			6.99		pH units		6.9-7.1	19-SEP-18
SOLIDS-TSS-WT	**Water**							
Batch R4226229								
WG2880532-3 DUP		**L2166478-9**						
Total Suspended Solids		47.7	49.7		mg/L	4.1	20	20-SEP-18
WG2880532-2 LCS								
Total Suspended Solids			100.1		%		85-115	20-SEP-18
WG2880532-1 MB								
Total Suspended Solids			<2.0		mg/L		2	20-SEP-18
TC-MF-WT	**Water**							
Batch R4228327								
WG2880924-3 DUP		**L2166765-1**						
Total Coliforms		0	0		CFU/100mL	0.0	65	20-SEP-18
WG2880924-1 MB								
Total Coliforms			0		CFU/100mL		1	20-SEP-18
TKN-WT	**Water**							
Batch R4227909								
WG2880310-3 DUP		**L2165142-1**						
Total Kjeldahl Nitrogen		0.71	0.77		mg/L	8.0	20	20-SEP-18
WG2881262-3 DUP		**L2166478-21**						
Total Kjeldahl Nitrogen		0.50	0.58		mg/L	15	20	20-SEP-18
WG2880310-2 LCS								
Total Kjeldahl Nitrogen			111.6		%		75-125	20-SEP-18
WG2881262-2 LCS								
Total Kjeldahl Nitrogen			98.6		%		75-125	20-SEP-18
WG2880310-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	20-SEP-18
WG2881262-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	20-SEP-18
WG2880310-4 MS		**L2165142-1**						
Total Kjeldahl Nitrogen			86.3		%		70-130	20-SEP-18
WG2881262-4 MS		**L2166478-21**						
Total Kjeldahl Nitrogen			100.5		%		70-130	20-SEP-18
VOC-511-HS-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4256067								
WG2889500-4 DUP		**WG2889500-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	02-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Acetone		39	37		ug/L	4.3	30	03-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	02-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	02-OCT-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	02-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	02-OCT-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	02-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	02-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	02-OCT-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	02-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	02-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	02-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	02-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	02-OCT-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	02-OCT-18
Styrene		<0.50	<0.50		ug/L			02-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4256067								
WG2889500-4 DUP		**WG2889500-3**						
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	02-OCT-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	02-OCT-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	02-OCT-18
WG2889500-1 LCS								
1,1,1,2-Tetrachloroethane			112.9		%		70-130	02-OCT-18
1,1,2,2-Tetrachloroethane			119.6		%		70-130	02-OCT-18
1,1,1-Trichloroethane			113.2		%		70-130	02-OCT-18
1,1,2-Trichloroethane			119.3		%		70-130	02-OCT-18
1,1-Dichloroethane			117.5		%		70-130	02-OCT-18
1,1-Dichloroethylene			107.3		%		70-130	02-OCT-18
1,2-Dibromoethane			122.8		%		70-130	02-OCT-18
1,2-Dichlorobenzene			116.1		%		70-130	02-OCT-18
1,2-Dichloroethane			126.9		%		70-130	02-OCT-18
1,2-Dichloropropane			119.8		%		70-130	02-OCT-18
1,3-Dichlorobenzene			112.9		%		70-130	02-OCT-18
1,4-Dichlorobenzene			115.1		%		70-130	02-OCT-18
Acetone			141.4	MES	%		60-140	02-OCT-18
Benzene			117.9		%		70-130	02-OCT-18
Bromodichloromethane			123.6		%		70-130	02-OCT-18
Bromoform			117.9		%		70-130	02-OCT-18
Bromomethane			90.3		%		60-140	02-OCT-18
Carbon tetrachloride			113.1		%		70-130	02-OCT-18
Chlorobenzene			113.8		%		70-130	02-OCT-18
Chloroform			120.5		%		70-130	02-OCT-18
cis-1,2-Dichloroethylene			117.1		%		70-130	02-OCT-18
cis-1,3-Dichloropropene			120.3		%		70-130	02-OCT-18
Dibromochloromethane			120.2		%		70-130	02-OCT-18
Dichlorodifluoromethane			82.8		%		50-140	02-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4256067								
WG2889500-1 LCS								
Ethylbenzene			103.1		%		70-130	02-OCT-18
n-Hexane			125.6		%		70-130	02-OCT-18
m+p-Xylenes			107.8		%		70-130	02-OCT-18
Methyl Ethyl Ketone			134.5		%		60-140	02-OCT-18
Methyl Isobutyl Ketone			130.9		%		60-140	02-OCT-18
Methylene Chloride			122.7		%		70-130	02-OCT-18
MTBE			113.3		%		70-130	02-OCT-18
o-Xylene			102.2		%		70-130	02-OCT-18
Styrene			102.9		%		70-130	02-OCT-18
Tetrachloroethylene			109.0		%		70-130	02-OCT-18
Toluene			106.3		%		70-130	02-OCT-18
trans-1,2-Dichloroethylene			113.3		%		70-130	02-OCT-18
trans-1,3-Dichloropropene			110.2		%		70-130	02-OCT-18
Trichloroethylene			117.2		%		70-130	02-OCT-18
Trichlorofluoromethane			121.3		%		60-140	02-OCT-18
Vinyl chloride			96.6		%		60-140	02-OCT-18
WG2889500-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	02-OCT-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	02-OCT-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	02-OCT-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	02-OCT-18
1,1-Dichloroethane			<0.50		ug/L		0.5	02-OCT-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	02-OCT-18
1,2-Dibromoethane			<0.20		ug/L		0.2	02-OCT-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	02-OCT-18
1,2-Dichloroethane			<0.50		ug/L		0.5	02-OCT-18
1,2-Dichloropropane			<0.50		ug/L		0.5	02-OCT-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	02-OCT-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	02-OCT-18
Acetone			<30		ug/L		30	02-OCT-18
Benzene			<0.50		ug/L		0.5	02-OCT-18
Bromodichloromethane			<2.0		ug/L		2	02-OCT-18
Bromoform			<5.0		ug/L		5	02-OCT-18
Bromomethane			<0.50		ug/L		0.5	02-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4256067								
WG2889500-2 MB								
Carbon tetrachloride			<0.20		ug/L		0.2	02-OCT-18
Chlorobenzene			<0.50		ug/L		0.5	02-OCT-18
Chloroform			<1.0		ug/L		1	02-OCT-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	02-OCT-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	02-OCT-18
Dibromochloromethane			<2.0		ug/L		2	02-OCT-18
Dichlorodifluoromethane			<2.0		ug/L		2	02-OCT-18
Ethylbenzene			<0.50		ug/L		0.5	02-OCT-18
n-Hexane			<0.50		ug/L		0.5	02-OCT-18
m+p-Xylenes			<0.40		ug/L		0.4	02-OCT-18
Methyl Ethyl Ketone			<20		ug/L		20	02-OCT-18
Methyl Isobutyl Ketone			<20		ug/L		20	02-OCT-18
Methylene Chloride			<5.0		ug/L		5	02-OCT-18
MTBE			<2.0		ug/L		2	02-OCT-18
o-Xylene			<0.30		ug/L		0.3	02-OCT-18
Styrene			<0.50		ug/L		0.5	02-OCT-18
Tetrachloroethylene			<0.50		ug/L		0.5	02-OCT-18
Toluene			<0.50		ug/L		0.5	02-OCT-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	02-OCT-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	02-OCT-18
Trichloroethylene			<0.50		ug/L		0.5	02-OCT-18
Trichlorofluoromethane			<5.0		ug/L		5	02-OCT-18
Vinyl chloride			<0.50		ug/L		0.5	02-OCT-18
Surrogate: 1,4-Difluorobenzene			98.0		%		70-130	02-OCT-18
Surrogate: 4-Bromofluorobenzene			92.0		%		70-130	02-OCT-18
WG2889500-5 MS		**WG2889500-3**						
1,1,1,2-Tetrachloroethane			115.0		%		50-140	02-OCT-18
1,1,2,2-Tetrachloroethane			119.5		%		50-140	02-OCT-18
1,1,1-Trichloroethane			115.5		%		50-140	02-OCT-18
1,1,2-Trichloroethane			117.1		%		50-140	02-OCT-18
1,1-Dichloroethane			117.7		%		50-140	02-OCT-18
1,1-Dichloroethylene			103.4		%		50-140	02-OCT-18
1,2-Dibromoethane			118.6		%		50-140	02-OCT-18
1,2-Dichlorobenzene			115.8		%		50-140	02-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4256067								
WG2889500-5 MS		**WG2889500-3**						
1,2-Dichloroethane			125.4		%		50-140	02-OCT-18
1,2-Dichloropropane			120.4		%		50-140	02-OCT-18
1,3-Dichlorobenzene			112.2		%		50-140	02-OCT-18
1,4-Dichlorobenzene			114.3		%		50-140	02-OCT-18
Acetone			135.2		%		50-140	02-OCT-18
Benzene			118.2		%		50-140	02-OCT-18
Bromodichloromethane			126.3		%		50-140	02-OCT-18
Bromoform			116.4		%		50-140	02-OCT-18
Bromomethane			80.5		%		50-140	02-OCT-18
Carbon tetrachloride			115.9		%		50-140	02-OCT-18
Chlorobenzene			113.8		%		50-140	02-OCT-18
Chloroform			123.0		%		50-140	02-OCT-18
cis-1,2-Dichloroethylene			117.6		%		50-140	02-OCT-18
cis-1,3-Dichloropropene			115.3		%		50-140	02-OCT-18
Dibromochloromethane			119.6		%		50-140	02-OCT-18
Dichlorodifluoromethane			56.4		%		50-140	02-OCT-18
Ethylbenzene			101.1		%		50-140	02-OCT-18
n-Hexane			115.9		%		50-140	02-OCT-18
m+p-Xylenes			107.1		%		50-140	02-OCT-18
Methyl Ethyl Ketone			123.8		%		50-140	02-OCT-18
Methyl Isobutyl Ketone			125.1		%		50-140	02-OCT-18
Methylene Chloride			119.8		%		50-140	02-OCT-18
MTBE			112.5		%		50-140	02-OCT-18
o-Xylene			100.6		%		50-140	02-OCT-18
Styrene			100.0		%		50-140	02-OCT-18
Tetrachloroethylene			108.8		%		50-140	02-OCT-18
Toluene			103.9		%		50-140	02-OCT-18
trans-1,2-Dichloroethylene			111.2		%		50-140	02-OCT-18
trans-1,3-Dichloropropene			100.6		%		50-140	02-OCT-18
Trichloroethylene			119.4		%		50-140	02-OCT-18
Trichlorofluoromethane			114.6		%		50-140	02-OCT-18
Vinyl chloride			82.6		%		50-140	02-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4258029								
WG2889485-1 LCS								
Acetone			93.0		%		60-140	03-OCT-18
WG2889485-2 MB								
Acetone			<30		ug/L		30	03-OCT-18

Quality Control Report

Workorder: L2166325 Report Date: 03-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2166325 Report Date: 03-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Hydrocarbons							
F1-O.Reg 153/04 (July 2011)							
	2	18-SEP-18 11:30	03-OCT-18 07:43	14	15	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2166325 were received on 18-SEP-18 14:05.

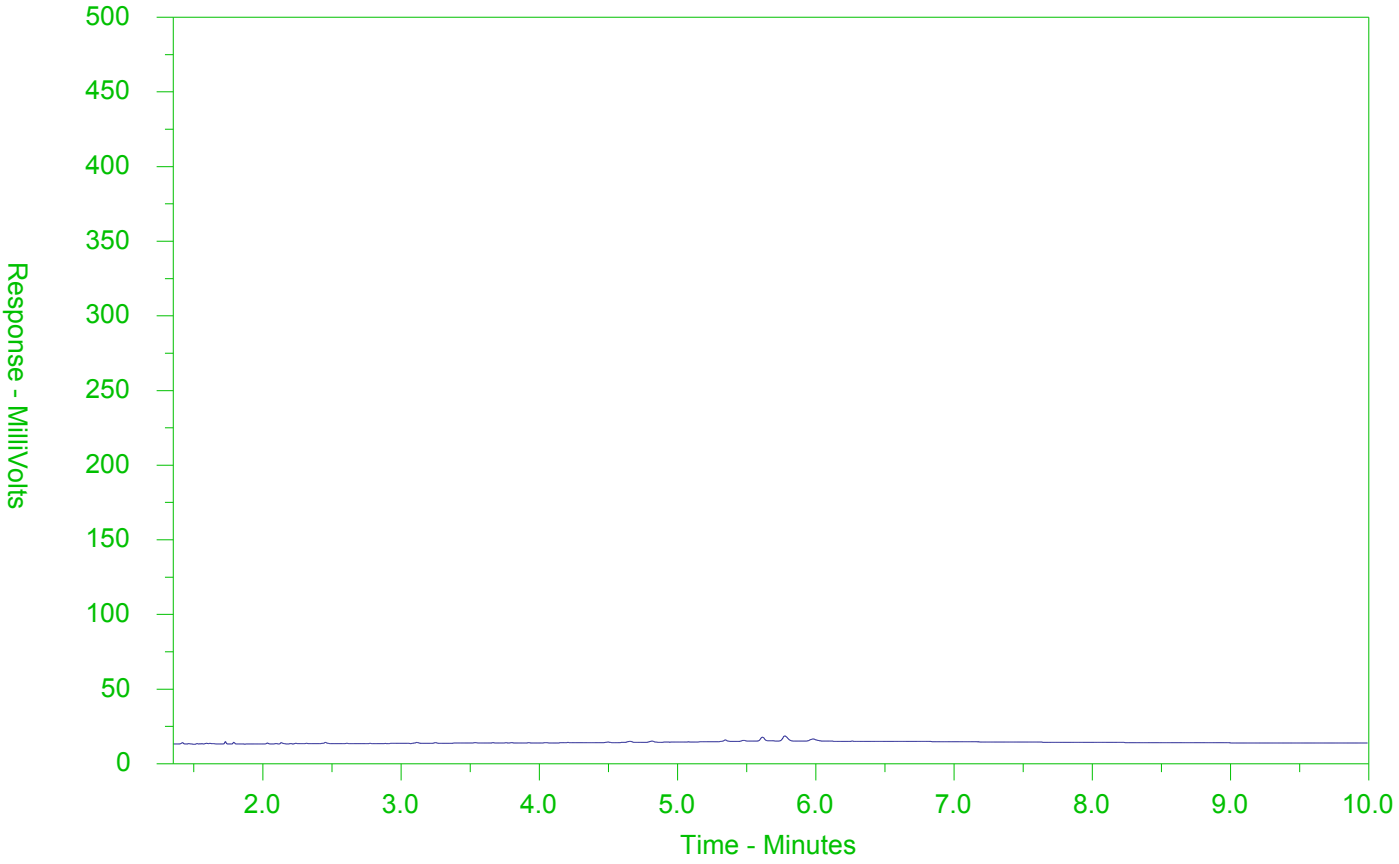
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2166325-1
Client Sample ID: PC-9



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

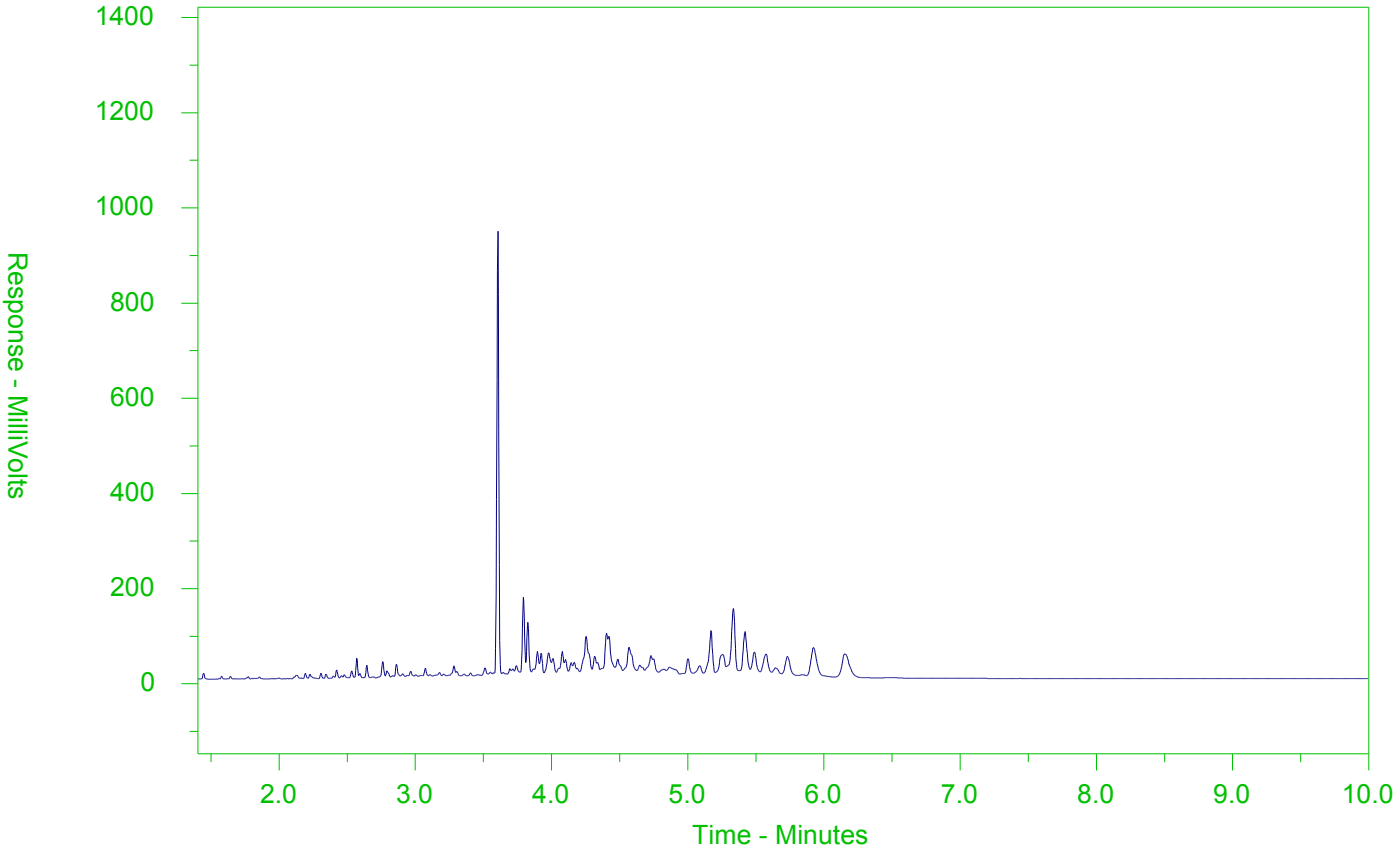
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2166325-2
Client Sample ID: PC-10



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2166325-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2166325

ALS Contact: Gayle Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT, P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail	NUMBER OF CONTAINERS
	PC-9	18/09/18	11:50	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	~~PC-10~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~			12
	~~PC-10~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~			12
	PC-10	18/09/18	11:30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☒ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	11.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
[illegible]	18/09/18	14:05					SEP 18/18	14:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 08-AUG-18
Report Date: 16-AUG-18 13:29 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2143440

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-684113
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143440-1	PC-1	Anions and Nutrients	Phosphorus, Total	0.0765	0.01	mg/L
		Bacteriological Tests	E. Coli	1190	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.114	0.015	mg/L
			Copper (Cu)-Total	0.0040	0.001	mg/L
		Speciated Metals	Chromium, Hexavalent	1.45	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.025	0.00002	ug/L
			Benzo(k)fluoranthene	0.016	0.0002	ug/L
			Chrysene	0.053	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.152	0.008	ug/L
			Phenanthrene	0.056	0.03	ug/L
L2143440-2	PC-2	Anions and Nutrients	Phosphorus, Total	0.0782	0.01	mg/L
		Bacteriological Tests	E. Coli	1280	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.153	0.015	mg/L
			Copper (Cu)-Total	0.0039	0.001	mg/L
		Speciated Metals	Chromium, Hexavalent	1.53	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.010	0.0002	ug/L
			Chrysene	0.022	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.057	0.008	ug/L
L2143440-3	PC-3	Anions and Nutrients	Phosphorus, Total	0.0521	0.01	mg/L
		Bacteriological Tests	E. Coli	1180	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.101	0.015	mg/L
			Copper (Cu)-Total	0.0031	0.001	mg/L
			Iron (Fe)-Total	0.477	0.3	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.010	0.0001	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143440-3	PC-3	Polycyclic Aromatic Hydrocarbons	Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.022	0.008	ug/L
L2143440-4	PC-4	Anions and Nutrients	Phosphorus, Total	0.0929	0.01	mg/L
		Bacteriological Tests	E. Coli	1270	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.604	0.015	mg/L
			Copper (Cu)-Total	0.0083	0.001	mg/L
			Iron (Fe)-Total	0.923	0.3	mg/L
			Lead (Pb)-Total	0.00332	0.001	mg/L
			Zinc (Zn)-Total	0.0294	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.56	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.031	0.00002	ug/L
			Benzo(k)fluoranthene	0.018	0.0002	ug/L
			Chrysene	0.048	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.109	0.008	ug/L
			Phenanthrene	0.052	0.03	ug/L
L2143440-5	PC-5	Anions and Nutrients	Phosphorus, Total	0.0570	0.01	mg/L
		Bacteriological Tests	E. Coli	860	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.167	0.015	mg/L
			Copper (Cu)-Total	0.0048	0.001	mg/L
			Iron (Fe)-Total	0.423	0.3	mg/L
			Lead (Pb)-Total	0.00266	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.026	0.0004	ug/L
			Benzo(g,h,i)perylene	0.038	0.00002	ug/L
			Benzo(k)fluoranthene	0.024	0.0002	ug/L
			Chrysene	0.068	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.184	0.008	ug/L
			Phenanthrene	0.084	0.03	ug/L
L2143440-6	PC-6	Anions and Nutrients	Phosphorus, Total	0.0631	0.01	mg/L
		Bacteriological Tests	E. Coli	660	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.265	0.015	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143440-6	PC-6	Total Metals	Copper (Cu)-Total	0.0063	0.001	mg/L
			Iron (Fe)-Total	0.385	0.3	mg/L
			Lead (Pb)-Total	0.00168	0.001	mg/L
			Zinc (Zn)-Total	0.0224	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	2.43	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.010	0.0002	ug/L
			Chrysene	0.028	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.069	0.008	ug/L
			Phenanthrene	0.040	0.03	ug/L
L2143440-7	PC-7	Anions and Nutrients	Phosphorus, Total	0.0501	0.01	mg/L
		Bacteriological Tests	E. Coli	1260	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.331	0.015	mg/L
			Copper (Cu)-Total	0.0082	0.001	mg/L
			Iron (Fe)-Total	0.379	0.3	mg/L
			Lead (Pb)-Total	0.00250	0.001	mg/L
			Zinc (Zn)-Total	0.0355	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	2.39	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.066	0.0008	ug/L
			Benzo(a)anthracene	0.077	0.0004	ug/L
			Benzo(g,h,i)perylene	0.045	0.00002	ug/L
			Benzo(k)fluoranthene	0.041	0.0002	ug/L
			Chrysene	0.174	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.765	0.008	ug/L
			Phenanthrene	0.959	0.03	ug/L
L2143440-8	PC-8	Anions and Nutrients	Phosphorus, Total	0.125	0.01	mg/L
		Bacteriological Tests	E. Coli	4800	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	<0.050	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143440-8	PC-8	Total Metals	Zinc (Zn)-Total	<0.030	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.58	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.012	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.103	0.008	ug/L
L2143440-9	PC-9	Anions and Nutrients	Phosphorus, Total	0.233	0.01	mg/L
		Bacteriological Tests	E. Coli	3900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	1.88	0.015	mg/L
			Cadmium (Cd)-Total	0.000194	0.0001	mg/L
			Cobalt (Co)-Total	0.00131	0.0009	mg/L
			Copper (Cu)-Total	0.0224	0.001	mg/L
			Iron (Fe)-Total	5.33	0.3	mg/L
			Lead (Pb)-Total	0.0218	0.001	mg/L
			Silver (Ag)-Total	0.000209	0.0001	mg/L
			Zinc (Zn)-Total	0.102	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	5.43	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.020	0.0008	ug/L
			Benzo(a)anthracene	0.122	0.0004	ug/L
			Benzo(g,h,i)perylene	0.206	0.00002	ug/L
			Benzo(k)fluoranthene	0.108	0.0002	ug/L
			Chrysene	0.256	0.0001	ug/L
			Dibenzo(ah)anthracene	0.036	0.002	ug/L
			Fluoranthene	0.584	0.008	ug/L
			Phenanthrene	0.282	0.03	ug/L
L2143440-10	PC-10	Anions and Nutrients	Phosphorus, Total	4.60	0.01	mg/L
		Bacteriological Tests	E. Coli	5500	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	7.52	0.015	mg/L
			Cadmium (Cd)-Total	0.000343	0.0001	mg/L
			Cobalt (Co)-Total	0.00516	0.0009	mg/L
			Copper (Cu)-Total	0.0519	0.001	mg/L
			Iron (Fe)-Total	9.77	0.3	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143440-10	PC-10	Total Metals	Lead (Pb)-Total	0.0188	0.001	mg/L
			Silver (Ag)-Total	0.000152	0.0001	mg/L
			Vanadium (V)-Total	0.0180	0.006	mg/L
			Zinc (Zn)-Total	0.163	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.062	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.026	0.0001	ug/L
			Dibenzo(ah)anthracene	0.032	0.002	ug/L
			Fluoranthene	0.056	0.008	ug/L
			Phenanthrene	0.064	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Conductivity	umhos/cm	-	-		299	242	444	324	832	223	663	3210	195
Hardness (as CaCO3)	mg/L	-	-		67 HTC	72 HTC	127 HTC	91 HTC	202 HTC	59 HTC	127 HTC	368 HTC	100 HTC
pH	pH units	6.5-8.5	-		7.71	7.84	7.86	7.73	7.91	7.51	7.79	8.07	8.17
Total Suspended Solids	mg/L	-	-		2.2	3.8	<2.0	18.1	11.2	9.5	10.9	2.1	139

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2143440-10 Sample Date: 08-AUG-18 Sample ID: PC-10
Conductivity	umhos/cm	-	-	419
Hardness (as CaCO3)	mg/L	-	-	172 HTC
pH	pH units	6.5-8.5	-	7.37
Total Suspended Solids	mg/L	-	-	1220

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Chloride (Cl)	mg/L	-	-		52.5	35.2	66.2	52.1	160	33.8	134	999 DLDS	32.6
Nitrate (as N)	mg/L	-	-		0.555	0.479	1.09	0.690	2.25	0.531	1.19	3.60 DLDS	0.422
Nitrite (as N)	mg/L	-	-		0.012	<0.010	<0.010	0.029	0.014	0.023	0.022	<0.050 DLDS	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-		0.56	1.69	1.10	1.18	1.13	2.10	1.27	5.76	2.47
Total Nitrogen	mg/L	-	-		1.13	2.17	2.19	1.90	3.39	2.65	2.48	9.36	2.89
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0378	0.0713	0.0370	0.0309	0.0203	0.0296	0.0181	0.114	0.0281
Phosphorus, Total	mg/L	0.01	-		0.0765	0.0782	0.0521	0.0929	0.0570	0.0631	0.0501	0.125	0.233

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2143440-10
			Sample Date	08-AUG-18
			Sample ID	PC-10
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Chloride (Cl)	mg/L	-	-	38.4
Nitrate (as N)	mg/L	-	-	0.147
Nitrite (as N)	mg/L	-	-	0.246
Total Kjeldahl Nitrogen	mg/L	-	-	22.5 DLHC
Total Nitrogen	mg/L	-	-	22.9
Phosphorus (P)-Total Dissolved	mg/L	-	-	2.34 DLHC
Phosphorus, Total	mg/L	0.01	-	4.60 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

				Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits											
Analyte	Unit	#1	#2										
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Lab ID				L2143440-10
Sample Date				08-AUG-18
Sample ID				PC-10
Cyanide, Free	mg/L	0.005	-	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
E. Coli	CFU/100mL	100	-		1190 DLM	1280 DLM	1180 DLM	1270 DLM	860 DLM	660 DLM	1260 DLM	4800 DLM	3900 DLM
Total Coliforms	CFU/100mL	-	-		55000 DLM	63000 DLM	9800 DLM	96000 DLM	52000 DLM	8400 DLM	9600 DLM	132000 DLM	71000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits		Lab ID	Sample Date	Sample ID
Analyte	Unit	#1	#2	L2143440-10	08-AUG-18	PC-10
E. Coli	CFU/100mL	100	-	5500 DLM		
Total Coliforms	CFU/100mL	-	-	147000 DLM		

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

		Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
		Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
		Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits									
Analyte	Unit	#1	#2								
Sodium Adsorption Ratio	SAR	-	-	1.79	1.15	1.52	1.31	2.65	1.16	3.04	11.8	0.82

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2143440-10
			Sample Date	08-AUG-18
			Sample ID	PC-10
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Sodium Adsorption Ratio	SAR	-	-	1.02

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Aluminum (Al)-Total	mg/L	0.015	-		0.114	0.153	0.101	0.604	0.167	0.265	0.331	<0.050 DLHC	1.88
Antimony (Sb)-Total	mg/L	0.02	-		0.00044	0.00040	0.00030	0.00051	0.00045	0.00066	0.00078	<0.0010 DLHC	0.00117
Arsenic (As)-Total	mg/L	0.005	-		0.00030	0.00068	0.00062	0.00061	0.00046	0.00045	0.00055	0.0013 DLHC	0.00203
Barium (Ba)-Total	mg/L	-	-		0.0147	0.0152	0.0210	0.0265	0.0549	0.0179	0.0343	0.0823 DLHC	0.0428
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010 DLHC	0.00011
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050 DLHC	0.000070
Boron (B)-Total	mg/L	0.2	-		0.012	0.015	0.014	0.020	0.027	0.013	0.023	<0.10 DLHC	0.012
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000015	0.000010	0.000012	0.000036	0.000022	0.000016	0.000029	<0.000050 DLHC	0.000194
Calcium (Ca)-Total	mg/L	-	-		22.2	23.2	40.4	28.4	59.8	19.5	38.2	102 DLHC	29.2
Cesium (Cs)-Total	mg/L	-	-		0.000014	0.000016	0.000010	0.000058	0.000021	0.000032	0.000034	0.00012 DLHC	0.000166
Chromium (Cr)-Total	mg/L	-	-		0.00172	0.00170	0.00212	0.00273	0.00239	0.00356	0.00335	<0.0050 DLHC	0.0117
Cobalt (Co)-Total	mg/L	0.0009	-		<0.00010	<0.00010	<0.00010	0.00043	0.00015	0.00019	0.00019	<0.0010 DLHC	0.00131
Copper (Cu)-Total	mg/L	0.001	-		0.0040	0.0039	0.0031	0.0083	0.0048	0.0063	0.0082	<0.010 DLHC	0.0224
Iron (Fe)-Total	mg/L	0.3	-		0.184	0.230	0.477	0.923	0.423	0.385	0.379	0.12 DLHC	5.33
Lead (Pb)-Total	mg/L	0.001	-		0.00085	0.00079	0.00051	0.00332	0.00266	0.00168	0.00250	0.00071 DLHC	0.0218
Magnesium (Mg)-Total	mg/L	-	-		2.80	3.32	6.35	4.98	12.7	2.51	7.76	27.4 DLHC	6.63
Manganese (Mn)-Total	mg/L	-	-		0.00841	0.0134	0.0195	0.0678	0.0433	0.0460	0.0352	0.0243 DLHC	0.293
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000018
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000505	0.000533	0.000434	0.000680	0.000685	0.000991	0.00118	0.00173 DLHC	0.000921
Nickel (Ni)-Total	mg/L	0.025	-		0.00062	0.00058	<0.00050	0.00135	0.00083	0.00110	0.00103	<0.0050 DLHC	0.00465
Potassium (K)-Total	mg/L	-	-		1.08	1.33	1.20	1.26	2.39	1.08	2.95	8.95 DLHC	1.82
Rubidium (Rb)-Total	mg/L	-	-		0.00068	0.00070	0.00060	0.00150	0.00114	0.00135	0.00239	0.0041 DLHC	0.00418
Selenium (Se)-Total	mg/L	0.1	-		0.000114	0.000130	0.000241	0.000146	0.000592	0.000176	0.000323	0.00092 DLHC	0.000241
Silicon (Si)-Total	mg/L	-	-		1.10	1.54	1.90	2.13	2.79	1.41	2.51	3.9 DLHC	4.12
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050 DLHC	0.000209
Sodium (Na)-Total	mg/L	-	-		33.7	22.3	39.3	28.8	86.5	20.5	78.8	518 DLHC	19.0
Strontium (Sr)-Total	mg/L	-	-		0.0865	0.110	0.132	0.149	0.201	0.0942	0.168	0.380 DLHC	0.0806
Sulfur (S)-Total	mg/L	-	-		2.17	1.98	3.16	3.78	9.05	2.80	8.39	20.1 DLHC	2.19
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020 DLHC	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.00010 DLHC	0.000031

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Total Metals - WATER

				Lab ID	L2143440-10
				Sample Date	08-AUG-18
				Sample ID	PC-10
		Guide Limits			
Analyte	Unit	#1	#2		
Aluminum (Al)-Total	mg/L	0.015	-	7.52	
Antimony (Sb)-Total	mg/L	0.02	-	0.00069	
Arsenic (As)-Total	mg/L	0.005	-	0.00359	
Barium (Ba)-Total	mg/L	-	-	0.0613	
Beryllium (Be)-Total	mg/L	0.011	-	0.00034	
Bismuth (Bi)-Total	mg/L	-	-	0.000405	
Boron (B)-Total	mg/L	0.2	-	0.030	
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000343	
Calcium (Ca)-Total	mg/L	-	-	50.2	
Cesium (Cs)-Total	mg/L	-	-	0.000414	
Chromium (Cr)-Total	mg/L	-	-	0.0106	
Cobalt (Co)-Total	mg/L	0.0009	-	0.00516	
Copper (Cu)-Total	mg/L	0.001	-	0.0519	
Iron (Fe)-Total	mg/L	0.3	-	9.77	
Lead (Pb)-Total	mg/L	0.001	-	0.0188	
Magnesium (Mg)-Total	mg/L	-	-	11.4	
Manganese (Mn)-Total	mg/L	-	-	0.251	
Mercury (Hg)-Total	mg/L	0.0002	-	0.000040	
Molybdenum (Mo)-Total	mg/L	0.04	-	0.000768	
Nickel (Ni)-Total	mg/L	0.025	-	0.0126	
Potassium (K)-Total	mg/L	-	-	8.94	
Rubidium (Rb)-Total	mg/L	-	-	0.0135	
Selenium (Se)-Total	mg/L	0.1	-	0.000377	
Silicon (Si)-Total	mg/L	-	-	11.9	
Silver (Ag)-Total	mg/L	0.0001	-	0.000152	
Sodium (Na)-Total	mg/L	-	-	30.8	
Strontium (Sr)-Total	mg/L	-	-	0.191	
Sulfur (S)-Total	mg/L	-	-	9.10	
Tellurium (Te)-Total	mg/L	-	-	<0.00020	
Thallium (Tl)-Total	mg/L	0.0003	-	<0.000060 DLUI	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2143440-1 08-AUG-18 PC-1	L2143440-2 08-AUG-18 PC-2	L2143440-3 08-AUG-18 PC-3	L2143440-4 08-AUG-18 PC-4	L2143440-5 08-AUG-18 PC-5	L2143440-6 08-AUG-18 PC-6	L2143440-7 08-AUG-18 PC-7	L2143440-8 08-AUG-18 PC-8	L2143440-9 08-AUG-18 PC-9
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010 DLHC	0.00012
Tin (Sn)-Total	mg/L	-	-	0.00091	0.00040	0.00023	0.00038	0.00026	0.00038	0.00035	<0.0010 DLHC	0.00151
Titanium (Ti)-Total	mg/L	-	-	0.00313	0.00642	0.00404	0.0205	0.00675	0.00981	0.0101	<0.0030 DLHC	0.0642
Tungsten (W)-Total	mg/L	0.03	-	<0.00010	<0.00010	<0.00010	0.00013	0.00020	0.00019	0.00058	<0.0010 DLHC	0.00087
Uranium (U)-Total	mg/L	0.005	-	0.000084	0.000046	0.000123	0.000244	0.000682	0.000100	0.000324	0.00061 DLHC	0.000226
Vanadium (V)-Total	mg/L	0.006	-	0.00161	0.00136	0.00121	0.00251	0.00137	0.00216	0.00222	<0.0050 DLHC	0.00596
Zinc (Zn)-Total	mg/L	0.02	-	0.0187	0.0099	0.0155	0.0294	0.0148	0.0224	0.0355	<0.030 DLHC	0.102
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	0.00035	<0.00030	<0.00030	0.00041	<0.0030 DLHC	0.00203

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2143440-10 Sample Date: 08-AUG-18 Sample ID: PC-10
Thorium (Th)-Total	mg/L	-	-	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00061
Titanium (Ti)-Total	mg/L	-	-	0.159
Tungsten (W)-Total	mg/L	0.03	-	<0.00010
Uranium (U)-Total	mg/L	0.005	-	0.000405
Vanadium (V)-Total	mg/L	0.006	-	0.0180
Zinc (Zn)-Total	mg/L	0.02	-	0.163
Zirconium (Zr)-Total	mg/L	0.004	-	0.00102

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

				Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits											
Analyte	Unit	#1	#2										
Chromium, Hexavalent	ug/L	1	-		1.45	1.53	<0.50	1.56	0.78	2.43	2.39	1.58	5.43

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2143440-10 Sample Date: 08-AUG-18 Sample ID: PC-10
Chromium, Hexavalent	ug/L	1	-	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

				Lab ID	L2143440-1	L2143440-2	L2143440-3	L2143440-4	L2143440-5	L2143440-6	L2143440-7	L2143440-8	L2143440-9
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits											
Analyte	Unit	#1	#2										
Acenaphthene	ug/L	-	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.398	<0.020
Acenaphthylene	ug/L	-	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.035	<0.020
Anthracene	ug/L	0.0008	-		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.066	<0.010	0.020
Benzo(a)anthracene	ug/L	0.0004	-		<0.020	<0.020	<0.020	<0.020	0.026	<0.020	0.077	<0.020	0.122
Benzo(a)pyrene	ug/L	-	-		0.015	0.010	<0.010	0.022	0.032	0.011	0.048	<0.010	0.168
Benzo(b)fluoranthene	ug/L	-	-		0.059	0.032	<0.020	0.055	0.080	0.032	0.126	<0.020	0.376
Benzo(g,h,i)perylene	ug/L	0.00002	-		0.025	<0.020	<0.020	0.031	0.038	<0.020	0.045	<0.020	0.206
Benzo(k)fluoranthene	ug/L	0.0002	-		0.016	0.010	<0.010	0.018	0.024	0.010	0.041	<0.010	0.108
Chrysene	ug/L	0.0001	-		0.053	0.022	0.010	0.048	0.068	0.028	0.174	0.012	0.256
Dibenzo(ah)anthracene	ug/L	0.002	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.036
Fluoranthene	ug/L	0.008	-		0.152	0.057	0.022	0.109	0.184	0.069	0.765	0.103	0.584
Fluorene	ug/L	0.2	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.067	0.022	0.027
Indeno(1,2,3-cd)pyrene	ug/L	-	-		0.027	<0.020	<0.020	0.030	0.041	<0.020	0.052	<0.020	0.212
1-Methylnaphthalene	ug/L	2	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.068	<0.050	<0.050
Phenanthrene	ug/L	0.03	-		0.056	0.024	<0.020	0.052	0.084	0.040	0.959	0.024	0.282
Pyrene	ug/L	-	-		0.082	0.036	<0.020	0.076	0.124	0.045	0.461	0.108	0.442
Surrogate: d10-Acenaphthene	%	-	-		96.4	92.4	95.4	95.7	90.4	98.1	92.7	94.0	92.7
Surrogate: d12-Chrysene	%	-	-		113.4	112.3	113.7	112.1	107.7	117.3	109.3	109.5	109.9
Surrogate: d8-Naphthalene	%	-	-		98.5	95.2	97.9	99.3	93.3	101.6	111.5	93.6	92.6
Surrogate: d10-Phenanthrene	%	-	-		101.8	99.8	101.8	101.3	97.2	105.3	100.8	101.6	101.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2143440-10
			Sample Date	08-AUG-18
			Sample ID	PC-10
		Guide Limits		
Analyte	Unit	#1	#2	
Acenaphthene	ug/L	-	-	<0.020
Acenaphthylene	ug/L	-	-	<0.020
Anthracene	ug/L	0.0008	-	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010
Benzo(b)fluoranthene	ug/L	-	-	0.026
Benzo(g,h,i)perylene	ug/L	0.00002	-	0.062
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010
Chrysene	ug/L	0.0001	-	0.026
Dibenzo(ah)anthracene	ug/L	0.002	-	0.032
Fluoranthene	ug/L	0.008	-	0.056
Fluorene	ug/L	0.2	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.340
1-Methylnaphthalene	ug/L	2	-	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020
Naphthalene	ug/L	7	-	<0.050
Phenanthrene	ug/L	0.03	-	0.064
Pyrene	ug/L	-	-	0.039
Surrogate: d10-Acenaphthene	%	-	-	98.3
Surrogate: d12-Chrysene	%	-	-	111.2
Surrogate: d8-Naphthalene	%	-	-	105.1
Surrogate: d10-Phenanthrene	%	-	-	100.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT Water Total P in Water by Colour APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT Water Total Dissolved P in Water by Colour APHA 4500-P B E

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

P-TD-COL-WT Water Total Dissolved P in Water by Colour APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PAH-PWQO-WT Water PWQO Polyaromatic Hydrocarbons (PAHs) SW846 8270

Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.

PH-WT Water pH APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

SOLIDS-TSS-WT Water Suspended solids APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TC-MF-WT Water Total Coliforms SM 9222B

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200

TKN-WT Water Total Kjeldahl Nitrogen APHA 4500-Norg D

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

Reference Information

17-684113

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2143440 Report Date: 16-AUG-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Chloride (Cl)		79.3	79.4		mg/L	0.1	20	11-AUG-18
WG2846994-2 LCS								
Chloride (Cl)			100.9		%		90-110	11-AUG-18
WG2846994-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Chloride (Cl)			98.7		%		75-125	11-AUG-18
CN-FREE-CFA-WT	**Water**							
Batch R4168767								
WG2848701-7 DUP		**L2142665-1**						
Cyanide, Free		<0.10	<0.10	RPD-NA	mg/L	N/A	20	13-AUG-18
WG2848701-6 LCS								
Cyanide, Free			99.0		%		80-120	13-AUG-18
WG2848701-5 MB								
Cyanide, Free			<0.0020		mg/L		0.002	13-AUG-18
WG2848701-8 MS		**L2142665-1**						
Cyanide, Free			76.3		%		75-125	13-AUG-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4162638								
WG2845041-4 DUP		**WG2845041-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	09-AUG-18
WG2845041-2 LCS								
Chromium, Hexavalent			100.2		%		80-120	09-AUG-18
WG2845041-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	09-AUG-18
WG2845041-5 MS		**WG2845041-3**						
Chromium, Hexavalent			96.5		%		70-130	09-AUG-18
EC-MF-WT	**Water**							
Batch R4166127								
WG2844740-3 DUP		**L2143430-1**						
E. Coli		1320	1280		CFU/100mL	3.1	65	10-AUG-18
WG2844740-1 MB								
E. Coli			0		CFU/100mL		1	10-AUG-18
EC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4162565								
WG2844537-8 DUP		**WG2844537-7**						
Conductivity		299	296		umhos/cm	1.0	10	09-AUG-18
WG2844537-6 LCS								
Conductivity			98.1		%		90-110	09-AUG-18
WG2844537-5 MB								
Conductivity			<3.0		umhos/cm		3	09-AUG-18
HG-T-CVAA-WT	**Water**							
Batch R4161892								
WG2844663-4 DUP		**WG2844663-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-AUG-18
WG2844663-2 LCS								
Mercury (Hg)-Total			105.0		%		80-120	09-AUG-18
WG2844663-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	09-AUG-18
WG2844663-6 MS		**WG2844663-5**						
Mercury (Hg)-Total			102.2		%		70-130	09-AUG-18
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-4 DUP		**WG2845592-3**						
Aluminum (Al)-Total		0.114	0.119		mg/L	3.9	20	13-AUG-18
Antimony (Sb)-Total		0.00044	0.00041		mg/L	6.3	20	13-AUG-18
Arsenic (As)-Total		0.00030	0.00029		mg/L	2.0	20	13-AUG-18
Barium (Ba)-Total		0.0147	0.0148		mg/L	0.8	20	13-AUG-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-18
Boron (B)-Total		0.012	0.013		mg/L	2.8	20	13-AUG-18
Cadmium (Cd)-Total		0.0000148	0.0000167		mg/L	12	20	13-AUG-18
Calcium (Ca)-Total		22.2	21.4		mg/L	3.4	20	13-AUG-18
Chromium (Cr)-Total		0.00172	0.00170		mg/L	1.3	20	13-AUG-18
Cesium (Cs)-Total		0.000014	0.000013		mg/L	13	20	13-AUG-18
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Copper (Cu)-Total		0.0040	0.0041		mg/L	1.9	20	13-AUG-18
Iron (Fe)-Total		0.184	0.183		mg/L	0.7	20	13-AUG-18
Lead (Pb)-Total		0.000848	0.000864		mg/L	1.8	20	13-AUG-18
Magnesium (Mg)-Total		2.80	2.75		mg/L	1.7	20	13-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-4 DUP		**WG2845592-3**						
Manganese (Mn)-Total		0.00841	0.00869		mg/L	3.2	20	13-AUG-18
Molybdenum (Mo)-Total		0.000505	0.000497		mg/L	1.7	20	13-AUG-18
Nickel (Ni)-Total		0.00062	0.00065		mg/L	4.8	20	13-AUG-18
Potassium (K)-Total		1.08	1.08		mg/L	0.1	20	13-AUG-18
Rubidium (Rb)-Total		0.00068	0.00065		mg/L	4.4	20	13-AUG-18
Selenium (Se)-Total		0.000114	0.000112		mg/L	1.5	20	13-AUG-18
Silicon (Si)-Total		1.10	1.13		mg/L	3.1	20	13-AUG-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-18
Sodium (Na)-Total		33.7	33.6		mg/L	0.2	20	13-AUG-18
Strontium (Sr)-Total		0.0865	0.0884		mg/L	2.2	20	13-AUG-18
Sulfur (S)-Total		2.17	2.20		mg/L	1.2	25	13-AUG-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	13-AUG-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	13-AUG-18
Tin (Sn)-Total		0.00091	0.00092		mg/L	1.4	20	13-AUG-18
Titanium (Ti)-Total		0.00313	0.00308		mg/L	1.5	20	13-AUG-18
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Uranium (U)-Total		0.000084	0.000084		mg/L	0.1	20	13-AUG-18
Vanadium (V)-Total		0.00161	0.00169		mg/L	4.3	20	13-AUG-18
Zinc (Zn)-Total		0.0187	0.0191		mg/L	1.9	20	13-AUG-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	13-AUG-18
WG2845592-2 LCS								
Aluminum (Al)-Total			110.1		%		80-120	10-AUG-18
Antimony (Sb)-Total			99.4		%		80-120	10-AUG-18
Arsenic (As)-Total			100.2		%		80-120	10-AUG-18
Barium (Ba)-Total			103.5		%		80-120	10-AUG-18
Beryllium (Be)-Total			100.1		%		80-120	10-AUG-18
Bismuth (Bi)-Total			100.1		%		80-120	10-AUG-18
Boron (B)-Total			94.7		%		80-120	10-AUG-18
Cadmium (Cd)-Total			92.8		%		80-120	10-AUG-18
Calcium (Ca)-Total			100.9		%		80-120	10-AUG-18
Chromium (Cr)-Total			96.1		%		80-120	10-AUG-18
Cesium (Cs)-Total			93.1		%		80-120	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-2 LCS								
Cobalt (Co)-Total			97.0		%		80-120	10-AUG-18
Copper (Cu)-Total			97.5		%		80-120	10-AUG-18
Iron (Fe)-Total			93.8		%		80-120	10-AUG-18
Lead (Pb)-Total			100.8		%		80-120	10-AUG-18
Magnesium (Mg)-Total			98.9		%		80-120	10-AUG-18
Manganese (Mn)-Total			99.8		%		80-120	10-AUG-18
Molybdenum (Mo)-Total			99.6		%		80-120	10-AUG-18
Nickel (Ni)-Total			98.4		%		80-120	10-AUG-18
Potassium (K)-Total			97.4		%		80-120	10-AUG-18
Rubidium (Rb)-Total			99.5		%		80-120	10-AUG-18
Selenium (Se)-Total			99.7		%		80-120	10-AUG-18
Silicon (Si)-Total			99.9		%		60-140	10-AUG-18
Silver (Ag)-Total			97.5		%		80-120	10-AUG-18
Sodium (Na)-Total			101.5		%		80-120	10-AUG-18
Strontium (Sr)-Total			95.3		%		80-120	10-AUG-18
Sulfur (S)-Total			93.0		%		80-120	10-AUG-18
Thallium (Tl)-Total			97.9		%		80-120	10-AUG-18
Tellurium (Te)-Total			100.9		%		80-120	10-AUG-18
Thorium (Th)-Total			93.1		%		70-130	10-AUG-18
Tin (Sn)-Total			91.9		%		80-120	10-AUG-18
Titanium (Ti)-Total			96.9		%		80-120	10-AUG-18
Tungsten (W)-Total			91.6		%		80-120	10-AUG-18
Uranium (U)-Total			97.0		%		80-120	10-AUG-18
Vanadium (V)-Total			100.1		%		80-120	10-AUG-18
Zinc (Zn)-Total			93.8		%		80-120	10-AUG-18
Zirconium (Zr)-Total			93.2		%		80-120	10-AUG-18
WG2845592-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	10-AUG-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-1 MB								
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	10-AUG-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-AUG-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	10-AUG-18
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	10-AUG-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Silicon (Si)-Total			<0.10		mg/L		0.1	10-AUG-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	10-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	10-AUG-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	10-AUG-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-AUG-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	10-AUG-18
WG2845592-5 MS		**WG2845592-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	10-AUG-18
Antimony (Sb)-Total			103.1		%		70-130	10-AUG-18
Arsenic (As)-Total			102.9		%		70-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-5 MS		**WG2845592-6**						
Barium (Ba)-Total			N/A	MS-B	%		-	10-AUG-18
Beryllium (Be)-Total			99.8		%		70-130	10-AUG-18
Bismuth (Bi)-Total			96.2		%		70-130	10-AUG-18
Boron (B)-Total			93.5		%		70-130	10-AUG-18
Cadmium (Cd)-Total			100.6		%		70-130	10-AUG-18
Calcium (Ca)-Total			N/A	MS-B	%		-	10-AUG-18
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-18
Cesium (Cs)-Total			95.1		%		70-130	10-AUG-18
Cobalt (Co)-Total			99.5		%		70-130	10-AUG-18
Copper (Cu)-Total			99.7		%		70-130	10-AUG-18
Iron (Fe)-Total			N/A	MS-B	%		-	10-AUG-18
Lead (Pb)-Total			96.9		%		70-130	10-AUG-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	10-AUG-18
Manganese (Mn)-Total			N/A	MS-B	%		-	10-AUG-18
Molybdenum (Mo)-Total			103.2		%		70-130	10-AUG-18
Nickel (Ni)-Total			98.6		%		70-130	10-AUG-18
Potassium (K)-Total			93.0		%		70-130	10-AUG-18
Rubidium (Rb)-Total			98.2		%		70-130	10-AUG-18
Selenium (Se)-Total			100.3		%		70-130	10-AUG-18
Silicon (Si)-Total			N/A	MS-B	%		-	10-AUG-18
Silver (Ag)-Total			96.5		%		70-130	10-AUG-18
Sodium (Na)-Total			N/A	MS-B	%		-	10-AUG-18
Strontium (Sr)-Total			N/A	MS-B	%		-	10-AUG-18
Sulfur (S)-Total			94.2		%		70-130	10-AUG-18
Thallium (Tl)-Total			96.7		%		70-130	10-AUG-18
Tellurium (Te)-Total			98.4		%		70-130	10-AUG-18
Thorium (Th)-Total			90.2		%		70-130	10-AUG-18
Tin (Sn)-Total			93.1		%		70-130	10-AUG-18
Titanium (Ti)-Total			90.6		%		70-130	10-AUG-18
Tungsten (W)-Total			92.4		%		70-130	10-AUG-18
Uranium (U)-Total			99.9		%		70-130	10-AUG-18
Vanadium (V)-Total			102.6		%		70-130	10-AUG-18
Zinc (Zn)-Total			92.5		%		70-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-5 MS		**WG2845592-6**						
Zirconium (Zr)-Total			88.5		%		70-130	10-AUG-18
NO2-IC-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Nitrite (as N)		0.044	0.044		mg/L	1.1	25	11-AUG-18
WG2846994-2 LCS								
Nitrite (as N)			100.8		%		70-130	11-AUG-18
WG2846994-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Nitrite (as N)			99.7		%		70-130	11-AUG-18
NO3-IC-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Nitrate (as N)		0.829	0.831		mg/L	0.2	25	11-AUG-18
WG2846994-2 LCS								
Nitrate (as N)			100.6		%		70-130	11-AUG-18
WG2846994-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Nitrate (as N)			98.6		%		70-130	11-AUG-18
P-T-COL-WT	**Water**							
Batch R4169436								
WG2848285-3 DUP		**L2143439-2**						
Phosphorus, Total		0.0556	0.0559		mg/L	0.4	20	15-AUG-18
WG2848285-2 LCS								
Phosphorus, Total			94.0		%		80-120	15-AUG-18
WG2848285-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	15-AUG-18
WG2848285-4 MS		**L2143439-2**						
Phosphorus, Total			93.7		%		70-130	15-AUG-18
P-TD-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4170676								
WG2849114-3 DUP		**L2143440-1**						
Phosphorus (P)-Total	Dissolved	0.0378	0.0331		mg/L	13	20	16-AUG-18
WG2849114-2 LCS								
Phosphorus (P)-Total	Dissolved		93.4		%		80-120	16-AUG-18
WG2849114-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	16-AUG-18
WG2849114-4 MS		**L2143440-1**						
Phosphorus (P)-Total	Dissolved		93.5		%		70-130	16-AUG-18
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-2 LCS								
1-Methylnaphthalene			109.7		%		50-150	10-AUG-18
2-Methylnaphthalene			101.7		%		50-150	10-AUG-18
Acenaphthene			108.2		%		50-150	10-AUG-18
Acenaphthylene			109.0		%		50-150	10-AUG-18
Anthracene			121.5		%		60-130	10-AUG-18
Benzo(a)anthracene			127.8		%		60-130	10-AUG-18
Benzo(a)pyrene			109.6		%		50-150	10-AUG-18
Benzo(b)fluoranthene			110.8		%		50-150	10-AUG-18
Benzo(g,h,i)perylene			111.6		%		60-130	10-AUG-18
Benzo(k)fluoranthene			109.8		%		60-130	10-AUG-18
Chrysene			124.5		%		60-130	10-AUG-18
Dibenzo(ah)anthracene			116.0		%		60-130	10-AUG-18
Fluoranthene			112.5		%		60-130	10-AUG-18
Fluorene			113.2		%		50-150	10-AUG-18
Indeno(1,2,3-cd)pyrene			117.2		%		50-150	10-AUG-18
Naphthalene			98.1		%		50-150	10-AUG-18
Phenanthrene			112.7		%		50-150	10-AUG-18
Pyrene			113.3		%		50-150	10-AUG-18
WG2844553-3 LCSD		**WG2844553-2**						
1-Methylnaphthalene		109.7	117.7		%	7.0	50	10-AUG-18
2-Methylnaphthalene		101.7	114.7		%	12	50	10-AUG-18
Acenaphthene		108.2	111.7		%	3.2	50	10-AUG-18
Acenaphthylene		109.0	114.1		%	4.6	50	10-AUG-18
Anthracene		121.5	126.2		%	3.8	50	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-3 LCSD		**WG2844553-2**						
Benzo(a)anthracene		127.8	127.0		%	0.6	50	10-AUG-18
Benzo(a)pyrene		109.6	114.2		%	4.1	50	10-AUG-18
Benzo(b)fluoranthene		110.8	116.2		%	4.7	50	10-AUG-18
Benzo(g,h,i)perylene		111.6	116.1		%	3.9	50	10-AUG-18
Benzo(k)fluoranthene		109.8	115.0		%	4.6	50	10-AUG-18
Chrysene		124.5	125.8		%	1.1	50	10-AUG-18
Dibenzo(ah)anthracene		116.0	119.3		%	2.8	50	10-AUG-18
Fluoranthene		112.5	117.7		%	4.5	50	10-AUG-18
Fluorene		113.2	118.5		%	4.5	50	10-AUG-18
Indeno(1,2,3-cd)pyrene		117.2	121.2		%	3.4	50	10-AUG-18
Naphthalene		98.1	113.0		%	14	50	10-AUG-18
Phenanthrene		112.7	117.5		%	4.2	50	10-AUG-18
Pyrene		113.3	118.6		%	4.5	50	10-AUG-18
WG2844553-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	10-AUG-18
2-Methylnaphthalene			<0.020		ug/L		0.02	10-AUG-18
Acenaphthene			<0.020		ug/L		0.02	10-AUG-18
Acenaphthylene			<0.020		ug/L		0.02	10-AUG-18
Anthracene			<0.010		ug/L		0.01	10-AUG-18
Benzo(a)anthracene			<0.020		ug/L		0.02	10-AUG-18
Benzo(a)pyrene			<0.010		ug/L		0.01	10-AUG-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	10-AUG-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	10-AUG-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	10-AUG-18
Chrysene			<0.010		ug/L		0.01	10-AUG-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	10-AUG-18
Fluoranthene			<0.010		ug/L		0.01	10-AUG-18
Fluorene			<0.020		ug/L		0.02	10-AUG-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	10-AUG-18
Naphthalene			<0.050		ug/L		0.05	10-AUG-18
Phenanthrene			<0.020		ug/L		0.02	10-AUG-18
Pyrene			<0.020		ug/L		0.02	10-AUG-18
Surrogate: d8-Naphthalene			102.6		%		40-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-1 MB								
Surrogate: d10-Phenanthrene			103.2		%		40-130	10-AUG-18
Surrogate: d12-Chrysene			114.4		%		40-130	10-AUG-18
Surrogate: d10-Acenaphthene			99.0		%		40-130	10-AUG-18
PH-WT	**Water**							
Batch R4162565								
WG2844537-8 DUP		**WG2844537-7**						
pH		7.71	7.74	J	pH units	0.04	0.2	09-AUG-18
WG2844537-6 LCS								
pH			7.01		pH units		6.9-7.1	09-AUG-18
SOLIDS-TSS-WT	**Water**							
Batch R4167227								
WG2845996-3 DUP		**L2143607-1**						
Total Suspended Solids		306	315		mg/L	2.9	20	13-AUG-18
WG2845996-2 LCS								
Total Suspended Solids			98.3		%		85-115	13-AUG-18
WG2845996-1 MB								
Total Suspended Solids			<2.0		mg/L		2	13-AUG-18
TC-MF-WT	**Water**							
Batch R4166110								
WG2844734-3 DUP		**L2143439-3**						
Total Coliforms		96000	91000		CFU/100mL	5.3	65	10-AUG-18
WG2844734-1 MB								
Total Coliforms			0		CFU/100mL		1	10-AUG-18
TKN-WT	**Water**							
Batch R4168095								
WG2847380-7 DUP		**L2143439-1**						
Total Kjeldahl Nitrogen		1.20	1.35		mg/L	12	20	13-AUG-18
WG2847380-6 LCS								
Total Kjeldahl Nitrogen			97.0		%		75-125	13-AUG-18
WG2847380-5 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	13-AUG-18
WG2847380-8 MS		**L2143439-1**						
Total Kjeldahl Nitrogen			102.2		%		70-130	13-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4169683								
WG2847732-3 DUP		**L2143433-1**						
Total Kjeldahl Nitrogen		1.11	1.19		mg/L	6.7	20	14-AUG-18
WG2847732-2 LCS								
Total Kjeldahl Nitrogen			104.7		%		75-125	14-AUG-18
WG2847732-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	14-AUG-18
WG2847732-4 MS		**L2143433-1**						
Total Kjeldahl Nitrogen			101.7		%		70-130	14-AUG-18

Quality Control Report

Workorder: L2143440 Report Date: 16-AUG-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2143440-COFC

COC Number: 17 - 684113

Page ... of ...

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Aquafor Beech Ltd.	Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:		Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business day [E-100%] ☐ / Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)] ☐
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:		Email 1 or Fax	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:		Email 2	
Postal Code:		Email 3	

Invoice To	Same as Report To ☐ YES ☐ NO	Invoice Distribution
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Company:		Email 1 or Fax
Contact:		Email 2

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2143440 COC	ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Analysis Request: Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	PC-1	8-AUG	10:00					
2	-2		10:15					
3	-3		11:00					
4	-4		11:25					
5	-5		14:00					
6	-6		12:30					
7	-7		12:45					
8	-8		13:38					
9	-9		15:20					
10	-10 W/ ND		14:56					

2 COOLERS

Bottles say sampled today

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☐	Ice Cubes ☒	Custody seal Intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
		0	0	15.3	21.0		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: Andrea C.	Date: Aug 8/18	Time: 17:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

SIF.

White Paper Co. 604 951-3800

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 20-SEP-18
Report Date: 04-OCT-18 15:13 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2168276

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-684122
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2168276-1	PC-1	Anions and Nutrients	Phosphorus, Total	5.65	0.01	mg/L
		Bacteriological Tests	E. Coli	460000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.437	0.015	mg/L
			Cadmium (Cd)-Total	0.000136	0.0001	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	0.160	0.001	mg/L
			Iron (Fe)-Total	0.82	0.3	mg/L
			Lead (Pb)-Total	0.00454	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	0.138	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.020	0.0008	ug/L
			Benzo(a)anthracene	<0.040	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.040	0.00002	ug/L
			Benzo(k)fluoranthene	<0.020	0.0002	ug/L
			Chrysene	0.052	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.040	0.002	ug/L
			Fluoranthene	0.036	0.008	ug/L
			Phenanthrene	0.052	0.03	ug/L
L2168276-2	PC-2	Anions and Nutrients	Phosphorus, Total	5.52	0.01	mg/L
		Bacteriological Tests	E. Coli	440000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.227	0.015	mg/L
			Cadmium (Cd)-Total	0.000146	0.0001	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	0.137	0.001	mg/L
			Lead (Pb)-Total	0.00248	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	0.125	0.02	mg/L
			Zirconium (Zr)-Total	0.0043	0.004	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.020	0.0008	ug/L
			Benzo(a)anthracene	<0.040	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.040	0.00002	ug/L
			Benzo(k)fluoranthene	<0.020	0.0002	ug/L
			Chrysene	0.036	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.040	0.002	ug/L
			Fluoranthene	0.040	0.008	ug/L
			Phenanthrene	0.056	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2168276-3	PC-3	Anions and Nutrients	Phosphorus, Total	0.288	0.01	mg/L
		Bacteriological Tests	E. Coli	3200	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.378	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Iron (Fe)-Total	1.41	0.3	mg/L
			Lead (Pb)-Total	0.00207	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	<0.030	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.32	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.025	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.047	0.008	ug/L
L2168276-4	PC-4	Anions and Nutrients	Phosphorus, Total	0.0601	0.01	mg/L
		Bacteriological Tests	E. Coli	4100	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.183	0.015	mg/L
			Copper (Cu)-Total	0.0023	0.001	mg/L
			Iron (Fe)-Total	0.476	0.3	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.033	0.008	ug/L
L2168276-5	PC-5	Anions and Nutrients	Phosphorus, Total	0.0129	0.01	mg/L
		Bacteriological Tests	E. Coli	1720	100	CFU/100mL
		Total Metals	Copper (Cu)-Total	0.0013	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2168276-5	PC-5	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2168276-6	PC-6	Anions and Nutrients	Phosphorus, Total	0.0599	0.01	mg/L
		Bacteriological Tests	E. Coli	660	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.048	0.015	mg/L
			Copper (Cu)-Total	0.0031	0.001	mg/L
			Zinc (Zn)-Total	0.0201	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.016	0.008	ug/L
L2168276-7	PC-7	Anions and Nutrients	Phosphorus, Total	0.0117	0.01	mg/L
		Speciated Metals	Chromium, Hexavalent	1.55	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2168276-8	PC-8	Anions and Nutrients	Phosphorus, Total	0.0139	0.01	mg/L
		Bacteriological Tests	E. Coli	840	100	CFU/100mL
		Total Metals	Copper (Cu)-Total	0.0014	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2168276-9	PC-9	Anions and Nutrients	Phosphorus, Total	0.0224	0.01	mg/L
		Bacteriological Tests	E. Coli	670	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.044	0.015	mg/L
			Copper (Cu)-Total	0.0027	0.001	mg/L
			Iron (Fe)-Total	0.611	0.3	mg/L
		Volatile Organic Compounds	Trichloroethylene	56.9	20	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.010	0.008	ug/L
L2168276-10	PC-10	Anions and Nutrients	Phosphorus, Total	0.0204	0.01	mg/L
		Bacteriological Tests	E. Coli	5600	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.062	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Iron (Fe)-Total	0.37	0.3	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	<0.030	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Conductivity	umhos/cm	-	-		1770	2720	6840	1580	1760	569	1640	1520	1530
Hardness (as CaCO3)	mg/L	-	-		323 HTC	364 HTC	567 HTC	373 HTC	402 HTC	120 HTC	377 HTC	369 HTC	459 HTC
pH	pH units	6.5-8.5	-		7.67	7.73	8.15	8.16	8.28	7.98	8.25	8.24	8.08
Total Suspended Solids	mg/L	-	-		328 DLHC	213 DLHC	26.0 DLHC	7.4	3.4	5.3	2.1	2.1	7.7

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2168276-10 Sample Date: 20-SEP-18 Sample ID: PC-10
Conductivity	umhos/cm	-	-	2340
Hardness (as CaCO3)	mg/L	-	-	400 HTC
pH	pH units	6.5-8.5	-	8.12
Total Suspended Solids	mg/L	-	-	21.7

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

				Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	Unit	Guide Limits #1	#2										
Chloride (Cl)	mg/L	-	-		341 DLDS	764 DLDS	2600 DLDS	354 DLDS	410 DLDS	109	392 DLDS	337 DLDS	280 DLDS
Nitrate (as N)	mg/L	-	-		<0.10 DLDS	<0.10 DLDS	0.92 DLDS	2.79 DLDS	5.50 DLDS	0.829	5.28 DLDS	5.11 DLDS	0.49 DLDS
Nitrite (as N)	mg/L	-	-		<0.050 DLDS	<0.050 DLDS	<0.10 DLDS	<0.050 DLDS	<0.050 DLDS	<0.010	<0.050 DLDS	<0.050 DLDS	<0.050 DLDS
Total Kjeldahl Nitrogen	mg/L	-	-		51.9 DLM	71	1.72	6.78	1.06	4.26	1.03	3.09	4.11
Total Nitrogen	mg/L	-	-		51.9	71	2.64	9.57	6.56	5.09	6.31	8.20	4.60
Phosphorus (P)-Total Dissolved	mg/L	-	-		3.12	3.26	0.168	0.0302	0.0118	0.0548	0.0104	0.0063	0.0039
Phosphorus, Total	mg/L	0.01	-		5.65 DLHC	5.52 DLHC	0.288	0.0601	0.0129	0.0599	0.0117	0.0139	0.0224

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

		Guide Limits			
				Lab ID	L2168276-10
				Sample Date	20-SEP-18
				Sample ID	PC-10
Analyte	**Unit**	**#1**	**#2**		
Chloride (Cl)	mg/L	-	-	614 DLDS	
Nitrate (as N)	mg/L	-	-	4.79 DLDS	
Nitrite (as N)	mg/L	-	-	<0.050 DLDS	
Total Kjeldahl Nitrogen	mg/L	-	-	7.79	
Total Nitrogen	mg/L	-	-	12.6	
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0076	
Phosphorus, Total	mg/L	0.01	-	0.0204	

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits								
Lab ID				L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
Sample Date				20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	**Unit**	**#1**	**#2**									
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits		
Lab ID				L2168276-10
Sample Date				20-SEP-18
Sample ID				PC-10
Analyte	**Unit**	**#1**	**#2**	
Cyanide, Free	mg/L	0.005	-	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits								
Analyte	**Unit**	**#1**	**#2**							
Lab ID				L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
Sample Date				20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
E. Coli	CFU/100mL	100	-	460000 DLM	440000 DLM	3200 DLM	4100 DLM	1720 DLM	660 DLM	12	840 DLM	670 DLM
Total Coliforms	CFU/100mL	-	-	760000 DLM	840000 DLM	47000 DLM	146000 DLM	61000 DLM	46000 DLM	2400 DLM	76000 DLM	48000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Lab ID				L2168276-10
Sample Date				20-SEP-18
Sample ID				PC-10
E. Coli	CFU/100mL	100	-	5600 DLM
Total Coliforms	CFU/100mL	-	-	61000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
			Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
			Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits										
Analyte	Unit	#1	#2									
Sodium Adsorption Ratio	SAR	-	-	4.64	5.69	25.9	3.89	4.46	2.23	4.18	3.65	2.94

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2168276-10
			Sample Date	20-SEP-18
			Sample ID	PC-10
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Sodium Adsorption Ratio	SAR	-	-	7.83

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Aluminum (Al)-Total	mg/L	0.015	-		0.437 DLHC	0.227 DLHC	0.378 DLHC	0.183	<0.010	0.048	<0.010	<0.010	0.044
Antimony (Sb)-Total	mg/L	0.02	-		<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.00025	<0.00010	0.00038	0.00015	<0.00010	0.00021
Arsenic (As)-Total	mg/L	0.005	-		<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.00043	0.00015	0.00034	0.00019	0.00028	0.00105
Barium (Ba)-Total	mg/L	-	-		0.0635 DLHC	0.0759 DLHC	0.179 DLHC	0.107	0.118	0.0368	0.133	0.0880	0.190
Beryllium (Be)-Total	mg/L	0.011	-		<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		0.00373 DLHC	0.00269 DLHC	<0.00050 DLHC	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.18 DLHC	0.18 DLHC	0.10 DLHC	0.057	0.048	0.019	0.046	0.039	0.097
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000136 DLHC	0.000146 DLHC	0.000058 DLHC	0.000023	0.000011	0.000013	0.000012	0.000011	0.000024
Calcium (Ca)-Total	mg/L	-	-		84.2 DLHC	93.0 DLHC	162 DLHC	106	116	36.4	108	108	141
Cesium (Cs)-Total	mg/L	-	-		<0.00010 DLHC	<0.00010 DLHC	0.00027 DLHC	0.000030	0.000010	0.000012	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L	-	-		<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.00050	0.00056	0.00088	0.00154	0.00055	0.00121
Cobalt (Co)-Total	mg/L	0.0009	-		<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	0.00043
Copper (Cu)-Total	mg/L	0.001	-		0.160 DLHC	0.137 DLHC	<0.010 DLHC	0.0023	0.0013	0.0031	<0.0010	0.0014	0.0027
Iron (Fe)-Total	mg/L	0.3	-		0.82 DLHC	0.26 DLHC	1.41 DLHC	0.476	<0.050	0.219	<0.050	0.192	0.611
Lead (Pb)-Total	mg/L	0.001	-		0.00454 DLHC	0.00248 DLHC	0.00207 DLHC	0.00080	<0.00010	0.00056	<0.00010	<0.00010	0.00075
Magnesium (Mg)-Total	mg/L	-	-		27.5 DLHC	31.9 DLHC	39.7 DLHC	26.0	27.0	7.07	26.3	24.0	25.9
Manganese (Mn)-Total	mg/L	-	-		0.0463 DLHC	0.0333 DLHC	0.248 DLHC	0.106	0.0187	0.0346	0.00279	0.0504	0.226
Mercury (Hg)-Total	mg/L	0.0002	-		0.000041	0.000029	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.00315 DLHC	0.00285 DLHC	0.00214 DLHC	0.00126	0.000477	0.000742	0.000855	0.000316	0.00501
Nickel (Ni)-Total	mg/L	0.025	-		<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	0.00091	0.00056	0.00062	<0.00050	0.00053	0.00138
Potassium (K)-Total	mg/L	-	-		16.8 DLHC	17.0 DLHC	10.5 DLHC	3.60	4.14	2.06	3.86	2.90	4.37
Rubidium (Rb)-Total	mg/L	-	-		0.0130 DLHC	0.0128 DLHC	0.0039 DLHC	0.00127	0.00065	0.00113	0.00048	0.00073	0.00150
Selenium (Se)-Total	mg/L	0.1	-		0.00079 DLHC	0.00072 DLHC	<0.00050 DLHC	0.000668	0.00125	0.000237	0.00164	0.000960	0.000637
Silicon (Si)-Total	mg/L	-	-		2.4 DLHC	2.2 DLHC	6.9 DLHC	5.37	5.22	2.16	5.91	6.01	6.42
Silver (Ag)-Total	mg/L	0.0001	-		<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		192 DLHC	250 DLHC	1420 DLHC	173 DLHC	205 DLHC	56.2	187 DLHC	161 DLHC	145 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.616 DLHC	0.699 DLHC	0.964 DLHC	0.450	0.409	0.157	0.420	0.274	0.723
Sulfur (S)-Total	mg/L	-	-		24.8 DLHC	26.1 DLHC	37.5 DLHC	20.0	18.4	4.93	17.5	17.3	38.3
Tellurium (Te)-Total	mg/L	-	-		<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.000010	0.000010	<0.000010	<0.000010	<0.000010	0.000015

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2168276-10 Sample Date: 20-SEP-18 Sample ID: PC-10
Aluminum (Al)-Total	mg/L	0.015	-	0.062 DLHC
Antimony (Sb)-Total	mg/L	0.02	-	<0.0010 DLHC
Arsenic (As)-Total	mg/L	0.005	-	<0.0010 DLHC
Barium (Ba)-Total	mg/L	-	-	0.106 DLHC
Beryllium (Be)-Total	mg/L	0.011	-	<0.0010 DLHC
Bismuth (Bi)-Total	mg/L	-	-	<0.00050 DLHC
Boron (B)-Total	mg/L	0.2	-	<0.10 DLHC
Cadmium (Cd)-Total	mg/L	0.0001	-	<0.000050 DLHC
Calcium (Ca)-Total	mg/L	-	-	122 DLHC
Cesium (Cs)-Total	mg/L	-	-	0.00010 DLHC
Chromium (Cr)-Total	mg/L	-	-	<0.0050 DLHC
Cobalt (Co)-Total	mg/L	0.0009	-	<0.0010 DLHC
Copper (Cu)-Total	mg/L	0.001	-	<0.010 DLHC
Iron (Fe)-Total	mg/L	0.3	-	0.37 DLHC
Lead (Pb)-Total	mg/L	0.001	-	0.00080 DLHC
Magnesium (Mg)-Total	mg/L	-	-	23.4 DLHC
Manganese (Mn)-Total	mg/L	-	-	0.0103 DLHC
Mercury (Hg)-Total	mg/L	0.0002	-	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-	0.00053 DLHC
Nickel (Ni)-Total	mg/L	0.025	-	<0.0050 DLHC
Potassium (K)-Total	mg/L	-	-	3.28 DLHC
Rubidium (Rb)-Total	mg/L	-	-	<0.0020 DLHC
Selenium (Se)-Total	mg/L	0.1	-	0.00173 DLHC
Silicon (Si)-Total	mg/L	-	-	6.0 DLHC
Silver (Ag)-Total	mg/L	0.0001	-	<0.00050 DLHC
Sodium (Na)-Total	mg/L	-	-	360 DLHC
Strontium (Sr)-Total	mg/L	-	-	0.367 DLHC
Sulfur (S)-Total	mg/L	-	-	16.6 DLHC
Tellurium (Te)-Total	mg/L	-	-	<0.0020 DLHC
Thallium (Tl)-Total	mg/L	0.0003	-	<0.00010 DLHC

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2168276-1 20-SEP-18 PC-1	L2168276-2 20-SEP-18 PC-2	L2168276-3 20-SEP-18 PC-3	L2168276-4 20-SEP-18 PC-4	L2168276-5 20-SEP-18 PC-5	L2168276-6 20-SEP-18 PC-6	L2168276-7 20-SEP-18 PC-7	L2168276-8 20-SEP-18 PC-8	L2168276-9 20-SEP-18 PC-9
Thorium (Th)-Total	mg/L	-	-	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.0033 DLHC	0.0022 DLHC	<0.0010 DLHC	0.00040	<0.00010	0.00024	<0.00010	0.00033	0.00115
Titanium (Ti)-Total	mg/L	-	-	0.0186 DLHC	0.0050 DLHC	<0.020 DLUI	0.00617	<0.00030	0.00171	<0.00030	<0.00030	<0.0030 DLUI
Tungsten (W)-Total	mg/L	0.03	-	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.00010	<0.00010	0.00032	<0.00010	<0.00010	0.00070
Uranium (U)-Total	mg/L	0.005	-	0.00061 DLHC	0.00056 DLHC	0.00106 DLHC	0.00173	0.00201	0.000278	0.000492	0.00139	0.00422
Vanadium (V)-Total	mg/L	0.006	-	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	0.00078	<0.00050	0.00075	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	0.02	-	0.138 DLHC	0.125 DLHC	<0.030 DLHC	0.0057	0.0045	0.0201	<0.0030	0.0034	0.0184
Zirconium (Zr)-Total	mg/L	0.004	-	<0.0030 DLHC	0.0043 DLHC	<0.0030 DLHC	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2168276-10 Sample Date: 20-SEP-18 Sample ID: PC-10
Thorium (Th)-Total	mg/L	-	-	<0.0010 DLHC
Tin (Sn)-Total	mg/L	-	-	<0.0010 DLHC
Titanium (Ti)-Total	mg/L	-	-	<0.0030 DLHC
Tungsten (W)-Total	mg/L	0.03	-	<0.0010 DLHC
Uranium (U)-Total	mg/L	0.005	-	0.00145 DLHC
Vanadium (V)-Total	mg/L	0.006	-	<0.0050 DLHC
Zinc (Zn)-Total	mg/L	0.02	-	<0.030 DLHC
Zirconium (Zr)-Total	mg/L	0.004	-	<0.0030 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

				Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits											
Analyte	Unit	#1	#2										
Chromium, Hexavalent	ug/L	1	-		<0.50	<0.50	1.32	<0.50	0.75	0.58	1.55	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2168276-10 Sample Date: 20-SEP-18 Sample ID: PC-10
Chromium, Hexavalent	ug/L	1	-	0.90

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Acetone	ug/L	-	-		<290 RRR	<78 RRR	<30 VTHS	<30 VTHS	<30 VTHS	<30 VTHS	<30 VTHS	<30 VTHS	<30 VTHS
Benzene	ug/L	100	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
					<0.50 VTHS	<0.50 VTHS		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Bromodichloromethane	ug/L	200	-		<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS
Bromoform	ug/L	60	-		<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS
Bromomethane	ug/L	-	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Carbon tetrachloride	ug/L	-	-		<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS
Chlorobenzene	ug/L	15	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Dibromochloromethane	ug/L	40	-		<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS
Chloroform	ug/L	-	-		1.7 VTHS	1.8 VTHS	<1.0 VTHS	<1.0 VTHS	<1.0 VTHS	<1.0 VTHS	<1.0 VTHS	<1.0 VTHS	<1.0 VTHS
1,2-Dibromoethane	ug/L	5	-		<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS	<0.20 VTHS
1,2-Dichlorobenzene	ug/L	2.5	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,3-Dichlorobenzene	ug/L	2.5	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,4-Dichlorobenzene	ug/L	4	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Dichlorodifluoromethane	ug/L	-	-		<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS
1,1-Dichloroethane	ug/L	200	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,2-Dichloroethane	ug/L	100	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,1-Dichloroethylene	ug/L	40	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	0.62 VTHS
cis-1,2-Dichloroethylene	ug/L	-	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	0.75 VTHS	3.83 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	407 DLHC
trans-1,2-Dichloroethylene	ug/L	-	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	2.64 VTHS
Methylene Chloride	ug/L	100	-		<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS
1,2-Dichloropropane	ug/L	0.7	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
cis-1,3-Dichloropropene	ug/L	-	-		<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS
trans-1,3-Dichloropropene	ug/L	7	-		<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS
1,3-Dichloropropene (cis & trans)	ug/L	-	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
					<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
n-Hexane	ug/L	-	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Methyl Ethyl Ketone	ug/L	400	-		<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS
Methyl Isobutyl Ketone	ug/L	-	-		<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS	<20 VTHS
MTBE	ug/L	-	-		<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS	<2.0 VTHS
Styrene	ug/L	4	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

				Lab ID	L2168276-10
				Sample Date	20-SEP-18
				Sample ID	PC-10
		Guide Limits			
Analyte	Unit	#1	#2		
Acetone	ug/L	-	-	<30 VTHS	
Benzene	ug/L	100	-	<0.50 VTHS	
				<0.50 VTHS	
Bromodichloromethane	ug/L	200	-	<2.0 VTHS	
Bromoform	ug/L	60	-	<5.0 VTHS	
Bromomethane	ug/L	-	-	<0.50 VTHS	
Carbon tetrachloride	ug/L	-	-	<0.20 VTHS	
Chlorobenzene	ug/L	15	-	<0.50 VTHS	
Dibromochloromethane	ug/L	40	-	<2.0 VTHS	
Chloroform	ug/L	-	-	<1.0 VTHS	
1,2-Dibromoethane	ug/L	5	-	<0.20 VTHS	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	
1,4-Dichlorobenzene	ug/L	4	-	<0.50 VTHS	
Dichlorodifluoromethane	ug/L	-	-	<2.0 VTHS	
1,1-Dichloroethane	ug/L	200	-	<0.50 VTHS	
1,2-Dichloroethane	ug/L	100	-	<0.50 VTHS	
1,1-Dichloroethylene	ug/L	40	-	<0.50 VTHS	
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50 VTHS	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 VTHS	
Methylene Chloride	ug/L	100	-	<5.0 VTHS	
1,2-Dichloropropane	ug/L	0.7	-	<0.50 VTHS	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 VTHS	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30 VTHS	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	
Ethylbenzene	ug/L	8	-	<0.50 VTHS	
				<0.50 VTHS	
n-Hexane	ug/L	-	-	<0.50 VTHS	
Methyl Ethyl Ketone	ug/L	400	-	<20 VTHS	
Methyl Isobutyl Ketone	ug/L	-	-	<20 VTHS	
MTBE	ug/L	-	-	<2.0 VTHS	
Styrene	ug/L	4	-	<0.50 VTHS	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
1,1,1,2-Tetrachloroethane	ug/L	20.0	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,1,2,2-Tetrachloroethane	ug/L	70	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Tetrachloroethylene	ug/L	50	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Toluene	ug/L	0.8	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
					<0.50 VTHS	0.52 VTHS		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,1,1-Trichloroethane	ug/L	10	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
1,1,2-Trichloroethane	ug/L	800	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS
Trichloroethylene	ug/L	20	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	56.9 VTHS
Trichlorofluoromethane	ug/L	-	-		<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS	<5.0 VTHS
Vinyl chloride	ug/L	600	-		<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	<0.50 VTHS	14.3 DLHC
o-Xylene	ug/L	40	-		<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS
					<0.30 VTHS	<0.30 VTHS		<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS	<0.30 VTHS
m+p-Xylenes	ug/L	2	-		<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS
					<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS	<0.40 VTHS
Xylenes (Total)	ug/L	-	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-		96.0	96.8	98.5	99.2	96.5	96.6	96.4	98.8	96.7
					96.1	96.0	97.0	96.4	99.4	96.9	98.0	95.3	96.3
Surrogate: 1,4-Difluorobenzene	%	-	-		99.7	99.7	99.4	99.4	99.8	98.9	100.1	99.6	99.0
					99.6	99.4	99.3	99.9	99.3	99.4	99.9	99.6	100.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

		Lab ID		L2168276-10
		Sample Date		20-SEP-18
		Sample ID		PC-10
Analyte	**Unit**	**Guide Limits #1**	**#2**	
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50 VTHS
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50 VTHS
Tetrachloroethylene	ug/L	50	-	<0.50 VTHS
Toluene	ug/L	0.8	-	<0.50 VTHS
				<0.50 VTHS
1,1,1-Trichloroethane	ug/L	10	-	<0.50 VTHS
1,1,2-Trichloroethane	ug/L	800	-	<0.50 VTHS
Trichloroethylene	ug/L	20	-	<0.50 VTHS
Trichlorofluoromethane	ug/L	-	-	<5.0 VTHS
Vinyl chloride	ug/L	600	-	<0.50 VTHS
o-Xylene	ug/L	40	-	<0.30 VTHS
				<0.30 VTHS
m+p-Xylenes	ug/L	2	-	<0.40 VTHS
				<0.40 VTHS
Xylenes (Total)	ug/L	-	-	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	97.9
				96.2
Surrogate: 1,4-Difluorobenzene	%	-	-	99.8
				99.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
				Sample Date	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
F1 (C6-C10)	ug/L	-	-		<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS	<25 VTHS
F1-BTEX	ug/L	-	-		<25	<25	<25	<25	<25	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-		360	280	<100	<100	<100	<100	<100	<100	<100
F2-Naphth	ug/L	-	-		360	280	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-		2860	2220	<250	<250	<250	<250	<250	<250	<250
F3-PAH	ug/L	-	-		2860	2220	<250	<250	<250	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-		1470	1120	<250	<250	<250	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-		4690	3620	<370	<370	<370	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-		YES	YES	YES	YES	YES	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-		98.2	95.6	87.5	93.4	88.1	91.8	81.8	83.5	84.0
Surrogate: 3,4-Dichlorotoluene	%	-	-		66.0	63.1	87.4	79.8	86.2	83.7	88.3	87.2	79.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

			Lab ID	L2168276-10
			Sample Date	20-SEP-18
			Sample ID	PC-10
		Guide Limits		
Analyte	Unit	#1	#2	
F1 (C6-C10)	ug/L	-	-	<25 VTHS
F1-BTEX	ug/L	-	-	<25
F2 (C10-C16)	ug/L	-	-	<100
F2-Naphth	ug/L	-	-	<100
F3 (C16-C34)	ug/L	-	-	<250
F3-PAH	ug/L	-	-	<250
F4 (C34-C50)	ug/L	-	-	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370
Chrom. to baseline at nC50		-	-	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	81.7
Surrogate: 3,4-Dichlorotoluene	%	-	-	83.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits									
Lab ID				L2168276-1	L2168276-2	L2168276-3	L2168276-4	L2168276-5	L2168276-6	L2168276-7	L2168276-8	L2168276-9
Sample Date				20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18	20-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	**Unit**	**#1**	**#2**									
Acenaphthene	ug/L	-	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	0.020 DLM	<0.020 DLM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.040 DLM	<0.040 DLM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	ug/L	-	-	0.044 DLM	<0.040 DLM	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.020 DLM	<0.020 DLM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	ug/L	0.0001	-	0.052 DLM	0.036 DLM	0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.036 DLM	0.040 DLM	0.047	0.033	<0.010	0.016	<0.010	<0.010	0.010
Fluorene	ug/L	0.2	-	<0.040 DLM	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.228 DLM	0.128 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1-Methylnaphthalene	ug/L	2	-	0.048 DLM	0.044 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	0.040 DLM	0.044 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.10 DLM	<0.10 DLM	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	0.052 DLM	0.056 DLM	0.020	0.024	<0.020	<0.020	<0.020	<0.020	<0.020
Pyrene	ug/L	-	-	0.048 DLM	<0.040 DLM	0.039	0.025	<0.020	<0.020	<0.020	<0.020	<0.020
Surrogate: d10-Acenaphthene	%	-	-	N/A SMI	N/A SMI	102.6	103.3	101.6	99.2	96.3	91.3	98.2
Surrogate: d12-Chrysene	%	-	-	104.5	109.5	104.0	99.7	98.1	99.3	91.1	91.0	98.2
Surrogate: d8-Naphthalene	%	-	-	N/A SMI	N/A SMI	107.2	107.0	105.7	101.7	99.2	94.1	101.7
Surrogate: d10-Phenanthrene	%	-	-	100.1	97.8	107.6	103.7	104.3	104.8	101.2	97.1	104.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Lab ID		L2168276-10
		Sample Date		20-SEP-18
		Sample ID		PC-10
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Acenaphthene	ug/L	-	-	<0.020
Acenaphthylene	ug/L	-	-	<0.020
Anthracene	ug/L	0.0008	-	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010
Benzo(b)fluoranthene	ug/L	-	-	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010
Chrysene	ug/L	0.0001	-	<0.010
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020
Fluoranthene	ug/L	0.008	-	<0.010
Fluorene	ug/L	0.2	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020
Naphthalene	ug/L	7	-	<0.050
Phenanthrene	ug/L	0.03	-	<0.020
Pyrene	ug/L	-	-	<0.020
Surrogate: d10-Acenaphthene	%	-	-	103.2
Surrogate: d12-Chrysene	%	-	-	105.7
Surrogate: d8-Naphthalene	%	-	-	105.8
Surrogate: d10-Phenanthrene	%	-	-	110.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2168276-1	Water	Note: RL raised due to instrument sensitivity.	
L2168276-2	Water	Note: RL raised due to instrument sensitivity.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
VTHS	Volatile test was conducted on sample with headspace. Results may be biased low.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
SMI	Surrogate recovery could not be measured due to sample matrix interference.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
BTX-511-HS-WT	Water	BTEX by Headspace	SW846 8260 (511)

BTX is determined by analyzing by headspace-GC/MS.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).	
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-684122

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2168276 Report Date: 04-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX-511-HS-WT	**Water**							
Batch R4230700								
WG2879908-4 DUP		**WG2879908-3**						
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	21-SEP-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	21-SEP-18
m+p-Xylenes		0.69	0.64		ug/L	7.5	30	21-SEP-18
o-Xylene		0.54	0.50		ug/L	7.7	30	21-SEP-18
Toluene		0.58	0.53		ug/L	9.0	30	21-SEP-18
WG2879908-1 LCS								
Benzene			99.99		%		70-130	21-SEP-18
Ethylbenzene			96.9		%		70-130	21-SEP-18
m+p-Xylenes			94.5		%		70-130	21-SEP-18
o-Xylene			97.7		%		70-130	21-SEP-18
Toluene			95.3		%		70-130	21-SEP-18
WG2879908-2 MB								
Benzene			<0.50		ug/L		0.5	21-SEP-18
Ethylbenzene			<0.50		ug/L		0.5	21-SEP-18
m+p-Xylenes			<0.40		ug/L		0.4	21-SEP-18
o-Xylene			<0.30		ug/L		0.3	21-SEP-18
Toluene			<0.50		ug/L		0.5	21-SEP-18
Surrogate: 1,4-Difluorobenzene			98.3		%		70-130	21-SEP-18
Surrogate: 4-Bromofluorobenzene			93.0		%		70-130	21-SEP-18
WG2879908-5 MS		**WG2879908-3**						
Benzene			100.3		%		50-140	21-SEP-18
Ethylbenzene			96.2		%		50-140	21-SEP-18
m+p-Xylenes			94.6		%		50-140	21-SEP-18
o-Xylene			97.4		%		50-140	21-SEP-18
Toluene			94.5		%		50-140	21-SEP-18
Batch R4238397								
WG2882769-4 DUP		**WG2882769-3**						
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	25-SEP-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	25-SEP-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
WG2882769-1 LCS								
Benzene			97.9		%		70-130	25-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX-511-HS-WT	**Water**							
Batch R4238397								
WG2882769-1 LCS								
Ethylbenzene			100.3		%		70-130	25-SEP-18
m+p-Xylenes			97.6		%		70-130	25-SEP-18
o-Xylene			101.1		%		70-130	25-SEP-18
Toluene			93.9		%		70-130	25-SEP-18
WG2882769-2 MB								
Benzene			<0.50		ug/L		0.5	25-SEP-18
Ethylbenzene			<0.50		ug/L		0.5	25-SEP-18
m+p-Xylenes			<0.40		ug/L		0.4	25-SEP-18
o-Xylene			<0.30		ug/L		0.3	25-SEP-18
Toluene			<0.50		ug/L		0.5	25-SEP-18
Surrogate: 1,4-Difluorobenzene			99.6		%		70-130	25-SEP-18
Surrogate: 4-Bromofluorobenzene			95.1		%		70-130	25-SEP-18
WG2882769-5 MS		**WG2882769-3**						
Benzene			99.2		%		50-140	25-SEP-18
Ethylbenzene			97.8		%		50-140	25-SEP-18
m+p-Xylenes			96.6		%		50-140	25-SEP-18
o-Xylene			99.7		%		50-140	25-SEP-18
Toluene			93.3		%		50-140	25-SEP-18
Batch R4238673								
WG2882768-4 DUP		**WG2882768-3**						
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	25-SEP-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	25-SEP-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	25-SEP-18
WG2882768-1 LCS								
Benzene			98.7		%		70-130	24-SEP-18
Ethylbenzene			100.8		%		70-130	24-SEP-18
m+p-Xylenes			99.4		%		70-130	24-SEP-18
o-Xylene			101.0		%		70-130	24-SEP-18
Toluene			94.5		%		70-130	24-SEP-18
WG2882768-2 MB								
Benzene			<0.50		ug/L		0.5	25-SEP-18
Ethylbenzene			<0.50		ug/L		0.5	25-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX-511-HS-WT	**Water**							
Batch R4238673								
WG2882768-2 MB								
m+p-Xylenes			<0.40		ug/L		0.4	25-SEP-18
o-Xylene			<0.30		ug/L		0.3	25-SEP-18
Toluene			<0.50		ug/L		0.5	25-SEP-18
Surrogate: 1,4-Difluorobenzene			99.0		%		70-130	25-SEP-18
Surrogate: 4-Bromofluorobenzene			94.8		%		70-130	25-SEP-18
WG2882768-5 MS		**WG2882768-3**						
Benzene			97.6		%		50-140	25-SEP-18
Ethylbenzene			99.0		%		50-140	25-SEP-18
m+p-Xylenes			96.6		%		50-140	25-SEP-18
o-Xylene			99.6		%		50-140	25-SEP-18
Toluene			93.0		%		50-140	25-SEP-18
CL-IC-N-WT	**Water**							
Batch R4240009								
WG2885041-4 DUP		**WG2885041-3**						
Chloride (Cl)		9.23	9.24		mg/L	0.1	20	24-SEP-18
WG2885041-9 DUP		**WG2885041-8**						
Chloride (Cl)		109	109		mg/L	0.2	20	24-SEP-18
WG2885041-2 LCS								
Chloride (Cl)			100.1		%		90-110	24-SEP-18
WG2885041-7 LCS								
Chloride (Cl)			100.2		%		90-110	24-SEP-18
WG2885041-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-SEP-18
WG2885041-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-SEP-18
WG2885041-10 MS		**WG2885041-8**						
Chloride (Cl)			N/A	MS-B	%		-	24-SEP-18
WG2885041-5 MS		**WG2885041-3**						
Chloride (Cl)			101.7		%		75-125	24-SEP-18
CN-FREE-CFA-WT	**Water**							
Batch R4230148								
WG2882744-2 LCS								
Cyanide, Free			101.1		%		80-120	21-SEP-18
WG2882744-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	21-SEP-18
CR-CR6-PWQO-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4251082								
WG2889578-4 DUP		**WG2889578-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	28-SEP-18
WG2889578-2 LCS								
Chromium, Hexavalent			99.6		%		80-120	28-SEP-18
WG2889578-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	28-SEP-18
WG2889578-5 MS		**WG2889578-3**						
Chromium, Hexavalent			95.7		%		70-130	28-SEP-18
EC-MF-WT	**Water**							
Batch R4233254								
WG2882970-1 MB								
E. Coli			0		CFU/100mL		1	22-SEP-18
EC-WT	**Water**							
Batch R4233548								
WG2882715-32 DUP		**WG2882715-31**						
Conductivity		1580	1580		umhos/cm	0.4	10	21-SEP-18
WG2882715-36 DUP		**WG2882715-35**						
Conductivity		727	724		umhos/cm	0.4	10	21-SEP-18
WG2882715-30 LCS								
Conductivity			97.5		%		90-110	21-SEP-18
WG2882715-34 LCS								
Conductivity			97.3		%		90-110	21-SEP-18
WG2882715-29 MB								
Conductivity			<3.0		umhos/cm		3	21-SEP-18
WG2882715-33 MB								
Conductivity			<3.0		umhos/cm		3	21-SEP-18
F1-HS-511-WT	**Water**							
Batch R4252187								
WG2887289-4 DUP		**WG2887289-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	01-OCT-18
WG2887289-1 LCS								
F1 (C6-C10)			98.9		%		80-120	28-SEP-18
WG2887289-2 MB								
F1 (C6-C10)			<25		ug/L		25	28-SEP-18
Surrogate: 3,4-Dichlorotoluene			80.9		%		60-140	28-SEP-18
WG2887289-5 MS		**WG2887289-3**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4252187								
WG2887289-5 MS		**WG2887289-3**						
F1 (C6-C10)			91.6		%		60-140	01-OCT-18
F2-F4-511-WT	**Water**							
Batch R4251267								
WG2885748-2 LCS								
F2 (C10-C16)			87.6		%		70-130	28-SEP-18
F3 (C16-C34)			87.2		%		70-130	28-SEP-18
F4 (C34-C50)			101.0		%		70-130	28-SEP-18
WG2885748-3 LCSD		**WG2885748-2**						
F2 (C10-C16)		87.6	93.2		%	6.2	50	28-SEP-18
F3 (C16-C34)		87.2	100.9		%	14	50	28-SEP-18
F4 (C34-C50)		101.0	104.8		%	3.7	50	28-SEP-18
WG2885748-1 MB								
F2 (C10-C16)			<100		ug/L		100	28-SEP-18
F3 (C16-C34)			<250		ug/L		250	28-SEP-18
F4 (C34-C50)			<250		ug/L		250	28-SEP-18
Surrogate: 2-Bromobenzotrifluoride			80.4		%		60-140	28-SEP-18
HG-T-CVAA-WT	**Water**							
Batch R4242767								
WG2886220-4 DUP		**WG2886220-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2886220-2 LCS								
Mercury (Hg)-Total			99.9		%		80-120	26-SEP-18
WG2886220-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	26-SEP-18
WG2886220-6 MS		**WG2886220-5**						
Mercury (Hg)-Total			98.0		%		70-130	26-SEP-18
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-4 DUP		**WG2882651-3**						
Aluminum (Al)-Total		0.0443	0.0415		mg/L	6.4	20	21-SEP-18
Antimony (Sb)-Total		0.00021	0.00021		mg/L	0.8	20	21-SEP-18
Arsenic (As)-Total		0.00105	0.00105		mg/L	0.2	20	21-SEP-18
Barium (Ba)-Total		0.190	0.199		mg/L	4.3	20	21-SEP-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-4 DUP		**WG2882651-3**						
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-SEP-18
Boron (B)-Total		0.097	0.095		mg/L	2.1	20	21-SEP-18
Cadmium (Cd)-Total		0.0000237	0.0000285		mg/L	18	20	21-SEP-18
Calcium (Ca)-Total		141	136		mg/L	3.4	20	21-SEP-18
Chromium (Cr)-Total		0.00121	0.00117		mg/L	3.6	20	21-SEP-18
Cesium (Cs)-Total		<0.000010	0.000010	RPD-NA	mg/L	N/A	20	21-SEP-18
Cobalt (Co)-Total		0.00043	0.00042		mg/L	1.4	20	21-SEP-18
Copper (Cu)-Total		0.0027	0.0027		mg/L	0.3	20	21-SEP-18
Iron (Fe)-Total		0.611	0.624		mg/L	2.1	20	21-SEP-18
Lead (Pb)-Total		0.000747	0.000727		mg/L	2.7	20	21-SEP-18
Magnesium (Mg)-Total		25.9	26.6		mg/L	2.7	20	21-SEP-18
Manganese (Mn)-Total		0.226	0.226		mg/L	0.0	20	21-SEP-18
Molybdenum (Mo)-Total		0.00501	0.00480		mg/L	4.3	20	21-SEP-18
Nickel (Ni)-Total		0.00138	0.00133		mg/L	3.4	20	21-SEP-18
Potassium (K)-Total		4.37	4.48		mg/L	2.5	20	21-SEP-18
Rubidium (Rb)-Total		0.00150	0.00141		mg/L	5.9	20	21-SEP-18
Selenium (Se)-Total		0.000637	0.000635		mg/L	0.4	20	21-SEP-18
Silicon (Si)-Total		6.42	6.44		mg/L	0.3	20	21-SEP-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-SEP-18
Sodium (Na)-Total		145	148		mg/L	2.4	20	21-SEP-18
Strontium (Sr)-Total		0.723	0.700		mg/L	3.3	20	21-SEP-18
Sulfur (S)-Total		38.3	38.5		mg/L	0.7	25	21-SEP-18
Thallium (Tl)-Total		0.000015	0.000014		mg/L	6.2	20	21-SEP-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	21-SEP-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	21-SEP-18
Tin (Sn)-Total		0.00115	0.00113		mg/L	1.4	20	21-SEP-18
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	21-SEP-18
Tungsten (W)-Total		0.00070	0.00069		mg/L	2.1	20	21-SEP-18
Uranium (U)-Total		0.00422	0.00416		mg/L	1.3	20	21-SEP-18
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-SEP-18
Zinc (Zn)-Total		0.0184	0.0186		mg/L	1.1	20	21-SEP-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2882651-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-2 LCS								
Aluminum (Al)-Total			100.9		%		80-120	21-SEP-18
Antimony (Sb)-Total			104.6		%		80-120	21-SEP-18
Arsenic (As)-Total			100.6		%		80-120	21-SEP-18
Barium (Ba)-Total			99.2		%		80-120	21-SEP-18
Beryllium (Be)-Total			100.5		%		80-120	21-SEP-18
Bismuth (Bi)-Total			104.9		%		80-120	21-SEP-18
Boron (B)-Total			93.5		%		80-120	21-SEP-18
Cadmium (Cd)-Total			97.8		%		80-120	21-SEP-18
Calcium (Ca)-Total			96.7		%		80-120	21-SEP-18
Chromium (Cr)-Total			99.9		%		80-120	21-SEP-18
Cesium (Cs)-Total			106.2		%		80-120	21-SEP-18
Cobalt (Co)-Total			101.3		%		80-120	21-SEP-18
Copper (Cu)-Total			100.9		%		80-120	21-SEP-18
Iron (Fe)-Total			97.1		%		80-120	21-SEP-18
Lead (Pb)-Total			102.7		%		80-120	21-SEP-18
Magnesium (Mg)-Total			100.5		%		80-120	21-SEP-18
Manganese (Mn)-Total			99.5		%		80-120	21-SEP-18
Molybdenum (Mo)-Total			101.4		%		80-120	21-SEP-18
Nickel (Ni)-Total			101.0		%		80-120	21-SEP-18
Potassium (K)-Total			96.6		%		80-120	21-SEP-18
Rubidium (Rb)-Total			103.3		%		80-120	21-SEP-18
Selenium (Se)-Total			100.7		%		80-120	21-SEP-18
Silicon (Si)-Total			98.7		%		60-140	21-SEP-18
Silver (Ag)-Total			103.4		%		80-120	21-SEP-18
Sodium (Na)-Total			101.8		%		80-120	21-SEP-18
Strontium (Sr)-Total			103.4		%		80-120	21-SEP-18
Sulfur (S)-Total			91.8		%		80-120	21-SEP-18
Thallium (Tl)-Total			99.8		%		80-120	21-SEP-18
Tellurium (Te)-Total			99.2		%		80-120	21-SEP-18
Thorium (Th)-Total			103.9		%		70-130	21-SEP-18
Tin (Sn)-Total			98.8		%		80-120	21-SEP-18
Titanium (Ti)-Total			94.3		%		80-120	21-SEP-18
Tungsten (W)-Total			100.2		%		80-120	21-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-2 LCS								
Uranium (U)-Total			102.0		%		80-120	21-SEP-18
Vanadium (V)-Total			100.8		%		80-120	21-SEP-18
Zinc (Zn)-Total			95.9		%		80-120	21-SEP-18
Zirconium (Zr)-Total			103.0		%		80-120	21-SEP-18
WG2882651-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	21-SEP-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-SEP-18
Boron (B)-Total			<0.010		mg/L		0.01	21-SEP-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	21-SEP-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-SEP-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	21-SEP-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	21-SEP-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	21-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	21-SEP-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-SEP-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	21-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-SEP-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	21-SEP-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	21-SEP-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	21-SEP-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	21-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	21-SEP-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	21-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	21-SEP-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	21-SEP-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	21-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-1 MB								
Thorium (Th)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-SEP-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	21-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	21-SEP-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-SEP-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-SEP-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	21-SEP-18
WG2882651-5 MS		**WG2882651-6**						
Aluminum (Al)-Total			89.2		%		70-130	21-SEP-18
Antimony (Sb)-Total			102.0		%		70-130	21-SEP-18
Arsenic (As)-Total			101.9		%		70-130	21-SEP-18
Barium (Ba)-Total			N/A	MS-B	%		-	21-SEP-18
Beryllium (Be)-Total			96.6		%		70-130	21-SEP-18
Bismuth (Bi)-Total			90.7		%		70-130	21-SEP-18
Cadmium (Cd)-Total			94.7		%		70-130	21-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	21-SEP-18
Chromium (Cr)-Total			99.7		%		70-130	21-SEP-18
Cesium (Cs)-Total			99.6		%		70-130	21-SEP-18
Cobalt (Co)-Total			99.6		%		70-130	21-SEP-18
Copper (Cu)-Total			89.3		%		70-130	21-SEP-18
Iron (Fe)-Total			N/A	MS-B	%		-	21-SEP-18
Lead (Pb)-Total			89.6		%		70-130	21-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	21-SEP-18
Manganese (Mn)-Total			91.0		%		70-130	21-SEP-18
Molybdenum (Mo)-Total			104.0		%		70-130	21-SEP-18
Nickel (Ni)-Total			96.4		%		70-130	21-SEP-18
Potassium (K)-Total			N/A	MS-B	%		-	21-SEP-18
Rubidium (Rb)-Total			96.5		%		70-130	21-SEP-18
Selenium (Se)-Total			98.5		%		70-130	21-SEP-18
Silicon (Si)-Total			N/A	MS-B	%		-	21-SEP-18
Silver (Ag)-Total			95.3		%		70-130	21-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	21-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	21-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4229850								
WG2882651-5 MS		**WG2882651-6**						
Sulfur (S)-Total			N/A	MS-B	%		-	21-SEP-18
Thallium (Tl)-Total			90.6		%		70-130	21-SEP-18
Tellurium (Te)-Total			90.3		%		70-130	21-SEP-18
Thorium (Th)-Total			98.9		%		70-130	21-SEP-18
Tin (Sn)-Total			99.1		%		70-130	21-SEP-18
Titanium (Ti)-Total			97.9		%		70-130	21-SEP-18
Tungsten (W)-Total			98.9		%		70-130	21-SEP-18
Uranium (U)-Total			N/A	MS-B	%		-	21-SEP-18
Vanadium (V)-Total			106.8		%		70-130	21-SEP-18
Zinc (Zn)-Total			87.2		%		70-130	21-SEP-18
Zirconium (Zr)-Total			101.6		%		70-130	21-SEP-18
NO2-IC-WT	**Water**							
Batch R4240009								
WG2885041-4 DUP		**WG2885041-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	24-SEP-18
WG2885041-9 DUP		**WG2885041-8**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	24-SEP-18
WG2885041-2 LCS								
Nitrite (as N)			100.5		%		70-130	24-SEP-18
WG2885041-7 LCS								
Nitrite (as N)			101.1		%		70-130	24-SEP-18
WG2885041-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	24-SEP-18
WG2885041-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	24-SEP-18
WG2885041-10 MS		**WG2885041-8**						
Nitrite (as N)			103.0		%		70-130	24-SEP-18
WG2885041-5 MS		**WG2885041-3**						
Nitrite (as N)			82.3		%		70-130	24-SEP-18
NO3-IC-WT	**Water**							
Batch R4240009								
WG2885041-4 DUP		**WG2885041-3**						
Nitrate (as N)		0.121	0.120		mg/L	0.4	25	24-SEP-18
WG2885041-9 DUP		**WG2885041-8**						
Nitrate (as N)		0.828	0.827		mg/L	0.1	25	24-SEP-18
WG2885041-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4240009								
WG2885041-2 LCS								
Nitrate (as N)			100.5		%		70-130	24-SEP-18
WG2885041-7 LCS								
Nitrate (as N)			100.4		%		70-130	24-SEP-18
WG2885041-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	24-SEP-18
WG2885041-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	24-SEP-18
WG2885041-10 MS		**WG2885041-8**						
Nitrate (as N)			102.8		%		70-130	24-SEP-18
WG2885041-5 MS		**WG2885041-3**						
Nitrate (as N)			102.2		%		70-130	24-SEP-18
P-T-COL-WT	**Water**							
Batch R4241552								
WG2885510-3 DUP		**L2169144-1**						
Phosphorus, Total		108	1.10		mg/L	1.7	20	26-SEP-18
WG2885510-2 LCS								
Phosphorus, Total			97.5		%		80-120	26-SEP-18
WG2885510-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	26-SEP-18
WG2885510-4 MS		**L2169144-1**						
Phosphorus, Total			N/A	MS-B	%		-	26-SEP-18
Batch R4245151								
WG2886365-3 DUP		**L2169108-1**						
Phosphorus, Total		0.167	0.165		mg/L	1.3	20	27-SEP-18
WG2886365-2 LCS								
Phosphorus, Total			95.0		%		80-120	27-SEP-18
WG2886365-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	27-SEP-18
WG2886365-4 MS		**L2169108-1**						
Phosphorus, Total			N/A	MS-B	%		-	27-SEP-18
P-TD-COL-WT	**Water**							
Batch R4241551								
WG2885503-3 DUP		**L2167326-1**						
Phosphorus (P)-Total Dissolved		0.0180	0.0141	J	mg/L	0.0039	0.006	26-SEP-18
WG2885505-3 DUP		**L2169144-1**						
Phosphorus (P)-Total Dissolved		103	1.01		mg/L	2.4	20	26-SEP-18
WG2885503-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4241551								
WG2885503-2 LCS								
Phosphorus (P)-Total	Dissolved		96.0		%		80-120	26-SEP-18
WG2885505-2 LCS								
Phosphorus (P)-Total	Dissolved		95.0		%		80-120	26-SEP-18
WG2885503-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	26-SEP-18
WG2885505-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	26-SEP-18
WG2885503-4 MS		**L2167326-1**						
Phosphorus (P)-Total	Dissolved		87.0		%		70-130	26-SEP-18
WG2885505-4 MS		**L2169144-1**						
Phosphorus (P)-Total	Dissolved		N/A	MS-B	%		-	26-SEP-18
PAH-PWQO-WT	**Water**							
Batch R4251173								
WG2885748-2 LCS								
1-Methylnaphthalene			93.3		%		50-150	28-SEP-18
2-Methylnaphthalene			94.9		%		50-150	28-SEP-18
Acenaphthene			94.2		%		50-150	28-SEP-18
Acenaphthylene			96.2		%		50-150	28-SEP-18
Anthracene			97.8		%		60-130	28-SEP-18
Benzo(a)anthracene			109.8		%		60-130	28-SEP-18
Benzo(a)pyrene			99.2		%		50-150	28-SEP-18
Benzo(b)fluoranthene			100.4		%		50-150	28-SEP-18
Benzo(g,h,i)perylene			98.4		%		60-130	28-SEP-18
Benzo(k)fluoranthene			99.0		%		60-130	28-SEP-18
Chrysene			114.9		%		60-130	28-SEP-18
Dibenzo(ah)anthracene			105.1		%		60-130	28-SEP-18
Fluoranthene			105.8		%		60-130	28-SEP-18
Fluorene			99.9		%		50-150	28-SEP-18
Indeno(1,2,3-cd)pyrene			107.2		%		50-150	28-SEP-18
Naphthalene			94.9		%		50-150	28-SEP-18
Phenanthrene			102.6		%		50-150	28-SEP-18
Pyrene			106.1		%		50-150	28-SEP-18
WG2885748-3 LCSD		**WG2885748-2**						
1-Methylnaphthalene		93.3	93.8		%	0.5	50	28-SEP-18
2-Methylnaphthalene		94.9	94.2		%	0.7	50	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4251173								
WG2885748-3 LCSD		**WG2885748-2**						
Acenaphthene		94.2	94.2		%	0.1	50	28-SEP-18
Acenaphthylene		96.2	95.5		%	0.8	50	28-SEP-18
Anthracene		97.8	97.0		%	0.8	50	28-SEP-18
Benzo(a)anthracene		109.8	108.8		%	1.0	50	28-SEP-18
Benzo(a)pyrene		99.2	97.6		%	1.6	50	28-SEP-18
Benzo(b)fluoranthene		100.4	102.9		%	2.4	50	28-SEP-18
Benzo(g,h,i)perylene		98.4	96.1		%	2.4	50	28-SEP-18
Benzo(k)fluoranthene		99.0	100.6		%	1.6	50	28-SEP-18
Chrysene		114.9	107.1		%	7.0	50	28-SEP-18
Dibenzo(ah)anthracene		105.1	101.8		%	3.2	50	28-SEP-18
Fluoranthene		105.8	105.0		%	0.8	50	28-SEP-18
Fluorene		99.9	98.2		%	1.7	50	28-SEP-18
Indeno(1,2,3-cd)pyrene		107.2	104.8		%	2.3	50	28-SEP-18
Naphthalene		94.9	93.9		%	1.0	50	28-SEP-18
Phenanthrene		102.6	101.8		%	0.9	50	28-SEP-18
Pyrene		106.1	107.1		%	1.0	50	28-SEP-18
WG2885748-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	28-SEP-18
2-Methylnaphthalene			<0.020		ug/L		0.02	28-SEP-18
Acenaphthene			<0.020		ug/L		0.02	28-SEP-18
Acenaphthylene			<0.020		ug/L		0.02	28-SEP-18
Anthracene			<0.010		ug/L		0.01	28-SEP-18
Benzo(a)anthracene			<0.020		ug/L		0.02	28-SEP-18
Benzo(a)pyrene			<0.010		ug/L		0.01	28-SEP-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	28-SEP-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	28-SEP-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	28-SEP-18
Chrysene			<0.010		ug/L		0.01	28-SEP-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	28-SEP-18
Fluoranthene			<0.010		ug/L		0.01	28-SEP-18
Fluorene			<0.020		ug/L		0.02	28-SEP-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	28-SEP-18
Naphthalene			<0.050		ug/L		0.05	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4251173								
WG2885748-1 MB								
Phenanthrene			<0.020		ug/L		0.02	28-SEP-18
Pyrene			<0.020		ug/L		0.02	28-SEP-18
Surrogate: d8-Naphthalene			110.1		%		40-130	28-SEP-18
Surrogate: d10-Phenanthrene			112.1		%		40-130	28-SEP-18
Surrogate: d12-Chrysene			109.6		%		40-130	28-SEP-18
Surrogate: d10-Acenaphthene			107.6		%		40-130	28-SEP-18
PH-WT	**Water**							
Batch R4233548								
WG2882715-32 DUP		**WG2882715-31**						
pH		8.16	8.22	J	pH units	0.06	0.2	21-SEP-18
WG2882715-36 DUP		**WG2882715-35**						
pH		8.73	8.73	J	pH units	0.00	0.2	21-SEP-18
WG2882715-30 LCS								
pH			7.00		pH units		6.9-7.1	21-SEP-18
WG2882715-34 LCS								
pH			7.00		pH units		6.9-7.1	21-SEP-18
SOLIDS-TSS-WT	**Water**							
Batch R4241608								
WG2885907-3 DUP		**L2169920-1**						
Total Suspended Solids		37.0	31.8		mg/L	15	20	26-SEP-18
WG2885907-2 LCS								
Total Suspended Solids			99.0		%		85-115	26-SEP-18
WG2885907-1 MB								
Total Suspended Solids			<2.0		mg/L		2	26-SEP-18
TC-MF-WT	**Water**							
Batch R4233257								
WG2882979-3 DUP		**L2168249-1**						
Total Coliforms		0	0		CFU/100mL	0.0	65	22-SEP-18
WG2882979-1 MB								
Total Coliforms			0		CFU/100mL		1	22-SEP-18
TKN-WT	**Water**							
Batch R4239470								
WG2884654-7 DUP		**WG2884654-9**						
Total Kjeldahl Nitrogen		90	103		mg/L	14	20	25-SEP-18
WG2884654-6 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4239470								
WG2884654-6 LCS								
Total Kjeldahl Nitrogen			86.2		%		75-125	25-SEP-18
WG2884654-5 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	25-SEP-18
WG2884654-8 MS		**WG2884654-9**						
Total Kjeldahl Nitrogen			N/A	MS-B	%		-	25-SEP-18
Batch R4258963								
WG2892076-3 DUP		**L2169120-3**						
Total Kjeldahl Nitrogen		<1.5	<1.5	RPD-NA	mg/L	N/A	20	03-OCT-18
WG2892076-2 LCS								
Total Kjeldahl Nitrogen			117.1		%		75-125	03-OCT-18
WG2892076-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	03-OCT-18
WG2892076-4 MS		**L2169120-3**						
Total Kjeldahl Nitrogen			86.1		%		70-130	03-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-4 DUP		**WG2887289-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	01-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-4 DUP		**WG2887289-3**						
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	01-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	01-OCT-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	01-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	01-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	01-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
WG2887289-1 LCS								
1,1,1,2-Tetrachloroethane			110.0		%		70-130	28-SEP-18
1,1,2,2-Tetrachloroethane			105.5		%		70-130	28-SEP-18
1,1,1-Trichloroethane			112.1		%		70-130	28-SEP-18
1,1,2-Trichloroethane			109.7		%		70-130	28-SEP-18
1,1-Dichloroethane			112.8		%		70-130	28-SEP-18
1,1-Dichloroethylene			109.5		%		70-130	28-SEP-18
1,2-Dibromoethane			108.4		%		70-130	28-SEP-18
1,2-Dichlorobenzene			115.7		%		70-130	28-SEP-18
1,2-Dichloroethane			109.1		%		70-130	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-1 LCS								
1,2-Dichloropropane			109.6		%		70-130	28-SEP-18
1,3-Dichlorobenzene			117.8		%		70-130	28-SEP-18
1,4-Dichlorobenzene			119.2		%		70-130	28-SEP-18
Acetone			110.9		%		60-140	28-SEP-18
Benzene			113.8		%		70-130	28-SEP-18
Bromodichloromethane			114.8		%		70-130	28-SEP-18
Bromoform			102.7		%		70-130	28-SEP-18
Bromomethane			93.6		%		60-140	28-SEP-18
Carbon tetrachloride			112.5		%		70-130	28-SEP-18
Chlorobenzene			115.5		%		70-130	28-SEP-18
Chloroform			112.7		%		70-130	28-SEP-18
cis-1,2-Dichloroethylene			109.9		%		70-130	28-SEP-18
cis-1,3-Dichloropropene			113.6		%		70-130	28-SEP-18
Dibromochloromethane			106.9		%		70-130	28-SEP-18
Dichlorodifluoromethane			143.1	MES	%		50-140	28-SEP-18
Ethylbenzene			115.6		%		70-130	28-SEP-18
n-Hexane			97.2		%		70-130	28-SEP-18
m+p-Xylenes			118.5		%		70-130	28-SEP-18
Methyl Ethyl Ketone			108.2		%		60-140	28-SEP-18
Methyl Isobutyl Ketone			102.1		%		60-140	28-SEP-18
Methylene Chloride			113.0		%		70-130	28-SEP-18
MTBE			116.3		%		70-130	28-SEP-18
o-Xylene			112.1		%		70-130	28-SEP-18
Styrene			115.7		%		70-130	28-SEP-18
Tetrachloroethylene			118.4		%		70-130	28-SEP-18
Toluene			114.3		%		70-130	28-SEP-18
trans-1,2-Dichloroethylene			115.0		%		70-130	28-SEP-18
trans-1,3-Dichloropropene			111.4		%		70-130	28-SEP-18
Trichloroethylene			118.9		%		70-130	28-SEP-18
Trichlorofluoromethane			126.6		%		60-140	28-SEP-18
Vinyl chloride			113.9		%		60-140	28-SEP-18
WG2887289-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-2 MB								
1,1,1-Trichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1-Dichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
1,2-Dibromoethane			<0.20		ug/L		0.2	28-SEP-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
1,2-Dichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,2-Dichloropropane			<0.50		ug/L		0.5	28-SEP-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
Acetone			<30		ug/L		30	28-SEP-18
Benzene			<0.50		ug/L		0.5	28-SEP-18
Bromodichloromethane			<2.0		ug/L		2	28-SEP-18
Bromoform			<5.0		ug/L		5	28-SEP-18
Bromomethane			<0.50		ug/L		0.5	28-SEP-18
Carbon tetrachloride			<0.20		ug/L		0.2	28-SEP-18
Chlorobenzene			<0.50		ug/L		0.5	28-SEP-18
Chloroform			<1.0		ug/L		1	28-SEP-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	28-SEP-18
Dibromochloromethane			<2.0		ug/L		2	28-SEP-18
Dichlorodifluoromethane			<2.0		ug/L		2	28-SEP-18
Ethylbenzene			<0.50		ug/L		0.5	28-SEP-18
n-Hexane			<0.50		ug/L		0.5	28-SEP-18
m+p-Xylenes			<0.40		ug/L		0.4	28-SEP-18
Methyl Ethyl Ketone			<20		ug/L		20	28-SEP-18
Methyl Isobutyl Ketone			<20		ug/L		20	28-SEP-18
Methylene Chloride			<5.0		ug/L		5	28-SEP-18
MTBE			<2.0		ug/L		2	28-SEP-18
o-Xylene			<0.30		ug/L		0.3	28-SEP-18
Styrene			<0.50		ug/L		0.5	28-SEP-18
Tetrachloroethylene			<0.50		ug/L		0.5	28-SEP-18
Toluene			<0.50		ug/L		0.5	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-2 MB								
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	28-SEP-18
Trichloroethylene			<0.50		ug/L		0.5	28-SEP-18
Trichlorofluoromethane			<5.0		ug/L		5	28-SEP-18
Vinyl chloride			<0.50		ug/L		0.5	28-SEP-18
Surrogate: 1,4-Difluorobenzene			99.8		%		70-130	28-SEP-18
Surrogate: 4-Bromofluorobenzene			98.0		%		70-130	28-SEP-18
WG2887289-5 MS		**WG2887289-3**						
1,1,1,2-Tetrachloroethane			110.3		%		50-140	01-OCT-18
1,1,2,2-Tetrachloroethane			108.7		%		50-140	01-OCT-18
1,1,1-Trichloroethane			110.1		%		50-140	01-OCT-18
1,1,2-Trichloroethane			114.0		%		50-140	01-OCT-18
1,1-Dichloroethane			113.5		%		50-140	01-OCT-18
1,1-Dichloroethylene			105.2		%		50-140	01-OCT-18
1,2-Dibromoethane			114.4		%		50-140	01-OCT-18
1,2-Dichlorobenzene			116.0		%		50-140	01-OCT-18
1,2-Dichloroethane			116.4		%		50-140	01-OCT-18
1,2-Dichloropropane			113.4		%		50-140	01-OCT-18
1,3-Dichlorobenzene			116.9		%		50-140	01-OCT-18
1,4-Dichlorobenzene			118.4		%		50-140	01-OCT-18
Acetone			118.9		%		50-140	01-OCT-18
Benzene			114.8		%		50-140	01-OCT-18
Bromodichloromethane			119.0		%		50-140	01-OCT-18
Bromoform			106.0		%		50-140	01-OCT-18
Bromomethane			92.3		%		50-140	01-OCT-18
Carbon tetrachloride			110.0		%		50-140	01-OCT-18
Chlorobenzene			114.9		%		50-140	01-OCT-18
Chloroform			114.5		%		50-140	01-OCT-18
cis-1,2-Dichloroethylene			112.7		%		50-140	01-OCT-18
cis-1,3-Dichloropropene			120.7		%		50-140	01-OCT-18
Dibromochloromethane			109.1		%		50-140	01-OCT-18
Dichlorodifluoromethane			120.4		%		50-140	01-OCT-18
Ethylbenzene			111.2		%		50-140	01-OCT-18
n-Hexane			124.1		%		50-140	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4252187								
WG2887289-5 MS		**WG2887289-3**						
m+p-Xylenes			114.6		%		50-140	01-OCT-18
Methyl Ethyl Ketone			110.3		%		50-140	01-OCT-18
Methyl Isobutyl Ketone			113.6		%		50-140	01-OCT-18
Methylene Chloride			115.4		%		50-140	01-OCT-18
MTBE			116.1		%		50-140	01-OCT-18
o-Xylene			109.4		%		50-140	01-OCT-18
Styrene			114.4		%		50-140	01-OCT-18
Tetrachloroethylene			114.3		%		50-140	01-OCT-18
Toluene			111.6		%		50-140	01-OCT-18
trans-1,2-Dichloroethylene			113.0		%		50-140	01-OCT-18
trans-1,3-Dichloropropene			117.1		%		50-140	01-OCT-18
Trichloroethylene			118.3		%		50-140	01-OCT-18
Trichlorofluoromethane			119.9		%		50-140	01-OCT-18
Vinyl chloride			105.4		%		50-140	01-OCT-18

Quality Control Report

Workorder: L2168276 Report Date: 04-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

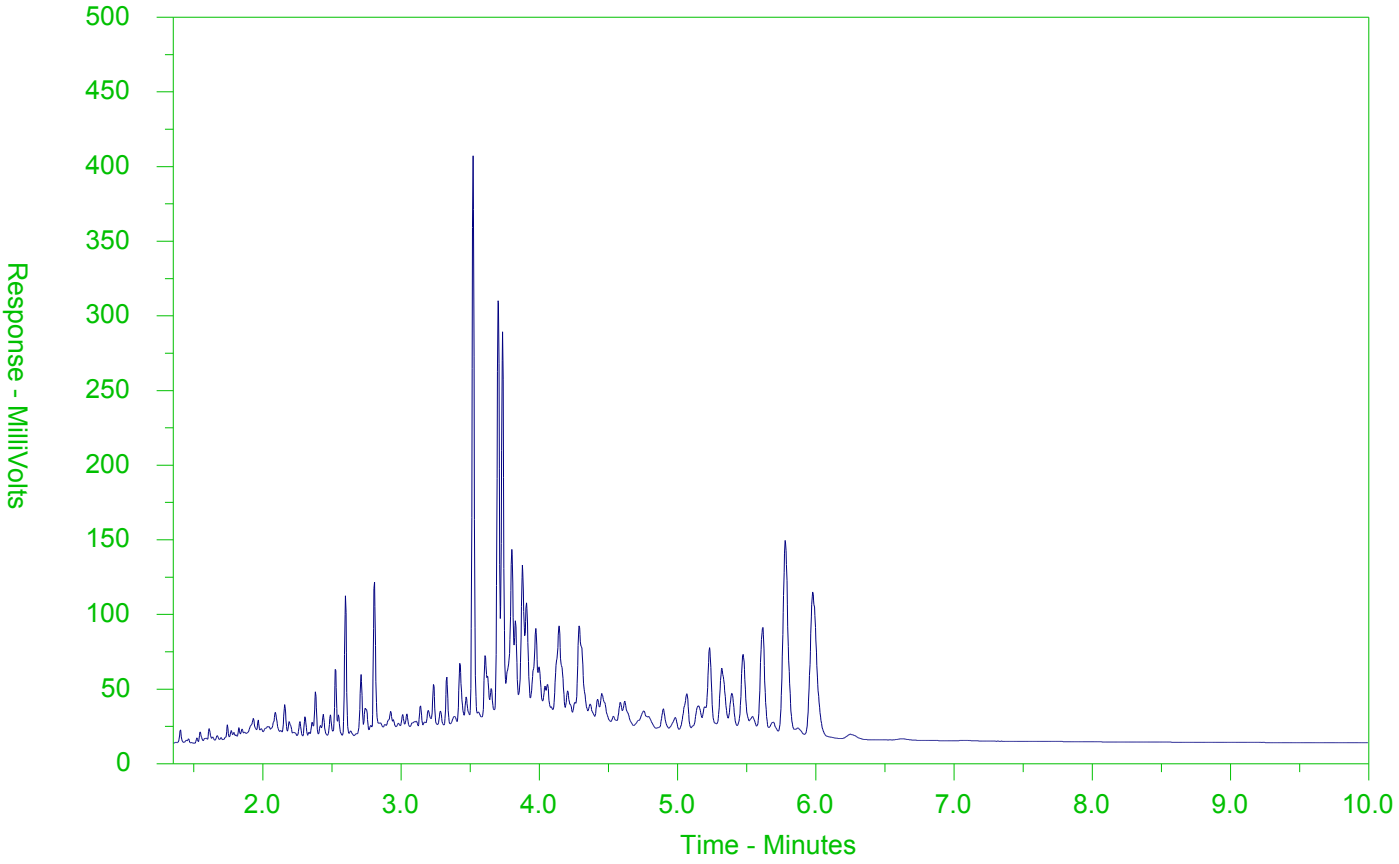
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-1
Client Sample ID: PC-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

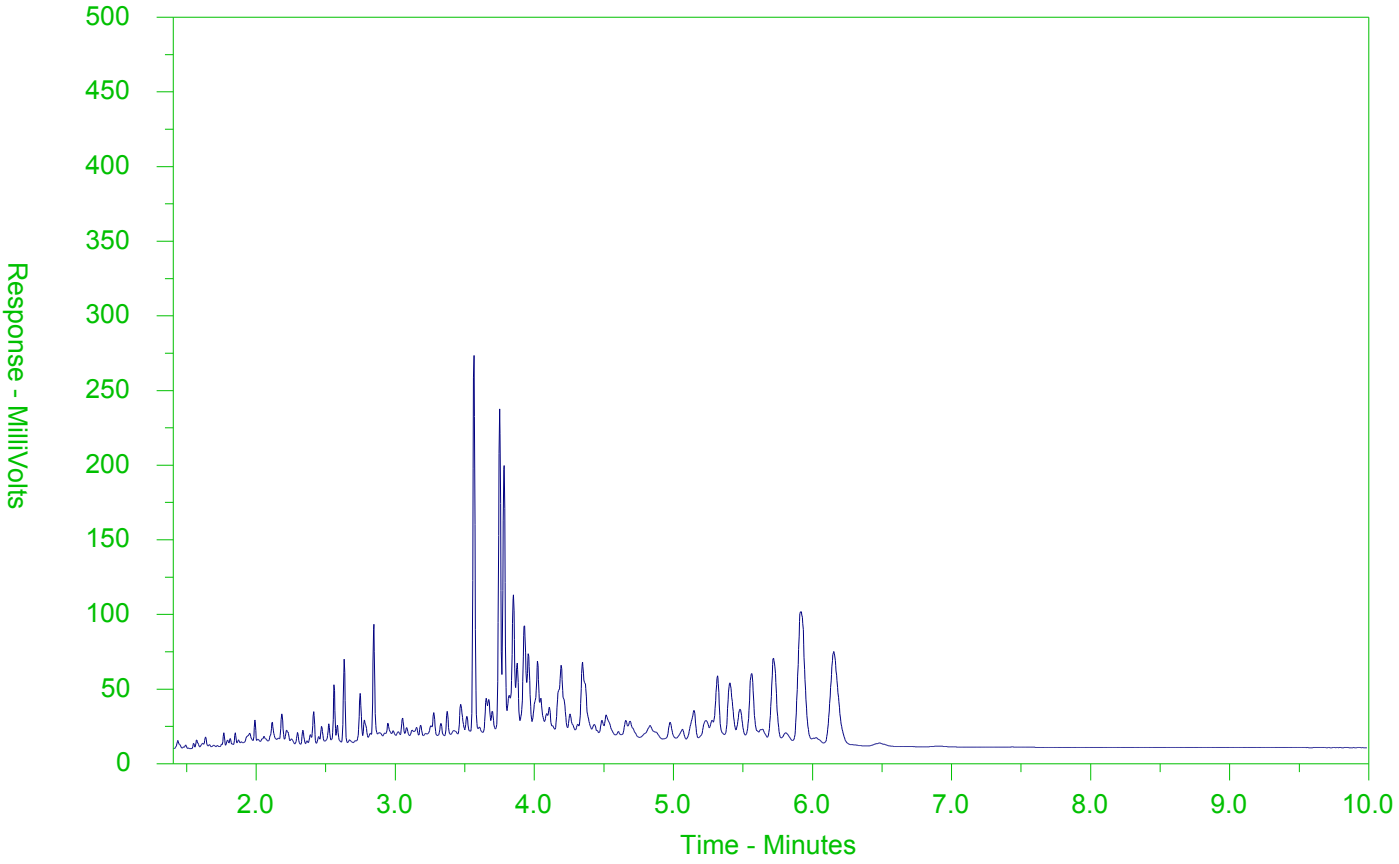
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-2
Client Sample ID: PC-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

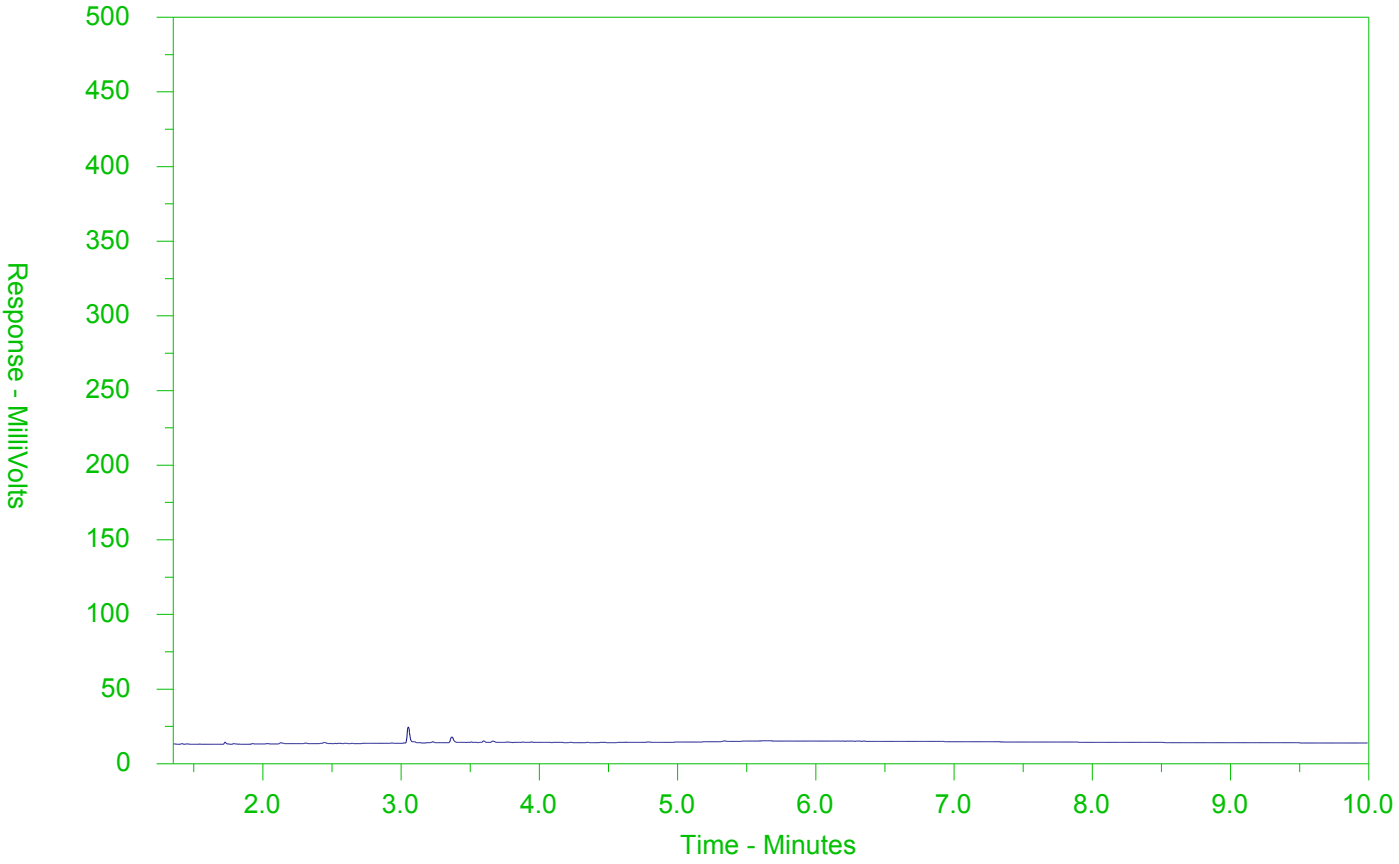
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-3
Client Sample ID: PC-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

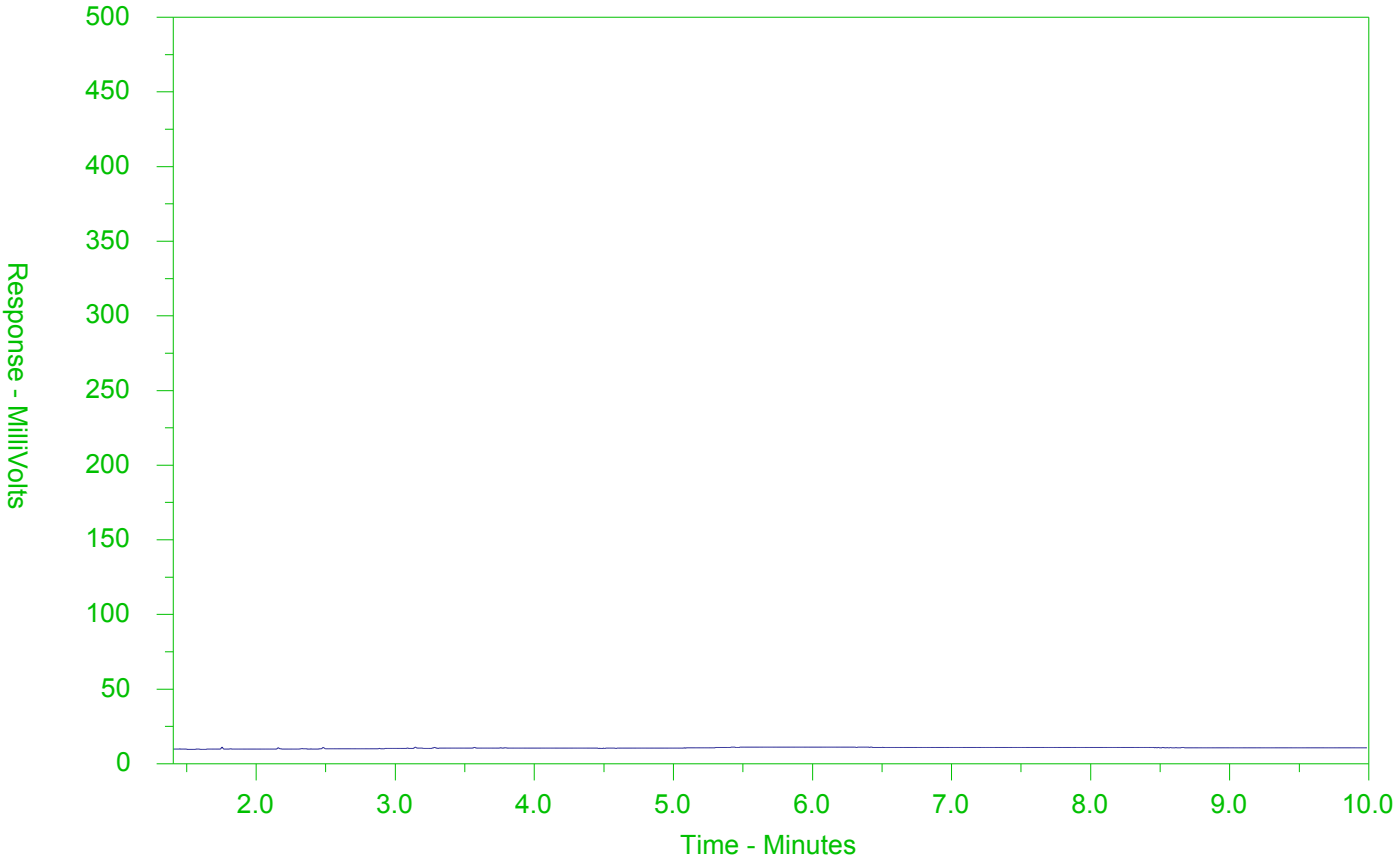
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-4
Client Sample ID: PC-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

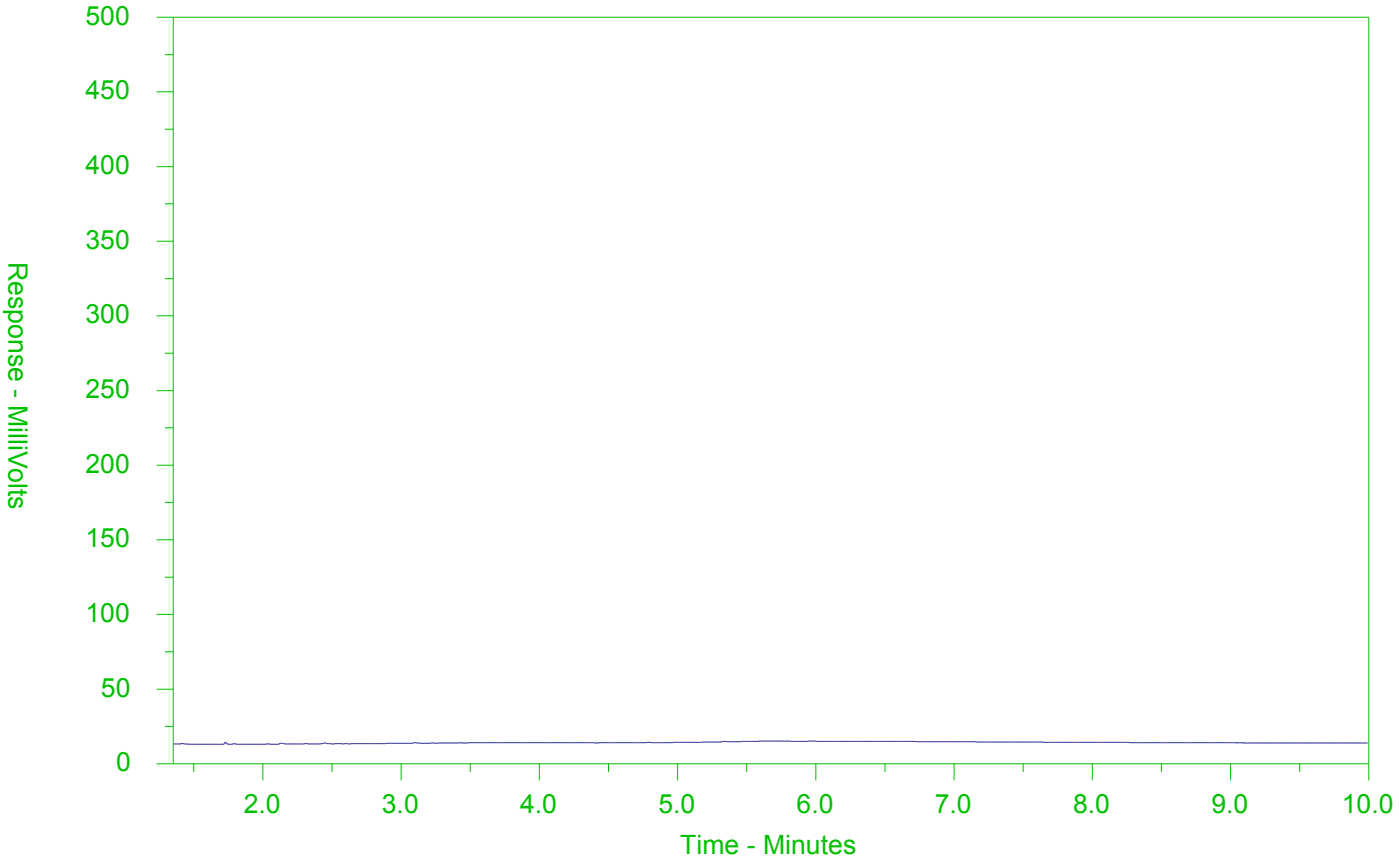
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-5
Client Sample ID: PC-5



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

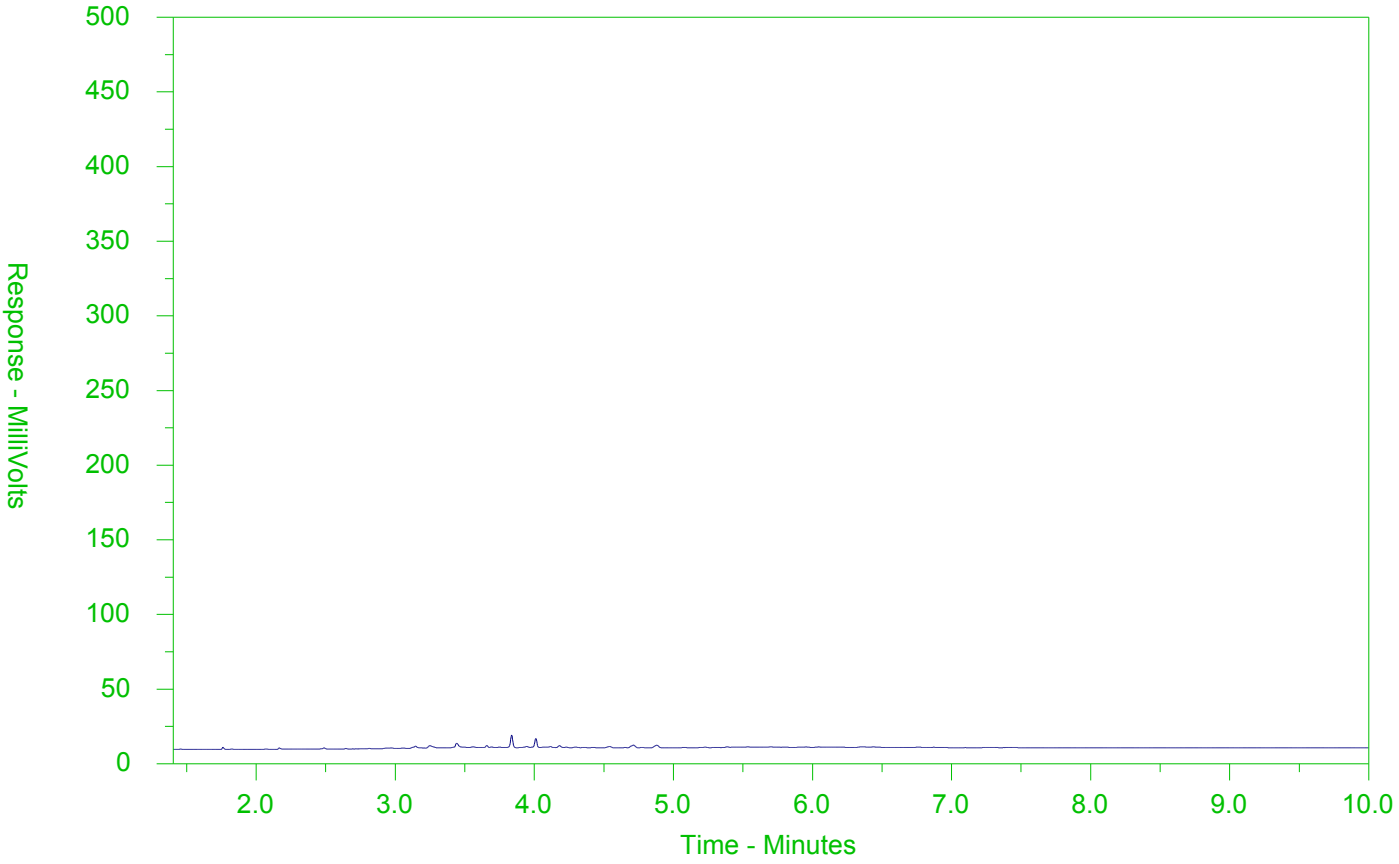
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-6
Client Sample ID: PC-6



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

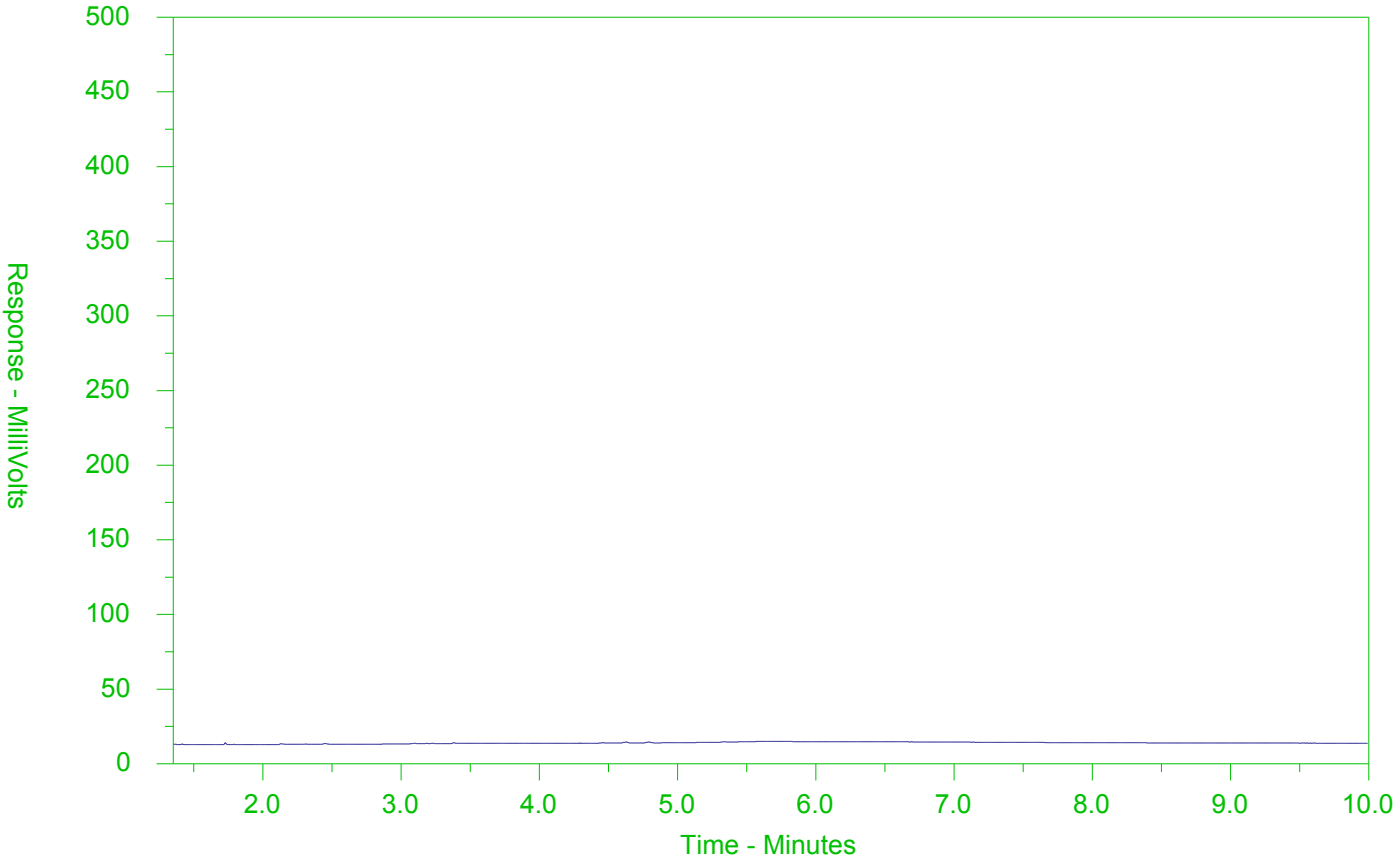
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-7
Client Sample ID: PC-7



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

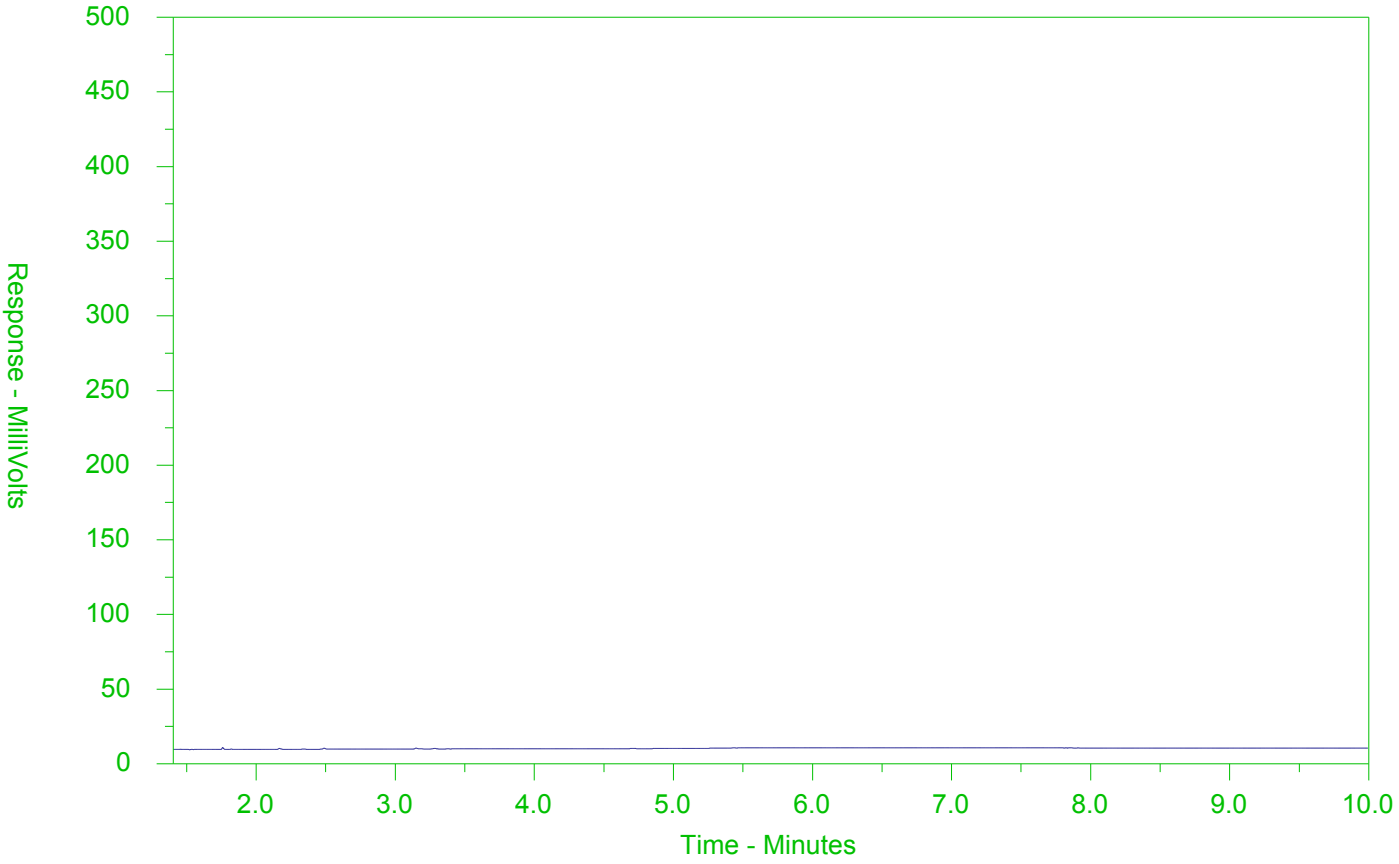
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-8
Client Sample ID: PC-8



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

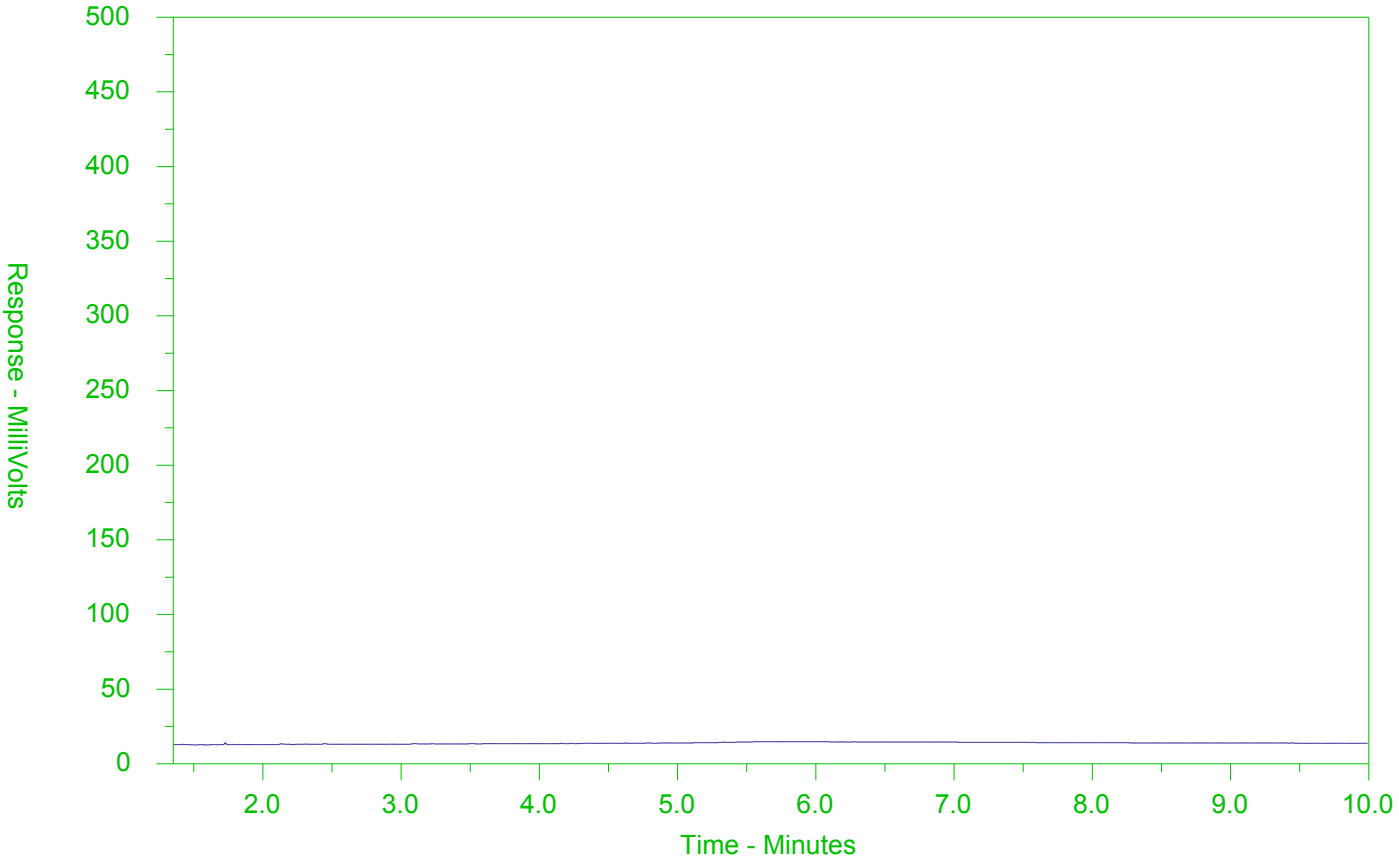
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-9
Client Sample ID: PC-9



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

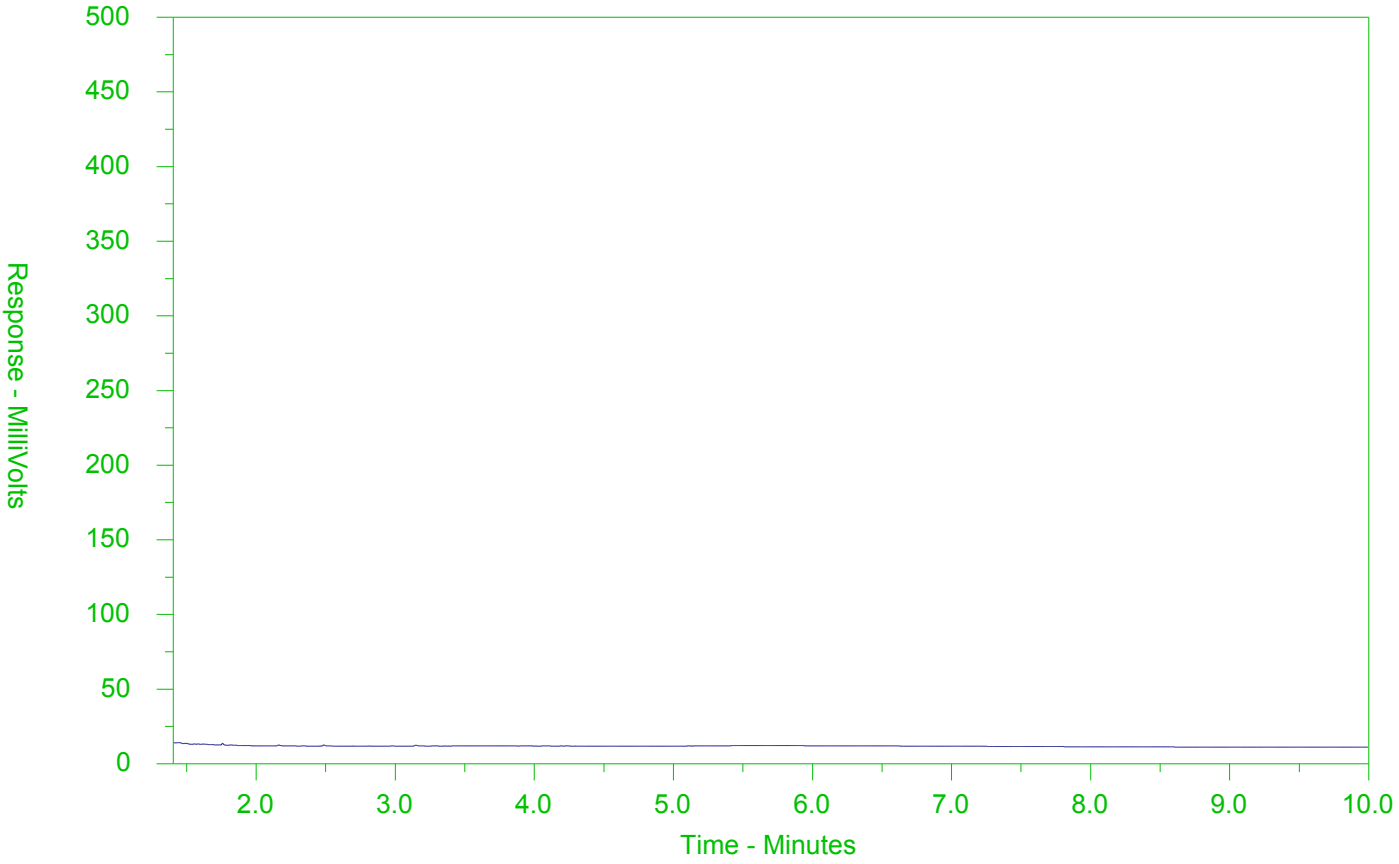
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2168276-10
Client Sample ID: PC-10



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2168276-COFC

COC Number: 17 - 684122

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	Darcy LaFramboise
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 Regal Road, Unit 3
City/Province:	Guelph, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [X] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	[X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	Mohawk Lake
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)			
AFE/Cost Center:		PO#	
Major/Minor Code:		Routing Code:	
Requisitioner:			
Location:			

ALS Lab Work Order # (lab use only): L2168276 COFC

ALS Contact: GB

Sampler:

Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, Hardness - CALC-WT	MET-ONT-PWQO-P_WT	N-TOT-WT	P-T-COL-WT, P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	BTEX	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	PC-1	20-9-18	14h40	Water	F	R	R	R	R	R	R	R	R	R	R	R	R			12
2	PC-2	"	14h15	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
3	PC-3	"	16h40	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
4	PC-2	"	15h03	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
5	PC-5	"	15h00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
6	PC-6	"	15h20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
7	PC-7	"	16:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
8	PC-8	"	11:40	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
9	PC-9	"	13h00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12
10	PC-10	"	13h40	Water	R	R	R	R	R	R	R	R	R	R	R	R	R			12

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

[ ] YES [X] NO

Are samples for human consumption/ use?

[ ] YES [X] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [ ] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			12.6		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Duncan Pooley	Date: Sept 20th, 2018	Time: 18h00	Received by:	Date:	Time:	Received by:	Date: Sept 20/2018	Time: 6:05 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

JULY 2017 FRONT

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 25-SEP-18
Report Date: 05-OCT-18 11:00 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2170520

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 17-684111
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170520-1	PC-1	Anions and Nutrients	Phosphorus, Total	0.109	0.01	mg/L
		Bacteriological Tests	E. Coli	90000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.376	0.015	mg/L
			Copper (Cu)-Total	0.0115	0.001	mg/L
			Iron (Fe)-Total	0.844	0.3	mg/L
			Lead (Pb)-Total	0.00348	0.001	mg/L
			Zinc (Zn)-Total	0.0469	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.031	0.00002	ug/L
			Benzo(k)fluoranthene	0.014	0.0002	ug/L
			Chrysene	0.037	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.064	0.008	ug/L
L2170520-2	PC-2	Anions and Nutrients	Phosphorus, Total	6.23	0.01	mg/L
		Bacteriological Tests	E. Coli	4400000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.221	0.015	mg/L
			Cadmium (Cd)-Total	0.000109	0.0001	mg/L
			Copper (Cu)-Total	0.128	0.001	mg/L
			Iron (Fe)-Total	0.319	0.3	mg/L
			Lead (Pb)-Total	0.00239	0.001	mg/L
			Silver (Ag)-Total	0.000296	0.0001	mg/L
			Zinc (Zn)-Total	0.153	0.02	mg/L
		Volatile Organic Compounds	Toluene	4.88	0.8	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.020	0.0008	ug/L
			Benzo(a)anthracene	<0.040	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.040	0.00002	ug/L
			Benzo(k)fluoranthene	<0.020	0.0002	ug/L
			Chrysene	0.048	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.040	0.002	ug/L
			Fluoranthene	0.044	0.008	ug/L
			Phenanthrene	0.072	0.03	ug/L
L2170520-3	PC-3	Anions and Nutrients	Phosphorus, Total	0.237	0.01	mg/L
		Bacteriological Tests	E. Coli	7300	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.597	0.015	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170520-3	PC-3	Total Metals	Copper (Cu)-Total	0.0087	0.001	mg/L
			Iron (Fe)-Total	0.932	0.3	mg/L
			Lead (Pb)-Total	0.00296	0.001	mg/L
			Zinc (Zn)-Total	0.0325	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.95	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.021	0.00002	ug/L
			Benzo(k)fluoranthene	0.014	0.0002	ug/L
			Chrysene	0.038	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.076	0.008	ug/L
L2170520-4	PC-4	Anions and Nutrients	Phosphorus, Total	0.104	0.01	mg/L
		Bacteriological Tests	E. Coli	23000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.434	0.015	mg/L
			Copper (Cu)-Total	0.0094	0.001	mg/L
			Iron (Fe)-Total	0.737	0.3	mg/L
			Lead (Pb)-Total	0.00217	0.001	mg/L
			Zinc (Zn)-Total	0.0362	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.62	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.026	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.052	0.008	ug/L
L2170520-5	PC-5	Anions and Nutrients	Phosphorus, Total	0.105	0.01	mg/L
		Bacteriological Tests	E. Coli	10300	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.253	0.015	mg/L
			Copper (Cu)-Total	0.0066	0.001	mg/L
			Lead (Pb)-Total	0.00140	0.001	mg/L
			Zinc (Zn)-Total	0.0234	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170520-5	PC-5	Polycyclic Aromatic Hydrocarbons	Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.014	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.045	0.008	ug/L
L2170520-6	PC-6	Anions and Nutrients	Phosphorus, Total	0.119	0.01	mg/L
		Bacteriological Tests	E. Coli	20900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.220	0.015	mg/L
			Copper (Cu)-Total	0.0107	0.001	mg/L
			Iron (Fe)-Total	0.550	0.3	mg/L
			Lead (Pb)-Total	0.00327	0.001	mg/L
			Zinc (Zn)-Total	0.0343	0.02	mg/L
		Volatile Organic Compounds	Toluene	0.93	0.8	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.027	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.074	0.008	ug/L
L2170520-7	PC-7	Anions and Nutrients	Phosphorus, Total	0.0187	0.01	mg/L
		Bacteriological Tests	E. Coli	5400	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.029	0.015	mg/L
			Copper (Cu)-Total	0.0020	0.001	mg/L
		Speciated Metals	Chromium, Hexavalent	1.55	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2170520-8	PC-8	Anions and Nutrients	Phosphorus, Total	0.0180	0.01	mg/L
		Bacteriological Tests	E. Coli	3600	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total		0.015	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170520-8	PC-8	Total Metals		0.056		
			Copper (Cu)-Total	0.0025	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.027	0.008	ug/L
L2170520-9	PC-9	Anions and Nutrients	Phosphorus, Total	0.0404	0.01	mg/L
		Bacteriological Tests	E. Coli	3900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.187	0.015	mg/L
			Copper (Cu)-Total	0.0086	0.001	mg/L
			Iron (Fe)-Total	0.391	0.3	mg/L
			Lead (Pb)-Total	0.00141	0.001	mg/L
		Volatile Organic Compounds	Trichloroethylene	20.8	20	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.029	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.184	0.008	ug/L
			Phenanthrene	0.237	0.03	ug/L
L2170520-10	PC-10	Anions and Nutrients	Phosphorus, Total	0.0688	0.01	mg/L
		Bacteriological Tests	E. Coli	11900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.268	0.015	mg/L
			Copper (Cu)-Total	0.0195	0.001	mg/L
			Iron (Fe)-Total	0.371	0.3	mg/L
			Lead (Pb)-Total	0.00181	0.001	mg/L
			Zinc (Zn)-Total	0.0344	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.31	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170520-10	PC-10	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.015	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.028	0.008	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Conductivity	umhos/cm	-	-		497	1640	1310	509	742	472	1570	1380	410
Hardness (as CaCO3)	mg/L	-	-		142 HTC	271 HTC	140 HTC	102 HTC	165 HTC	99 HTC	371 HTC	354 HTC	119 HTC
pH	pH units	6.5-8.5	-		7.85	7.61	7.93	7.74	7.75	7.61	7.98	8.15	7.57
Total Suspended Solids	mg/L	-	-		22.0	242 DLHC	10.4	16.6	7.3	8.4	3.5	2.9	3.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-10 Sample Date: 25-SEP-18 Sample ID: PC-10
Conductivity	umhos/cm	-	-	858
Hardness (as CaCO3)	mg/L	-	-	152 HTC
pH	pH units	6.5-8.5	-	7.83
Total Suspended Solids	mg/L	-	-	8.1

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

				Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	Unit	Guide Limits #1	#2										
Chloride (Cl)	mg/L	-	-		91.7	265 DLDS	346 DLDS	97.1	144	90.5	332 DLDS	293 DLDS	61.0
Nitrate (as N)	mg/L	-	-		0.769	<0.10 DLDS	0.65 DLDS	1.02	2.16	1.08	4.47 DLDS	4.42 DLDS	0.336
Nitrite (as N)	mg/L	-	-		0.015	<0.050 DLDS	<0.050 DLDS	0.030	<0.010	0.013	<0.050 DLDS	<0.050 DLDS	0.012
Total Kjeldahl Nitrogen	mg/L	-	-		<1.5 DLM	55 DLM	<1.5 DLM	1.92	2.0 DLM	4.6 DLM	1.31	3.6 DLM	2.84
Total Nitrogen	mg/L	-	-		<1.5	55	<1.5	2.97	4.2	5.7	5.78	8.0	3.19
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0411	3.16 DLHC	0.0351	0.0462	0.0752	0.0588	0.0145	0.0072	0.0156
Phosphorus, Total	mg/L	0.01	-		0.109	6.23 DLHC	0.237	0.104	0.105	0.119	0.0187	0.0180	0.0404

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-10 Sample Date: 25-SEP-18 Sample ID: PC-10
Chloride (Cl)	mg/L	-	-	180
Nitrate (as N)	mg/L	-	-	1.65
Nitrite (as N)	mg/L	-	-	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-	<1.5 DLM
Total Nitrogen	mg/L	-	-	1.7
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0291
Phosphorus, Total	mg/L	0.01	-	0.0688

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Cyanides - WATER

		Guide Limits								
Lab ID				L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
Sample Date				25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	**Unit**	**#1**	**#2**									
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits		Lab ID	Sample Date	Sample ID
Analyte	Unit	#1	#2	L2170520-10	25-SEP-18	PC-10
Cyanide, Free	mg/L	0.005	-	<0.0020		

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
E. Coli	CFU/100mL	100	-		90000 DLM	4400000 DLM	7300 DLM	23000 DLM	10300 DLM	20900 DLM	5400 DLM	3600 DLM	3900 DLM
Total Coliforms	CFU/100mL	-	-		470000 DLM	>20000000 DLM	91000 DLM	>200000 DLM	132000 DLM	>200000 DLM	28000 DLM	19000 DLM	27000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

				Lab ID	L2170520-10
				Sample Date	25-SEP-18
				Sample ID	PC-10
Analyte	Unit	Guide Limits #1	#2		
E. Coli	CFU/100mL	100	-	11900 DLM	
Total Coliforms	CFU/100mL	-	-	117000 DLM	

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
			Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
			Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	Unit	Guide Limits #1	#2									
Sodium Adsorption Ratio	SAR	-	-	2.31	4.70	7.37	2.39	2.51	2.10	4.03	3.28	1.34

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-10 Sample Date: 25-SEP-18 Sample ID: PC-10
Sodium Adsorption Ratio	SAR	-	-	3.71

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Aluminum (Al)-Total	mg/L	0.015	-		0.376	0.221	0.597	0.434	0.253	0.220	0.029	0.056	0.187
Antimony (Sb)-Total	mg/L	0.02	-		0.00083	0.00058	0.00057	0.00070	0.00047	0.00059	0.00021	0.00021	0.00254
Arsenic (As)-Total	mg/L	0.005	-		0.00076	0.00062	0.00078	0.00061	0.00035	0.00042	0.00024	0.00031	0.00111
Barium (Ba)-Total	mg/L	-	-		0.0352	0.0436	0.0378	0.0254	0.0463	0.0289	0.130	0.0769	0.0502
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	0.00273	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.020	0.145	0.029	0.038	0.026	0.019	0.043	0.036	0.027
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000034	0.000109	0.000052	0.000038	0.000034	0.000034	0.000022	0.000018	0.000030
Calcium (Ca)-Total	mg/L	-	-		43.0	70.8	42.8	30.4	48.8	29.8	107	105	36.0
Cesium (Cs)-Total	mg/L	-	-		0.000038	0.000050	0.000050	0.000051	0.000021	0.000020	<0.000010	<0.000010	0.000038
Chromium (Cr)-Total	mg/L	-	-		0.00219	0.00137	0.00321	0.00248	0.00119	0.00134	0.00160	0.00088	0.00078
Cobalt (Co)-Total	mg/L	0.0009	-		0.00029	0.00037	0.00044	0.00036	0.00017	0.00016	<0.00010	<0.00010	0.00022
Copper (Cu)-Total	mg/L	0.001	-		0.0115	0.128	0.0087	0.0094	0.0066	0.0107	0.0020	0.0025	0.0086
Iron (Fe)-Total	mg/L	0.3	-		0.844	0.319	0.932	0.737	0.299	0.550	0.085	0.235	0.391
Lead (Pb)-Total	mg/L	0.001	-		0.00348	0.00239	0.00296	0.00217	0.00140	0.00327	0.00049	0.00028	0.00141
Magnesium (Mg)-Total	mg/L	-	-		8.34	22.9	8.14	6.28	10.6	5.88	25.5	22.0	7.02
Manganese (Mn)-Total	mg/L	-	-		0.0499	0.0337	0.0542	0.0513	0.0373	0.0481	0.00588	0.0468	0.0567
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	0.000018	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000993	0.00266	0.00136	0.000967	0.000683	0.000772	0.000880	0.000411	0.00161
Nickel (Ni)-Total	mg/L	0.025	-		0.00168	0.00289	0.00178	0.00138	0.00090	0.00091	<0.00050	0.00053	0.00097
Potassium (K)-Total	mg/L	-	-		1.87	17.2	2.01	2.21	3.09	2.69	3.78	2.78	1.33
Rubidium (Rb)-Total	mg/L	-	-		0.00155	0.0125	0.00180	0.00196	0.00135	0.00173	0.00057	0.00087	0.00090
Selenium (Se)-Total	mg/L	0.1	-		0.000249	0.000577	0.000168	0.000199	0.000631	0.000309	0.00168	0.000870	0.000286
Silicon (Si)-Total	mg/L	-	-		2.77	2.21	3.55	1.83	2.62	1.86	5.79	5.47	2.12
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	0.000296	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		63.1	178 DLHC	201 DLHC	55.4	74.1	47.9	179 DLHC	142 DLHC	33.6
Strontium (Sr)-Total	mg/L	-	-		0.225	0.490	0.246	0.167	0.199	0.129	0.440	0.271	0.163
Sulfur (S)-Total	mg/L	-	-		5.82	29.2	10.0	7.21	7.41	5.41	17.4	14.9	9.10
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-10 Sample Date: 25-SEP-18 Sample ID: PC-10
Aluminum (Al)-Total	mg/L	0.015	-	0.268
Antimony (Sb)-Total	mg/L	0.02	-	0.00077
Arsenic (As)-Total	mg/L	0.005	-	0.00050
Barium (Ba)-Total	mg/L	-	-	0.0376
Beryllium (Be)-Total	mg/L	0.011	-	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	<0.000050
Boron (B)-Total	mg/L	0.2	-	0.028
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000051
Calcium (Ca)-Total	mg/L	-	-	47.5
Cesium (Cs)-Total	mg/L	-	-	0.000024
Chromium (Cr)-Total	mg/L	-	-	0.00182
Cobalt (Co)-Total	mg/L	0.0009	-	0.00022
Copper (Cu)-Total	mg/L	0.001	-	0.0195
Iron (Fe)-Total	mg/L	0.3	-	0.371
Lead (Pb)-Total	mg/L	0.001	-	0.00181
Magnesium (Mg)-Total	mg/L	-	-	8.03
Manganese (Mn)-Total	mg/L	-	-	0.0261
Mercury (Hg)-Total	mg/L	0.0002	-	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-	0.00103
Nickel (Ni)-Total	mg/L	0.025	-	0.00121
Potassium (K)-Total	mg/L	-	-	1.94
Rubidium (Rb)-Total	mg/L	-	-	0.00103
Selenium (Se)-Total	mg/L	0.1	-	0.000603
Silicon (Si)-Total	mg/L	-	-	2.96
Silver (Ag)-Total	mg/L	0.0001	-	<0.000050
Sodium (Na)-Total	mg/L	-	-	105 DLHC
Strontium (Sr)-Total	mg/L	-	-	0.198
Sulfur (S)-Total	mg/L	-	-	7.70
Tellurium (Te)-Total	mg/L	-	-	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2170520-1 / 25-SEP-18 / PC-1	L2170520-2 / 25-SEP-18 / PC-2	L2170520-3 / 25-SEP-18 / PC-3	L2170520-4 / 25-SEP-18 / PC-4	L2170520-5 / 25-SEP-18 / PC-5	L2170520-6 / 25-SEP-18 / PC-6	L2170520-7 / 25-SEP-18 / PC-7	L2170520-8 / 25-SEP-18 / PC-8	L2170520-9 / 25-SEP-18 / PC-9
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00134	0.00188	0.00147	0.00082	0.00047	0.00033	0.00014	0.00019	0.00028
Titanium (Ti)-Total	mg/L	-	-	0.0148	0.00488	0.0154	0.0138	0.0113	0.00854	<0.0020 DLUI	<0.0020 DLUI	0.00635
Tungsten (W)-Total	mg/L	0.03	-	<0.00010	<0.00010	0.00021	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	0.00679
Uranium (U)-Total	mg/L	0.005	-	0.000247	0.000460	0.000266	0.000285	0.000706	0.000276	0.000496	0.00118	0.000944
Vanadium (V)-Total	mg/L	0.006	-	0.00238	0.00069	0.00384	0.00210	0.00155	0.00142	<0.00050	0.00061	0.00096
Zinc (Zn)-Total	mg/L	0.02	-	0.0469	0.153	0.0325	0.0362	0.0234	0.0343	0.0062	0.0084	0.0196
Zirconium (Zr)-Total	mg/L	0.004	-	0.00053	0.00189	0.00037	0.00047	<0.00030	<0.00030	<0.00030	<0.00030	0.00059

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-10 Sample Date: 25-SEP-18 Sample ID: PC-10
Thorium (Th)-Total	mg/L	-	-	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00083
Titanium (Ti)-Total	mg/L	-	-	0.0106
Tungsten (W)-Total	mg/L	0.03	-	0.00010
Uranium (U)-Total	mg/L	0.005	-	0.000455
Vanadium (V)-Total	mg/L	0.006	-	0.00219
Zinc (Zn)-Total	mg/L	0.02	-	0.0344
Zirconium (Zr)-Total	mg/L	0.004	-	0.00043

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Speciated Metals - WATER

		Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
		Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
		Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
		Guide Limits									
Analyte	Unit	#1	#2								
Chromium, Hexavalent	ug/L	1	-	0.97	<0.50	1.95	1.62	0.91	0.89	1.55	0.53	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Speciated Metals - WATER

			Lab ID	L2170520-10
			Sample Date	25-SEP-18
			Sample ID	PC-10
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Chromium, Hexavalent	ug/L	1	-	1.31

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170520-1 / Sample Date: 25-SEP-18 / Sample ID: PC-1	Lab ID: L2170520-2 / Sample Date: 25-SEP-18 / Sample ID: PC-2	Lab ID: L2170520-3 / Sample Date: 25-SEP-18 / Sample ID: PC-3	Lab ID: L2170520-4 / Sample Date: 25-SEP-18 / Sample ID: PC-4	Lab ID: L2170520-5 / Sample Date: 25-SEP-18 / Sample ID: PC-5	Lab ID: L2170520-6 / Sample Date: 25-SEP-18 / Sample ID: PC-6	Lab ID: L2170520-7 / Sample Date: 25-SEP-18 / Sample ID: PC-7	Lab ID: L2170520-8 / Sample Date: 25-SEP-18 / Sample ID: PC-8	Lab ID: L2170520-9 / Sample Date: 25-SEP-18 / Sample ID: PC-9
Acetone	ug/L	-	-	<30	80 VTHS	<30	<30	<30	<30	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	2.1	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	2.40	1.22	<0.50	<0.50	180
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.95 VTHS
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2170520-10
				Sample Date	25-SEP-18
				Sample ID	PC-10
		Guide Limits			
Analyte	Unit	#1	#2		
Acetone	ug/L	-	-	<30	
Benzene	ug/L	100	-	<0.50	
Bromodichloromethane	ug/L	200	-	<2.0	
Bromoform	ug/L	60	-	<5.0	
Bromomethane	ug/L	-	-	<0.50	
Carbon tetrachloride	ug/L	-	-	<0.20	
Chlorobenzene	ug/L	15	-	<0.50	
Dibromochloromethane	ug/L	40	-	<2.0	
Chloroform	ug/L	-	-	<1.0	
1,2-Dibromoethane	ug/L	5	-	<0.20	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	
1,4-Dichlorobenzene	ug/L	4	-	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<2.0	
1,1-Dichloroethane	ug/L	200	-	<0.50	
1,2-Dichloroethane	ug/L	100	-	<0.50	
1,1-Dichloroethylene	ug/L	40	-	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	
Methylene Chloride	ug/L	100	-	<5.0	
1,2-Dichloropropane	ug/L	0.7	-	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	
Ethylbenzene	ug/L	8	-	<0.50	
n-Hexane	ug/L	-	-	<0.50	
Methyl Ethyl Ketone	ug/L	400	-	<20	
Methyl Isobutyl Ketone	ug/L	-	-	<20	
MTBE	ug/L	-	-	<2.0	
Styrene	ug/L	4	-	<0.50	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
1,1,1,2-Tetrachloroethane	ug/L	20.0	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	<0.50
Toluene	ug/L	0.8	-		<0.50	4.88	<0.50	<0.50	<0.50	0.93	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<3.9 DLQ
1,1,2-Trichloroethane	ug/L	800	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20.8
Trichlorofluoromethane	ug/L	-	-		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.4
o-Xylene	ug/L	40	-		<0.30	0.49	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-		<0.40	1.13	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-		<0.50	1.62	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-		88.7	85.9	87.5	86.0	85.8	85.3	85.2	84.1	83.9
Surrogate: 1,4-Difluorobenzene	%	-	-		98.3	98.4	97.6	98.4	97.1	97.9	97.5	98.0	97.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2170520-10
				Sample Date	25-SEP-18
				Sample ID	PC-10
Analyte	Unit	Guide Limits #1	#2		
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	
Tetrachloroethylene	ug/L	50	-	<0.50	
Toluene	ug/L	0.8	-	<0.50	
1,1,1-Trichloroethane	ug/L	10	-	<0.50	
1,1,2-Trichloroethane	ug/L	800	-	<0.50	
Trichloroethylene	ug/L	20	-	<0.50	
Trichlorofluoromethane	ug/L	-	-	<5.0	
Vinyl chloride	ug/L	600	-	<0.50	
o-Xylene	ug/L	40	-	<0.30	
m+p-Xylenes	ug/L	2	-	<0.40	
Xylenes (Total)	ug/L	-	-	<0.50	
Surrogate: 4-Bromofluorobenzene	%	-	-	84.1	
Surrogate: 1,4-Difluorobenzene	%	-	-	97.5	

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Hydrocarbons - WATER

		Guide Limits								
Lab ID				L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
Sample Date				25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	**Unit**	**#1**	**#2**									
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25	<25	<25	<25	<25	27
F1-BTEX	ug/L	-	-	<25	<25	<25	<25	<25	<25	<25	<25	27
F2 (C10-C16)	ug/L	-	-	<100	120	<100	<100	<100	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	120	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	950	1520	350	390	250	<250	<250	<250	<250
F3-PAH	ug/L	-	-	950	1520	350	390	250	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	290	710	<250	<250	<250	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	1240	2350	<370	390	<370	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES	YES	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	98.6	112.0	99.1	114.1	98.7	98.3	89.7	94.5	97.5
Surrogate: 3,4-Dichlorotoluene	%	-	-	89.6	62.4	92.9	88.3	86.6	87.5	85.3	80.8	85.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

			Lab ID	L2170520-10
			Sample Date	25-SEP-18
			Sample ID	PC-10
		Guide Limits		
Analyte	Unit	#1	#2	
F1 (C6-C10)	ug/L	-	-	<25
F1-BTEX	ug/L	-	-	<25
F2 (C10-C16)	ug/L	-	-	<100
F2-Naphth	ug/L	-	-	<100
F3 (C16-C34)	ug/L	-	-	<250
F3-PAH	ug/L	-	-	<250
F4 (C34-C50)	ug/L	-	-	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370
Chrom. to baseline at nC50		-	-	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	100.9
Surrogate: 3,4-Dichlorotoluene	%	-	-	89.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits									
Lab ID				L2170520-1	L2170520-2	L2170520-3	L2170520-4	L2170520-5	L2170520-6	L2170520-7	L2170520-8	L2170520-9
Sample Date				25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
Sample ID				PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9
Analyte	**Unit**	**#1**	**#2**									
Acenaphthene	ug/L	-	-	<0.020	0.052 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	0.020 DLM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	0.018	<0.040 DLM	0.014	0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	ug/L	-	-	0.058	<0.040 DLM	0.051	0.035	0.027	0.032	<0.020	<0.020	0.026
Benzo(g,h,i)perylene	ug/L	0.00002	-	0.031	<0.040 DLM	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	0.014	<0.020 DLM	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	ug/L	0.0001	-	0.037	0.048 DLM	0.038	0.026	0.014	0.027	<0.010	<0.010	0.029
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.064	0.044 R	0.076	0.052	0.045	0.074	<0.010	0.027	0.184
Fluorene	ug/L	0.2	-	<0.020	<0.040 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.027	0.144 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020	0.092 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	0.100 DLM	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	0.12 DLM	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	0.029	0.072 DLM	0.026	0.022	0.030	0.027	<0.020	<0.020	0.237
Pyrene	ug/L	-	-	0.062	0.044 R	0.063	0.048	0.036	0.050	<0.020	<0.020	0.057
Surrogate: d10-Acenaphthene	%	-	-	100.0	N/A SMI	121.6	108.5	103.9	113.6	100.1	98.3	105.9
Surrogate: d12-Chrysene	%	-	-	110.5	110.3	117.1	114.3	79.5	118.6	105.9	104.5	111.8
Surrogate: d8-Naphthalene	%	-	-	106.7	N/A SMI	114.6	105.8	115.4	106.5	110.7	111.6	100.9
Surrogate: d10-Phenanthrene	%	-	-	106.4	105.1	76.7	87.3	116.5	82.5	110.9	84.2	76.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2170520-10
			Sample Date	25-SEP-18
			Sample ID	PC-10
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Acenaphthene	ug/L	-	-	<0.020
Acenaphthylene	ug/L	-	-	<0.020
Anthracene	ug/L	0.0008	-	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010
Benzo(b)fluoranthene	ug/L	-	-	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010
Chrysene	ug/L	0.0001	-	0.015
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020
Fluoranthene	ug/L	0.008	-	0.028
Fluorene	ug/L	0.2	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020
Naphthalene	ug/L	7	-	<0.050
Phenanthrene	ug/L	0.03	-	0.028
Pyrene	ug/L	-	-	0.040
Surrogate: d10-Acenaphthene	%	-	-	105.5
Surrogate: d12-Chrysene	%	-	-	106.6
Surrogate: d8-Naphthalene	%	-	-	100.4
Surrogate: d10-Phenanthrene	%	-	-	111.4

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
VTHS	Volatile test was conducted on sample with headspace. Results may be biased low.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
SMI	Surrogate recovery could not be measured due to sample matrix interference.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-684111

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2170520 Report Date: 05-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Chloride (Cl)		70.9	70.8		mg/L	0.1	20	28-SEP-18
WG2889777-7 LCS								
Chloride (Cl)			100.1		%		90-110	28-SEP-18
WG2889777-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Chloride (Cl)			100.2		%		75-125	28-SEP-18
CN-FREE-CFA-WT	**Water**							
Batch R4245670								
WG2887461-3 DUP		**L2170515-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887461-2 LCS								
Cyanide, Free			96.5		%		80-120	26-SEP-18
WG2887461-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	26-SEP-18
WG2887461-4 MS		**L2170515-1**						
Cyanide, Free			86.1		%		75-125	26-SEP-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4251082								
WG2889578-9 DUP		**WG2889578-8**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	28-SEP-18
WG2889578-7 LCS								
Chromium, Hexavalent			99.5		%		80-120	28-SEP-18
WG2889578-6 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	28-SEP-18
WG2889578-10 MS		**WG2889578-8**						
Chromium, Hexavalent			95.9		%		70-130	28-SEP-18
EC-MF-WT	**Water**							
Batch R4246827								
WG2887262-3 DUP		**L2170520-9**						
E. Coli		3900	3700		CFU/100mL	5.3	65	27-SEP-18
WG2887262-1 MB								
E. Coli			0		CFU/100mL		1	27-SEP-18
EC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4245236								
WG2886889-8 DUP		**WG2886889-7**						
Conductivity		2300	2300		umhos/cm	0.0	10	26-SEP-18
WG2886889-6 LCS								
Conductivity			100.1		%		90-110	26-SEP-18
WG2886889-5 MB								
Conductivity			<3.0		umhos/cm		3	26-SEP-18
F1-HS-511-WT	**Water**							
Batch R4253718								
WG2890532-4 DUP		**WG2890532-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	01-OCT-18
WG2890532-1 LCS								
F1 (C6-C10)			112.5		%		80-120	01-OCT-18
WG2890532-2 MB								
F1 (C6-C10)			<25		ug/L		25	01-OCT-18
Surrogate: 3,4-Dichlorotoluene			95.9		%		60-140	01-OCT-18
WG2890532-5 MS		**WG2890532-3**						
F1 (C6-C10)			91.7		%		60-140	01-OCT-18
F2-F4-511-WT	**Water**							
Batch R4251008								
WG2887995-2 LCS								
F2 (C10-C16)			95.1		%		70-130	27-SEP-18
F3 (C16-C34)			100.2		%		70-130	27-SEP-18
F4 (C34-C50)			108.4		%		70-130	27-SEP-18
WG2887995-3 LCSD		**WG2887995-2**						
F2 (C10-C16)		95.1	93.6		%	1.6	50	27-SEP-18
F3 (C16-C34)		100.2	98.4		%	1.8	50	27-SEP-18
F4 (C34-C50)		108.4	104.7		%	3.5	50	27-SEP-18
WG2887995-1 MB								
F2 (C10-C16)			<100		ug/L		100	27-SEP-18
F3 (C16-C34)			<250		ug/L		250	27-SEP-18
F4 (C34-C50)			<250		ug/L		250	27-SEP-18
Surrogate: 2-Bromobenzotrifluoride			87.4		%		60-140	27-SEP-18
Batch R4251276								
WG2888239-2 LCS								
F2 (C10-C16)			89.8		%		70-130	28-SEP-18
F3 (C16-C34)			91.8		%		70-130	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT	**Water**							
Batch R4251276								
WG2888239-2 LCS								
F4 (C34-C50)			106.3		%		70-130	28-SEP-18
WG2888239-3 LCSD		**WG2888239-2**						
F2 (C10-C16)		89.8	91.1		%	1.4	50	28-SEP-18
F3 (C16-C34)		91.8	94.2		%	2.6	50	28-SEP-18
F4 (C34-C50)		106.3	97.4		%	8.7	50	28-SEP-18
WG2888239-1 MB								
F2 (C10-C16)			<100		ug/L		100	28-SEP-18
F3 (C16-C34)			<250		ug/L		250	28-SEP-18
F4 (C34-C50)			<250		ug/L		250	28-SEP-18
Surrogate: 2-Bromobenzotrifluoride			91.6		%		60-140	28-SEP-18
HG-T-CVAA-WT	**Water**							
Batch R4242850								
WG2887067-3 DUP		**L2169655-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887067-2 LCS								
Mercury (Hg)-Total			100.0		%		80-120	26-SEP-18
WG2887067-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	26-SEP-18
WG2887067-4 MS		**L2169900-1**						
Mercury (Hg)-Total			95.5		%		70-130	26-SEP-18
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-4 DUP		**WG2886705-3**						
Aluminum (Al)-Total		0.367	0.366		mg/L	0.4	20	26-SEP-18
Antimony (Sb)-Total		0.00054	0.00051		mg/L	6.7	20	26-SEP-18
Arsenic (As)-Total		0.00091	0.00086		mg/L	5.1	20	26-SEP-18
Barium (Ba)-Total		0.0708	0.0707		mg/L	0.1	20	26-SEP-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-SEP-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-SEP-18
Boron (B)-Total		0.039	0.039		mg/L	0.9	20	26-SEP-18
Cadmium (Cd)-Total		0.0000236	0.0000241		mg/L	2.1	20	26-SEP-18
Calcium (Ca)-Total		60.7	61.5		mg/L	1.2	20	26-SEP-18
Chromium (Cr)-Total		0.00084	0.00093		mg/L	9.8	20	26-SEP-18
Cesium (Cs)-Total		0.000034	0.000034		mg/L	0.3	20	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-4 DUP		**WG2886705-3**						
Cobalt (Co)-Total		0.00030	0.00030		mg/L	0.6	20	26-SEP-18
Copper (Cu)-Total		0.0043	0.0042		mg/L	2.9	20	26-SEP-18
Iron (Fe)-Total		0.746	0.760		mg/L	1.8	20	26-SEP-18
Lead (Pb)-Total		0.00278	0.00277		mg/L	0.6	20	26-SEP-18
Magnesium (Mg)-Total		16.7	16.7		mg/L	0.1	20	26-SEP-18
Manganese (Mn)-Total		0.0912	0.0916		mg/L	0.4	20	26-SEP-18
Molybdenum (Mo)-Total		0.000840	0.000854		mg/L	1.7	20	26-SEP-18
Nickel (Ni)-Total		0.00130	0.00125		mg/L	4.2	20	26-SEP-18
Potassium (K)-Total		3.38	3.57		mg/L	5.5	20	26-SEP-18
Rubidium (Rb)-Total		0.00159	0.00154		mg/L	2.8	20	26-SEP-18
Selenium (Se)-Total		0.000420	0.000402		mg/L	4.3	20	26-SEP-18
Silicon (Si)-Total		3.11	3.05		mg/L	1.7	20	26-SEP-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-SEP-18
Sodium (Na)-Total		111	110		mg/L	0.9	20	26-SEP-18
Strontium (Sr)-Total		0.287	0.274		mg/L	4.9	20	26-SEP-18
Sulfur (S)-Total		11.9	11.5		mg/L	3.3	25	26-SEP-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-SEP-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	26-SEP-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	26-SEP-18
Tin (Sn)-Total		0.00022	0.00021		mg/L	3.8	20	26-SEP-18
Titanium (Ti)-Total		0.00970	0.00947		mg/L	2.3	20	26-SEP-18
Tungsten (W)-Total		0.00018	0.00018		mg/L	1.4	20	26-SEP-18
Uranium (U)-Total		0.000831	0.000823		mg/L	1.0	20	26-SEP-18
Vanadium (V)-Total		0.00154	0.00146		mg/L	5.6	20	26-SEP-18
Zinc (Zn)-Total		0.0117	0.0114		mg/L	2.5	20	26-SEP-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2886705-2 LCS								
Aluminum (Al)-Total			100.3		%		80-120	26-SEP-18
Antimony (Sb)-Total			99.1		%		80-120	26-SEP-18
Arsenic (As)-Total			99.7		%		80-120	26-SEP-18
Barium (Ba)-Total			98.2		%		80-120	26-SEP-18
Beryllium (Be)-Total			97.2		%		80-120	26-SEP-18
Bismuth (Bi)-Total			98.7		%		80-120	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-2 LCS								
Boron (B)-Total			94.1		%		80-120	26-SEP-18
Cadmium (Cd)-Total			102.2		%		80-120	26-SEP-18
Calcium (Ca)-Total			98.5		%		80-120	26-SEP-18
Chromium (Cr)-Total			99.4		%		80-120	26-SEP-18
Cesium (Cs)-Total			102.2		%		80-120	26-SEP-18
Cobalt (Co)-Total			98.5		%		80-120	26-SEP-18
Copper (Cu)-Total			99.3		%		80-120	26-SEP-18
Iron (Fe)-Total			99.6		%		80-120	26-SEP-18
Lead (Pb)-Total			96.3		%		80-120	26-SEP-18
Magnesium (Mg)-Total			100.1		%		80-120	26-SEP-18
Manganese (Mn)-Total			100.2		%		80-120	26-SEP-18
Molybdenum (Mo)-Total			101.2		%		80-120	26-SEP-18
Nickel (Ni)-Total			99.2		%		80-120	26-SEP-18
Potassium (K)-Total			93.8		%		80-120	26-SEP-18
Rubidium (Rb)-Total			103.6		%		80-120	26-SEP-18
Selenium (Se)-Total			101.8		%		80-120	26-SEP-18
Silicon (Si)-Total			98.9		%		60-140	26-SEP-18
Silver (Ag)-Total			99.7		%		80-120	26-SEP-18
Sodium (Na)-Total			99.6		%		80-120	26-SEP-18
Strontium (Sr)-Total			106.4		%		80-120	26-SEP-18
Sulfur (S)-Total			91.3		%		80-120	26-SEP-18
Thallium (Tl)-Total			95.2		%		80-120	26-SEP-18
Tellurium (Te)-Total			97.7		%		80-120	26-SEP-18
Thorium (Th)-Total			95.2		%		70-130	26-SEP-18
Tin (Sn)-Total			100.0		%		80-120	26-SEP-18
Titanium (Ti)-Total			95.8		%		80-120	26-SEP-18
Tungsten (W)-Total			92.9		%		80-120	26-SEP-18
Uranium (U)-Total			97.4		%		80-120	26-SEP-18
Vanadium (V)-Total			100.7		%		80-120	26-SEP-18
Zinc (Zn)-Total			96.3		%		80-120	26-SEP-18
Zirconium (Zr)-Total			102.0		%		80-120	26-SEP-18
WG2886705-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	26-SEP-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-1 MB								
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Boron (B)-Total			<0.010		mg/L		0.01	26-SEP-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	26-SEP-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-SEP-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	26-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	26-SEP-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-SEP-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	26-SEP-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	26-SEP-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	26-SEP-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	26-SEP-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	26-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	26-SEP-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	26-SEP-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-SEP-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-SEP-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	26-SEP-18
WG2886705-5 MS		**WG2886705-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	26-SEP-18
Antimony (Sb)-Total			95.2		%		70-130	26-SEP-18
Arsenic (As)-Total			92.3		%		70-130	26-SEP-18
Barium (Ba)-Total			N/A	MS-B	%		-	26-SEP-18
Beryllium (Be)-Total			85.2		%		70-130	26-SEP-18
Bismuth (Bi)-Total			86.8		%		70-130	26-SEP-18
Boron (B)-Total			80.4		%		70-130	26-SEP-18
Cadmium (Cd)-Total			91.7		%		70-130	26-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	26-SEP-18
Chromium (Cr)-Total			91.2		%		70-130	26-SEP-18
Cesium (Cs)-Total			92.5		%		70-130	26-SEP-18
Cobalt (Co)-Total			88.8		%		70-130	26-SEP-18
Copper (Cu)-Total			88.4		%		70-130	26-SEP-18
Iron (Fe)-Total			N/A	MS-B	%		-	26-SEP-18
Lead (Pb)-Total			85.0		%		70-130	26-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-SEP-18
Manganese (Mn)-Total			N/A	MS-B	%		-	26-SEP-18
Molybdenum (Mo)-Total			95.5		%		70-130	26-SEP-18
Nickel (Ni)-Total			87.6		%		70-130	26-SEP-18
Potassium (K)-Total			N/A	MS-B	%		-	26-SEP-18
Rubidium (Rb)-Total			92.4		%		70-130	26-SEP-18
Selenium (Se)-Total			93.9		%		70-130	26-SEP-18
Silicon (Si)-Total			N/A	MS-B	%		-	26-SEP-18
Silver (Ag)-Total			87.2		%		70-130	26-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	26-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	26-SEP-18
Sulfur (S)-Total			N/A	MS-B	%		-	26-SEP-18
Thallium (Tl)-Total			86.7		%		70-130	26-SEP-18
Tellurium (Te)-Total			84.7		%		70-130	26-SEP-18
Thorium (Th)-Total			79.0		%		70-130	26-SEP-18
Tin (Sn)-Total			90.7		%		70-130	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-5 MS		**WG2886705-6**						
Titanium (Ti)-Total			90.7		%		70-130	26-SEP-18
Tungsten (W)-Total			87.6		%		70-130	26-SEP-18
Uranium (U)-Total			N/A	MS-B	%		-	26-SEP-18
Vanadium (V)-Total			93.9		%		70-130	26-SEP-18
Zinc (Zn)-Total			86.9		%		70-130	26-SEP-18
Zirconium (Zr)-Total			74.0		%		70-130	26-SEP-18
NO2-IC-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Nitrite (as N)		0.015	0.014		mg/L	1.9	25	28-SEP-18
WG2889777-7 LCS								
Nitrite (as N)			105.1		%		70-130	28-SEP-18
WG2889777-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Nitrite (as N)			102.8		%		70-130	28-SEP-18
NO3-IC-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Nitrate (as N)		0.595	0.598		mg/L	0.6	25	28-SEP-18
WG2889777-7 LCS								
Nitrate (as N)			100.9		%		70-130	28-SEP-18
WG2889777-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Nitrate (as N)			102.7		%		70-130	28-SEP-18
P-T-COL-WT	**Water**							
Batch R4252009								
WG2889947-3 DUP		**L2169900-1**						
Phosphorus, Total		0.848	0.891		mg/L	4.9	20	30-SEP-18
WG2889947-2 LCS								
Phosphorus, Total			95.3		%		80-120	30-SEP-18
WG2889947-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	30-SEP-18
WG2889947-4 MS		**L2169900-1**						
Phosphorus, Total			N/A	MS-B	%		-	30-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4252006								
WG2889948-3 DUP		**L2170515-2**						
Phosphorus (P)-Total	Dissolved	0.0125	0.0122		mg/L	2.7	20	30-SEP-18
WG2889948-2 LCS								
Phosphorus (P)-Total	Dissolved		95.8		%		80-120	30-SEP-18
WG2889948-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	30-SEP-18
WG2889948-4 MS		**L2170515-2**						
Phosphorus (P)-Total	Dissolved		97.9		%		70-130	30-SEP-18
PAH-PWQO-WT	**Water**							
Batch R4259467								
WG2888239-2 LCS								
1-Methylnaphthalene			93.1		%		50-150	04-OCT-18
2-Methylnaphthalene			95.1		%		50-150	04-OCT-18
Acenaphthene			94.1		%		50-150	04-OCT-18
Acenaphthylene			98.0		%		50-150	04-OCT-18
Anthracene			103.3		%		60-130	04-OCT-18
Benzo(a)anthracene			123.7		%		60-130	04-OCT-18
Benzo(a)pyrene			101.4		%		50-150	04-OCT-18
Benzo(b)fluoranthene			109.9		%		50-150	04-OCT-18
Benzo(g,h,i)perylene			104.6		%		60-130	04-OCT-18
Benzo(k)fluoranthene			102.8		%		60-130	04-OCT-18
Chrysene			119.7		%		60-130	04-OCT-18
Dibenzo(ah)anthracene			107.5		%		60-130	04-OCT-18
Fluoranthene			109.7		%		60-130	04-OCT-18
Fluorene			102.2		%		50-150	04-OCT-18
Indeno(1,2,3-cd)pyrene			115.4		%		50-150	04-OCT-18
Naphthalene			97.2		%		50-150	04-OCT-18
Phenanthrene			106.5		%		50-150	04-OCT-18
Pyrene			110.4		%		50-150	04-OCT-18
WG2888239-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
2-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthylene			<0.020		ug/L		0.02	04-OCT-18
Anthracene			<0.010		ug/L		0.01	04-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4259467								
WG2888239-1 MB								
Benzo(a)anthracene			<0.020		ug/L		0.02	04-OCT-18
Benzo(a)pyrene			<0.010		ug/L		0.01	04-OCT-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	04-OCT-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	04-OCT-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	04-OCT-18
Chrysene			<0.010		ug/L		0.01	04-OCT-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	04-OCT-18
Fluoranthene			<0.010		ug/L		0.01	04-OCT-18
Fluorene			<0.020		ug/L		0.02	04-OCT-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	04-OCT-18
Naphthalene			<0.050		ug/L		0.05	04-OCT-18
Phenanthrene			<0.020		ug/L		0.02	04-OCT-18
Pyrene			<0.020		ug/L		0.02	04-OCT-18
Surrogate: d8-Naphthalene			109.3		%		40-130	04-OCT-18
Surrogate: d10-Phenanthrene			112.6		%		40-130	04-OCT-18
Surrogate: d12-Chrysene			111.5		%		40-130	04-OCT-18
Surrogate: d10-Acenaphthene			105.7		%		40-130	04-OCT-18
Batch R4259731								
WG2887995-2 LCS								
1-Methylnaphthalene			90.1		%		50-150	04-OCT-18
2-Methylnaphthalene			92.4		%		50-150	04-OCT-18
Acenaphthene			91.8		%		50-150	04-OCT-18
Acenaphthylene			94.9		%		50-150	04-OCT-18
Anthracene			98.6		%		60-130	04-OCT-18
Benzo(a)anthracene			115.4		%		60-130	04-OCT-18
Benzo(a)pyrene			100.2		%		50-150	04-OCT-18
Benzo(b)fluoranthene			110.2		%		50-150	04-OCT-18
Benzo(g,h,i)perylene			97.5		%		60-130	04-OCT-18
Benzo(k)fluoranthene			101.4		%		60-130	04-OCT-18
Chrysene			109.0		%		60-130	04-OCT-18
Dibenzo(ah)anthracene			102.2		%		60-130	04-OCT-18
Fluoranthene			103.8		%		60-130	04-OCT-18
Fluorene			98.1		%		50-150	04-OCT-18
Indeno(1,2,3-cd)pyrene			110.2		%		50-150	04-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4259731								
WG2887995-2 LCS								
Naphthalene			102.6		%		50-150	04-OCT-18
Phenanthrene			102.3		%		50-150	04-OCT-18
Pyrene			104.6		%		50-150	04-OCT-18
WG2887995-3 LCSD		**WG2887995-2**						
1-Methylnaphthalene		90.1	88.3		%	2.0	50	04-OCT-18
2-Methylnaphthalene		92.4	91.0		%	1.5	50	04-OCT-18
Acenaphthene		91.8	89.9		%	2.1	50	04-OCT-18
Acenaphthylene		94.9	93.0		%	2.0	50	04-OCT-18
Anthracene		98.6	97.1		%	1.5	50	04-OCT-18
Benzo(a)anthracene		115.4	113.7		%	1.5	50	04-OCT-18
Benzo(a)pyrene		100.2	97.8		%	2.3	50	04-OCT-18
Benzo(b)fluoranthene		110.2	106.9		%	3.1	50	04-OCT-18
Benzo(g,h,i)perylene		97.5	97.8		%	0.2	50	04-OCT-18
Benzo(k)fluoranthene		101.4	100.1		%	1.3	50	04-OCT-18
Chrysene		109.0	110.2		%	1.1	50	04-OCT-18
Dibenzo(ah)anthracene		102.2	101.4		%	0.8	50	04-OCT-18
Fluoranthene		103.8	102.7		%	1.1	50	04-OCT-18
Fluorene		98.1	97.1		%	1.0	50	04-OCT-18
Indeno(1,2,3-cd)pyrene		110.2	108.5		%	1.6	50	04-OCT-18
Naphthalene		102.6	99.9		%	2.6	50	04-OCT-18
Phenanthrene		102.3	100.9		%	1.4	50	04-OCT-18
Pyrene		104.6	103.2		%	1.3	50	04-OCT-18
WG2887995-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
2-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthylene			<0.020		ug/L		0.02	04-OCT-18
Anthracene			<0.010		ug/L		0.01	04-OCT-18
Benzo(a)anthracene			<0.020		ug/L		0.02	04-OCT-18
Benzo(a)pyrene			<0.010		ug/L		0.01	04-OCT-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	04-OCT-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	04-OCT-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	04-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4259731								
WG2887995-1 MB								
Chrysene			<0.010		ug/L		0.01	04-OCT-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	04-OCT-18
Fluoranthene			<0.010		ug/L		0.01	04-OCT-18
Fluorene			<0.020		ug/L		0.02	04-OCT-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	04-OCT-18
Naphthalene			0.070	B	ug/L		0.05	04-OCT-18
Phenanthrene			<0.020		ug/L		0.02	04-OCT-18
Pyrene			<0.020		ug/L		0.02	04-OCT-18
Surrogate: d8-Naphthalene			100.6		%		40-130	04-OCT-18
Surrogate: d10-Phenanthrene			99.4		%		40-130	04-OCT-18
Surrogate: d12-Chrysene			98.0		%		40-130	04-OCT-18
Surrogate: d10-Acenaphthene			94.1		%		40-130	04-OCT-18
PH-WT	**Water**							
Batch R4245236								
WG2886889-8 DUP		**WG2886889-7**						
pH		7.76	7.78	J	pH units	0.02	0.2	26-SEP-18
WG2886889-6 LCS								
pH			7.01		pH units		6.9-7.1	26-SEP-18
SOLIDS-TSS-WT	**Water**							
Batch R4249687								
WG2888278-3 DUP		**L2170520-3**						
Total Suspended Solids		10.4	11.2		mg/L	7.4	20	28-SEP-18
WG2888278-2 LCS								
Total Suspended Solids			99.5		%		85-115	28-SEP-18
WG2888278-1 MB								
Total Suspended Solids			<2.0		mg/L		2	28-SEP-18
TC-MF-WT	**Water**							
Batch R4249857								
WG2887270-3 DUP		**L2170520-5**						
Total Coliforms		132000	128000		CFU/100mL	3.1	65	27-SEP-18
WG2887270-1 MB								
Total Coliforms			0		CFU/100mL		1	27-SEP-18
TKN-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4258963								
WG2892086-2 LCS								
Total Kjeldahl Nitrogen			93.1		%		75-125	03-OCT-18
WG2892086-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	03-OCT-18
Batch R4259941								
WG2893615-3 DUP		**L2172729-9**						
Total Kjeldahl Nitrogen		0.80	0.80		mg/L	0.3	20	04-OCT-18
WG2893615-2 LCS								
Total Kjeldahl Nitrogen			111.8		%		75-125	04-OCT-18
WG2893615-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	04-OCT-18
WG2893615-4 MS		**L2172729-9**						
Total Kjeldahl Nitrogen			90.3		%		70-130	04-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-4 DUP		**WG2890532-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	01-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	01-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-4 DUP		**WG2890532-3**						
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	01-OCT-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	01-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	01-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	01-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	01-OCT-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	01-OCT-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	01-OCT-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	01-OCT-18
WG2890532-1 LCS								
1,1,1,2-Tetrachloroethane			104.9		%		70-130	01-OCT-18
1,1,2,2-Tetrachloroethane			94.0		%		70-130	01-OCT-18
1,1,1-Trichloroethane			117.9		%		70-130	01-OCT-18
1,1,2-Trichloroethane			104.7		%		70-130	01-OCT-18
1,1-Dichloroethane			126.3		%		70-130	01-OCT-18
1,1-Dichloroethylene			124.0		%		70-130	01-OCT-18
1,2-Dibromoethane			100.8		%		70-130	01-OCT-18
1,2-Dichlorobenzene			115.8		%		70-130	01-OCT-18
1,2-Dichloroethane			111.5		%		70-130	01-OCT-18
1,2-Dichloropropane			113.6		%		70-130	01-OCT-18
1,3-Dichlorobenzene			119.7		%		70-130	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-1 LCS								
1,4-Dichlorobenzene			120.7		%		70-130	01-OCT-18
Acetone			112.0		%		60-140	01-OCT-18
Benzene			120.0		%		70-130	01-OCT-18
Bromodichloromethane			110.8		%		70-130	01-OCT-18
Bromoform			86.3		%		70-130	01-OCT-18
Bromomethane			93.2		%		60-140	01-OCT-18
Carbon tetrachloride			117.3		%		70-130	01-OCT-18
Chlorobenzene			114.6		%		70-130	01-OCT-18
Chloroform			117.9		%		70-130	01-OCT-18
cis-1,2-Dichloroethylene			114.4		%		70-130	01-OCT-18
cis-1,3-Dichloropropene			110.3		%		70-130	01-OCT-18
Dibromochloromethane			97.2		%		70-130	01-OCT-18
Dichlorodifluoromethane			117.0		%		50-140	01-OCT-18
Ethylbenzene			113.5		%		70-130	01-OCT-18
n-Hexane			110.7		%		70-130	01-OCT-18
m+p-Xylenes			118.3		%		70-130	01-OCT-18
Methyl Ethyl Ketone			99.7		%		60-140	01-OCT-18
Methyl Isobutyl Ketone			84.5		%		60-140	01-OCT-18
Methylene Chloride			115.4		%		70-130	01-OCT-18
MTBE			115.3		%		70-130	01-OCT-18
o-Xylene			107.7		%		70-130	01-OCT-18
Styrene			106.5		%		70-130	01-OCT-18
Tetrachloroethylene			119.4		%		70-130	01-OCT-18
Toluene			115.3		%		70-130	01-OCT-18
trans-1,2-Dichloroethylene			125.5		%		70-130	01-OCT-18
trans-1,3-Dichloropropene			103.1		%		70-130	01-OCT-18
Trichloroethylene			119.6		%		70-130	01-OCT-18
Trichlorofluoromethane			133.5		%		60-140	01-OCT-18
Vinyl chloride			113.1		%		60-140	01-OCT-18
WG2890532-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	01-OCT-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	01-OCT-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	01-OCT-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-2 MB								
1,1-Dichloroethane			<0.50		ug/L		0.5	01-OCT-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	01-OCT-18
1,2-Dibromoethane			<0.20		ug/L		0.2	01-OCT-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	01-OCT-18
1,2-Dichloroethane			<0.50		ug/L		0.5	01-OCT-18
1,2-Dichloropropane			<0.50		ug/L		0.5	01-OCT-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	01-OCT-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	01-OCT-18
Acetone			<30		ug/L		30	01-OCT-18
Benzene			<0.50		ug/L		0.5	01-OCT-18
Bromodichloromethane			<2.0		ug/L		2	01-OCT-18
Bromoform			<5.0		ug/L		5	01-OCT-18
Bromomethane			<0.50		ug/L		0.5	01-OCT-18
Carbon tetrachloride			<0.20		ug/L		0.2	01-OCT-18
Chlorobenzene			<0.50		ug/L		0.5	01-OCT-18
Chloroform			<1.0		ug/L		1	01-OCT-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	01-OCT-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	01-OCT-18
Dibromochloromethane			<2.0		ug/L		2	01-OCT-18
Dichlorodifluoromethane			<2.0		ug/L		2	01-OCT-18
Ethylbenzene			<0.50		ug/L		0.5	01-OCT-18
n-Hexane			<0.50		ug/L		0.5	01-OCT-18
m+p-Xylenes			<0.40		ug/L		0.4	01-OCT-18
Methyl Ethyl Ketone			<20		ug/L		20	01-OCT-18
Methyl Isobutyl Ketone			<20		ug/L		20	01-OCT-18
Methylene Chloride			<5.0		ug/L		5	01-OCT-18
MTBE			<2.0		ug/L		2	01-OCT-18
o-Xylene			<0.30		ug/L		0.3	01-OCT-18
Styrene			<0.50		ug/L		0.5	01-OCT-18
Tetrachloroethylene			<0.50		ug/L		0.5	01-OCT-18
Toluene			<0.50		ug/L		0.5	01-OCT-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	01-OCT-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-2 MB								
Trichloroethylene			<0.50		ug/L		0.5	01-OCT-18
Trichlorofluoromethane			<5.0		ug/L		5	01-OCT-18
Vinyl chloride			<0.50		ug/L		0.5	01-OCT-18
Surrogate: 1,4-Difluorobenzene			97.3		%		70-130	01-OCT-18
Surrogate: 4-Bromofluorobenzene			84.2		%		70-130	01-OCT-18
WG2890532-5 MS		**WG2890532-3**						
1,1,1,2-Tetrachloroethane			106.7		%		50-140	01-OCT-18
1,1,2,2-Tetrachloroethane			98.5		%		50-140	01-OCT-18
1,1,1-Trichloroethane			116.1		%		50-140	01-OCT-18
1,1,2-Trichloroethane			108.5		%		50-140	01-OCT-18
1,1-Dichloroethane			124.4		%		50-140	01-OCT-18
1,1-Dichloroethylene			115.9		%		50-140	01-OCT-18
1,2-Dibromoethane			104.7		%		50-140	01-OCT-18
1,2-Dichlorobenzene			114.9		%		50-140	01-OCT-18
1,2-Dichloroethane			114.6		%		50-140	01-OCT-18
1,2-Dichloropropane			115.2		%		50-140	01-OCT-18
1,3-Dichlorobenzene			116.4		%		50-140	01-OCT-18
1,4-Dichlorobenzene			116.4		%		50-140	01-OCT-18
Acetone			118.2		%		50-140	01-OCT-18
Benzene			119.6		%		50-140	01-OCT-18
Bromodichloromethane			114.2		%		50-140	01-OCT-18
Bromoform			90.8		%		50-140	01-OCT-18
Bromomethane			86.6		%		50-140	01-OCT-18
Carbon tetrachloride			114.4		%		50-140	01-OCT-18
Chlorobenzene			114.3		%		50-140	01-OCT-18
Chloroform			118.9		%		50-140	01-OCT-18
cis-1,2-Dichloroethylene			114.5		%		50-140	01-OCT-18
cis-1,3-Dichloropropene			109.5		%		50-140	01-OCT-18
Dibromochloromethane			100.3		%		50-140	01-OCT-18
Dichlorodifluoromethane			92.9		%		50-140	01-OCT-18
Ethylbenzene			110.8		%		50-140	01-OCT-18
n-Hexane			135.9		%		50-140	01-OCT-18
m+p-Xylenes			115.3		%		50-140	01-OCT-18
Methyl Ethyl Ketone			100.6		%		50-140	01-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4253718								
WG2890532-5 MS		**WG2890532-3**						
Methyl Isobutyl Ketone			92.2		%		50-140	01-OCT-18
Methylene Chloride			115.4		%		50-140	01-OCT-18
MTBE			115.2		%		50-140	01-OCT-18
o-Xylene			106.7		%		50-140	01-OCT-18
Styrene			106.9		%		50-140	01-OCT-18
Tetrachloroethylene			113.6		%		50-140	01-OCT-18
Toluene			113.0		%		50-140	01-OCT-18
trans-1,2-Dichloroethylene			119.3		%		50-140	01-OCT-18
trans-1,3-Dichloropropene			102.1		%		50-140	01-OCT-18
Trichloroethylene			117.4		%		50-140	01-OCT-18
Trichlorofluoromethane			123.2		%		50-140	01-OCT-18
Vinyl chloride			99.8		%		50-140	01-OCT-18
Batch R4255794								
WG2888171-1 LCS								
trans-1,2-Dichloroethylene			111.3		%		70-130	01-OCT-18
WG2888171-2 MB								
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	02-OCT-18
Batch R4257267								
WG2887908-4 DUP		**WG2887908-3**						
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	02-OCT-18
WG2887908-1 LCS								
Acetone			117.1		%		60-140	02-OCT-18
WG2887908-2 MB								
Acetone			<30		ug/L		30	02-OCT-18
WG2887908-5 MS		**WG2887908-3**						
Acetone			109.3		%		50-140	03-OCT-18

Quality Control Report

Workorder: L2170520 Report Date: 05-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

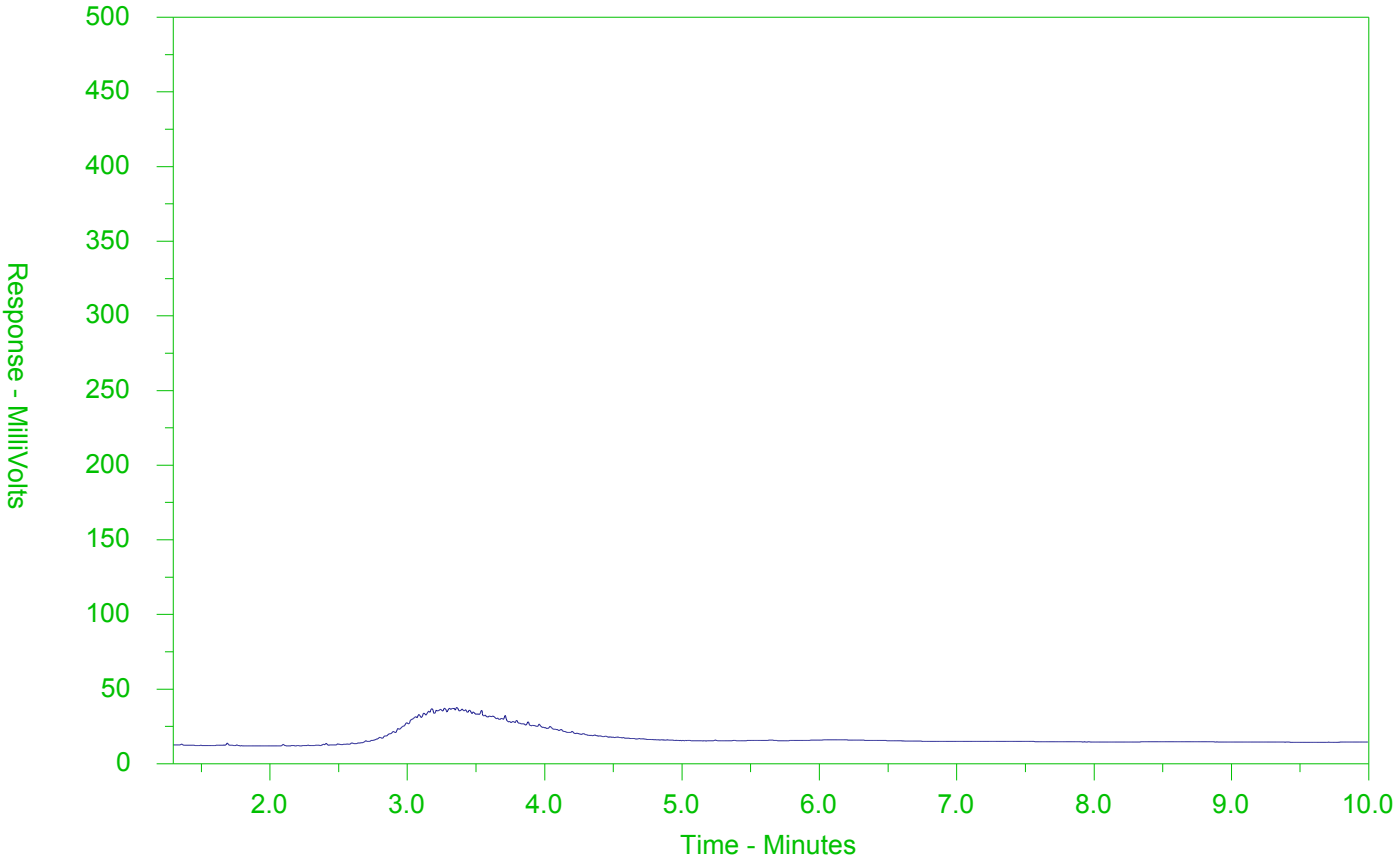
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-1
Client Sample ID: PC-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

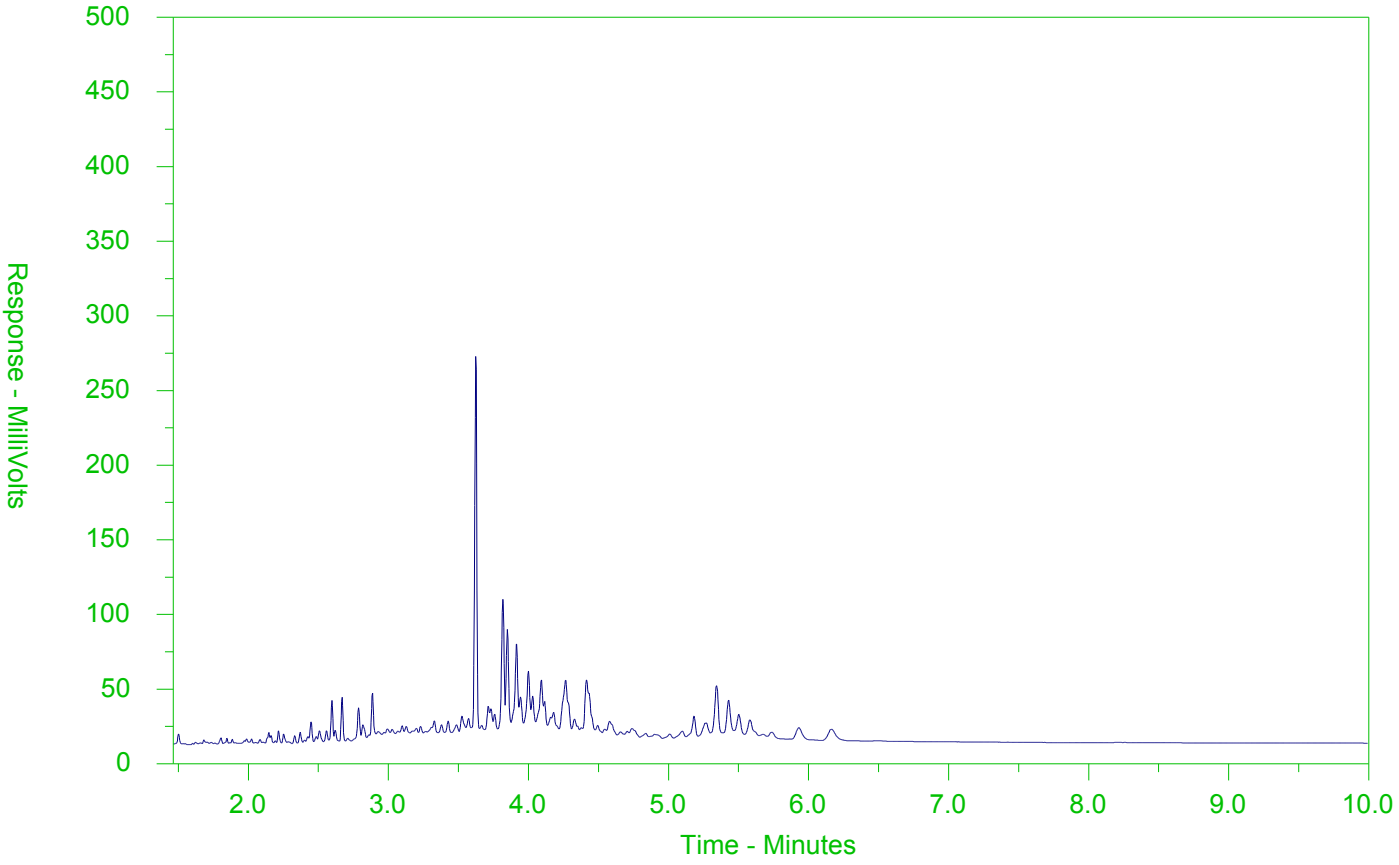
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-2
Client Sample ID: PC-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

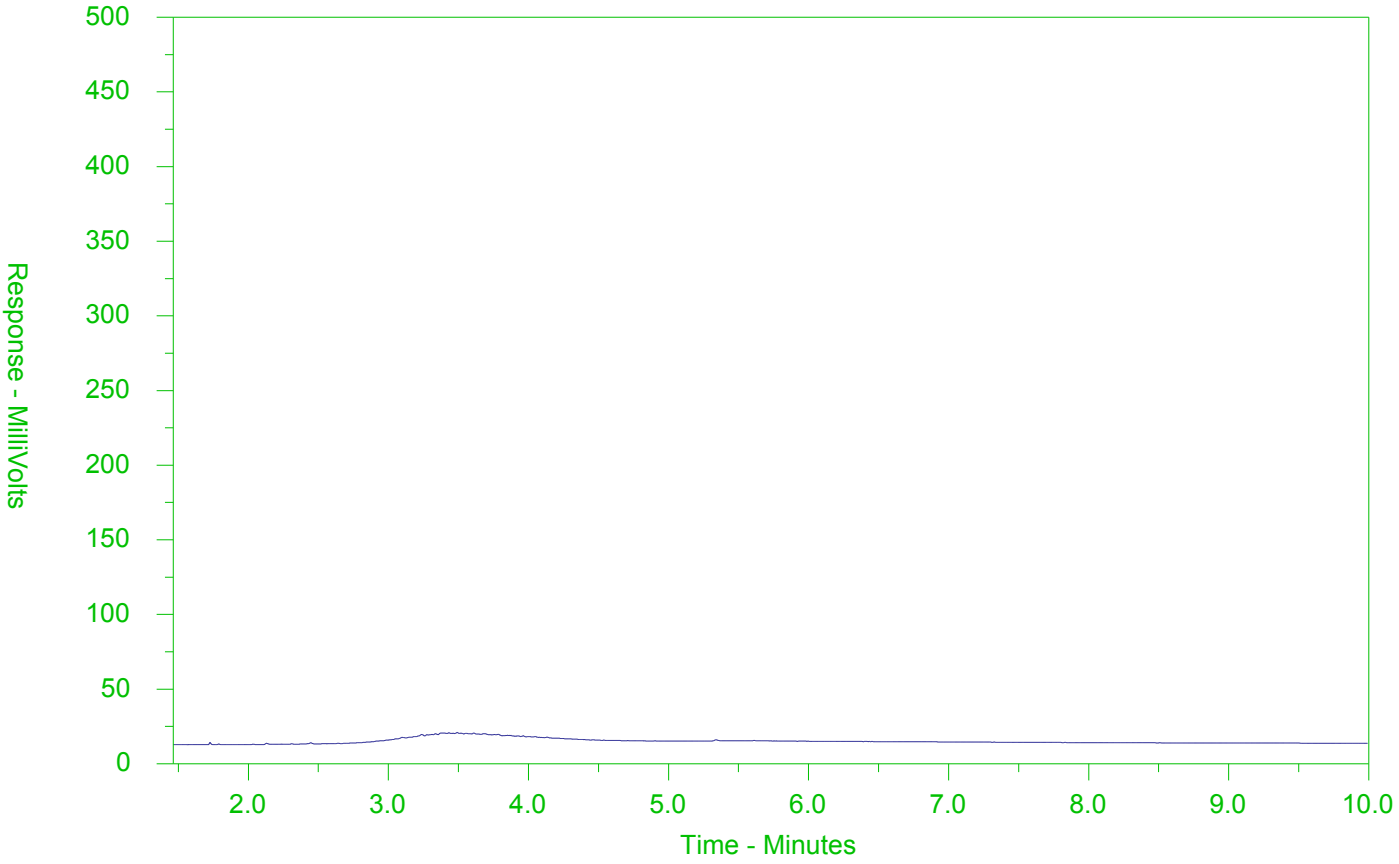
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-3
Client Sample ID: PC-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

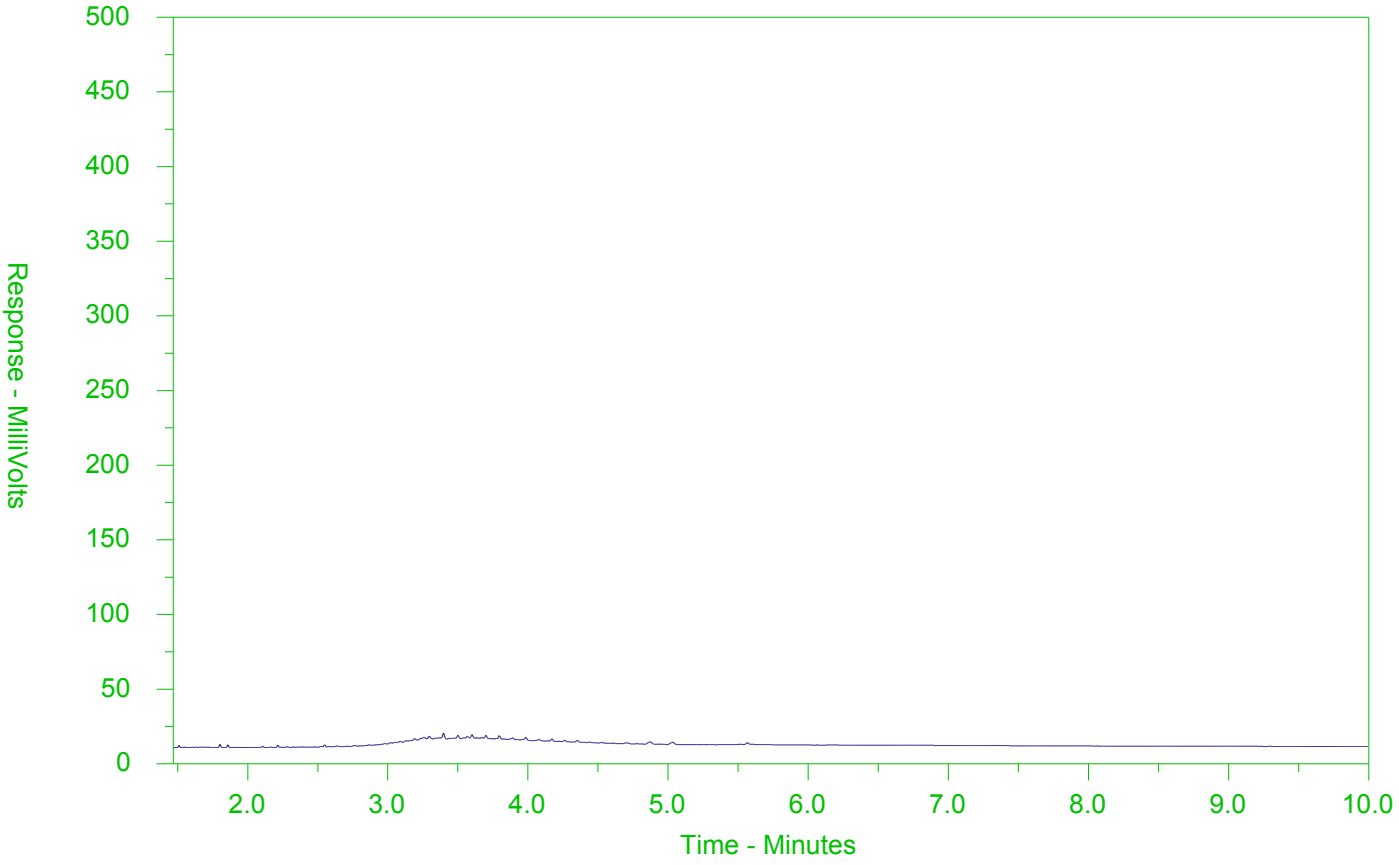
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-4
Client Sample ID: PC-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

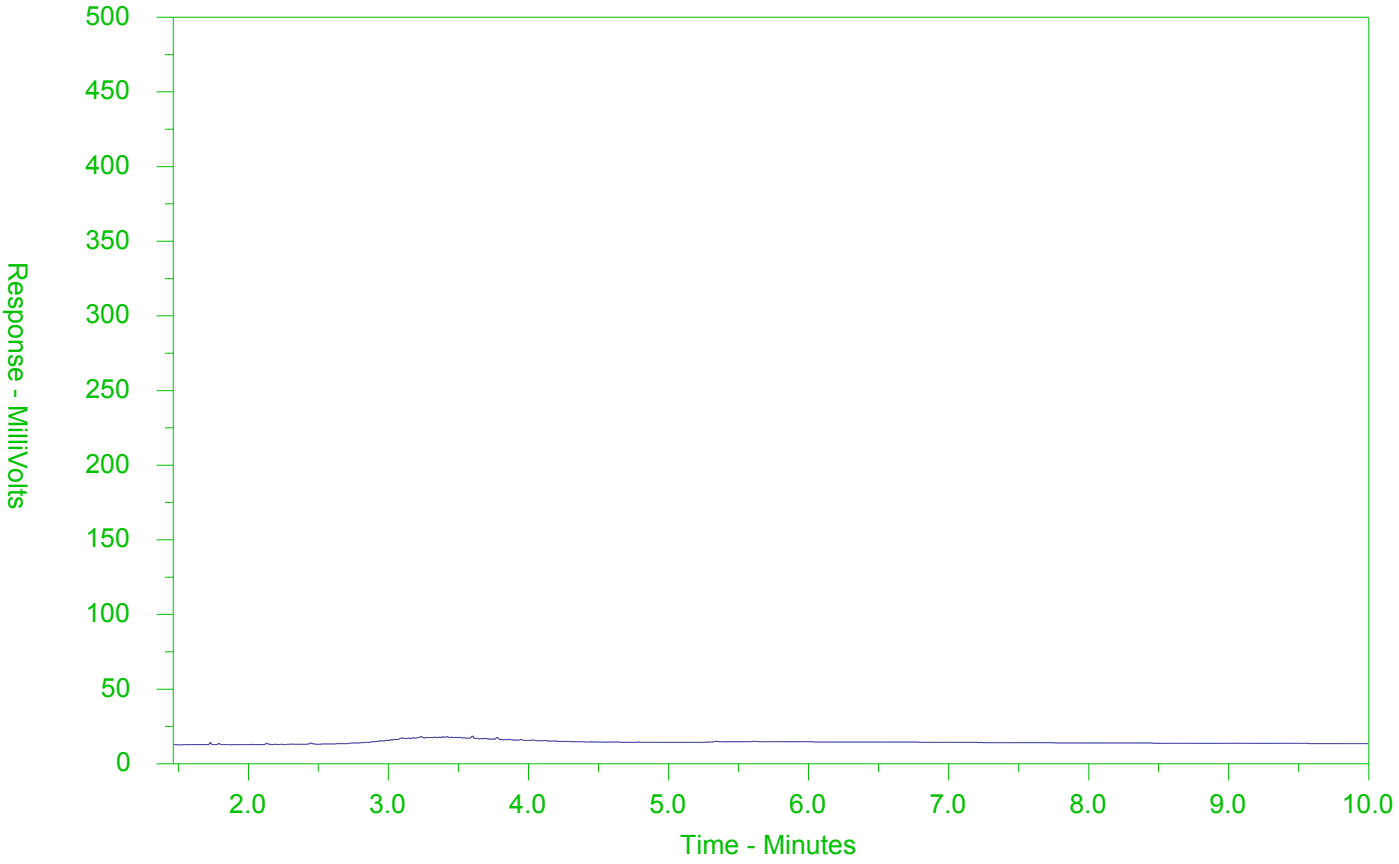
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-5
Client Sample ID: PC-5



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

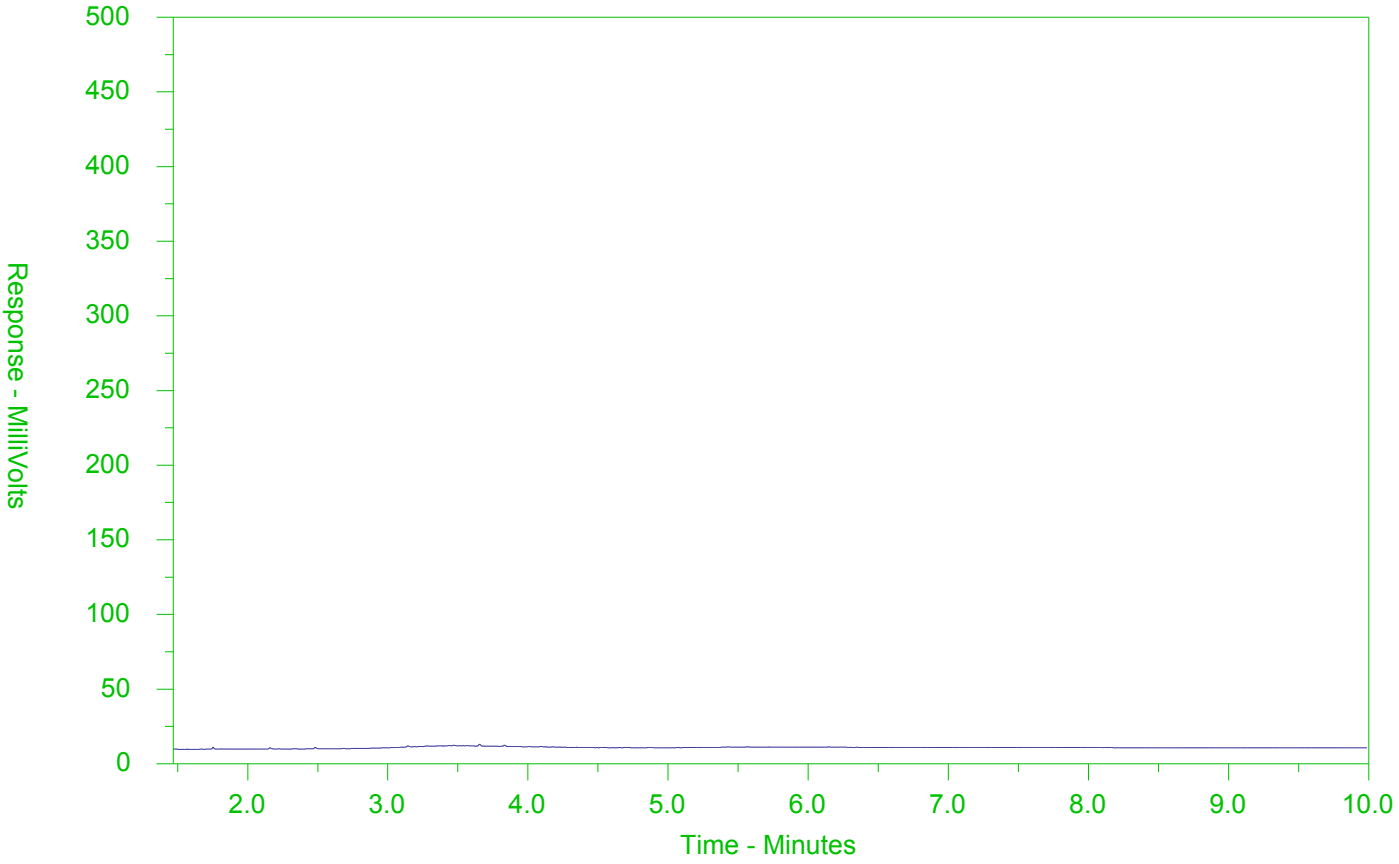
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-6
Client Sample ID: PC-6



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

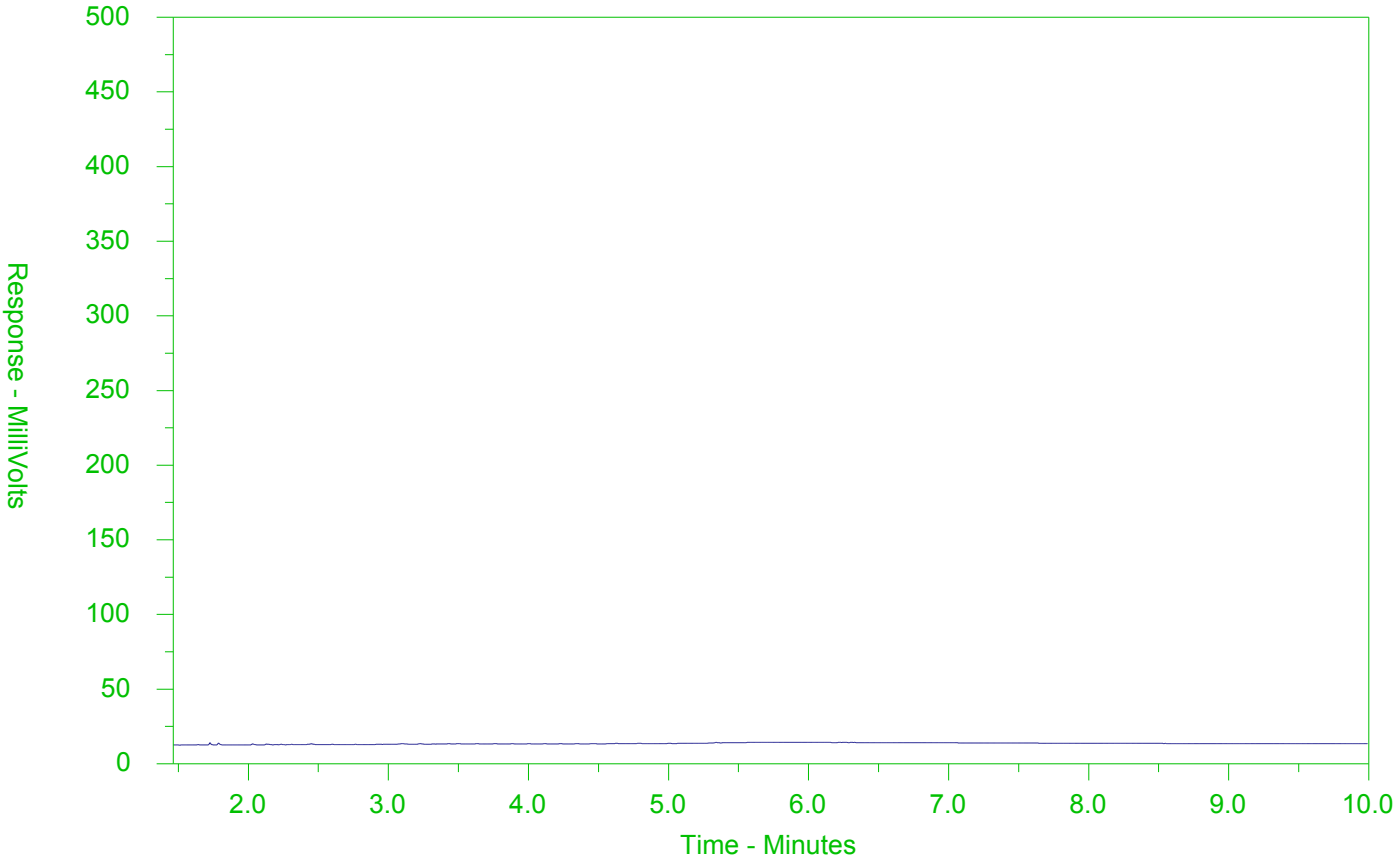
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-7
Client Sample ID: PC-7



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

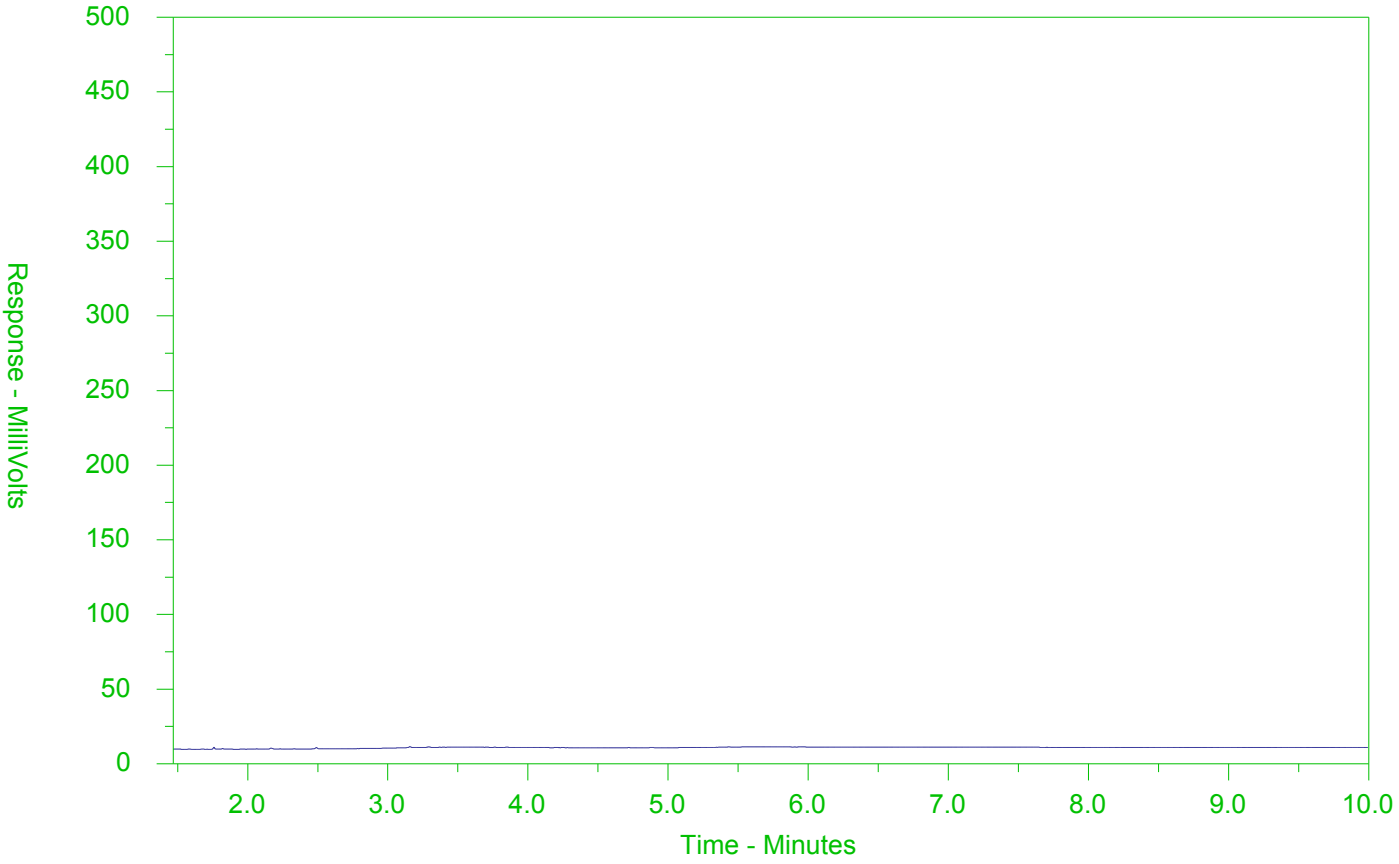
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-8
Client Sample ID: PC-8



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

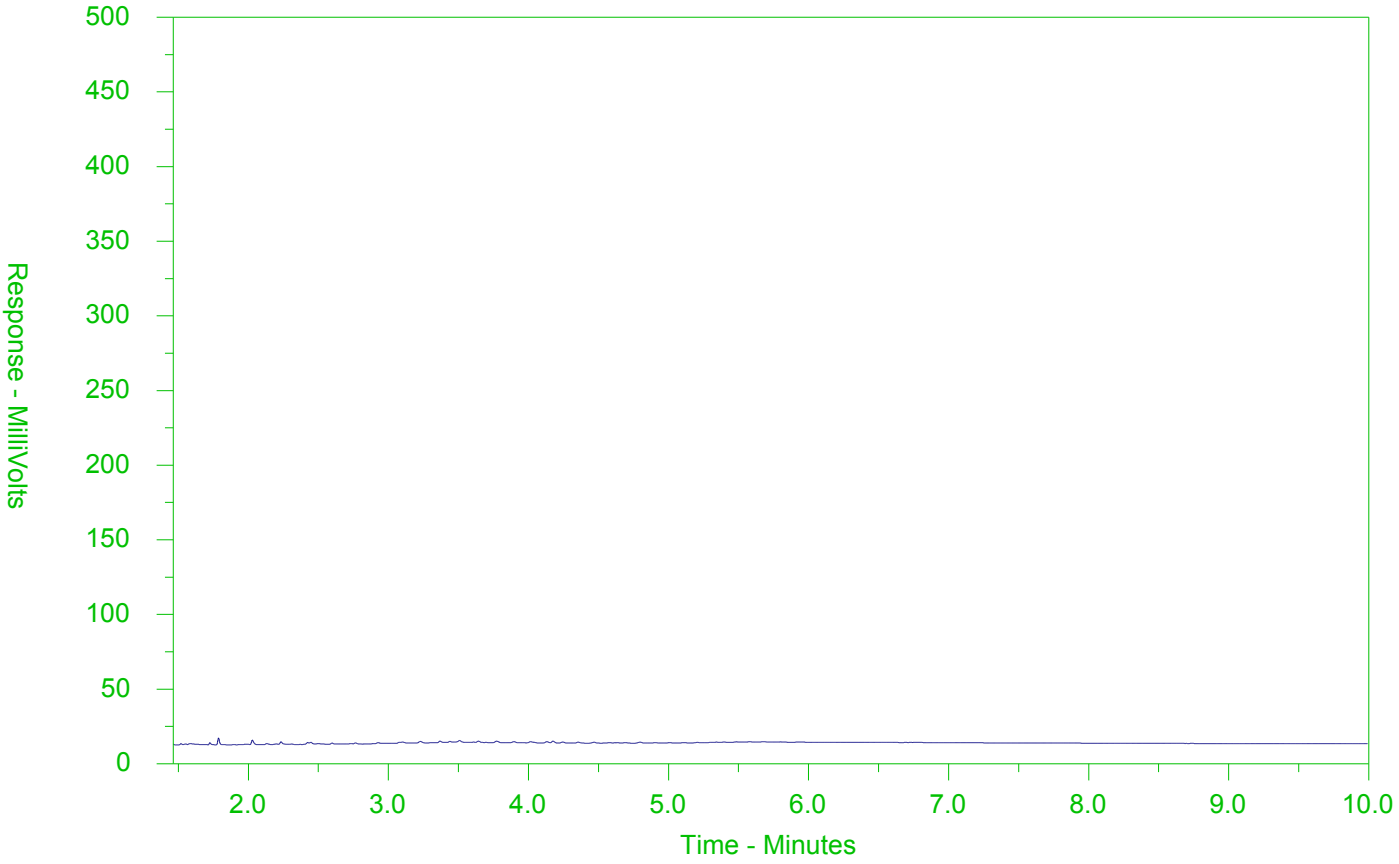
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-9
Client Sample ID: PC-9



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

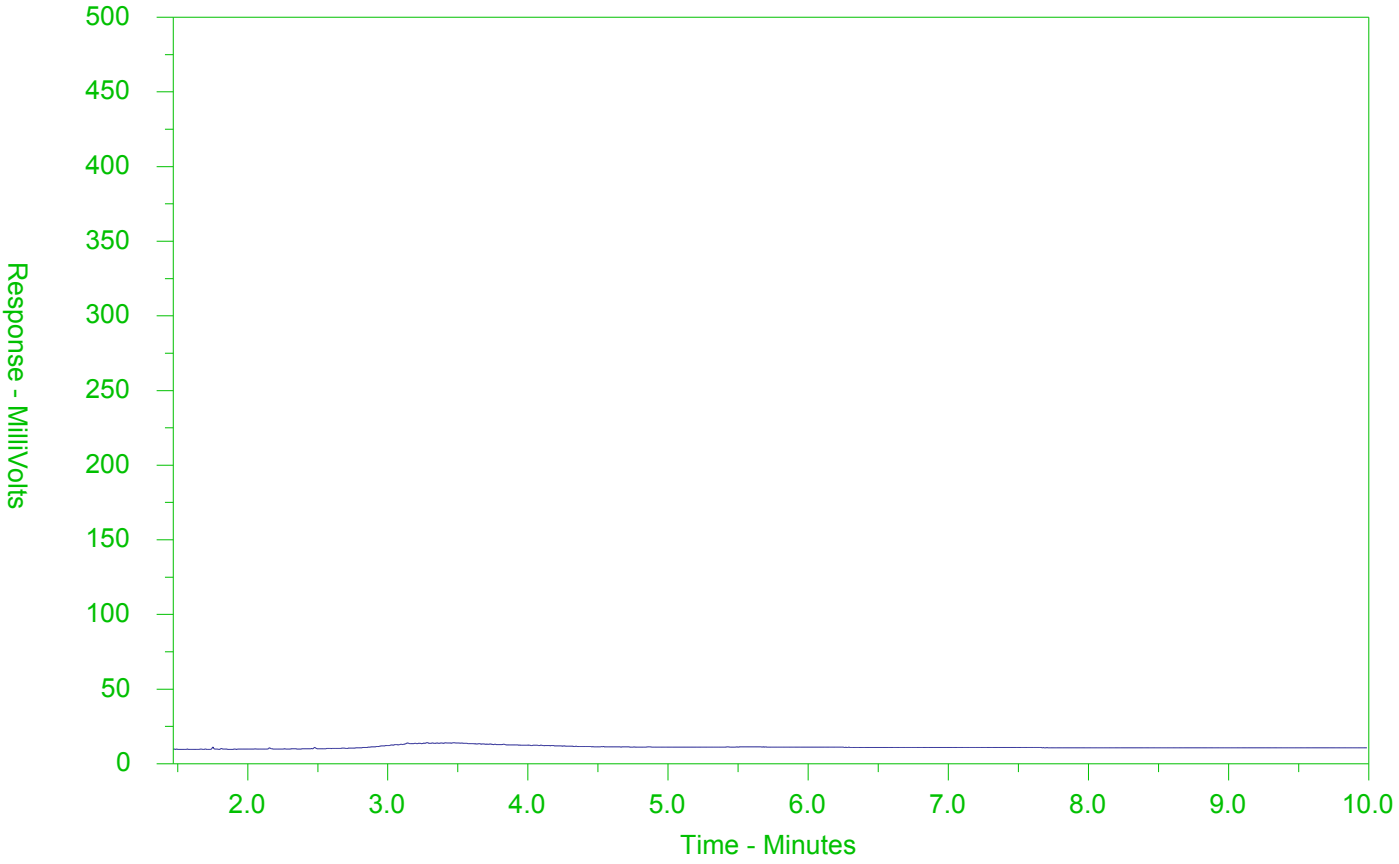
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170520-10
Client Sample ID: PC-10



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2170520-COFC

COC Number: 17 - 684111

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:		Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:		Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business day [E-100%] ☐ / Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)] ☐
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Street:		Email 1 or Fax	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:		Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:		Email 3	

Invoice To		Invoice Distribution	
	Same as Report To ☐ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☐ YES ☐ NO		
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2170520	ALS Contact:	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	PH-WT	HARDNESS-CALC-WT	ETL-SAR-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT	P-TD-COL-WT	PAH-PWQO-WT	Solids-TSS-WT	TC,EC-MF-WT	VOC, F1-F4	OCP, PCB	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	PC-1	25-09-18	13h35		R													A				
	PC-2	25-09-18	13h30																			
	PC-3	25-09-18	12:20																			
	PC-4	25-09-18	9.50																			
	PC-5	25-09-18	9:40																			
	PC-6	25-09-18	11h30																			
	PC-7	25-09-18	11h55																			
	PC-8	25-09-18	13h20																			
	PC-9	25-09-18	12h00																			
	PC-10	25-09-18	13h10																			

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				15.1			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
[illegible] Pelly	Sept 25th 2018	15:25				SB	09/25/18	3:20 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — JULY 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 12-OCT-18
Report Date: 23-OCT-18 07:44 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180375

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-667360
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Physical Tests (WATER)

Analyte	Unit	ALS ID	L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
		Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		Sampled Time	14:40	13:30	12:55	12:05	11:46	11:05
		Sample ID	**PC-1**	**PC-2**	**PC-3**	**PC-4**	**PC-5**	**PC-6**
Conductivity	umhos/cm		9740	4100	4830	2700	1870	1640
Hardness (as CaCO3)	mg/L		667 HTC	493 HTC	566 HTC	354 HTC	449 HTC	374 HTC
pH	pH units		8.17	8.21	8.14	8.19	8.05	7.69
Total Suspended Solids	mg/L		59.8	120	13.0	28.5	36.1	345 DLHC

Physical Tests (WATER)

Analyte	Unit	ALS ID	L2180375-7	L2180375-8	L2180375-9	L2180375-10
		Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		Sampled Time	10:05	08:50	15:25	14:55
		Sample ID	**PC-7**	**PC-8**	**PC-9**	**PC-10**
Conductivity	umhos/cm		2060	2220	1230	2340
Hardness (as CaCO3)	mg/L		526 HTC	472 HTC	876 HTC	620 HTC
pH	pH units		8.30	8.04	8.07	7.88
Total Suspended Solids	mg/L		18.6	212 DLHC	553 DLHC	100

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-1 12-OCT-18 14:40 PC-1	L2180375-2 12-OCT-18 13:30 PC-2	L2180375-3 12-OCT-18 12:55 PC-3	L2180375-4 12-OCT-18 12:05 PC-4	L2180375-5 12-OCT-18 11:46 PC-5	L2180375-6 12-OCT-18 11:05 PC-6
Chloride (Cl)	mg/L		4180 DLDS	1440 DLDS	1800 DLDS	756 DLDS	463 DLDS	271 DLDS
Nitrate (as N)	mg/L		2.06 DLDS	0.75 DLDS	2.75 DLDS	4.41 DLDS	2.99 DLDS	<0.10 DLDS
Nitrite (as N)	mg/L		<0.20 DLDS	<0.10 DLDS	<0.10 DLDS	<0.050 DLDS	<0.050 DLDS	<0.050 DLDS
Total Kjeldahl Nitrogen	mg/L		2.30	1.5 DLM	3.02	<1.5 DLM	3.20	6.64
Total Nitrogen	mg/L		4.36	2.3	5.77	4.4	6.19	6.64
Phosphorus (P)-Total Dissolved	mg/L		0.110	0.0286	0.0117	0.0161	0.0111	4.16 DLHC
Phosphorus, Total	mg/L		0.189	0.219	0.0545	0.0396	0.0456	7.44 DLHC

Anions and Nutrients (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-7 12-OCT-18 10:05 PC-7	L2180375-8 12-OCT-18 08:50 PC-8	L2180375-9 12-OCT-18 15:25 PC-9	L2180375-10 12-OCT-18 14:55 PC-10
Chloride (Cl)	mg/L		549 DLDS	494 DLDS	109 DLDS	567 DLDS
Nitrate (as N)	mg/L		4.25 DLDS	0.26 DLDS	0.73 DLDS	0.22 DLDS
Nitrite (as N)	mg/L		<0.050 DLDS	0.093 DLDS	<0.050 DLDS	<0.050 DLDS
Total Kjeldahl Nitrogen	mg/L		1.57	65.6 DLM	2.6 DLM	8.89
Total Nitrogen	mg/L		5.82	66.0	3.3	9.11
Phosphorus (P)-Total Dissolved	mg/L		0.0077	3.22 DLHC	0.0107	0.0042
Phosphorus, Total	mg/L		0.0367	4.60 DLHC	0.476	0.0758

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID						
		L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
		12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		14:40	13:30	12:55	12:05	11:46	11:05
		PC-1	**PC-2**	**PC-3**	**PC-4**	**PC-5**	**PC-6**
Cyanide, Free	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Cyanides (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2180375-7	L2180375-8	L2180375-9	L2180375-10
		12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		10:05	08:50	15:25	14:55
		PC-7	**PC-8**	**PC-9**	**PC-10**
Cyanide, Free	mg/L	<0.0020	<0.0020	<0.0020	<0.0020

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests (WATER)

	ALS ID	L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
	Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
	Sampled Time	14:40	13:30	12:55	12:05	11:46	11:05
	Sample ID	**PC-1**	**PC-2**	**PC-3**	**PC-4**	**PC-5**	**PC-6**
Analyte	Unit						
E. Coli	CFU/100mL	5500 DLM	1400 DLM	510 DLM	3500 DLM	6300 DLM	8200000 DLM
Total Coliforms	CFU/100mL	380000 DLM	8300 DLM	5200 DLM	30000 DLM	41000	NR NDOG

Bacteriological Tests (WATER)

	ALS ID	L2180375-7	L2180375-8	L2180375-9	L2180375-10
	Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
	Sampled Time	10:05	08:50	15:25	14:55
	Sample ID	**PC-7**	**PC-8**	**PC-9**	**PC-10**
Analyte	Unit				
E. Coli	CFU/100mL	1400 DLM	2210000 DLM	23000 DLM	300 DLM
Total Coliforms	CFU/100mL	6600 DLM	NR NDOG	29000 DLM	4900 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals (WATER)

Analyte	Unit	ALS ID	L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
		Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		Sampled Time	14:40	13:30	12:55	12:05	11:46	11:05
		Sample ID	**PC-1**	**PC-2**	**PC-3**	**PC-4**	**PC-5**	**PC-6**
Sodium Adsorption Ratio	SAR		35.3	14.4	16.5	10.6	5.22	3.88

Metals (WATER)

Analyte	Unit	ALS ID	L2180375-7	L2180375-8	L2180375-9	L2180375-10
		Sampled Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
		Sampled Time	10:05	08:50	15:25	14:55
		Sample ID	**PC-7**	**PC-8**	**PC-9**	**PC-10**
Sodium Adsorption Ratio	SAR		6.25	5.99	1.16	4.82

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	L2180375-1 12-OCT-18 14:40 PC-1	L2180375-2 12-OCT-18 13:30 PC-2	L2180375-3 12-OCT-18 12:55 PC-3	L2180375-4 12-OCT-18 12:05 PC-4	L2180375-5 12-OCT-18 11:46 PC-5	L2180375-6 12-OCT-18 11:05 PC-6
Aluminum (Al)-Total	mg/L	0.566 DLHC	0.290 DLHC	<0.050 DLHC	0.090 DLHC	0.141 DLHC	0.631 DLHC
Antimony (Sb)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.0011 DLHC
Arsenic (As)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.0023 DLHC	0.0017 DLHC
Barium (Ba)-Total	mg/L	0.201 DLHC	0.129 DLHC	0.140 DLHC	0.0995 DLHC	0.0964 DLHC	0.0561 DLHC
Beryllium (Be)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC
Bismuth (Bi)-Total	mg/L	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	0.00445 DLHC
Boron (B)-Total	mg/L	<0.10 DLHC	<0.10 DLHC	<0.10 DLHC	<0.10 DLHC	<0.10 DLHC	0.20 DLHC
Cadmium (Cd)-Total	mg/L	0.000076 DLHC	0.000067 DLHC	<0.000050 DLHC	<0.000050 DLHC	<0.000050 DLHC	0.000189 DLHC
Calcium (Ca)-Total	mg/L	195 DLHC	141 DLHC	173 DLHC	96.7 DLHC	133 DLHC	102 DLHC
Cesium (Cs)-Total	mg/L	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	0.00014 DLHC
Chromium (Cr)-Total	mg/L	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	0.0238 DLHC
Cobalt (Co)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.0015 DLHC
Copper (Cu)-Total	mg/L	<0.010 DLHC	<0.010 DLHC	<0.010 DLHC	<0.010 DLHC	0.011 DLHC	0.206 DLHC
Iron (Fe)-Total	mg/L	1.75 DLHC	2.71 DLHC	0.85 DLHC	0.53 DLHC	1.19 DLHC	8.83 DLHC
Lead (Pb)-Total	mg/L	0.00422 DLHC	0.00692 DLHC	<0.00050 DLHC	0.00305 DLHC	0.00229 DLHC	0.00976 DLHC
Magnesium (Mg)-Total	mg/L	43.8 DLHC	34.4 DLHC	32.5 DLHC	27.4 DLHC	28.6 DLHC	29.1 DLHC
Manganese (Mn)-Total	mg/L	0.276 DLHC	0.100 DLHC	0.260 DLHC	0.0327 DLHC	0.149 DLHC	0.120 DLHC
Mercury (Hg)-Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000107
Molybdenum (Mo)-Total	mg/L	0.00151 DLHC	0.00077 DLHC	0.00085 DLHC	0.00094 DLHC	0.00056 DLHC	0.00436 DLHC
Nickel (Ni)-Total	mg/L	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	0.0228 DLHC
Potassium (K)-Total	mg/L	8.71 DLHC	2.28 DLHC	4.32 DLHC	6.61 DLHC	3.35 DLHC	17.2 DLHC
Rubidium (Rb)-Total	mg/L	0.0035 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	0.0116 DLHC
Selenium (Se)-Total	mg/L	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	0.00101 DLHC	0.00064 DLHC	0.00060 DLHC
Silicon (Si)-Total	mg/L	6.8 DLHC	5.5 DLHC	5.9 DLHC	7.3 DLHC	6.5 DLHC	3.9 DLHC
Silver (Ag)-Total	mg/L	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC	<0.00050 DLHC
Sodium (Na)-Total	mg/L	2090 DLHC	734 DLHC	902 DLHC	460 DLHC	254 DLHC	173 DLHC
Strontium (Sr)-Total	mg/L	1.09 DLHC	0.394 DLHC	0.575 DLHC	0.394 DLHC	0.393 DLHC	0.501 DLHC
Sulfur (S)-Total	mg/L	42.8 DLHC	22.0 DLHC	21.7 DLHC	18.3 DLHC	13.7 DLHC	27.5 DLHC
Tellurium (Te)-Total	mg/L	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC	<0.0020 DLHC
Thallium (Tl)-Total	mg/L	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC	<0.00010 DLHC
Thorium (Th)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC
Tin (Sn)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	0.0013 DLHC
Titanium (Ti)-Total	mg/L	0.0198 DLHC	0.0109 DLHC	<0.0030 DLHC	0.0031 DLHC	0.0046 DLHC	0.0128 DLHC
Tungsten (W)-Total	mg/L	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC	<0.0010 DLHC
Uranium (U)-Total	mg/L	0.00149 DLHC	0.00089 DLHC	0.00124 DLHC	0.00111 DLHC	0.00123 DLHC	0.00080 DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	L2180375-7 12-OCT-18 10:05 PC-7		L2180375-8 12-OCT-18 08:50 PC-8		L2180375-9 12-OCT-18 15:25 PC-9		L2180375-10 12-OCT-18 14:55 PC-10	
Aluminum (Al)-Total	mg/L	1.82	DLHC	1.02	DLHC	5.41	DLHC	0.252	DLHC
Antimony (Sb)-Total	mg/L	0.0013	DLHC	<0.0010	DLHC	0.0018	DLHC	0.0020	DLHC
Arsenic (As)-Total	mg/L	<0.0010	DLHC	<0.0010	DLHC	0.0067	DLHC	0.0010	DLHC
Barium (Ba)-Total	mg/L	0.101	DLHC	0.0926	DLHC	0.159	DLHC	0.421	DLHC
Beryllium (Be)-Total	mg/L	<0.0010	DLHC	<0.0010	DLHC	<0.0010	DLHC	<0.0010	DLHC
Bismuth (Bi)-Total	mg/L	<0.00050	DLHC	<0.00050	DLHC	<0.00050	DLHC	<0.00050	DLHC
Boron (B)-Total	mg/L	<0.10	DLHC	<0.10	DLHC	0.25	DLHC	0.16	DLHC
Cadmium (Cd)-Total	mg/L	0.000329	DLHC	0.000101	DLHC	0.000616	DLHC	0.000067	DLHC
Calcium (Ca)-Total	mg/L	149	DLHC	130	DLHC	251	DLHC	204	DLHC
Cesium (Cs)-Total	mg/L	<0.00010	DLHC	<0.00010	DLHC	0.00049	DLHC	<0.00010	DLHC
Chromium (Cr)-Total	mg/L	0.0074	DLHC	0.0063	DLHC	0.0226	DLHC	<0.0050	DLHC
Cobalt (Co)-Total	mg/L	0.0040	DLHC	<0.0010	DLHC	0.0063	DLHC	<0.0010	DLHC
Copper (Cu)-Total	mg/L	0.069	DLHC	0.114	DLHC	0.088	DLHC	0.012	DLHC
Iron (Fe)-Total	mg/L	2.50	DLHC	3.74	DLHC	20.6	DLHC	3.94	DLHC
Lead (Pb)-Total	mg/L	0.0409	DLHC	0.0103	DLHC	0.139	DLHC	0.00757	DLHC
Magnesium (Mg)-Total	mg/L	37.3	DLHC	36.0	DLHC	60.5	DLHC	27.1	DLHC
Manganese (Mn)-Total	mg/L	0.380	DLHC	0.133	DLHC	1.30	DLHC	0.927	DLHC
Mercury (Hg)-Total	mg/L	<0.000010		0.000011		0.000035		0.000020	
Molybdenum (Mo)-Total	mg/L	0.00055	DLHC	0.00226	DLHC	0.00265	DLHC	0.00486	DLHC
Nickel (Ni)-Total	mg/L	0.0087	DLHC	0.0098	DLHC	0.0251	DLHC	<0.0050	DLHC
Potassium (K)-Total	mg/L	3.88	DLHC	21.7	DLHC	6.33	DLHC	7.09	DLHC
Rubidium (Rb)-Total	mg/L	<0.0020	DLHC	0.0168	DLHC	0.0089	DLHC	0.0036	DLHC
Selenium (Se)-Total	mg/L	0.00082	DLHC	<0.00050	DLHC	0.00074	DLHC	<0.00050	DLHC
Silicon (Si)-Total	mg/L	6.2	DLHC	5.6	DLHC	14.7	DLHC	9.9	DLHC
Silver (Ag)-Total	mg/L	<0.00050	DLHC	<0.00050	DLHC	<0.00050	DLHC	<0.00050	DLHC
Sodium (Na)-Total	mg/L	329	DLHC	299	DLHC	78.6	DLHC	276	DLHC
Strontium (Sr)-Total	mg/L	1.29	DLHC	0.455	DLHC	0.733	DLHC	0.930	DLHC
Sulfur (S)-Total	mg/L	18.2	DLHC	20.2	DLHC	71.7	DLHC	16.3	DLHC
Tellurium (Te)-Total	mg/L	<0.0020	DLHC	<0.0020	DLHC	<0.0020	DLHC	<0.0020	DLHC
Thallium (Tl)-Total	mg/L	<0.00010	DLHC	<0.00010	DLHC	0.00010	DLHC	<0.00010	DLHC
Thorium (Th)-Total	mg/L	<0.0010	DLHC	<0.0010	DLHC	<0.0010	DLHC	<0.0010	DLHC
Tin (Sn)-Total	mg/L	<0.0010	DLHC	<0.0010	DLHC	0.0021	DLHC	<0.0010	DLHC
Titanium (Ti)-Total	mg/L	0.0152	DLHC	0.0147	DLHC	0.171	DLHC	0.0091	DLHC
Tungsten (W)-Total	mg/L	<0.0010	DLHC	<0.0010	DLHC	<0.0010	DLHC	0.0141	DLHC
Uranium (U)-Total	mg/L	0.00084	DLHC	0.00082	DLHC	0.00545	DLHC	0.00231	DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-1 12-OCT-18 14:40 PC-1	L2180375-2 12-OCT-18 13:30 PC-2	L2180375-3 12-OCT-18 12:55 PC-3	L2180375-4 12-OCT-18 12:05 PC-4	L2180375-5 12-OCT-18 11:46 PC-5	L2180375-6 12-OCT-18 11:05 PC-6
Vanadium (V)-Total	mg/L		<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC	<0.0050 DLHC
Zinc (Zn)-Total	mg/L		0.045 DLHC	0.269 DLHC	<0.030 DLHC	0.086 DLHC	<0.030 DLHC	0.176 DLHC
Zirconium (Zr)-Total	mg/L		<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-7 12-OCT-18 10:05 **PC-7**	L2180375-8 12-OCT-18 08:50 **PC-8**	L2180375-9 12-OCT-18 15:25 **PC-9**	L2180375-10 12-OCT-18 14:55 **PC-10**
Vanadium (V)-Total	mg/L		<0.0050 DLHC	<0.0050 DLHC	0.0172 DLHC	<0.0050 DLHC
Zinc (Zn)-Total	mg/L		0.369 DLHC	0.235 DLHC	0.346 DLHC	0.082 DLHC
Zirconium (Zr)-Total	mg/L		<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC	<0.0030 DLHC

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID					
		L2180375-1 12-OCT-18 14:40 **PC-1**	L2180375-2 12-OCT-18 13:30 **PC-2**	L2180375-3 12-OCT-18 12:55 **PC-3**	L2180375-4 12-OCT-18 12:05 **PC-4**	L2180375-5 12-OCT-18 11:46 **PC-5**	L2180375-6 12-OCT-18 11:05 **PC-6**
Chromium, Hexavalent	ug/L	0.99	0.63	<0.50	0.75	<0.50	<0.50

Speciated Metals (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID			
		L2180375-7 12-OCT-18 10:05 **PC-7**	L2180375-8 12-OCT-18 08:50 **PC-8**	L2180375-9 12-OCT-18 15:25 **PC-9**	L2180375-10 12-OCT-18 14:55 **PC-10**
Chromium, Hexavalent	ug/L	<0.50	<0.50	<0.50	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds (WATER)

Analyte	Unit	L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
ALS ID		L2180375-1	L2180375-2	L2180375-3	L2180375-4	L2180375-5	L2180375-6
Sampled Date		12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
Sampled Time		14:40	13:30	12:55	12:05	11:46	11:05
Sample ID		**PC-1**	**PC-2**	**PC-3**	**PC-4**	**PC-5**	**PC-6**
Benzene	ug/L	<0.50 OWP	<0.50 OWP	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	<0.50 OWP	<0.50 OWP	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	<0.50 OWP	<0.50 OWP	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	<0.30 OWP	<0.30 OWP	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	<0.40 OWP	<0.40 OWP	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	93.4	92.5	91.6	78.1	77.3	76.5
Surrogate: 1,4-Difluorobenzene	%	96.8	96.1	95.9	96.3	96.4	96.4

Volatile Organic Compounds (WATER)

Analyte	Unit	L2180375-7	L2180375-8	L2180375-9	L2180375-10
ALS ID		L2180375-7	L2180375-8	L2180375-9	L2180375-10
Sampled Date		12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
Sampled Time		10:05	08:50	15:25	14:55
Sample ID		**PC-7**	**PC-8**	**PC-9**	**PC-10**
Benzene	ug/L	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	76.9	79.4	75.8	75.8
Surrogate: 1,4-Difluorobenzene	%	97.4	96.0	95.7	96.0

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-1 12-OCT-18 14:40 **PC-1**	L2180375-2 12-OCT-18 13:30 **PC-2**	L2180375-3 12-OCT-18 12:55 **PC-3**	L2180375-4 12-OCT-18 12:05 **PC-4**	L2180375-5 12-OCT-18 11:46 **PC-5**	L2180375-6 12-OCT-18 11:05 **PC-6**	
Acenaphthene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
Acenaphthylene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
Anthracene	ug/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Benzo(a)anthracene	ug/L		<0.020	0.084	<0.020	<0.020	<0.020	<0.020	
Benzo(a)pyrene	ug/L		<0.010	0.090	<0.010	0.014	<0.010	<0.010	
Benzo(b)fluoranthene	ug/L		<0.020	0.184	<0.020	0.032	<0.020	0.046	
Benzo(g,h,i)perylene	ug/L		<0.020	0.118	<0.020	<0.020	<0.020	0.047	
Benzo(k)fluoranthene	ug/L		<0.010	0.054	<0.010	0.011	<0.010	0.013	
Chrysene	ug/L		0.016	0.127	<0.010	0.022	<0.010	0.040	
Dibenzo(ah)anthracene	ug/L		<0.020	0.022	<0.020	<0.020	<0.020	0.032	
Fluoranthene	ug/L		0.041	0.128	0.022	0.032	<0.010	0.029	
Fluorene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	0.051	R
Indeno(1,2,3-cd)pyrene	ug/L		<0.020	0.115	<0.020	<0.020	<0.020	0.397	
1-Methylnaphthalene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
2-Methylnaphthalene	ug/L		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
Naphthalene	ug/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Phenanthrene	ug/L		0.020	0.025	<0.020	<0.020	<0.020	0.038	R
Pyrene	ug/L		0.035	0.107	<0.020	0.027	<0.020	<0.035	DLQ
Surrogate: d10-Acenaphthene	%		91.3	91.2	90.6	94.4	98.6	92.6	
Surrogate: d12-Chrysene	%		95.8	103.0	101.0	101.0	102.1	105.2	
Surrogate: d8-Naphthalene	%		73.6	97.0	98.7	93.1	88.8	99.4	
Surrogate: d10-Phenanthrene	%		94.7	94.1	98.1	97.1	99.6	99.3	

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2180375-7 12-OCT-18 10:05 **PC-7**	L2180375-8 12-OCT-18 08:50 **PC-8**	L2180375-9 12-OCT-18 15:25 **PC-9**	L2180375-10 12-OCT-18 14:55 **PC-10**
Acenaphthene	ug/L		<0.020	<0.020	0.151	0.050
Acenaphthylene	ug/L		<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L		<0.010	<0.010	0.049	0.011
Benzo(a)anthracene	ug/L		0.024	<0.020	0.113	<0.020
Benzo(a)pyrene	ug/L		0.020	<0.010	0.090	0.015
Benzo(b)fluoranthene	ug/L		0.040	<0.020	0.145	0.030
Benzo(g,h,i)perylene	ug/L		0.022	<0.020	0.076	<0.020
Benzo(k)fluoranthene	ug/L		0.013	<0.010	0.046	<0.010
Chrysene	ug/L		0.036	<0.010	0.122	0.027
Dibenzo(ah)anthracene	ug/L		<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L		0.084	0.014	0.366	0.106
Fluorene	ug/L		<0.020	0.048 R	0.128	0.022
Indeno(1,2,3-cd)pyrene	ug/L		0.023	0.129	0.086	<0.020
1-Methylnaphthalene	ug/L		<0.020	<0.020	0.026	0.601
2-Methylnaphthalene	ug/L		<0.020	<0.020	<0.020	0.374
Naphthalene	ug/L		<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L		0.034	<0.020	0.212	0.085
Pyrene	ug/L		0.065	<0.020	0.288	0.100
Surrogate: d10-Acenaphthene	%		95.7	114.6	92.3	95.2
Surrogate: d12-Chrysene	%		102.8	106.8	103.1	101.1
Surrogate: d8-Naphthalene	%		81.3	112.4	93.0	97.8
Surrogate: d10-Phenanthrene	%		99.4	101.8	98.6	104.2

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
NDOG	No Data Due to Overgrown Plate (Microbiology test). Overcrowded, confluent &/or non-identifiable microbial growth prevented

Reference Information

	identification & measurement of target coliform colonies.
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
OWP	Organic water sample contained visible sediment (must be included as part of analysis). Measured concentrations of organic

Reference Information

substances in water can be biased high due to presence of sediment.

DLHC Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
BTX-511-HS-WT	Water	BTEX by Headspace	SW846 8260 (511)

BTX is determined by analyzing by headspace-GC/MS.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

17-667360

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180375-COFC

COC Number: 17 - 667360

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 Regal Road, Unit 3
City/Province:	Guelph, ONT
Postal Code:	N1K 1B6

Report Format / Distribution	
Select Report Format:	[X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice To		
	Same as Report To	[X] YES [ ] NO
	Copy of Invoice with Report	[X] YES [ ] NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): LA180375 10 DAY

ALS Contact: GB. Sampler:

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Cl-IC-N-WT	CN-FREE-CFA-WT	EC-WT	Hardness ETL-SAR-CALC-WT, CALC-WT	NET-ONT-PWQO-WT	N-TOT-WT	P-T-CO2-WT, PTD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC, EC-MF-WT	BTEX	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	PC-1	12-10-18	14:40	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
2	PC-2	"	13:30	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
3	PC-3	"	12:55	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
4	PC-4	"	12:05	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
5	PC-5	"	11:46	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
6	PC-6	"	11:05	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
7	PC-7	"	10:05	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
8	PC-8	"	9:50	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
9	PC-9	"	15:25	water	R	R	R	R	R	R	R	R	R	R	R	R	R			
10	PC-10	"	14:55	water	R	R	R	R	R	R	R	R	R	R	R	R	R			

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	
Are samples for human consumption/ use? [ ] YES [X] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [ ] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				9.3	9.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date: 12-Oct-18	Time: 18:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white report copy.

[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

JULY 2017 FRONT

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 29-OCT-18
Report Date: 01-NOV-18 09:05 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2188307

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2188307-1	PC-01	Anions and Nutrients	Phosphorus, Total	0.0740	0.01	mg/L
		Bacteriological Tests	E. Coli	530	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.729	0.015	mg/L
			Copper (Cu)-Total	0.0068	0.001	mg/L
			Iron (Fe)-Total	1.06	0.3	mg/L
			Lead (Pb)-Total	0.00290	0.001	mg/L
		Speciated Metals	Chromium, Hexavalent	1.05	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.030	0.00002	ug/L
			Benzo(k)fluoranthene	0.015	0.0002	ug/L
			Chrysene	0.030	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.059	0.008	ug/L
			Phenanthrene	0.037	0.03	ug/L
L2188307-2	PC-02	Anions and Nutrients	Phosphorus, Total	0.0224	0.01	mg/L
		Bacteriological Tests	E. Coli	470	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.062	0.015	mg/L
			Copper (Cu)-Total	0.0024	0.001	mg/L
			Zinc (Zn)-Total	0.0414	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	<0.010	0.008	ug/L
L2188307-3	PC-03	Anions and Nutrients	Phosphorus, Total	0.0324	0.01	mg/L
		Bacteriological Tests	E. Coli	400	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.566	0.015	mg/L
			Copper (Cu)-Total	0.0233	0.001	mg/L
			Iron (Fe)-Total	4.25	0.3	mg/L
			Lead (Pb)-Total	0.00547	0.001	mg/L
			Zinc (Zn)-Total	0.0935	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	2.04	1	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2188307-3	PC-03	Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.013	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.027	0.008	ug/L
L2188307-4	PC-04	Anions and Nutrients	Phosphorus, Total	0.0761	0.01	mg/L
		Bacteriological Tests	E. Coli	4400	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.220	0.015	mg/L
			Copper (Cu)-Total	0.0138	0.001	mg/L
			Iron (Fe)-Total	0.881	0.3	mg/L
			Lead (Pb)-Total	0.00621	0.001	mg/L
			Zinc (Zn)-Total	0.0859	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.04	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.025	0.00002	ug/L
			Benzo(k)fluoranthene	0.012	0.0002	ug/L
			Chrysene	0.032	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.063	0.008	ug/L
			Phenanthrene	0.042	0.03	ug/L
L2188307-5	PC-05	Anions and Nutrients	Phosphorus, Total	0.108	0.01	mg/L
		Bacteriological Tests	E. Coli	720	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.134	0.015	mg/L
			Copper (Cu)-Total	0.0061	0.001	mg/L
			Iron (Fe)-Total	0.336	0.3	mg/L
			Lead (Pb)-Total	0.00108	0.001	mg/L
			Zinc (Zn)-Total	0.0236	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.012	0.0001	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2188307-5	PC-05	Polycyclic Aromatic Hydrocarbons	Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.024	0.008	ug/L
L2188307-6	PC-06	Anions and Nutrients	Phosphorus, Total	5.73	0.01	mg/L
		Bacteriological Tests	E. Coli	6200000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.573	0.015	mg/L
			Boron (B)-Total	0.300	0.2	mg/L
			Cadmium (Cd)-Total	0.000185	0.0001	mg/L
			Copper (Cu)-Total	0.165	0.001	mg/L
			Iron (Fe)-Total	1.80	0.3	mg/L
			Lead (Pb)-Total	0.00620	0.001	mg/L
			Silver (Ag)-Total	0.000232	0.0001	mg/L
			Zinc (Zn)-Total	0.477	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.020	0.0002	ug/L
			Chrysene	0.042	0.0001	ug/L
			Dibenzo(ah)anthracene	0.052	0.002	ug/L
			Fluoranthene	0.056	0.008	ug/L
			Phenanthrene	0.070	0.03	ug/L
L2188307-7	PC-07	Anions and Nutrients	Phosphorus, Total	0.0640	0.01	mg/L
		Bacteriological Tests	E. Coli	5100	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.551	0.015	mg/L
			Copper (Cu)-Total	0.0113	0.001	mg/L
			Iron (Fe)-Total	1.11	0.3	mg/L
			Lead (Pb)-Total	0.00582	0.001	mg/L
			Zinc (Zn)-Total	0.0776	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.39	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.037	0.0004	ug/L
			Benzo(g,h,i)perylene	0.073	0.00002	ug/L
			Benzo(k)fluoranthene	0.028	0.0002	ug/L
			Chrysene	0.076	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.158	0.008	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2188307-7	PC-07	Polycyclic Aromatic Hydrocarbons	Phenanthrene	0.066	0.03	ug/L
L2188307-8	PC-08	Anions and Nutrients	Phosphorus, Total	0.0262	0.01	mg/L
		Bacteriological Tests	E. Coli	7900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.088	0.015	mg/L
			Copper (Cu)-Total	0.0022	0.001	mg/L
			Lead (Pb)-Total	0.00166	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.015	0.008	ug/L
L2188307-9	PC-09	Anions and Nutrients	Phosphorus, Total	0.0144	0.01	mg/L
		Bacteriological Tests	E. Coli	180	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.045	0.015	mg/L
			Copper (Cu)-Total	0.0031	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.019	0.008	ug/L
L2188307-10	PC-10	Anions and Nutrients	Phosphorus, Total	0.0576	0.01	mg/L
		Bacteriological Tests	E. Coli	540	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.500	0.015	mg/L
			Copper (Cu)-Total	0.0265	0.001	mg/L
			Iron (Fe)-Total	0.831	0.3	mg/L
			Lead (Pb)-Total	0.00905	0.001	mg/L
			Zinc (Zn)-Total	0.0514	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.013	0.0008	ug/L
			Benzo(a)anthracene	0.058	0.0004	ug/L
			Benzo(g,h,i)perylene	0.083	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2188307-10	PC-10	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	0.050	0.0002	ug/L
			Chrysene	0.152	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.549	0.008	ug/L
			Phenanthrene	0.672	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
Conductivity	umhos/cm	-	-		909	135	379	241	1,000.00	1,626.00	198	91.0	106
Hardness (as CaCO3)	mg/L	-	-		71 HTC	50 HTC	118 HTC	65 HTC	243 HTC	315 HTC	63 HTC	42 HTC	20 HTC
pH	pH units	6.5-8.5	-		8.10	7.79	7.82	7.69	7.90	7.45	7.93	7.84	7.53
Total Suspended Solids	mg/L	-	-		8.8	<2.0	17.2	9.7	27.9	258	18.5	4.1	16.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2188307-10 Sample Date: 27-OCT-18 Sample ID: PC-10
Conductivity	umhos/cm	-	-	89.6
Hardness (as CaCO3)	mg/L	-	-	38 HTC
pH	pH units	6.5-8.5	-	7.68
Total Suspended Solids	mg/L	-	-	14.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
Chloride (Cl)	mg/L	-	-		248	12.3	79.6	36.9	208	275	24.8	3.10	18.5
Nitrate (as N)	mg/L	-	-		0.231	0.226	0.293	0.496	1.08	0.033	0.487	0.223	0.138
Nitrite (as N)	mg/L	-	-		0.020	<0.010	0.010	0.011	0.010	<0.010	0.021	0.014	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-		1.15	0.96	1.52	0.67	2.17	48 DLM	1.42	5.53	2.96
Total Nitrogen	mg/L	-	-		1.40	1.19	1.82	1.18	3.26	48	1.93	5.77	3.10
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0545	0.0236	0.0202	0.0500	0.0367	2.88 DLHC	0.0274	0.0181	0.0055
Phosphorus, Total	mg/L	0.01	-		0.0740	0.0224	0.0324	0.0761	0.108	5.73 DLHC	0.0640	0.0262	0.0144

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2188307-10
			Sample Date	27-OCT-18
			Sample ID	PC-10
		Guide Limits		
Analyte	Unit	#1	#2	
Chloride (Cl)	mg/L	-	-	5.54
Nitrate (as N)	mg/L	-	-	0.335
Nitrite (as N)	mg/L	-	-	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-	1.94
Total Nitrogen	mg/L	-	-	2.28
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0294
Phosphorus, Total	mg/L	0.01	-	0.0576

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
		Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
		Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
		Guide Limits									
Analyte	Unit	#1	#2								
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Lab ID				L2188307-10
Sample Date				27-OCT-18
Sample ID				PC-10
Cyanide, Free	mg/L	0.005	-	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
E. Coli	CFU/100mL	100	-		530 DLM	470 DLM	400 DLM	4400 DLM	720 DLM	6200000 DLM	5100 DLM	7900 DLM	180 DLM
Total Coliforms	CFU/100mL	-	-		9800 DLM	1600 DLM	4200 DLM	46000 DLM	5600 DLM	13200000 DLM	38000 DLM	91000 DLM	560 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

		Guide Limits			
				Lab ID	L2188307-10
				Sample Date	27-OCT-18
				Sample ID	PC-10
Analyte	**Unit**	**#1**	**#2**		
E. Coli	CFU/100mL	100	-	540 DLM	
Total Coliforms	CFU/100mL	-	-	3600 DLM	

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
			Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
			Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
		Guide Limits										
Analyte	Unit	#1	#2									
Sodium Adsorption Ratio	SAR	-	-	7.80	0.41	1.80	1.19	2.94	3.93	0.82	0.20	1.03

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2188307-10
			Sample Date	27-OCT-18
			Sample ID	PC-10
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Sodium Adsorption Ratio	SAR	-	-	0.35

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
Aluminum (Al)-Total	mg/L	0.015	-		0.729	0.062	0.566	0.220	0.134	0.573	0.551	0.088	0.045
Antimony (Sb)-Total	mg/L	0.02	-		0.00026	0.00016	0.00106	0.00064	0.00041	0.00080	0.00118	0.00021	0.00035
Arsenic (As)-Total	mg/L	0.005	-		0.00078	0.00023	0.00091	0.00050	0.00088	0.00081	0.00045	0.00044	0.00021
Barium (Ba)-Total	mg/L	-	-		0.0152	0.0130	0.0239	0.0165	0.0442	0.0492	0.0193	0.00562	0.00811
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	0.000059	<0.000050	<0.000050	0.00319	0.000057	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.014	<0.010	<0.010	0.011	0.022	0.300	0.011	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000033	0.000096	0.000053	0.000063	0.000029	0.000185	0.000044	0.000029	0.000019
Calcium (Ca)-Total	mg/L	-	-		21.2	15.7	35.1	19.8	73.0	86.9	19.8	13.6	6.13
Cesium (Cs)-Total	mg/L	-	-		0.000061	<0.000010	0.000051	0.000020	0.000016	0.000054	0.000065	<0.000010	0.000013
Chromium (Cr)-Total	mg/L	-	-		0.00245	<0.00050	0.0108	0.00234	0.00071	0.00543	0.00376	0.00054	<0.00050
Cobalt (Co)-Total	mg/L	0.0009	-		0.00048	0.00015	0.00066	0.00022	0.00012	0.00085	0.00038	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.001	-		0.0068	0.0024	0.0233	0.0138	0.0061	0.165	0.0113	0.0022	0.0031
Iron (Fe)-Total	mg/L	0.3	-		1.06	0.070	4.25	0.881	0.336	1.80	1.11	0.128	0.084
Lead (Pb)-Total	mg/L	0.001	-		0.00290	0.00027	0.00547	0.00621	0.00108	0.00620	0.00582	0.00166	0.00076
Magnesium (Mg)-Total	mg/L	-	-		4.47	2.71	7.42	3.73	14.8	23.9	3.37	2.03	1.14
Manganese (Mn)-Total	mg/L	-	-		0.0564	0.193	0.161	0.0347	0.0324	0.0682	0.0410	0.00730	0.00902
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	0.000019	<0.000010	0.000033	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.00200	0.000160	0.00107	0.000735	0.000578	0.00260	0.00177	0.000243	0.000155
Nickel (Ni)-Total	mg/L	0.025	-		0.00182	0.00120	0.00438	0.00163	0.00092	0.00571	0.00175	<0.00050	0.00060
Potassium (K)-Total	mg/L	-	-		1.75	0.267	1.05	2.16	2.39	14.9	0.911	0.489	0.330
Rubidium (Rb)-Total	mg/L	-	-		0.00167	0.00024	0.00118	0.00085	0.00105	0.0113	0.00133	0.00039	0.00034
Selenium (Se)-Total	mg/L	0.1	-		0.000103	0.000064	0.000074	0.000146	0.000223	0.000587	0.000111	0.000084	<0.000050
Silicon (Si)-Total	mg/L	-	-		2.65	0.64	1.60	1.27	3.28	2.67	1.38	0.60	0.33
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000232	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		151 DLHC	6.64	44.8	22.0	105 DLHC	160 DLHC	15.0	2.94	10.6
Strontium (Sr)-Total	mg/L	-	-		0.200	0.0315	0.101	0.0715	0.372	0.533	0.946	0.0853	0.0213
Sulfur (S)-Total	mg/L	-	-		6.92	1.36	2.07	1.95	9.01	30.5	3.68	1.23	1.36
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		0.000019	<0.000010	0.000014	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2188307-10 Sample Date: 27-OCT-18 Sample ID: PC-10
Aluminum (Al)-Total	mg/L	0.015	-	0.500
Antimony (Sb)-Total	mg/L	0.02	-	0.00164
Arsenic (As)-Total	mg/L	0.005	-	0.00065
Barium (Ba)-Total	mg/L	-	-	0.0141
Beryllium (Be)-Total	mg/L	0.011	-	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	<0.000050
Boron (B)-Total	mg/L	0.2	-	<0.010
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000092
Calcium (Ca)-Total	mg/L	-	-	12.3
Cesium (Cs)-Total	mg/L	-	-	0.000041
Chromium (Cr)-Total	mg/L	-	-	0.00222
Cobalt (Co)-Total	mg/L	0.0009	-	0.00030
Copper (Cu)-Total	mg/L	0.001	-	0.0265
Iron (Fe)-Total	mg/L	0.3	-	0.831
Lead (Pb)-Total	mg/L	0.001	-	0.00905
Magnesium (Mg)-Total	mg/L	-	-	1.78
Manganese (Mn)-Total	mg/L	-	-	0.0427
Mercury (Hg)-Total	mg/L	0.0002	-	0.000021
Molybdenum (Mo)-Total	mg/L	0.04	-	0.00295
Nickel (Ni)-Total	mg/L	0.025	-	0.00171
Potassium (K)-Total	mg/L	-	-	0.861
Rubidium (Rb)-Total	mg/L	-	-	0.00113
Selenium (Se)-Total	mg/L	0.1	-	0.000125
Silicon (Si)-Total	mg/L	-	-	1.32
Silver (Ag)-Total	mg/L	0.0001	-	<0.000050
Sodium (Na)-Total	mg/L	-	-	4.93
Strontium (Sr)-Total	mg/L	-	-	0.0543
Sulfur (S)-Total	mg/L	-	-	0.96
Tellurium (Te)-Total	mg/L	-	-	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-	0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
Thorium (Th)-Total	mg/L	-	-		<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-		0.00020	<0.00010	0.00116	0.00102	0.00019	0.00456	0.00081	0.00012	<0.00010
Titanium (Ti)-Total	mg/L	-	-		0.0225	0.00168	0.0214	0.00774	0.00634	0.0183	0.0214	0.00305	<0.0020 DLUI
Tungsten (W)-Total	mg/L	0.03	-		0.00031	<0.00010	0.00024	0.00031	<0.00010	0.00013	0.00013	<0.00010	<0.00010
Uranium (U)-Total	mg/L	0.005	-		0.000202	0.000073	0.000128	0.000126	0.000653	0.000699	0.000484	0.000049	0.000105
Vanadium (V)-Total	mg/L	0.006	-		0.00392	0.00067	0.00294	0.00128	0.00099	0.00146	0.00224	0.00060	<0.00050
Zinc (Zn)-Total	mg/L	0.02	-		0.0194	0.0414	0.0935	0.0859	0.0236	0.477	0.0776	0.0171	0.0157
Zirconium (Zr)-Total	mg/L	0.004	-		0.00040	<0.00030	0.00040	<0.00030	<0.00030	0.00337	0.00074	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2188307-10 Sample Date: 27-OCT-18 Sample ID: PC-10
Thorium (Th)-Total	mg/L	-	-	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00090
Titanium (Ti)-Total	mg/L	-	-	0.0172
Tungsten (W)-Total	mg/L	0.03	-	0.0277
Uranium (U)-Total	mg/L	0.005	-	0.000153
Vanadium (V)-Total	mg/L	0.006	-	0.00213
Zinc (Zn)-Total	mg/L	0.02	-	0.0514
Zirconium (Zr)-Total	mg/L	0.004	-	0.00037

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

				Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
Analyte	Unit	Guide Limits #1	#2										
Chromium, Hexavalent	ug/L	1	-	1.05	<0.50	2.04	1.04	0.72	<0.50	1.39	0.59	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2188307-10 Sample Date: 27-OCT-18 Sample ID: PC-10
Chromium, Hexavalent	ug/L	1	-	0.81

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Volatile Organic Compounds - WATER

				Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
		Guide Limits											
Analyte	Unit	#1	#2										
Acetone	ug/L	-	-	<30	<30	<30	<30	<30	58	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.4	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.57
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2188307-10
			Sample Date	27-OCT-18
			Sample ID	PC-10
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Acetone	ug/L	-	-	<30
Benzene	ug/L	100	-	<0.50
Bromodichloromethane	ug/L	200	-	<2.0
Bromoform	ug/L	60	-	<5.0
Bromomethane	ug/L	-	-	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20
Chlorobenzene	ug/L	15	-	<0.50
Dibromochloromethane	ug/L	40	-	<2.0
Chloroform	ug/L	-	-	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50
Methylene Chloride	ug/L	100	-	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50
Ethylbenzene	ug/L	8	-	<0.50
n-Hexane	ug/L	-	-	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20
MTBE	ug/L	-	-	<2.0
Styrene	ug/L	4	-	<0.50

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
		Guide Limits											
Analyte	Unit	#1	#2										
1,1,1,2-Tetrachloroethane	ug/L	20.0	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-		<0.50	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.96
Trichlorofluoromethane	ug/L	-	-		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.71
o-Xylene	ug/L	40	-		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-		97.3	97.5	96.9	95.7	96.7	94.5	95.7	95.9	96.0
Surrogate: 1,4-Difluorobenzene	%	-	-		95.5	95.4	94.3	95.4	94.6	94.9	95.2	94.2	95.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2188307-10
			Sample Date	27-OCT-18
			Sample ID	PC-10
		Guide Limits		
Analyte	Unit	#1	#2	
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50
Toluene	ug/L	0.8	-	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50
Trichloroethylene	ug/L	20	-	2.30
Trichlorofluoromethane	ug/L	-	-	<5.0
Vinyl chloride	ug/L	600	-	<0.50
o-Xylene	ug/L	40	-	<0.30
m+p-Xylenes	ug/L	2	-	<0.40
Xylenes (Total)	ug/L	-	-	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	96.9
Surrogate: 1,4-Difluorobenzene	%	-	-	94.7

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
F1 (C6-C10)	ug/L	-	-		<25	<25	<25	<25	<25	<25	<25	<25	<25
F1-BTEX	ug/L	-	-		<25	<25	<25	<25	<25	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-		<100	<100	<100	<100	<100	190	<100	<100	<100
F2-Naphth	ug/L	-	-		<100	<100	<100	<100	<100	190	<100	<100	<100
F3 (C16-C34)	ug/L	-	-		<250	<250	360	580	<250	3210	1240	<250	<250
F3-PAH	ug/L	-	-		<250	<250	350	580	<250	3210	1240	<250	<250
F4 (C34-C50)	ug/L	-	-		<250	<250	<250	<250	<250	1580	320	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-		<370	<370	<370	580	<370	4980	1570	<370	<370
Chrom. to baseline at nC50		-	-		YES	YES	YES	YES	YES	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-		97.7	96.0	97.5	93.2	95.3	95.4	96.2	97.4	91.2
Surrogate: 3,4-Dichlorotoluene	%	-	-		87.7	85.1	82.1	80.6	82.5	61.9	83.3	82.2	85.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

			Lab ID	L2188307-10
			Sample Date	27-OCT-18
			Sample ID	PC-10
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
F1 (C6-C10)	ug/L	-	-	<25
F1-BTEX	ug/L	-	-	<25
F2 (C10-C16)	ug/L	-	-	<100
F2-Naphth	ug/L	-	-	<100
F3 (C16-C34)	ug/L	-	-	1010
F3-PAH	ug/L	-	-	1010
F4 (C34-C50)	ug/L	-	-	290
Total Hydrocarbons (C6-C50)	ug/L	-	-	1300
Chrom. to baseline at nC50		-	-	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	101.7
Surrogate: 3,4-Dichlorotoluene	%	-	-	86.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

				Lab ID	L2188307-1	L2188307-2	L2188307-3	L2188307-4	L2188307-5	L2188307-6	L2188307-7	L2188307-8	L2188307-9
				Sample Date	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18	27-OCT-18
				Sample ID	PC-01	PC-02	PC-03	PC-04	PC-05	PC-06	PC-07	PC-08	PC-09
		Guide Limits											
Analyte	Unit	#1	#2										
Acenaphthene	ug/L	-	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.037	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-		0.019	<0.010	<0.010	0.015	<0.010	<0.010	0.047	<0.010	<0.010
Benzo(b)fluoranthene	ug/L	-	-		0.050	<0.020	0.020	0.050	<0.020	0.064	0.114	<0.020	<0.020
Benzo(g,h,i)perylene	ug/L	0.00002	-		0.030	<0.020	<0.020	0.025	<0.020	<0.020	0.073	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-		0.015	<0.010	<0.010	0.012	<0.010	<0.020 DLM	0.028	<0.010	<0.010
Chrysene	ug/L	0.0001	-		0.030	<0.010	0.013	0.032	0.012	0.042 DLM	0.076	<0.010	<0.010
Dibenzo(ah)anthracene	ug/L	0.002	-		<0.020	<0.020	<0.020	<0.020	<0.020	0.052	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-		0.059	<0.010	0.027	0.063	0.024	0.056 DLM	0.158	0.015	0.019
Fluorene	ug/L	0.2	-		<0.020	<0.020	<0.020	<0.020	<0.020	0.059 R	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-		0.029	<0.020	<0.020	0.024	<0.020	0.670	0.065	<0.020	<0.020
1-Methylnaphthalene	ug/L	2	-		0.027	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-		0.028	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-		0.037	<0.020	<0.020	0.042	<0.020	0.070	0.066	<0.020	0.022
Pyrene	ug/L	-	-		0.054	<0.020	0.028	0.074	0.023	0.050	0.149	<0.020	<0.020
Surrogate: d10-Acenaphthene	%	-	-		92.5	97.4	101.1	91.6	99.3	86.9	113.9	98.2	92.4
Surrogate: d12-Chrysene	%	-	-		102.4	108.9	115.3	101.3	106.0	89.6	119.8	111.9	109.5
Surrogate: d8-Naphthalene	%	-	-		98.6	102.1	107.5	98.6	105.4	115.5	120.3	103.2	96.5
Surrogate: d10-Phenanthrene	%	-	-		100.1	104.5	109.3	98.5	108.2	93.7	107.6	106.0	102.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits		
Lab ID				L2188307-10
Sample Date				27-OCT-18
Sample ID				PC-10
Analyte	**Unit**	**#1**	**#2**	
Acenaphthene	ug/L	-	-	<0.020
Acenaphthylene	ug/L	-	-	<0.020
Anthracene	ug/L	0.0008	-	0.013
Benzo(a)anthracene	ug/L	0.0004	-	0.058
Benzo(a)pyrene	ug/L	-	-	0.070
Benzo(b)fluoranthene	ug/L	-	-	0.192
Benzo(g,h,i)perylene	ug/L	0.00002	-	0.083
Benzo(k)fluoranthene	ug/L	0.0002	-	0.050
Chrysene	ug/L	0.0001	-	0.152
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020
Fluoranthene	ug/L	0.008	-	0.549
Fluorene	ug/L	0.2	-	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.091
1-Methylnaphthalene	ug/L	2	-	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020
Naphthalene	ug/L	7	-	<0.050
Phenanthrene	ug/L	0.03	-	0.672
Pyrene	ug/L	-	-	0.280
Surrogate: d10-Acenaphthene	%	-	-	104.9
Surrogate: d12-Chrysene	%	-	-	122.2
Surrogate: d8-Naphthalene	%	-	-	110.4
Surrogate: d10-Phenanthrene	%	-	-	112.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Reference Information

WT ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4306987								
WG2917034-18 DUP		**WG2917034-20**						
Chloride (Cl)		250	249		mg/L	0.3	20	29-OCT-18
WG2917034-17 LCS								
Chloride (Cl)			99.4		%		90-110	29-OCT-18
WG2917034-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	29-OCT-18
WG2917034-19 MS		**WG2917034-20**						
Chloride (Cl)			N/A	MS-B	%		-	29-OCT-18
CN-FREE-CFA-WT	**Water**							
Batch R4304729								
WG2916683-10 LCS								
Cyanide, Free			94.1		%		80-120	29-OCT-18
WG2916683-9 MB								
Cyanide, Free			<0.0020		mg/L		0.002	29-OCT-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4306170								
WG2917260-4 DUP		**WG2917260-3**						
Chromium, Hexavalent		1.05	1.05		ug/L	0.1	20	29-OCT-18
WG2917260-2 LCS								
Chromium, Hexavalent			103.0		%		80-120	29-OCT-18
WG2917260-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	29-OCT-18
WG2917260-5 MS		**WG2917260-3**						
Chromium, Hexavalent			100.2		%		70-130	29-OCT-18
EC-MF-WT	**Water**							
Batch R4307250								
WG2916746-3 DUP		**L2188307-9**						
E. Coli		180	130		CFU/100mL	32	65	30-OCT-18
WG2916746-1 MB								
E. Coli			0		CFU/100mL		1	30-OCT-18
EC-WT	**Water**							
Batch R4304391								
WG2915779-7 DUP		**WG2915779-8**						
Conductivity		857	859		umhos/cm	0.2	10	29-OCT-18
WG2915779-5 MB								
Conductivity			<3.0		umhos/cm		3	29-OCT-18
F1-HS-511-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4305878								
WG2914550-4 DUP		**WG2914550-3**						
F1 (C6-C10)		33	32		ug/L	0.5	30	30-OCT-18
WG2914550-1 LCS								
F1 (C6-C10)			112.4		%		80-120	30-OCT-18
WG2914550-2 MB								
F1 (C6-C10)			<25		ug/L		25	30-OCT-18
Surrogate: 3,4-Dichlorotoluene			85.4		%		60-140	30-OCT-18
WG2914550-5 MS		**WG2914550-3**						
F1 (C6-C10)			83.7		%		60-140	30-OCT-18
F2-F4-511-WT	**Water**							
Batch R4307075								
WG2917103-2 LCS								
F2 (C10-C16)			102.4		%		70-130	30-OCT-18
F3 (C16-C34)			104.6		%		70-130	30-OCT-18
F4 (C34-C50)			110.4		%		70-130	30-OCT-18
WG2917103-1 MB								
F2 (C10-C16)			<100		ug/L		100	30-OCT-18
F3 (C16-C34)			<250		ug/L		250	30-OCT-18
F4 (C34-C50)			<250		ug/L		250	30-OCT-18
Surrogate: 2-Bromobenzotrifluoride			89.0		%		60-140	30-OCT-18
HG-T-CVAA-WT	**Water**							
Batch R4306209								
WG2917050-3 DUP		**L2188307-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-OCT-18
WG2917050-2 LCS								
Mercury (Hg)-Total			98.2		%		80-120	30-OCT-18
WG2917050-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	30-OCT-18
WG2917050-4 MS		**L2188307-2**						
Mercury (Hg)-Total			92.5		%		70-130	30-OCT-18
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-4 DUP		**WG2917132-3**						
Aluminum (Al)-Total		0.729	0.736		mg/L	1.0	20	29-OCT-18
Antimony (Sb)-Total		0.00026	0.00026		mg/L	2.9	20	29-OCT-18
Arsenic (As)-Total		0.00078	0.00077		mg/L	1.6	20	29-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-4 DUP		**WG2917132-3**						
Barium (Ba)-Total		0.0152	0.0148		mg/L	2.1	20	29-OCT-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-OCT-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-OCT-18
Boron (B)-Total		0.014	0.013		mg/L	2.3	20	29-OCT-18
Cadmium (Cd)-Total		0.0000326	0.0000291		mg/L	11	20	29-OCT-18
Calcium (Ca)-Total		21.2	20.9		mg/L	1.3	20	29-OCT-18
Chromium (Cr)-Total		0.00245	0.00238		mg/L	3.0	20	30-OCT-18
Cesium (Cs)-Total		0.000061	0.000062		mg/L	1.0	20	29-OCT-18
Cobalt (Co)-Total		0.00048	0.00047		mg/L	1.8	20	29-OCT-18
Copper (Cu)-Total		0.0068	0.0063		mg/L	7.4	20	29-OCT-18
Iron (Fe)-Total		1.06	1.05		mg/L	1.1	20	29-OCT-18
Lead (Pb)-Total		0.00290	0.00292		mg/L	1.0	20	29-OCT-18
Magnesium (Mg)-Total		4.47	4.50		mg/L	0.6	20	29-OCT-18
Manganese (Mn)-Total		0.0564	0.0568		mg/L	0.8	20	29-OCT-18
Molybdenum (Mo)-Total		0.00200	0.00199		mg/L	0.7	20	29-OCT-18
Nickel (Ni)-Total		0.00182	0.00168		mg/L	7.8	20	29-OCT-18
Potassium (K)-Total		1.75	1.75		mg/L	0.0	20	29-OCT-18
Rubidium (Rb)-Total		0.00167	0.00165		mg/L	1.3	20	29-OCT-18
Selenium (Se)-Total		0.000103	0.000126		mg/L	20	20	29-OCT-18
Silicon (Si)-Total		2.65	2.70		mg/L	1.9	20	29-OCT-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-OCT-18
Sodium (Na)-Total		151	153		mg/L	1.4	20	29-OCT-18
Strontium (Sr)-Total		0.200	0.195		mg/L	2.1	20	29-OCT-18
Sulfur (S)-Total		6.92	6.94		mg/L	0.3	25	29-OCT-18
Thallium (Tl)-Total		0.000019	0.000013	J	mg/L	0.000006	0.00002	29-OCT-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	29-OCT-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	29-OCT-18
Tin (Sn)-Total		0.00020	0.00020		mg/L	1.6	20	29-OCT-18
Titanium (Ti)-Total		0.0225	0.0229		mg/L	1.7	20	29-OCT-18
Tungsten (W)-Total		0.00031	0.00032		mg/L	2.3	20	29-OCT-18
Uranium (U)-Total		0.000202	0.000216		mg/L	6.8	20	29-OCT-18
Vanadium (V)-Total		0.00392	0.00396		mg/L	1.1	20	29-OCT-18
Zinc (Zn)-Total		0.0194	0.0197		mg/L			29-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-4 DUP		**WG2917132-3**						
Zinc (Zn)-Total		0.0194	0.0197		mg/L	1.9	20	29-OCT-18
Zirconium (Zr)-Total		0.00040	0.00048		mg/L	18	20	29-OCT-18
WG2917132-2 LCS								
Aluminum (Al)-Total			99.5		%		80-120	29-OCT-18
Antimony (Sb)-Total			100.8		%		80-120	29-OCT-18
Arsenic (As)-Total			96.9		%		80-120	29-OCT-18
Barium (Ba)-Total			100.2		%		80-120	29-OCT-18
Beryllium (Be)-Total			89.1		%		80-120	29-OCT-18
Bismuth (Bi)-Total			93.6		%		80-120	29-OCT-18
Boron (B)-Total			90.0		%		80-120	29-OCT-18
Cadmium (Cd)-Total			94.2		%		80-120	29-OCT-18
Calcium (Ca)-Total			94.6		%		80-120	29-OCT-18
Chromium (Cr)-Total			97.4		%		80-120	29-OCT-18
Cesium (Cs)-Total			100.7		%		80-120	29-OCT-18
Cobalt (Co)-Total			94.3		%		80-120	29-OCT-18
Copper (Cu)-Total			94.7		%		80-120	29-OCT-18
Iron (Fe)-Total			94.8		%		80-120	29-OCT-18
Lead (Pb)-Total			98.3		%		80-120	29-OCT-18
Magnesium (Mg)-Total			95.1		%		80-120	29-OCT-18
Manganese (Mn)-Total			98.0		%		80-120	29-OCT-18
Molybdenum (Mo)-Total			97.4		%		80-120	29-OCT-18
Nickel (Ni)-Total			94.9		%		80-120	29-OCT-18
Potassium (K)-Total			101.4		%		80-120	29-OCT-18
Rubidium (Rb)-Total			101.6		%		80-120	29-OCT-18
Selenium (Se)-Total			95.5		%		80-120	29-OCT-18
Silicon (Si)-Total			97.8		%		60-140	29-OCT-18
Silver (Ag)-Total			101.6		%		80-120	29-OCT-18
Sodium (Na)-Total			94.9		%		80-120	29-OCT-18
Strontium (Sr)-Total			94.2		%		80-120	29-OCT-18
Sulfur (S)-Total			90.2		%		80-120	29-OCT-18
Thallium (Tl)-Total			99.2		%		80-120	29-OCT-18
Tellurium (Te)-Total			97.9		%		80-120	29-OCT-18
Thorium (Th)-Total			96.6		%		70-130	29-OCT-18
Tin (Sn)-Total			95.0		%		80-120	29-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-2 LCS								
Titanium (Ti)-Total			92.0		%		80-120	29-OCT-18
Tungsten (W)-Total			100.5		%		80-120	29-OCT-18
Uranium (U)-Total			98.2		%		80-120	29-OCT-18
Vanadium (V)-Total			97.4		%		80-120	29-OCT-18
Zinc (Zn)-Total			98.0		%		80-120	29-OCT-18
Zirconium (Zr)-Total			96.5		%		80-120	29-OCT-18
WG2917132-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	29-OCT-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	29-OCT-18
Boron (B)-Total			<0.010		mg/L		0.01	29-OCT-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	29-OCT-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	29-OCT-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	29-OCT-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	29-OCT-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	29-OCT-18
Iron (Fe)-Total			<0.010		mg/L		0.01	29-OCT-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	29-OCT-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	29-OCT-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	29-OCT-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	29-OCT-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	29-OCT-18
Potassium (K)-Total			<0.050		mg/L		0.05	29-OCT-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	29-OCT-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	29-OCT-18
Silicon (Si)-Total			<0.10		mg/L		0.1	29-OCT-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	29-OCT-18
Sodium (Na)-Total			<0.050		mg/L		0.05	29-OCT-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	29-OCT-18
Sulfur (S)-Total			<0.50		mg/L		0.5	29-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	29-OCT-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	29-OCT-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	29-OCT-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	29-OCT-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	29-OCT-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	29-OCT-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	29-OCT-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	29-OCT-18
WG2917132-5 MS		**WG2917132-6**						
Aluminum (Al)-Total			102.2		%		70-130	29-OCT-18
Antimony (Sb)-Total			99.3		%		70-130	29-OCT-18
Arsenic (As)-Total			91.5		%		70-130	29-OCT-18
Barium (Ba)-Total			N/A	MS-B	%		-	29-OCT-18
Beryllium (Be)-Total			83.0		%		70-130	29-OCT-18
Bismuth (Bi)-Total			90.7		%		70-130	29-OCT-18
Boron (B)-Total			83.3		%		70-130	29-OCT-18
Cadmium (Cd)-Total			92.3		%		70-130	29-OCT-18
Calcium (Ca)-Total			N/A	MS-B	%		-	29-OCT-18
Chromium (Cr)-Total			90.9		%		70-130	29-OCT-18
Cesium (Cs)-Total			98.8		%		70-130	29-OCT-18
Cobalt (Co)-Total			90.5		%		70-130	29-OCT-18
Copper (Cu)-Total			88.6		%		70-130	29-OCT-18
Iron (Fe)-Total			N/A	MS-B	%		-	29-OCT-18
Lead (Pb)-Total			90.8		%		70-130	29-OCT-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	29-OCT-18
Manganese (Mn)-Total			N/A	MS-B	%		-	29-OCT-18
Molybdenum (Mo)-Total			91.6		%		70-130	29-OCT-18
Nickel (Ni)-Total			90.3		%		70-130	29-OCT-18
Potassium (K)-Total			94.9		%		70-130	29-OCT-18
Rubidium (Rb)-Total			95.6		%		70-130	29-OCT-18
Selenium (Se)-Total			90.5		%		70-130	29-OCT-18
Silicon (Si)-Total			N/A	MS-B	%		-	29-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4303538								
WG2917132-5 MS		**WG2917132-6**						
Silver (Ag)-Total			96.3		%		70-130	29-OCT-18
Sodium (Na)-Total			N/A	MS-B	%		-	29-OCT-18
Strontium (Sr)-Total			N/A	MS-B	%		-	29-OCT-18
Sulfur (S)-Total			89.1		%		70-130	29-OCT-18
Thallium (Tl)-Total			94.1		%		70-130	29-OCT-18
Tellurium (Te)-Total			94.1		%		70-130	29-OCT-18
Thorium (Th)-Total			87.9		%		70-130	29-OCT-18
Tin (Sn)-Total			93.7		%		70-130	29-OCT-18
Titanium (Ti)-Total			89.9		%		70-130	29-OCT-18
Tungsten (W)-Total			94.7		%		70-130	29-OCT-18
Uranium (U)-Total			90.4		%		70-130	29-OCT-18
Vanadium (V)-Total			92.8		%		70-130	29-OCT-18
Zinc (Zn)-Total			N/A	MS-B	%		-	29-OCT-18
Zirconium (Zr)-Total			84.8		%		70-130	29-OCT-18
NO2-IC-WT	**Water**							
Batch R4306987								
WG2917034-18 DUP		**WG2917034-20**						
Nitrite (as N)		0.019	0.018		mg/L	2.5	25	29-OCT-18
WG2917034-17 LCS								
Nitrite (as N)			97.9		%		70-130	29-OCT-18
WG2917034-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	29-OCT-18
WG2917034-19 MS		**WG2917034-20**						
Nitrite (as N)			101.4		%		70-130	29-OCT-18
NO3-IC-WT	**Water**							
Batch R4306987								
WG2917034-18 DUP		**WG2917034-20**						
Nitrate (as N)		0.229	0.227		mg/L	0.7	25	29-OCT-18
WG2917034-17 LCS								
Nitrate (as N)			99.1		%		70-130	29-OCT-18
WG2917034-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	29-OCT-18
WG2917034-19 MS		**WG2917034-20**						
Nitrate (as N)			103.8		%		70-130	29-OCT-18
P-T-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-WT	**Water**							
Batch R4305853								
WG2917133-3 DUP		**L2188307-5**						
Phosphorus, Total		0.108	0.106		mg/L	1.6	20	30-OCT-18
WG2917133-2 LCS								
Phosphorus, Total			98.8		%		80-120	30-OCT-18
WG2917133-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	30-OCT-18
WG2917133-4 MS		**L2188307-5**						
Phosphorus, Total			N/A	MS-B	%		-	30-OCT-18
P-TD-COL-WT	**Water**							
Batch R4305854								
WG2917136-3 DUP		**L2188307-5**						
Phosphorus (P)-Total	Dissolved	0.0367	0.0391		mg/L	6.2	20	30-OCT-18
WG2917136-2 LCS								
Phosphorus (P)-Total	Dissolved		100.1		%		80-120	30-OCT-18
WG2917136-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	30-OCT-18
WG2917136-4 MS		**L2188307-5**						
Phosphorus (P)-Total	Dissolved		98.5		%		70-130	30-OCT-18
PAH-PWQO-WT	**Water**							
Batch R4307130								
WG2917103-2 LCS								
1-Methylnaphthalene			92.3		%		50-150	30-OCT-18
2-Methylnaphthalene			89.6		%		50-150	30-OCT-18
Acenaphthene			95.3		%		50-150	30-OCT-18
Acenaphthylene			98.6		%		50-150	30-OCT-18
Anthracene			106.0		%		60-130	30-OCT-18
Benzo(a)anthracene			118.0		%		60-130	30-OCT-18
Benzo(a)pyrene			100.2		%		50-150	30-OCT-18
Benzo(b)fluoranthene			94.0		%		50-150	30-OCT-18
Benzo(g,h,i)perylene			96.9		%		60-130	30-OCT-18
Benzo(k)fluoranthene			99.8		%		60-130	30-OCT-18
Chrysene			113.9		%		60-130	30-OCT-18
Dibenzo(ah)anthracene			102.8		%		60-130	30-OCT-18
Fluoranthene			102.7		%		60-130	30-OCT-18
Fluorene			100.7		%		50-150	30-OCT-18
Indeno(1,2,3-cd)pyrene			105.4		%		50-150	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4307130								
WG2917103-2 LCS								
Naphthalene			94.5		%		50-150	30-OCT-18
Phenanthrene			103.2		%		50-150	30-OCT-18
Pyrene			103.8		%		50-150	30-OCT-18
WG2917103-3 LCSD		**WG2917103-2**						
1-Methylnaphthalene		92.3	99.4		%	7.3	50	30-OCT-18
2-Methylnaphthalene		89.6	96.2		%	7.1	50	30-OCT-18
Acenaphthene		95.3	102.5		%	7.3	50	30-OCT-18
Acenaphthylene		98.6	105.9		%	7.2	50	30-OCT-18
Anthracene		106.0	115.0		%	8.1	50	30-OCT-18
Benzo(a)anthracene		118.0	128.8		%	8.8	50	30-OCT-18
Benzo(a)pyrene		100.2	108.2		%	7.7	50	30-OCT-18
Benzo(b)fluoranthene		94.0	101.7		%	7.8	50	30-OCT-18
Benzo(g,h,i)perylene		96.9	104.4		%	7.5	50	30-OCT-18
Benzo(k)fluoranthene		99.8	107.5		%	7.5	50	30-OCT-18
Chrysene		113.9	126.2		%	10	50	30-OCT-18
Dibenzo(ah)anthracene		102.8	106.8		%	3.8	50	30-OCT-18
Fluoranthene		102.7	111.8		%	8.4	50	30-OCT-18
Fluorene		100.7	109.9		%	8.7	50	30-OCT-18
Indeno(1,2,3-cd)pyrene		105.4	114.5		%	8.2	50	30-OCT-18
Naphthalene		94.5	102.2		%	7.9	50	30-OCT-18
Phenanthrene		103.2	112.7		%	8.8	50	30-OCT-18
Pyrene		103.8	112.4		%	8.0	50	30-OCT-18
WG2917103-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	30-OCT-18
2-Methylnaphthalene			<0.020		ug/L		0.02	30-OCT-18
Acenaphthene			<0.020		ug/L		0.02	30-OCT-18
Acenaphthylene			<0.020		ug/L		0.02	30-OCT-18
Anthracene			<0.010		ug/L		0.01	30-OCT-18
Benzo(a)anthracene			<0.020		ug/L		0.02	30-OCT-18
Benzo(a)pyrene			<0.010		ug/L		0.01	30-OCT-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	30-OCT-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	30-OCT-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4307130								
WG2917103-1 MB								
Chrysene			<0.010		ug/L		0.01	30-OCT-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	30-OCT-18
Fluoranthene			<0.010		ug/L		0.01	30-OCT-18
Fluorene			<0.020		ug/L		0.02	30-OCT-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	30-OCT-18
Naphthalene			<0.050		ug/L		0.05	30-OCT-18
Phenanthrene			<0.020		ug/L		0.02	30-OCT-18
Pyrene			<0.020		ug/L		0.02	30-OCT-18
Surrogate: d8-Naphthalene			101.9		%		40-130	30-OCT-18
Surrogate: d10-Phenanthrene			102.1		%		40-130	30-OCT-18
Surrogate: d12-Chrysene			110.7		%		40-130	30-OCT-18
Surrogate: d10-Acenaphthene			97.0		%		40-130	30-OCT-18
PH-WT	**Water**							
Batch R4304391								
WG2915779-7 DUP		**WG2915779-8**						
pH		7.10	7.14	J	pH units	0.04	0.2	29-OCT-18
WG2915779-6 LCS								
pH			7.00		pH units		6.9-7.1	29-OCT-18
SOLIDS-TSS-WT	**Water**							
Batch R4306157								
WG2916868-3 DUP		**L2187307-1**						
Total Suspended Solids		357	373		mg/L	4.6	20	30-OCT-18
WG2916868-2 LCS								
Total Suspended Solids			99.5		%		85-115	30-OCT-18
WG2916868-1 MB								
Total Suspended Solids			<2.0		mg/L		2	30-OCT-18
TC-MF-WT	**Water**							
Batch R4307207								
WG2916747-3 DUP		**L2188307-3**						
Total Coliforms		4200	5300		CFU/100mL	23	65	30-OCT-18
WG2916747-1 MB								
Total Coliforms			0		CFU/100mL		1	30-OCT-18
TKN-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4307033								
WG2917327-3 DUP		**L2188307-1**						
Total Kjeldahl Nitrogen		1.15	1.21		mg/L	5.4	20	30-OCT-18
WG2917327-2 LCS								
Total Kjeldahl Nitrogen			100.5		%		75-125	30-OCT-18
WG2917327-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	30-OCT-18
WG2917327-4 MS		**L2188307-1**						
Total Kjeldahl Nitrogen			103.6		%		70-130	30-OCT-18
Batch R4308787								
WG2918894-3 DUP		**L2187477-18**						
Total Kjeldahl Nitrogen		1.69	1.46		mg/L	15	20	31-OCT-18
WG2918894-2 LCS								
Total Kjeldahl Nitrogen			106.5		%		75-125	31-OCT-18
WG2918894-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	31-OCT-18
WG2918894-4 MS		**L2187477-18**						
Total Kjeldahl Nitrogen			92.7		%		70-130	31-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-4 DUP		**WG2914550-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	30-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Acetone		211	189		ug/L	11	30	30-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	30-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-4 DUP		**WG2914550-3**						
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	30-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	30-OCT-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	30-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	30-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	30-OCT-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	30-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	30-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	30-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	30-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	30-OCT-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	30-OCT-18
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Toluene		0.61	0.57		ug/L	6.8	30	30-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	30-OCT-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	30-OCT-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	30-OCT-18
WG2914550-1 LCS								
1,1,1,2-Tetrachloroethane			110.4		%		70-130	30-OCT-18
1,1,2,2-Tetrachloroethane			117.6		%		70-130	30-OCT-18
1,1,1-Trichloroethane			104.6		%		70-130	30-OCT-18
1,1,2-Trichloroethane			117.9		%		70-130	30-OCT-18
1,1-Dichloroethane			112.2		%		70-130	30-OCT-18
1,1-Dichloroethylene			99.6		%		70-130	30-OCT-18
1,2-Dibromoethane			114.7		%		70-130	30-OCT-18
1,2-Dichlorobenzene			111.0		%		70-130	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-1 LCS								
1,2-Dichloroethane			119.4		%		70-130	30-OCT-18
1,2-Dichloropropane			116.3		%		70-130	30-OCT-18
1,3-Dichlorobenzene			104.5		%		70-130	30-OCT-18
1,4-Dichlorobenzene			107.3		%		70-130	30-OCT-18
Acetone			141.8	MES	%		60-140	30-OCT-18
Benzene			111.9		%		70-130	30-OCT-18
Bromodichloromethane			116.5		%		70-130	30-OCT-18
Bromoform			114.8		%		70-130	30-OCT-18
Bromomethane			85.0		%		60-140	30-OCT-18
Carbon tetrachloride			101.3		%		70-130	30-OCT-18
Chlorobenzene			111.5		%		70-130	30-OCT-18
Chloroform			112.1		%		70-130	30-OCT-18
cis-1,2-Dichloroethylene			104.2		%		70-130	30-OCT-18
cis-1,3-Dichloropropene			109.8		%		70-130	30-OCT-18
Dibromochloromethane			117.6		%		70-130	30-OCT-18
Dichlorodifluoromethane			92.2		%		50-140	30-OCT-18
Ethylbenzene			101.0		%		70-130	30-OCT-18
n-Hexane			88.6		%		70-130	30-OCT-18
m+p-Xylenes			104.0		%		70-130	30-OCT-18
Methyl Ethyl Ketone			135.3		%		60-140	30-OCT-18
Methyl Isobutyl Ketone			134.7		%		60-140	30-OCT-18
Methylene Chloride			109.8		%		70-130	30-OCT-18
MTBE			110.4		%		70-130	30-OCT-18
o-Xylene			101.0		%		70-130	30-OCT-18
Styrene			105.0		%		70-130	30-OCT-18
Tetrachloroethylene			103.0		%		70-130	30-OCT-18
Toluene			105.6		%		70-130	30-OCT-18
trans-1,2-Dichloroethylene			106.2		%		70-130	30-OCT-18
trans-1,3-Dichloropropene			110.0		%		70-130	30-OCT-18
Trichloroethylene			109.2		%		70-130	30-OCT-18
Trichlorofluoromethane			110.3		%		60-140	30-OCT-18
Vinyl chloride			98.9		%		60-140	30-OCT-18
WG2914550-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-2 MB								
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	30-OCT-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	30-OCT-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	30-OCT-18
1,1-Dichloroethane			<0.50		ug/L		0.5	30-OCT-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	30-OCT-18
1,2-Dibromoethane			<0.20		ug/L		0.2	30-OCT-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	30-OCT-18
1,2-Dichloroethane			<0.50		ug/L		0.5	30-OCT-18
1,2-Dichloropropane			<0.50		ug/L		0.5	30-OCT-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	30-OCT-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	30-OCT-18
Acetone			<30		ug/L		30	30-OCT-18
Benzene			<0.50		ug/L		0.5	30-OCT-18
Bromodichloromethane			<2.0		ug/L		2	30-OCT-18
Bromoform			<5.0		ug/L		5	30-OCT-18
Bromomethane			<0.50		ug/L		0.5	30-OCT-18
Carbon tetrachloride			<0.20		ug/L		0.2	30-OCT-18
Chlorobenzene			<0.50		ug/L		0.5	30-OCT-18
Chloroform			<1.0		ug/L		1	30-OCT-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	30-OCT-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	30-OCT-18
Dibromochloromethane			<2.0		ug/L		2	30-OCT-18
Dichlorodifluoromethane			<2.0		ug/L		2	30-OCT-18
Ethylbenzene			<0.50		ug/L		0.5	30-OCT-18
n-Hexane			<0.50		ug/L		0.5	30-OCT-18
m+p-Xylenes			<0.40		ug/L		0.4	30-OCT-18
Methyl Ethyl Ketone			<20		ug/L		20	30-OCT-18
Methyl Isobutyl Ketone			<20		ug/L		20	30-OCT-18
Methylene Chloride			<5.0		ug/L		5	30-OCT-18
MTBE			<2.0		ug/L		2	30-OCT-18
o-Xylene			<0.30		ug/L		0.3	30-OCT-18
Styrene			<0.50		ug/L		0.5	30-OCT-18
Tetrachloroethylene			<0.50		ug/L		0.5	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-2 MB								
Toluene			<0.50		ug/L		0.5	30-OCT-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	30-OCT-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	30-OCT-18
Trichloroethylene			<0.50		ug/L		0.5	30-OCT-18
Trichlorofluoromethane			<5.0		ug/L		5	30-OCT-18
Vinyl chloride			<0.50		ug/L		0.5	30-OCT-18
Surrogate: 1,4-Difluorobenzene			95.1		%		70-130	30-OCT-18
Surrogate: 4-Bromofluorobenzene			96.2		%		70-130	30-OCT-18
WG2914550-5 MS		**WG2914550-3**						
1,1,1,2-Tetrachloroethane			109.3		%		50-140	30-OCT-18
1,1,2,2-Tetrachloroethane			101.6		%		50-140	30-OCT-18
1,1,1-Trichloroethane			105.9		%		50-140	30-OCT-18
1,1,2-Trichloroethane			107.8		%		50-140	30-OCT-18
1,1-Dichloroethane			108.1		%		50-140	30-OCT-18
1,1-Dichloroethylene			100.1		%		50-140	30-OCT-18
1,2-Dibromoethane			102.7		%		50-140	30-OCT-18
1,2-Dichlorobenzene			106.6		%		50-140	30-OCT-18
1,2-Dichloroethane			106.9		%		50-140	30-OCT-18
1,2-Dichloropropane			108.7		%		50-140	30-OCT-18
1,3-Dichlorobenzene			105.4		%		50-140	30-OCT-18
1,4-Dichlorobenzene			106.4		%		50-140	30-OCT-18
Acetone			N/A	MS-B	%		-	30-OCT-18
Benzene			108.2		%		50-140	30-OCT-18
Bromodichloromethane			108.4		%		50-140	30-OCT-18
Bromoform			102.4		%		50-140	30-OCT-18
Bromomethane			81.7		%		50-140	30-OCT-18
Carbon tetrachloride			102.7		%		50-140	30-OCT-18
Chlorobenzene			111.2		%		50-140	30-OCT-18
Chloroform			107.5		%		50-140	30-OCT-18
cis-1,2-Dichloroethylene			99.95		%		50-140	30-OCT-18
cis-1,3-Dichloropropene			107.9		%		50-140	30-OCT-18
Dibromochloromethane			109.6		%		50-140	30-OCT-18
Dichlorodifluoromethane			95.2		%		50-140	30-OCT-18
Ethylbenzene			106.8		%		50-140	30-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4305878								
WG2914550-5 MS		**WG2914550-3**						
n-Hexane			90.0		%		50-140	30-OCT-18
m+p-Xylenes			108.9		%		50-140	30-OCT-18
Methyl Ethyl Ketone			106.1		%		50-140	30-OCT-18
Methyl Isobutyl Ketone			100.9		%		50-140	30-OCT-18
Methylene Chloride			100.1		%		50-140	30-OCT-18
MTBE			109.2		%		50-140	30-OCT-18
o-Xylene			104.6		%		50-140	30-OCT-18
Styrene			105.4		%		50-140	30-OCT-18
Tetrachloroethylene			109.8		%		50-140	30-OCT-18
Toluene			108.8		%		50-140	30-OCT-18
trans-1,2-Dichloroethylene			106.8		%		50-140	30-OCT-18
trans-1,3-Dichloropropene			108.1		%		50-140	30-OCT-18
Trichloroethylene			110.4		%		50-140	30-OCT-18
Trichlorofluoromethane			112.3		%		50-140	30-OCT-18
Vinyl chloride			99.5		%		50-140	30-OCT-18

Quality Control Report

Workorder: L2188307 Report Date: 01-NOV-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

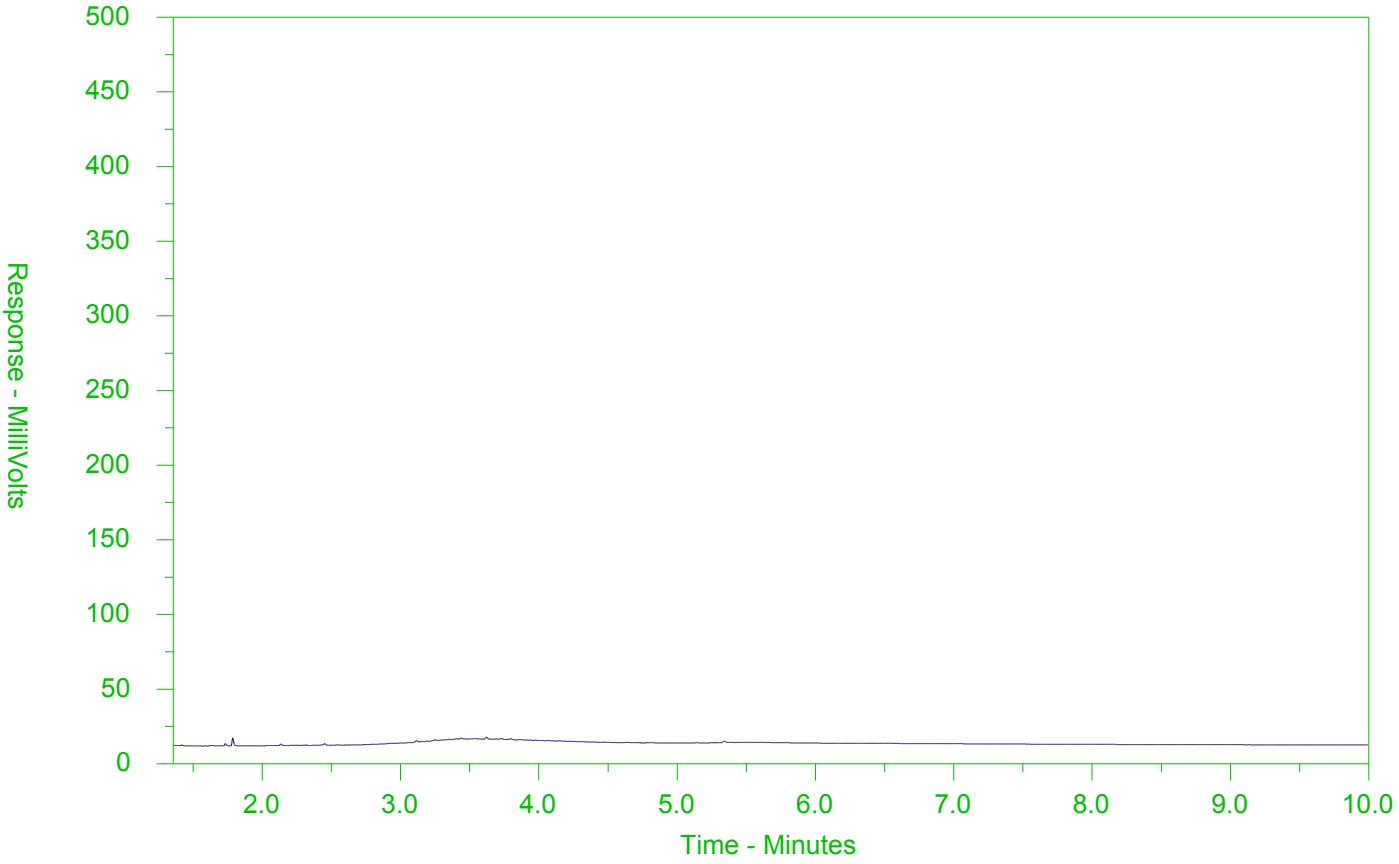
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-1
Client Sample ID: PC-01



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

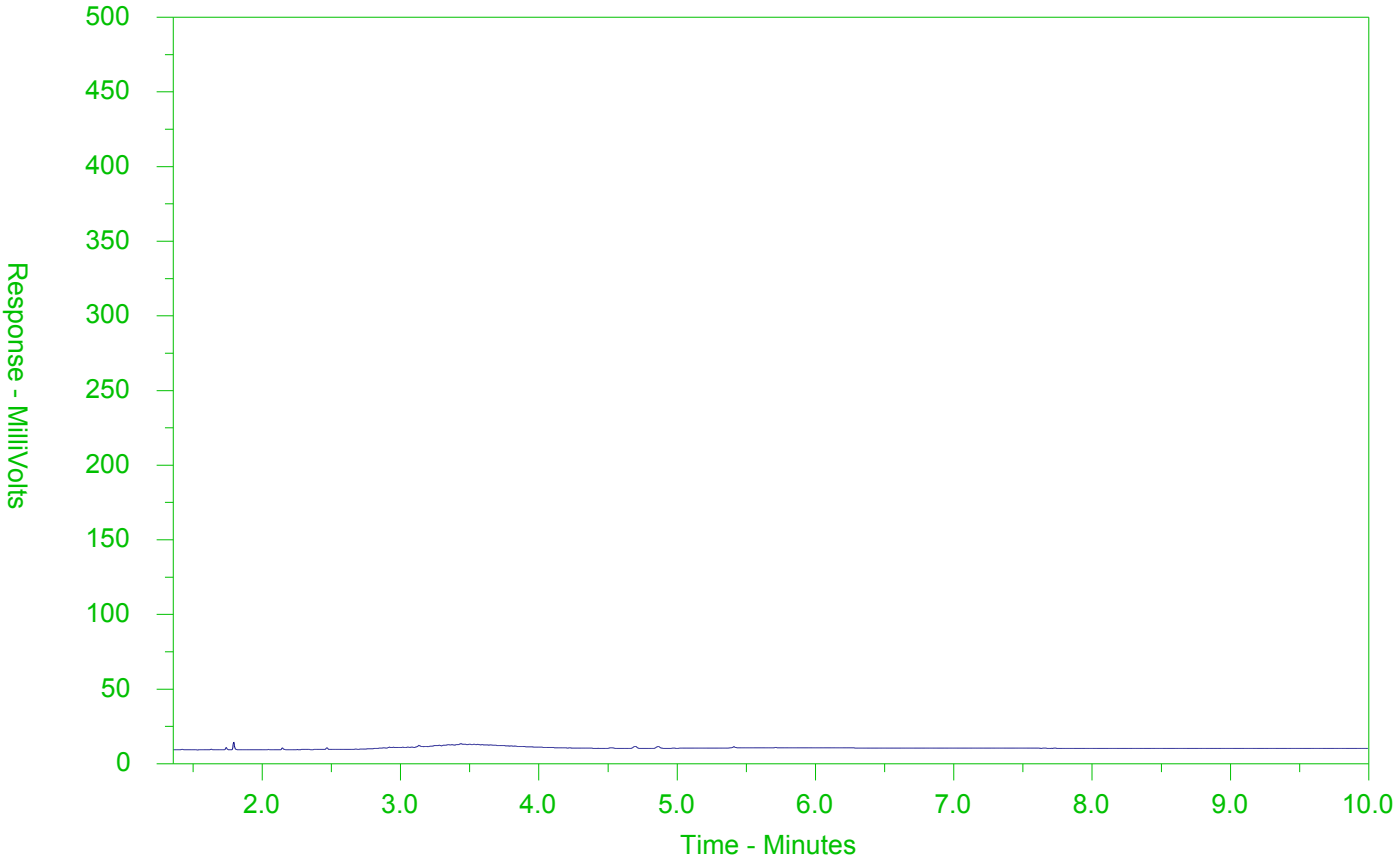
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-2
Client Sample ID: PC-02



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

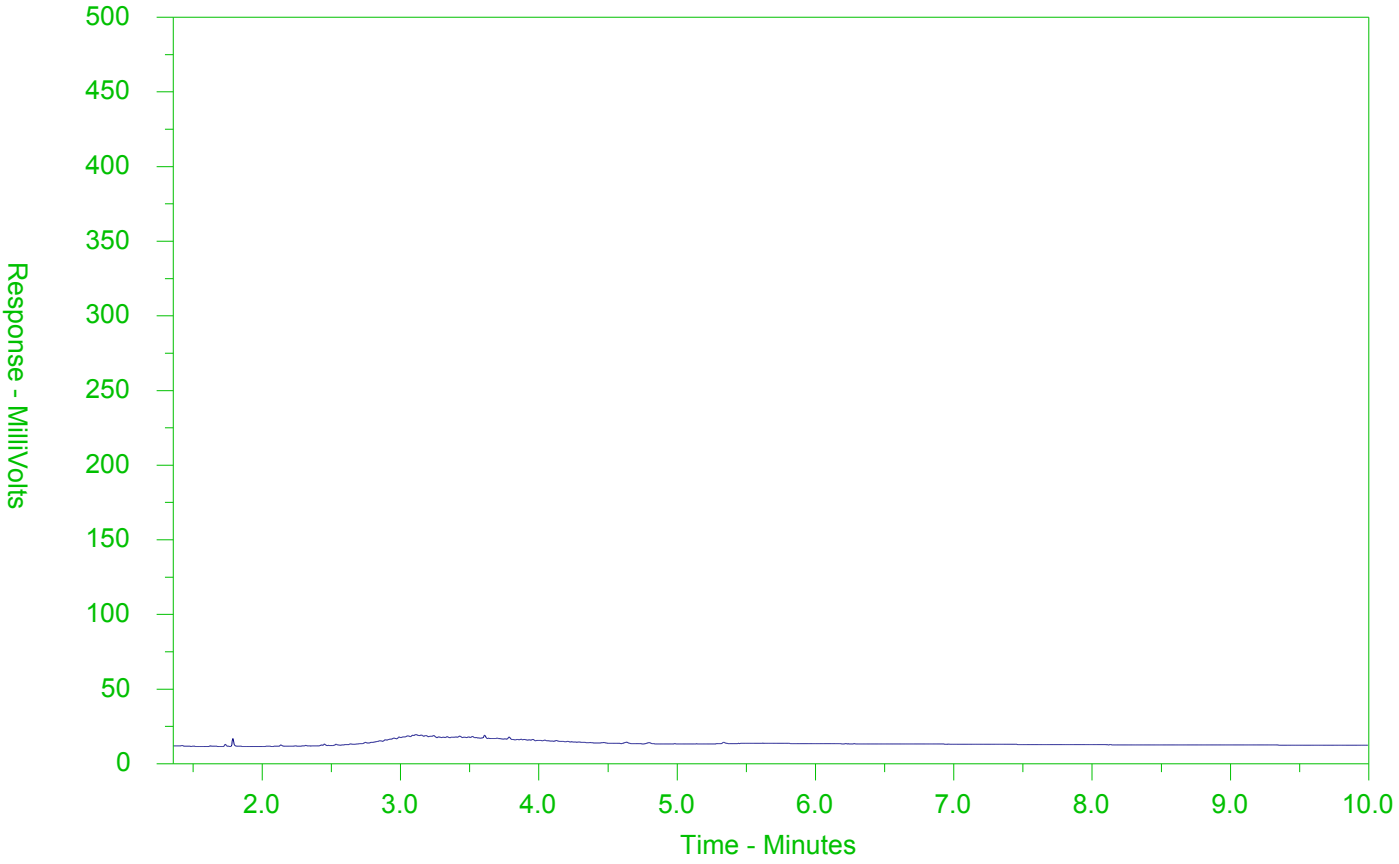
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-3
Client Sample ID: PC-03



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

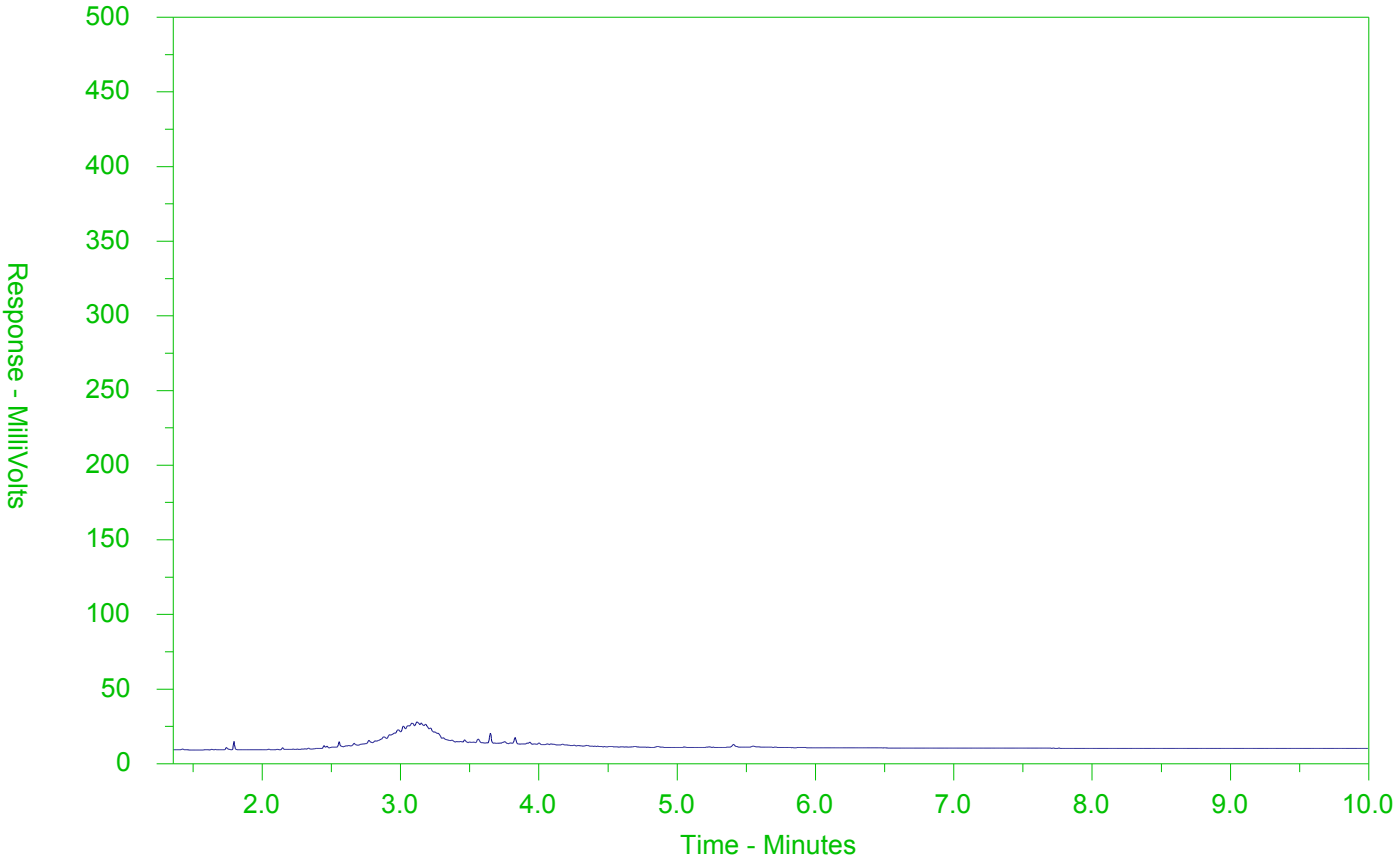
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-4
Client Sample ID: PC-04



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

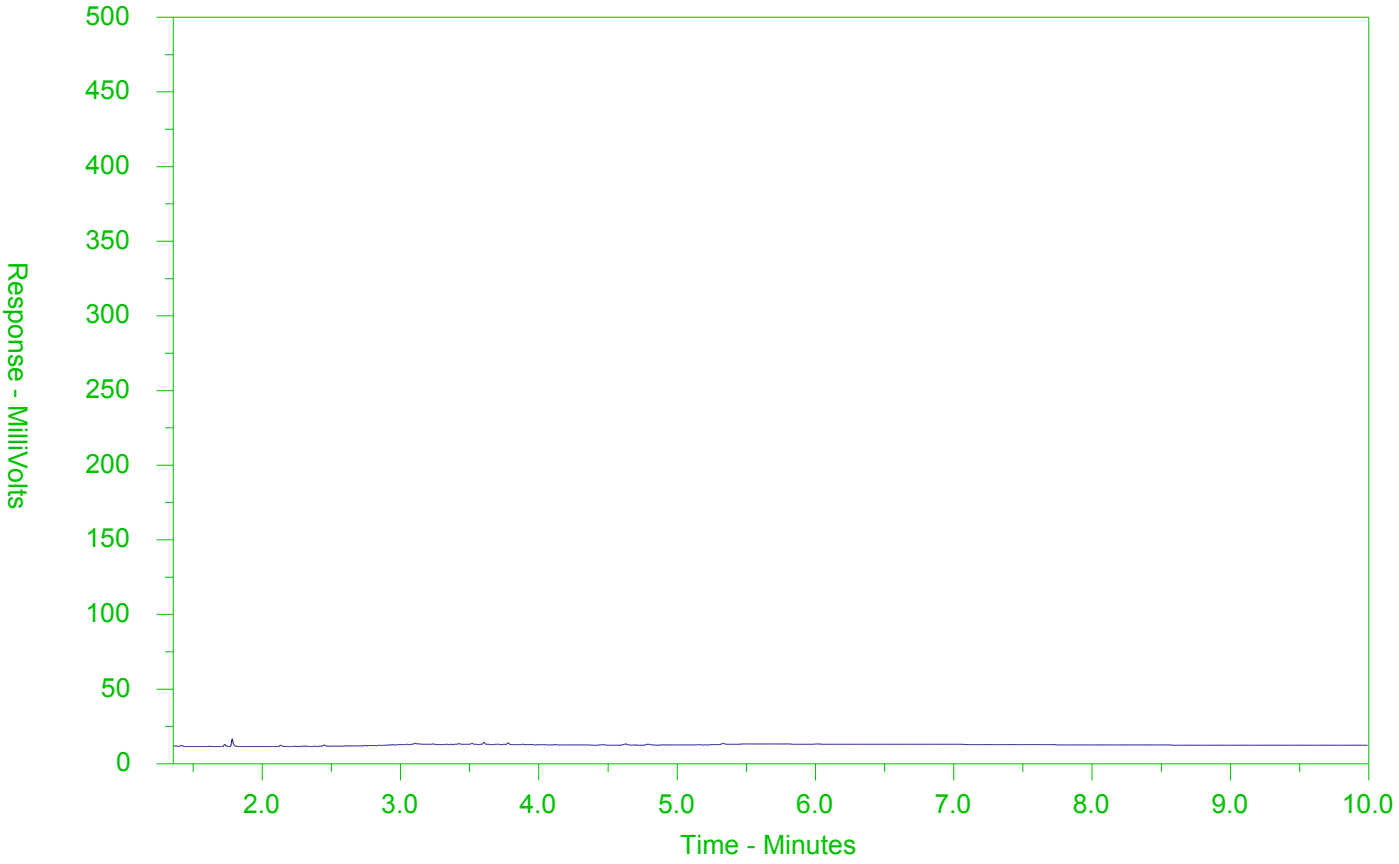
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-5
Client Sample ID: PC-05



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

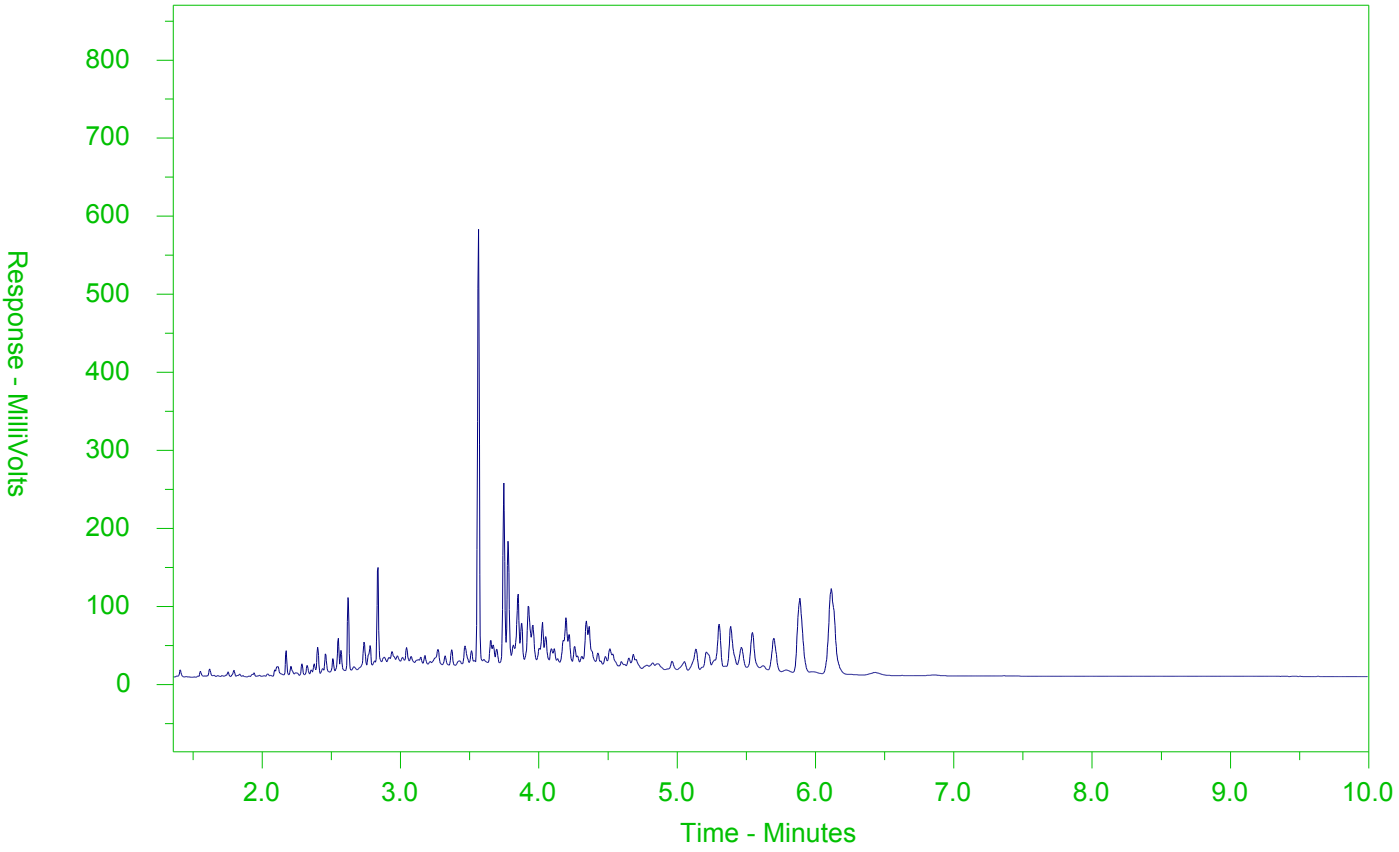
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-6
Client Sample ID: PC-06



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

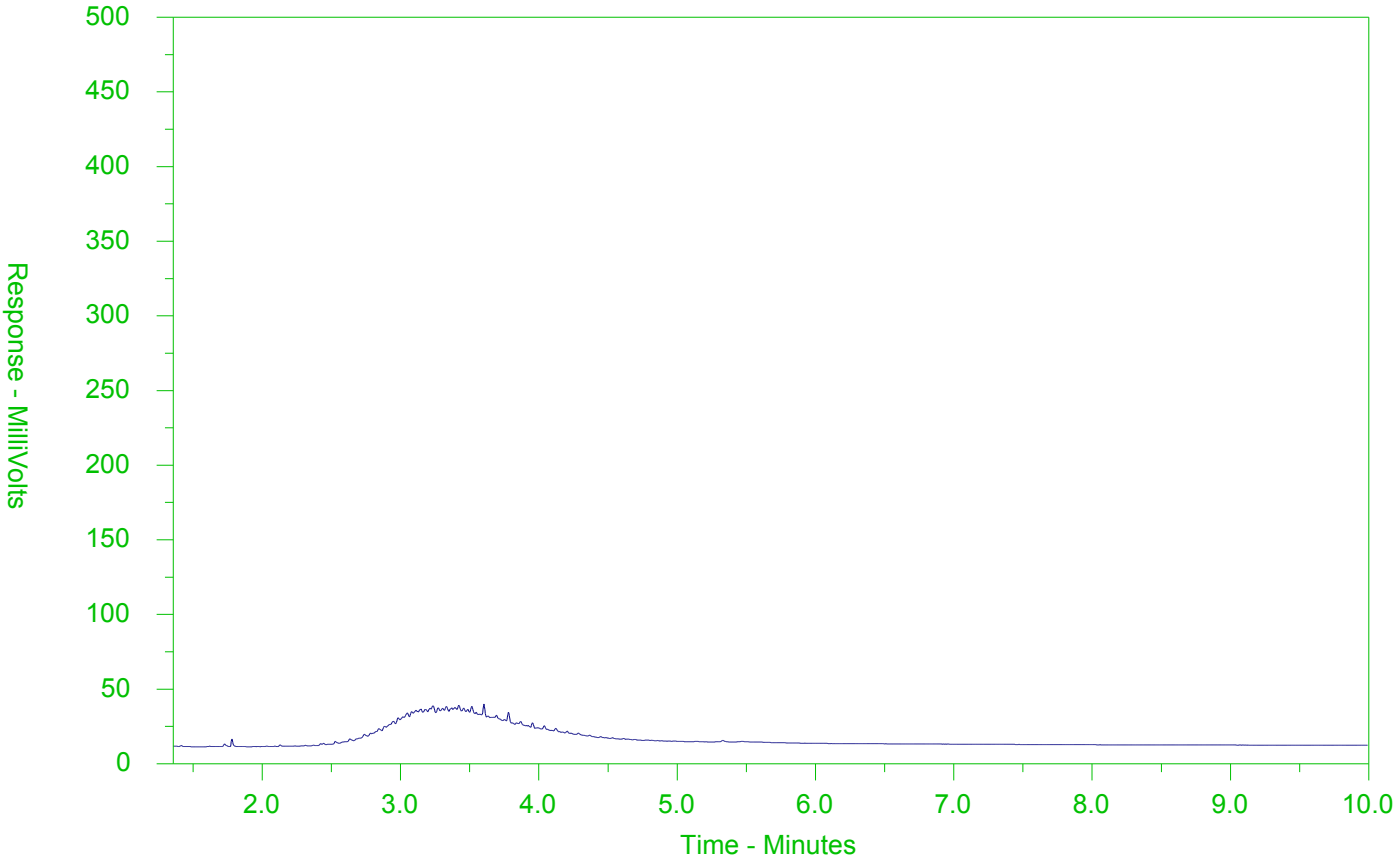
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-7
Client Sample ID: PC-07



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

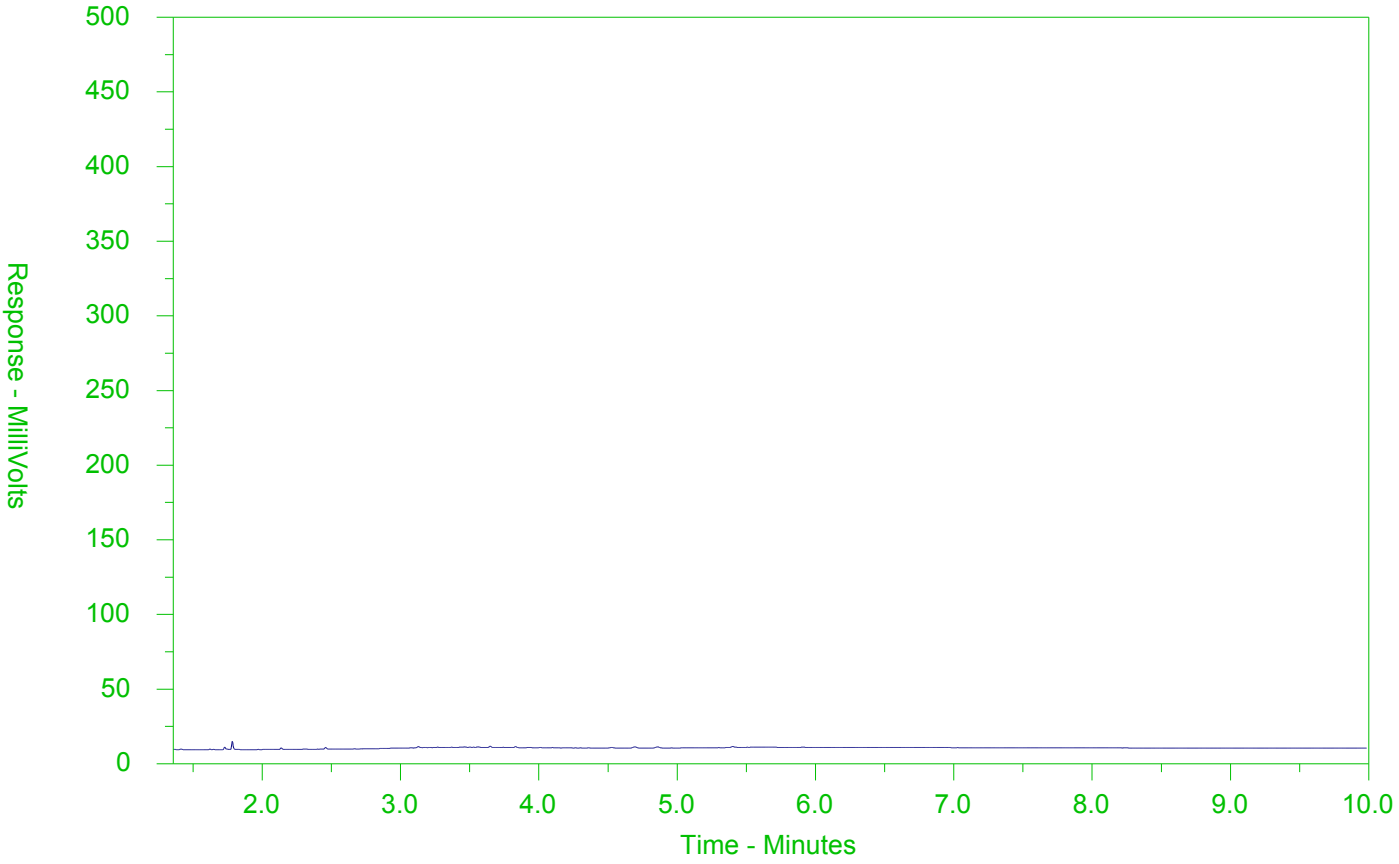
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-8
Client Sample ID: PC-08



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

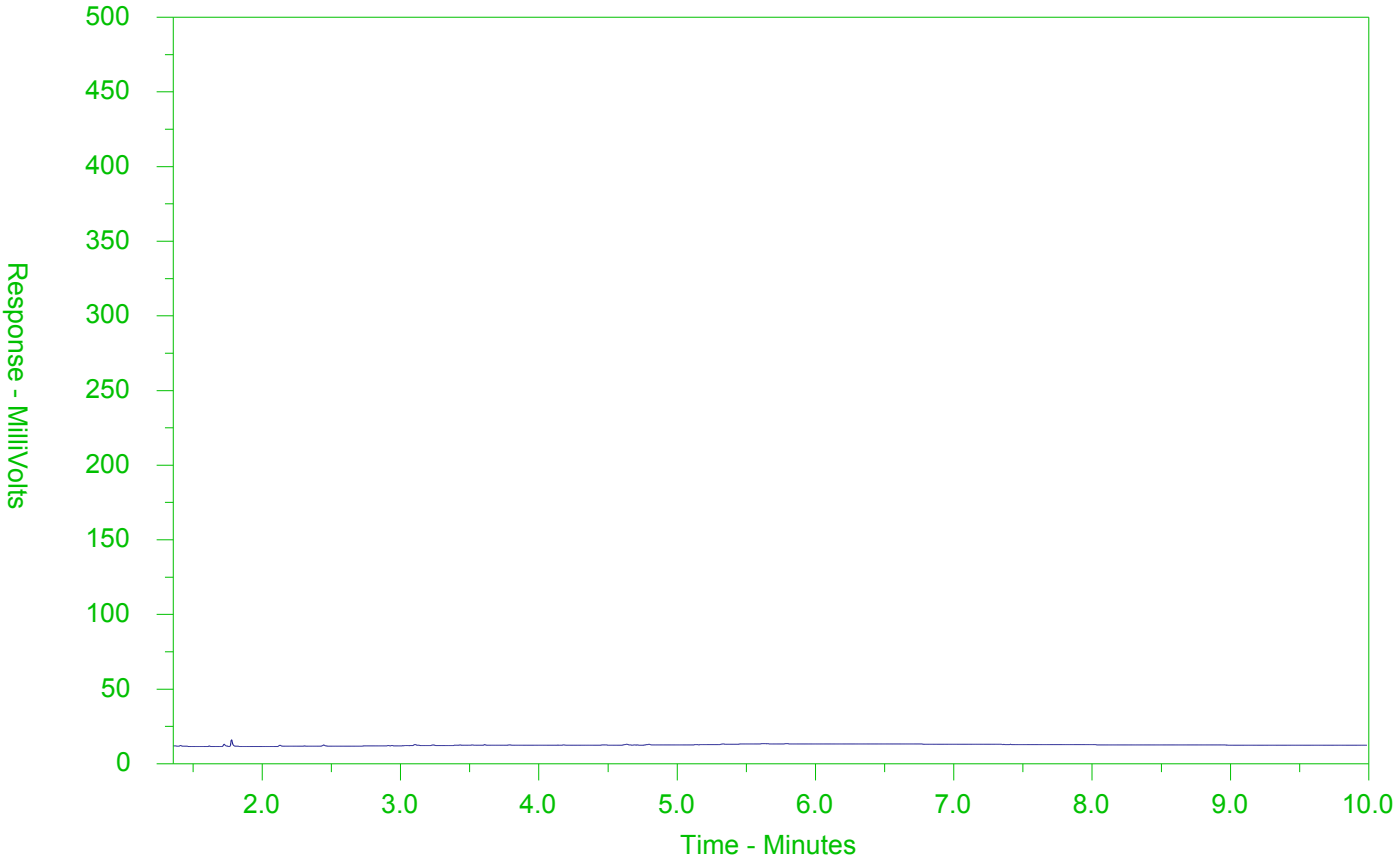
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-9
Client Sample ID: PC-09



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

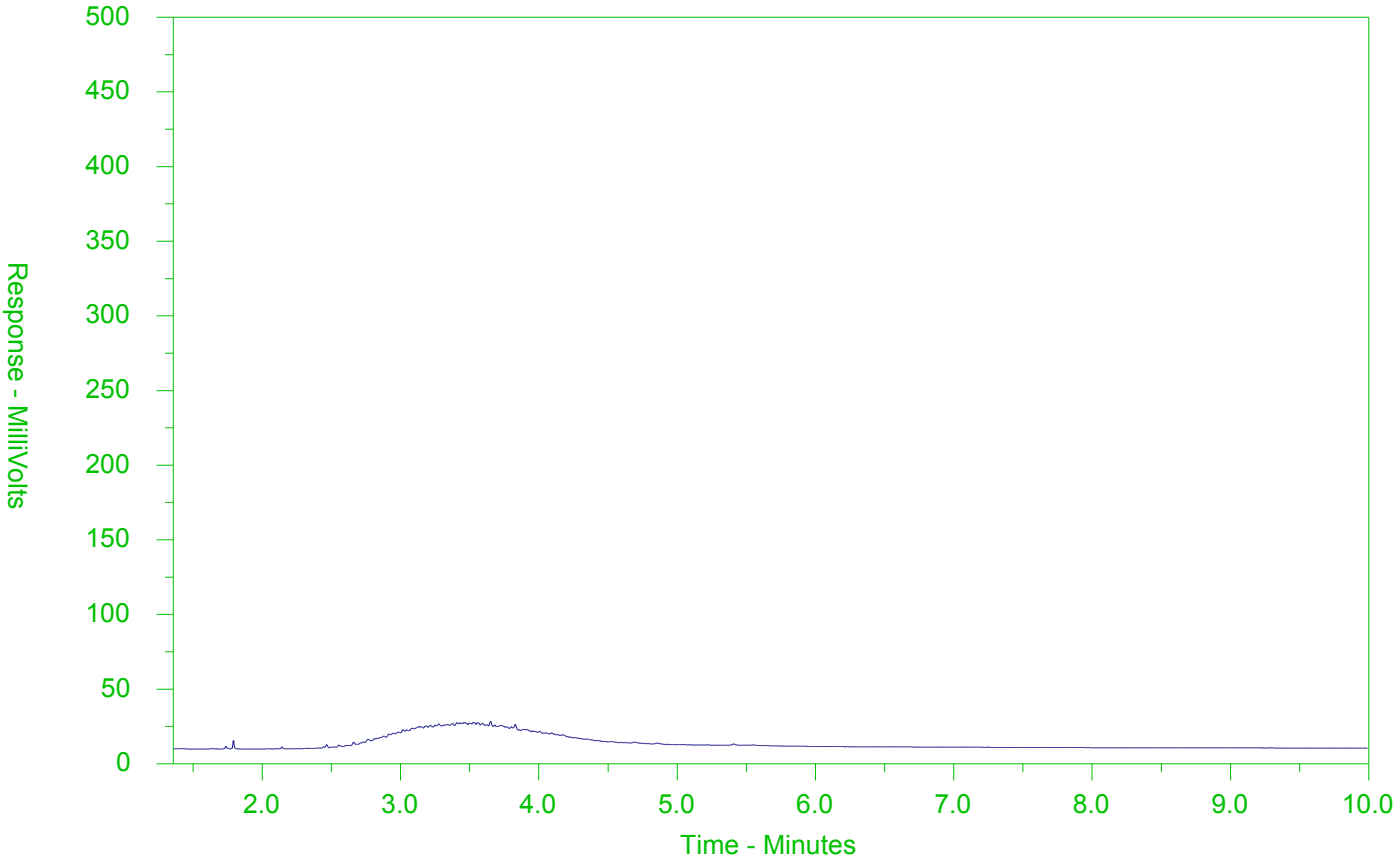
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2188307-10
Client Sample ID: PC-10



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2188307-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax laframboise.d@aquaforbeech.com
Email 2 cowlin.w@aquaforbeech.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☑ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885
Job #: MOHAWK LAKE
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2188307

ALS Contact: Gayle | Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT, PH-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-W	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT,P-TD-COL-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	VOC,F1-F4	OCP, PCB	SAMPLES ON HOLD	Sample is hazardous (please provide further deta	NUMBER OF CONTAINERS
	PC-01	27/10/18	13h11	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	PC-02		13h24	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	PC-03		13h37	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	PC-04		14h00	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	PC-05		14h15																
	PC-06		14h40																
	PC-07		14h50																
	PC-08		15h10																
	PC-09		12h57																
	PC-10		12h35																

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☒
Ice Packs ☒ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C	
				3.9°C	1.4°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: MMS	Date: OCT-29-18	Time: 9:00am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 25-JUN-18
Report Date: 05-JUL-18 12:28 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2118408

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2118408-1	WQ-1	Anions and Nutrients	Phosphorus, Total	0.0477	0.01	mg/L
		Bacteriological Tests	E. Coli	250	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.159	0.015	mg/L
			Copper (Cu)-Total	0.0019	0.001	mg/L
			Iron (Fe)-Total	0.360	0.3	mg/L
			Lead (Pb)-Total	0.00214	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.028	0.008	ug/L
L2118408-2	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0419	0.01	mg/L
		Bacteriological Tests	E. Coli	560	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.112	0.015	mg/L
			Copper (Cu)-Total	0.0026	0.001	mg/L
			Iron (Fe)-Total	0.368	0.3	mg/L
			Lead (Pb)-Total	0.00273	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.014	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.051	0.008	ug/L
L2118408-3	WQ-3	Anions and Nutrients	Phosphorus, Total	0.0814	0.01	mg/L
		Bacteriological Tests	E. Coli	970	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.192	0.015	mg/L
			Copper (Cu)-Total	0.0051	0.001	mg/L
			Iron (Fe)-Total	0.717	0.3	mg/L
			Lead (Pb)-Total	0.00319	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2118408-3	WQ-3	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.024	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.088	0.008	ug/L
			Phenanthrene	0.054	0.03	ug/L
L2118408-4	WQ-4	Anions and Nutrients	Phosphorus, Total	0.0659	0.01	mg/L
		Bacteriological Tests	E. Coli	1060	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.110	0.015	mg/L
			Copper (Cu)-Total	0.0038	0.001	mg/L
			Iron (Fe)-Total	0.764	0.3	mg/L
			Lead (Pb)-Total	0.00254	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.028	0.00002	ug/L
			Benzo(k)fluoranthene	0.019	0.0002	ug/L
			Chrysene	0.043	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.182	0.008	ug/L
			Phenanthrene	0.112	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2118408-1	25-JUN-18	WQ-1
				L2118408-2	25-JUN-18	WQ-2
				L2118408-3	25-JUN-18	WQ-3
				L2118408-4	25-JUN-18	WQ-4
Conductivity	umhos/cm	-	-	1260	1190	789	1740
Hardness (as CaCO3)	mg/L	-	-	240 HTC	231 HTC	174 HTC	409 HTC
pH	pH units	6.5-8.5	-	8.34	8.41	8.22	8.11
Total Suspended Solids	mg/L	-	-	13.8	13.4	14.7	23.4

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2118408-1	L2118408-2	L2118408-3	L2118408-4
			Sample Date	25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
Chloride (Cl)	mg/L	-	-	276	261	152	366
Nitrate (as N)	mg/L	-	-	0.472	0.523	0.707	3.23
Nitrite (as N)	mg/L	-	-	0.026	0.027	0.028	0.038
Total Kjeldahl Nitrogen	mg/L	-	-	0.95	1.09	1.12	0.99
Total Nitrogen	mg/L	-	-	1.45	1.64	1.86	4.26
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0139	0.0142	0.0146	0.0264
Phosphorus, Total	mg/L	0.01	-	0.0477	0.0419	0.0814	0.0659

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2118408-1	L2118408-2	L2118408-3	L2118408-4
				Sample Date	25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2118408-1 25-JUN-18 WQ-1	L2118408-2 25-JUN-18 WQ-2	L2118408-3 25-JUN-18 WQ-3	L2118408-4 25-JUN-18 WQ-4
E. Coli	CFU/100mL	100	-	250 DLM	560 DLM	970 DLM	1060 DLM
Total Coliforms	CFU/100mL	-	-	960 DLM	3200 DLM	10300 DLM	12100 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2118408-1	L2118408-2	L2118408-3	L2118408-4
			Sample Date	25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
Sodium Adsorption Ratio	SAR	-	-	4.63	4.62	2.76	4.54

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2118408-1	L2118408-2	L2118408-3	L2118408-4
				Sample Date	25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Aluminum (Al)-Total	mg/L	0.015	-		0.159	0.112	0.192	0.110
Antimony (Sb)-Total	mg/L	0.02	-		0.00054	0.00054	0.00058	0.00058
Arsenic (As)-Total	mg/L	0.005	-		0.00098	0.00099	0.00084	0.00067
Barium (Ba)-Total	mg/L	-	-		0.0685	0.0644	0.0500	0.110
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.044	0.042	0.032	0.050
Cadmium (Cd)-Total	mg/L	0.0001	-		<0.000010	0.000014	0.000013	0.000017
Calcium (Ca)-Total	mg/L	-	-		66.4	64.6	51.3	120
Cesium (Cs)-Total	mg/L	-	-		0.000013	0.000011	0.000019	0.000013
Chromium (Cr)-Total	mg/L	-	-		0.00058	0.00160	0.00096	0.00101
Cobalt (Co)-Total	mg/L	0.0009	-		0.00016	0.00013	0.00018	0.00022
Copper (Cu)-Total	mg/L	0.001	-		0.0019	0.0026	0.0051	0.0038
Iron (Fe)-Total	mg/L	0.3	-		0.360	0.368	0.717	0.764
Lead (Pb)-Total	mg/L	0.001	-		0.00214	0.00273	0.00319	0.00254
Magnesium (Mg)-Total	mg/L	-	-		18.1	17.0	11.1	26.6
Manganese (Mn)-Total	mg/L	-	-		0.0660	0.0703	0.0879	0.116
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000926	0.000920	0.000846	0.00106
Nickel (Ni)-Total	mg/L	0.025	-		0.00093	0.00099	0.00115	0.00106
Potassium (K)-Total	mg/L	-	-		3.17	3.03	2.12	4.13
Rubidium (Rb)-Total	mg/L	-	-		0.00128	0.00124	0.00116	0.00124
Selenium (Se)-Total	mg/L	0.1	-		0.000533	0.000551	0.000432	0.00116
Silicon (Si)-Total	mg/L	-	-		4.09	3.88	2.83	5.57
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		165 DLHC	161 DLHC	83.5	211 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.287	0.282	0.247	0.391
Sulfur (S)-Total	mg/L	-	-		11.9	11.6	8.16	19.8
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2118408-1	L2118408-2	L2118408-3	L2118408-4
				25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
				WQ-1	WQ-2	WQ-3	WQ-4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00010	0.00015	0.00022	0.00017
Titanium (Ti)-Total	mg/L	-	-	0.00479	0.00322	0.00621	0.00451
Tungsten (W)-Total	mg/L	0.03	-	0.00037	0.00039	0.00053	0.00120
Uranium (U)-Total	mg/L	0.005	-	0.000920	0.000832	0.000608	0.00138
Vanadium (V)-Total	mg/L	0.006	-	0.00147	0.00143	0.00159	0.00140
Zinc (Zn)-Total	mg/L	0.02	-	0.0048	0.0058	0.0097	0.0110
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2118408-1	L2118408-2	L2118408-3	L2118408-4
			Sample Date	25-JUN-18	25-JUN-18	25-JUN-18	25-JUN-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	Guide Limits #1	#2				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	0.010	0.010	0.023
Benzo(b)fluoranthene	ug/L	-	-	<0.020	0.026	0.031	0.058
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	0.028
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	<0.010	0.019
Chrysene	ug/L	0.0001	-	<0.010	0.014	0.024	0.043
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.028	0.051	0.088	0.182
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	0.023
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	0.029
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	0.022	0.054	0.112
Pyrene	ug/L	-	-	<0.020	0.028	0.045	0.101
Surrogate: d10-Acenaphthene	%	-	-	105.7	101.7	95.9	101.2
Surrogate: d12-Chrysene	%	-	-	65.0	95.0	73.0	73.5
Surrogate: d8-Naphthalene	%	-	-	113.3	109.4	104.4	109.8
Surrogate: d10-Phenanthrene	%	-	-	110.2	104.2	100.7	105.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TC-MF-WT	Water	Total Coliforms	SM 9222B
A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2118408 Report Date: 05-JUL-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4104567								
WG2809480-4 DUP		**WG2809480-3**						
Chloride (Cl)		367	366		mg/L	0.2	20	28-JUN-18
WG2809480-2 LCS								
Chloride (Cl)			101.2		%		90-110	28-JUN-18
WG2809480-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	28-JUN-18
WG2809480-5 MS		**WG2809480-3**						
Chloride (Cl)			N/A	MS-B	%		-	28-JUN-18
CN-FREE-CFA-WT	**Water**							
Batch R4104149								
WG2810596-7 DUP		**L2116462-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	29-JUN-18
WG2810596-6 LCS								
Cyanide, Free			97.9		%		80-120	29-JUN-18
WG2810596-5 MB								
Cyanide, Free			<0.0020		mg/L		0.002	29-JUN-18
WG2810596-8 MS		**L2116462-1**						
Cyanide, Free			100.6		%		75-125	29-JUN-18
EC-MF-WT	**Water**							
Batch R4099247								
WG2806899-1 MB								
E. Coli			0		CFU/100mL		1	27-JUN-18
EC-WT	**Water**							
Batch R4099089								
WG2808019-12 DUP		**WG2808019-11**						
Conductivity		1340	1340		umhos/cm	0.1	10	27-JUN-18
WG2808019-10 LCS								
Conductivity			99.9		%		90-110	27-JUN-18
WG2808019-9 MB								
Conductivity			<3.0		umhos/cm		3	27-JUN-18
HG-T-CVAA-WT	**Water**							
Batch R4097438								
WG2806934-3 DUP		**L2117915-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-JUN-18
WG2806934-2 LCS								
Mercury (Hg)-Total			101.0		%		80-120	26-JUN-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4097438								
WG2806934-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	26-JUN-18
WG2806934-4 MS		**L2117915-1**						
Mercury (Hg)-Total			92.7		%		70-130	26-JUN-18
MET-T-CCMS-WT	**Water**							
Batch R4098031								
WG2806696-4 DUP		**WG2806696-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	26-JUN-18
Antimony (Sb)-Total		0.0010	0.0010		mg/L	0.1	20	26-JUN-18
Arsenic (As)-Total		0.0015	0.0013		mg/L	14	20	26-JUN-18
Barium (Ba)-Total		0.118	0.119		mg/L	1.5	20	26-JUN-18
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-JUN-18
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-JUN-18
Boron (B)-Total		0.14	0.15		mg/L	4.9	20	26-JUN-18
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-JUN-18
Calcium (Ca)-Total		133	137		mg/L	3.1	20	26-JUN-18
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUN-18
Cesium (Cs)-Total		0.00027	0.00028		mg/L	2.4	20	26-JUN-18
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-JUN-18
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-JUN-18
Iron (Fe)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	26-JUN-18
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-JUN-18
Magnesium (Mg)-Total		30.0	31.9		mg/L	6.0	20	26-JUN-18
Manganese (Mn)-Total		0.0319	0.0331		mg/L	3.8	20	26-JUN-18
Molybdenum (Mo)-Total		0.0139	0.0151		mg/L	8.4	20	26-JUN-18
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUN-18
Potassium (K)-Total		72.0	75.0		mg/L	4.1	20	26-JUN-18
Rubidium (Rb)-Total		0.104	0.106		mg/L	2.0	20	26-JUN-18
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-JUN-18
Silicon (Si)-Total		7.1	7.3		mg/L	3.5	20	26-JUN-18
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-JUN-18
Sodium (Na)-Total		220	222		mg/L	0.9	20	26-JUN-18
Strontium (Sr)-Total		1.46	1.49		mg/L	2.0	20	26-JUN-18
Sulfur (S)-Total		90.9	94.8		mg/L	4.2	25	26-JUN-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4098031								
WG2806696-4 DUP		**WG2806696-3**						
Thallium (Tl)-Total		0.00011	0.00011		mg/L	4.0	20	26-JUN-18
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	26-JUN-18
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	26-JUN-18
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-JUN-18
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-JUN-18
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-JUN-18
Uranium (U)-Total		0.00207	0.00228		mg/L	9.8	20	26-JUN-18
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUN-18
Zinc (Zn)-Total		0.107	0.112		mg/L	4.6	20	26-JUN-18
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-JUN-18
WG2806696-2 LCS								
Aluminum (Al)-Total			103.1		%		80-120	26-JUN-18
Antimony (Sb)-Total			109.0		%		80-120	26-JUN-18
Arsenic (As)-Total			100.9		%		80-120	26-JUN-18
Barium (Ba)-Total			101.5		%		80-120	26-JUN-18
Beryllium (Be)-Total			103.7		%		80-120	26-JUN-18
Bismuth (Bi)-Total			101.2		%		80-120	26-JUN-18
Boron (B)-Total			103.3		%		80-120	26-JUN-18
Cadmium (Cd)-Total			99.8		%		80-120	26-JUN-18
Calcium (Ca)-Total			100.7		%		80-120	26-JUN-18
Chromium (Cr)-Total			100.3		%		80-120	26-JUN-18
Cesium (Cs)-Total			98.6		%		80-120	26-JUN-18
Cobalt (Co)-Total			98.4		%		80-120	26-JUN-18
Copper (Cu)-Total			98.9		%		80-120	26-JUN-18
Iron (Fe)-Total			99.6		%		80-120	26-JUN-18
Lead (Pb)-Total			101.9		%		80-120	26-JUN-18
Magnesium (Mg)-Total			102.2		%		80-120	26-JUN-18
Manganese (Mn)-Total			102.1		%		80-120	26-JUN-18
Molybdenum (Mo)-Total			101.9		%		80-120	26-JUN-18
Nickel (Ni)-Total			100.3		%		80-120	26-JUN-18
Potassium (K)-Total			110.0		%		80-120	26-JUN-18
Rubidium (Rb)-Total			106.1		%		80-120	26-JUN-18
Selenium (Se)-Total			98.3		%		80-120	26-JUN-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4098031								
WG2806696-2 LCS								
Silicon (Si)-Total			104.2		%		60-140	26-JUN-18
Silver (Ag)-Total			99.9		%		80-120	26-JUN-18
Sodium (Na)-Total			102.2		%		80-120	26-JUN-18
Strontium (Sr)-Total			100.8		%		80-120	26-JUN-18
Sulfur (S)-Total			102.7		%		80-120	26-JUN-18
Thallium (Tl)-Total			104.4		%		80-120	26-JUN-18
Tellurium (Te)-Total			100.3		%		80-120	26-JUN-18
Thorium (Th)-Total			103.2		%		70-130	26-JUN-18
Tin (Sn)-Total			100.6		%		80-120	26-JUN-18
Titanium (Ti)-Total			100.1		%		80-120	26-JUN-18
Tungsten (W)-Total			101.3		%		80-120	26-JUN-18
Uranium (U)-Total			107.4		%		80-120	26-JUN-18
Vanadium (V)-Total			102.8		%		80-120	26-JUN-18
Zinc (Zn)-Total			92.3		%		80-120	26-JUN-18
Zirconium (Zr)-Total			99.3		%		80-120	26-JUN-18
WG2806696-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	26-JUN-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-JUN-18
Boron (B)-Total			<0.010		mg/L		0.01	26-JUN-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	26-JUN-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-JUN-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	26-JUN-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	26-JUN-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	26-JUN-18
Iron (Fe)-Total			<0.010		mg/L		0.01	26-JUN-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-JUN-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-JUN-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	26-JUN-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-JUN-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4098031								
WG2806696-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-JUN-18
Potassium (K)-Total			<0.050		mg/L		0.05	26-JUN-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	26-JUN-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-JUN-18
Silicon (Si)-Total			<0.10		mg/L		0.1	26-JUN-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	26-JUN-18
Sodium (Na)-Total			<0.050		mg/L		0.05	26-JUN-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	26-JUN-18
Sulfur (S)-Total			<0.50		mg/L		0.5	26-JUN-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-JUN-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	26-JUN-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-JUN-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	26-JUN-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-JUN-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-JUN-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-JUN-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	26-JUN-18
WG2806696-5 MS		**WG2806696-3**						
Aluminum (Al)-Total			101.6		%		70-130	26-JUN-18
Antimony (Sb)-Total			103.2		%		70-130	26-JUN-18
Arsenic (As)-Total			101.8		%		70-130	26-JUN-18
Barium (Ba)-Total			N/A	MS-B	%		-	26-JUN-18
Beryllium (Be)-Total			104.0		%		70-130	26-JUN-18
Bismuth (Bi)-Total			97.9		%		70-130	26-JUN-18
Boron (B)-Total			N/A	MS-B	%		-	26-JUN-18
Cadmium (Cd)-Total			97.8		%		70-130	26-JUN-18
Calcium (Ca)-Total			N/A	MS-B	%		-	26-JUN-18
Chromium (Cr)-Total			101.4		%		70-130	26-JUN-18
Cesium (Cs)-Total			98.8		%		70-130	26-JUN-18
Cobalt (Co)-Total			98.5		%		70-130	26-JUN-18
Copper (Cu)-Total			99.0		%		70-130	26-JUN-18
Iron (Fe)-Total			98.9		%		70-130	26-JUN-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4098031								
WG2806696-5 MS		**WG2806696-3**						
Lead (Pb)-Total			98.9		%		70-130	26-JUN-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-JUN-18
Manganese (Mn)-Total			N/A	MS-B	%		-	26-JUN-18
Molybdenum (Mo)-Total			N/A	MS-B	%		-	26-JUN-18
Nickel (Ni)-Total			98.3		%		70-130	26-JUN-18
Potassium (K)-Total			N/A	MS-B	%		-	26-JUN-18
Rubidium (Rb)-Total			N/A	MS-B	%		-	26-JUN-18
Selenium (Se)-Total			100.3		%		70-130	26-JUN-18
Silicon (Si)-Total			N/A	MS-B	%		-	26-JUN-18
Silver (Ag)-Total			98.8		%		70-130	26-JUN-18
Sodium (Na)-Total			N/A	MS-B	%		-	26-JUN-18
Strontium (Sr)-Total			N/A	MS-B	%		-	26-JUN-18
Sulfur (S)-Total			N/A	MS-B	%		-	26-JUN-18
Thallium (Tl)-Total			98.2		%		70-130	26-JUN-18
Tellurium (Te)-Total			83.3		%		70-130	26-JUN-18
Thorium (Th)-Total			95.5		%		70-130	26-JUN-18
Tin (Sn)-Total			99.6		%		70-130	26-JUN-18
Titanium (Ti)-Total			102.4		%		70-130	26-JUN-18
Tungsten (W)-Total			99.5		%		70-130	26-JUN-18
Uranium (U)-Total			N/A	MS-B	%		-	26-JUN-18
Vanadium (V)-Total			104.2		%		70-130	26-JUN-18
Zinc (Zn)-Total			N/A	MS-B	%		-	26-JUN-18
Zirconium (Zr)-Total			96.3		%		70-130	26-JUN-18
NO2-IC-WT	**Water**							
Batch R4104567								
WG2809480-4 DUP		**WG2809480-3**						
Nitrite (as N)		0.040	0.038		mg/L	5.5	25	28-JUN-18
WG2809480-2 LCS								
Nitrite (as N)			100.7		%		70-130	28-JUN-18
WG2809480-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	28-JUN-18
WG2809480-5 MS		**WG2809480-3**						
Nitrite (as N)			96.4		%		70-130	28-JUN-18
NO3-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4104567								
WG2809480-4 DUP		**WG2809480-3**						
Nitrate (as N)		3.24	3.24		mg/L	0.1	25	28-JUN-18
WG2809480-2 LCS								
Nitrate (as N)			100.7		%		70-130	28-JUN-18
WG2809480-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	28-JUN-18
WG2809480-5 MS		**WG2809480-3**						
Nitrate (as N)			N/A	MS-B	%		-	28-JUN-18
P-T-COL-WT	**Water**							
Batch R4108872								
WG2811166-3 DUP		**L2118400-1**						
Phosphorus, Total		0.0860	0.0889		mg/L	3.3	20	03-JUL-18
WG2811166-2 LCS								
Phosphorus, Total			94.6		%		80-120	03-JUL-18
WG2811166-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	03-JUL-18
WG2811166-4 MS		**L2118400-1**						
Phosphorus, Total			84.0		%		70-130	03-JUL-18
P-TD-COL-WT	**Water**							
Batch R4108871								
WG2811167-3 DUP		**L2114435-6**						
Phosphorus (P)-Total	Dissolved	0.0060	0.0057		mg/L	6.3	20	03-JUL-18
WG2811167-2 LCS								
Phosphorus (P)-Total	Dissolved		91.9		%		80-120	03-JUL-18
WG2811167-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	03-JUL-18
WG2811167-4 MS		**L2114435-6**						
Phosphorus (P)-Total	Dissolved		99.7		%		70-130	03-JUL-18
PAH-PWQO-WT	**Water**							
Batch R4112954								
WG2813171-2 LCS								
1-Methylnaphthalene			92.3		%		50-150	05-JUL-18
2-Methylnaphthalene			93.0		%		50-150	05-JUL-18
Acenaphthene			98.2		%		50-150	05-JUL-18
Acenaphthylene			94.2		%		50-150	05-JUL-18
Anthracene			90.5		%		60-130	05-JUL-18
Benzo(a)anthracene			95.8		%		60-130	05-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4112954								
WG2813171-2 LCS								
Benzo(a)pyrene			93.4		%		50-150	05-JUL-18
Benzo(b)fluoranthene			97.2		%		50-150	05-JUL-18
Benzo(g,h,i)perylene			98.6		%		60-130	05-JUL-18
Benzo(k)fluoranthene			102.2		%		60-130	05-JUL-18
Chrysene			104.2		%		60-130	05-JUL-18
Dibenzo(ah)anthracene			103.3		%		60-130	05-JUL-18
Fluoranthene			97.8		%		60-130	05-JUL-18
Fluorene			97.4		%		50-150	05-JUL-18
Indeno(1,2,3-cd)pyrene			95.0		%		50-150	05-JUL-18
Naphthalene			94.3		%		50-150	05-JUL-18
Phenanthrene			97.9		%		50-150	05-JUL-18
Pyrene			91.4		%		50-150	05-JUL-18
WG2813171-3 LCSD		**WG2813171-2**						
1-Methylnaphthalene		92.3	89.3		%	3.3	50	05-JUL-18
2-Methylnaphthalene		93.0	90.2		%	3.1	50	05-JUL-18
Acenaphthene		98.2	93.6		%	4.8	50	05-JUL-18
Acenaphthylene		94.2	92.5		%	1.8	50	05-JUL-18
Anthracene		90.5	84.5		%	6.9	50	05-JUL-18
Benzo(a)anthracene		95.8	86.3		%	10	50	05-JUL-18
Benzo(a)pyrene		93.4	85.0		%	9.3	50	05-JUL-18
Benzo(b)fluoranthene		97.2	91.3		%	6.3	50	05-JUL-18
Benzo(g,h,i)perylene		98.6	89.6		%	9.5	50	05-JUL-18
Benzo(k)fluoranthene		102.2	96.1		%	6.1	50	05-JUL-18
Chrysene		104.2	95.6		%	8.6	50	05-JUL-18
Dibenzo(ah)anthracene		103.3	95.2		%	8.1	50	05-JUL-18
Fluoranthene		97.8	90.8		%	7.5	50	05-JUL-18
Fluorene		97.4	89.4		%	8.5	50	05-JUL-18
Indeno(1,2,3-cd)pyrene		95.0	87.8		%	7.9	50	05-JUL-18
Naphthalene		94.3	91.1		%	3.5	50	05-JUL-18
Phenanthrene		97.9	91.6		%	6.7	50	05-JUL-18
Pyrene		91.4	83.6		%	9.0	50	05-JUL-18
WG2813171-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	05-JUL-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4112954								
WG2813171-1 MB								
2-Methylnaphthalene			<0.020		ug/L		0.02	05-JUL-18
Acenaphthene			<0.020		ug/L		0.02	05-JUL-18
Acenaphthylene			<0.020		ug/L		0.02	05-JUL-18
Anthracene			<0.010		ug/L		0.01	05-JUL-18
Benzo(a)anthracene			<0.020		ug/L		0.02	05-JUL-18
Benzo(a)pyrene			<0.010		ug/L		0.01	05-JUL-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	05-JUL-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	05-JUL-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	05-JUL-18
Chrysene			<0.010		ug/L		0.01	05-JUL-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	05-JUL-18
Fluoranthene			<0.010		ug/L		0.01	05-JUL-18
Fluorene			<0.020		ug/L		0.02	05-JUL-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	05-JUL-18
Naphthalene			<0.050		ug/L		0.05	05-JUL-18
Phenanthrene			<0.020		ug/L		0.02	05-JUL-18
Pyrene			<0.020		ug/L		0.02	05-JUL-18
Surrogate: d8-Naphthalene			112.9		%		40-130	05-JUL-18
Surrogate: d10-Phenanthrene			108.2		%		40-130	05-JUL-18
Surrogate: d12-Chrysene			102.5		%		40-130	05-JUL-18
Surrogate: d10-Acenaphthene			106.0		%		40-130	05-JUL-18
PH-WT	**Water**							
Batch R4098060								
WG2806362-15 DUP		**WG2806362-14**						
pH		7.94	7.94	J	pH units	0.00	0.2	26-JUN-18
WG2806362-13 LCS								
pH			7.01		pH units		6.9-7.1	26-JUN-18
Batch R4098223								
WG2807414-3 DUP		**WG2807414-2**						
pH		7.86	7.86	J	pH units	0.00	0.2	27-JUN-18
WG2807414-1 LCS								
pH			6.99		pH units		6.9-7.1	27-JUN-18
SOLIDS-TSS-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4103891								
WG2809153-3 DUP		**L2119018-7**						
Total Suspended Solids		5300	5260		mg/L	0.8	20	29-JUN-18
WG2809153-2 LCS								
Total Suspended Solids			100.6		%		85-115	29-JUN-18
WG2809153-1 MB								
Total Suspended Solids			<2.0		mg/L		2	29-JUN-18
TC-MF-WT	**Water**							
Batch R4099221								
WG2806891-3 DUP		**L2118207-1**						
Total Coliforms		0	0		CFU/100mL	0.0	65	27-JUN-18
WG2806891-1 MB								
Total Coliforms			0		CFU/100mL		1	27-JUN-18
TKN-WT	**Water**							
Batch R4110540								
WG2812172-3 DUP		**L2118400-1**						
Total Kjeldahl Nitrogen		26.2	25.8		mg/L	1.3	20	03-JUL-18
WG2812172-2 LCS								
Total Kjeldahl Nitrogen			111.2		%		75-125	03-JUL-18
WG2812172-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	03-JUL-18
WG2812172-4 MS		**L2118400-1**						
Total Kjeldahl Nitrogen			N/A	MS-B	%		-	03-JUL-18

Quality Control Report

Workorder: L2118408 Report Date: 05-JUL-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2118408-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution		Turnaround Time (TAT) Requested
Company:	AQUAFOR BEECH LIMITED	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)		Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	DARCY LAFRAMBOISE	Quality Control (QC) Report with Report ☑ YES ☐ NO		PRIORITY (Business Days): 4 day [P4-20%] ☐; 3 day [P3-25%] ☐; 2 day [P2-50%] ☐
Phone:	519-224-3740	☑ Compare Results to Criteria on Report - provide details below if box checked		EMERGENCY: 1 Business day [E1 - 100%] ☐; Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	55 REGAL ROAD, UNIT 3	Email 1 or Fax: laframboise.d@aquaforbeech.com		For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	GUELPH, ON	Email 2: cowlin.w@aquaforbeech.com		
Postal Code:	N1K 1B6	Email 3:		
Invoice To	Same as Report To ☑ YES ☐ NO	**Invoice Distribution**		
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX		
Company:		Email 1 or Fax:		
Contact:		Email 2:		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q67885	AFE/Cost Center:	PO#:
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2118408 AP 25C

ALS Contact: Gayle

Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT,P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	WQ-1	25/06/18	16h50	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-2	25/06/18	16h30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-3	25/06/18	16h20	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-4	25/06/18	15h40	Water	R	R	R	R	R	R	R	R	R	R	R	R			12

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				18.9			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: AP	Date: 25-6-18	Time: 18:25

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 08-AUG-18
Report Date: 16-AUG-18 13:29 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2143439

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143439-1	WQ-1	Anions and Nutrients	Phosphorus, Total	0.0658	0.01	mg/L
		Bacteriological Tests	E. Coli	410	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.154	0.015	mg/L
			Copper (Cu)-Total	0.0019	0.001	mg/L
			Iron (Fe)-Total	0.422	0.3	mg/L
			Lead (Pb)-Total	0.00183	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.014	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.033	0.008	ug/L
L2143439-2	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0556	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.052	0.015	mg/L
			Copper (Cu)-Total	0.0014	0.001	mg/L
			Lead (Pb)-Total	0.00131	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.022	0.008	ug/L
L2143439-3	WQ-3	Anions and Nutrients	Phosphorus, Total	0.0765	0.01	mg/L
		Bacteriological Tests	E. Coli	1090	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.301	0.015	mg/L
			Copper (Cu)-Total	0.0045	0.001	mg/L
			Iron (Fe)-Total	0.654	0.3	mg/L
			Lead (Pb)-Total	0.00226	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.023	0.00002	ug/L
			Benzo(k)fluoranthene	0.015	0.0002	ug/L
			Chrysene	0.050	0.0001	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2143439-3	WQ-3	Polycyclic Aromatic Hydrocarbons	Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.142	0.008	ug/L
			Phenanthrene	0.074	0.03	ug/L
L2143439-4	WQ-4	Anions and Nutrients	Phosphorus, Total	0.0790	0.01	mg/L
		Bacteriological Tests	E. Coli	1170	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.245	0.015	mg/L
			Copper (Cu)-Total	0.0065	0.001	mg/L
			Iron (Fe)-Total	0.712	0.3	mg/L
			Lead (Pb)-Total	0.00401	0.001	mg/L
			Zinc (Zn)-Total	0.0201	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.015	0.0008	ug/L
			Benzo(a)anthracene	0.032	0.0004	ug/L
			Benzo(g,h,i)perylene	0.049	0.00002	ug/L
			Benzo(k)fluoranthene	0.032	0.0002	ug/L
			Chrysene	0.084	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.251	0.008	ug/L
			Phenanthrene	0.156	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2143439-1 / Sample Date 08-AUG-18 / Sample ID WQ-1	Lab ID L2143439-2 / Sample Date 08-AUG-18 / Sample ID WQ-2	Lab ID L2143439-3 / Sample Date 08-AUG-18 / Sample ID WQ-3	Lab ID L2143439-4 / Sample Date 08-AUG-18 / Sample ID WQ-4
Conductivity	umhos/cm	-	-	1090	1100	722	473
Hardness (as CaCO3)	mg/L	-	-	212 HTC	210 HTC	181 HTC	127 HTC
pH	pH units	6.5-8.5	-	7.94	8.12	7.73	7.77
Total Suspended Solids	mg/L	-	-	23.4	12.8	16.2	14.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2143439-1 08-AUG-18 WQ-1	L2143439-2 08-AUG-18 WQ-2	L2143439-3 08-AUG-18 WQ-3	L2143439-4 08-AUG-18 WQ-4
Chloride (Cl)	mg/L	-	-	255	255	138	79.3
Nitrate (as N)	mg/L	-	-	0.139	0.196	1.09	0.829
Nitrite (as N)	mg/L	-	-	0.012	0.016	0.037	0.044
Total Kjeldahl Nitrogen	mg/L	-	-	1.20	1.02	0.95	0.80
Total Nitrogen	mg/L	-	-	1.35	1.23	2.08	1.67
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0177	0.0142	0.0322	0.0256
Phosphorus, Total	mg/L	0.01	-	0.0658	0.0556	0.0765	0.0790

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2143439-1	L2143439-2	L2143439-3	L2143439-4
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	0.0037

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

				Lab ID	L2143439-1	L2143439-2	L2143439-3	L2143439-4
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	Guide Limits #1	#2					
E. Coli	CFU/100mL	100	-	410 DLM	87	1090 DLM	1170 DLM
Total Coliforms	CFU/100mL	-	-	3100 DLM	3600 DLM	96000 DLM	56000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2143439-1	L2143439-2	L2143439-3	L2143439-4
			Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
Sodium Adsorption Ratio	SAR	-	-	4.23	4.31	2.40	1.69

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2143439-1	L2143439-2	L2143439-3	L2143439-4
				Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Aluminum (Al)-Total	mg/L	0.015	-		0.154	0.052	0.301	0.245
Antimony (Sb)-Total	mg/L	0.02	-		0.00047	0.00049	0.00041	0.00059
Arsenic (As)-Total	mg/L	0.005	-		0.00110	0.00105	0.00062	0.00068
Barium (Ba)-Total	mg/L	-	-		0.0646	0.0644	0.0511	0.0358
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.045	0.043	0.030	0.024
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000012	<0.000010	0.000019	0.000026
Calcium (Ca)-Total	mg/L	-	-		55.4	54.9	54.8	37.2
Cesium (Cs)-Total	mg/L	-	-		0.000020	0.000012	0.000034	0.000026
Chromium (Cr)-Total	mg/L	-	-		<0.00050	<0.00050	0.00127	0.00152
Cobalt (Co)-Total	mg/L	0.0009	-		0.00013	<0.00010	0.00024	0.00020
Copper (Cu)-Total	mg/L	0.001	-		0.0019	0.0014	0.0045	0.0065
Iron (Fe)-Total	mg/L	0.3	-		0.422	0.243	0.654	0.712
Lead (Pb)-Total	mg/L	0.001	-		0.00183	0.00131	0.00226	0.00401
Magnesium (Mg)-Total	mg/L	-	-		17.8	17.7	10.8	8.40
Manganese (Mn)-Total	mg/L	-	-		0.0761	0.0593	0.102	0.0670
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000836	0.000848	0.000867	0.000939
Nickel (Ni)-Total	mg/L	0.025	-		0.00093	0.00081	0.00108	0.00106
Potassium (K)-Total	mg/L	-	-		2.95	2.93	2.06	1.91
Rubidium (Rb)-Total	mg/L	-	-		0.00137	0.00116	0.00142	0.00135
Selenium (Se)-Total	mg/L	0.1	-		0.000424	0.000436	0.000384	0.000235
Silicon (Si)-Total	mg/L	-	-		4.75	4.54	3.02	1.98
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		141 DLHC	143 DLHC	74.4	43.7
Strontium (Sr)-Total	mg/L	-	-		0.254	0.246	0.207	0.175
Sulfur (S)-Total	mg/L	-	-		11.3	11.8	7.77	7.58
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2143439-1	08-AUG-18	WQ-1
				L2143439-2	08-AUG-18	WQ-2
				L2143439-3	08-AUG-18	WQ-3
				L2143439-4	08-AUG-18	WQ-4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00049	0.00032	0.00026	0.00035
Titanium (Ti)-Total	mg/L	-	-	0.00449	<0.0020 DLUI	0.0100	0.00900
Tungsten (W)-Total	mg/L	0.03	-	0.00036	0.00035	0.00033	0.00030
Uranium (U)-Total	mg/L	0.005	-	0.000764	0.000781	0.000566	0.000216
Vanadium (V)-Total	mg/L	0.006	-	0.00123	0.00099	0.00173	0.00179
Zinc (Zn)-Total	mg/L	0.02	-	0.0055	<0.0030	0.0165	0.0201
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

			Lab ID	L2143439-1	L2143439-2	L2143439-3	L2143439-4
			Sample Date	08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50	0.67	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2143439-1	L2143439-2	L2143439-3	L2143439-4
Sample Date				08-AUG-18	08-AUG-18	08-AUG-18	08-AUG-18
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	0.015
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	0.032
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010	0.016	0.038
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020	0.049	0.097
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	0.023	0.049
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	0.015	0.032
Chrysene	ug/L	0.0001	-	0.014	<0.010	0.050	0.084
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.033	0.022	0.142	0.251
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	0.030
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	0.025	0.051
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	0.074	0.156
Pyrene	ug/L	-	-	0.023	<0.020	0.091	0.164
Surrogate: d10-Acenaphthene	%	-	-	94.6	96.7	99.2	93.5
Surrogate: d12-Chrysene	%	-	-	107.7	112.8	115.7	110.3
Surrogate: d8-Naphthalene	%	-	-	96.5	100.6	100.8	95.8
Surrogate: d10-Phenanthrene	%	-	-	97.6	101.8	104.6	100.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TC-MF-WT	Water	Total Coliforms	SM 9222B
A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Reference Information

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2143439 Report Date: 16-AUG-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Chloride (Cl)		79.3	79.4		mg/L	0.1	20	11-AUG-18
WG2846994-2 LCS								
Chloride (Cl)			100.9		%		90-110	11-AUG-18
WG2846994-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Chloride (Cl)			98.7		%		75-125	11-AUG-18
CN-FREE-CFA-WT	**Water**							
Batch R4168767								
WG2848701-7 DUP		**L2142665-1**						
Cyanide, Free		<0.10	<0.10	RPD-NA	mg/L	N/A	20	13-AUG-18
WG2848701-6 LCS								
Cyanide, Free			99.0		%		80-120	13-AUG-18
WG2848701-5 MB								
Cyanide, Free			<0.0020		mg/L		0.002	13-AUG-18
WG2848701-8 MS		**L2142665-1**						
Cyanide, Free			76.3		%		75-125	13-AUG-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4162638								
WG2845041-4 DUP		**WG2845041-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	09-AUG-18
WG2845041-2 LCS								
Chromium, Hexavalent			100.2		%		80-120	09-AUG-18
WG2845041-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	09-AUG-18
WG2845041-5 MS		**WG2845041-3**						
Chromium, Hexavalent			96.5		%		70-130	09-AUG-18
EC-MF-WT	**Water**							
Batch R4166127								
WG2844740-3 DUP		**L2143430-1**						
E. Coli		1320	1280		CFU/100mL	3.1	65	10-AUG-18
WG2844740-1 MB								
E. Coli			0		CFU/100mL		1	10-AUG-18
EC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4162565								
WG2844537-8 DUP		**WG2844537-7**						
Conductivity		299	296		umhos/cm	1.0	10	09-AUG-18
WG2844537-6 LCS								
Conductivity			98.1		%		90-110	09-AUG-18
WG2844537-5 MB								
Conductivity			<3.0		umhos/cm		3	09-AUG-18
HG-T-CVAA-WT	**Water**							
Batch R4161892								
WG2844663-4 DUP		**WG2844663-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-AUG-18
WG2844663-2 LCS								
Mercury (Hg)-Total			105.0		%		80-120	09-AUG-18
WG2844663-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	09-AUG-18
WG2844663-6 MS		**WG2844663-5**						
Mercury (Hg)-Total			102.2		%		70-130	09-AUG-18
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-4 DUP		**WG2845592-3**						
Aluminum (Al)-Total		0.114	0.119		mg/L	3.9	20	13-AUG-18
Antimony (Sb)-Total		0.00044	0.00041		mg/L	6.3	20	13-AUG-18
Arsenic (As)-Total		0.00030	0.00029		mg/L	2.0	20	13-AUG-18
Barium (Ba)-Total		0.0147	0.0148		mg/L	0.8	20	13-AUG-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-18
Boron (B)-Total		0.012	0.013		mg/L	2.8	20	13-AUG-18
Cadmium (Cd)-Total		0.0000148	0.0000167		mg/L	12	20	13-AUG-18
Calcium (Ca)-Total		22.2	21.4		mg/L	3.4	20	13-AUG-18
Chromium (Cr)-Total		0.00172	0.00170		mg/L	1.3	20	13-AUG-18
Cesium (Cs)-Total		0.000014	0.000013		mg/L	13	20	13-AUG-18
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Copper (Cu)-Total		0.0040	0.0041		mg/L	1.9	20	13-AUG-18
Iron (Fe)-Total		0.184	0.183		mg/L	0.7	20	13-AUG-18
Lead (Pb)-Total		0.000848	0.000864		mg/L	1.8	20	13-AUG-18
Magnesium (Mg)-Total		2.80	2.75		mg/L	1.7	20	13-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-4 DUP		**WG2845592-3**						
Manganese (Mn)-Total		0.00841	0.00869		mg/L	3.2	20	13-AUG-18
Molybdenum (Mo)-Total		0.000505	0.000497		mg/L	1.7	20	13-AUG-18
Nickel (Ni)-Total		0.00062	0.00065		mg/L	4.8	20	13-AUG-18
Potassium (K)-Total		1.08	1.08		mg/L	0.1	20	13-AUG-18
Rubidium (Rb)-Total		0.00068	0.00065		mg/L	4.4	20	13-AUG-18
Selenium (Se)-Total		0.000114	0.000112		mg/L	1.5	20	13-AUG-18
Silicon (Si)-Total		1.10	1.13		mg/L	3.1	20	13-AUG-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-18
Sodium (Na)-Total		33.7	33.6		mg/L	0.2	20	13-AUG-18
Strontium (Sr)-Total		0.0865	0.0884		mg/L	2.2	20	13-AUG-18
Sulfur (S)-Total		2.17	2.20		mg/L	1.2	25	13-AUG-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	13-AUG-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	13-AUG-18
Tin (Sn)-Total		0.00091	0.00092		mg/L	1.4	20	13-AUG-18
Titanium (Ti)-Total		0.00313	0.00308		mg/L	1.5	20	13-AUG-18
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-AUG-18
Uranium (U)-Total		0.000084	0.000084		mg/L	0.1	20	13-AUG-18
Vanadium (V)-Total		0.00161	0.00169		mg/L	4.3	20	13-AUG-18
Zinc (Zn)-Total		0.0187	0.0191		mg/L	1.9	20	13-AUG-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	13-AUG-18
WG2845592-2 LCS								
Aluminum (Al)-Total			110.1		%		80-120	10-AUG-18
Antimony (Sb)-Total			99.4		%		80-120	10-AUG-18
Arsenic (As)-Total			100.2		%		80-120	10-AUG-18
Barium (Ba)-Total			103.5		%		80-120	10-AUG-18
Beryllium (Be)-Total			100.1		%		80-120	10-AUG-18
Bismuth (Bi)-Total			100.1		%		80-120	10-AUG-18
Boron (B)-Total			94.7		%		80-120	10-AUG-18
Cadmium (Cd)-Total			92.8		%		80-120	10-AUG-18
Calcium (Ca)-Total			100.9		%		80-120	10-AUG-18
Chromium (Cr)-Total			96.1		%		80-120	10-AUG-18
Cesium (Cs)-Total			93.1		%		80-120	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-2 LCS								
Cobalt (Co)-Total			97.0		%		80-120	10-AUG-18
Copper (Cu)-Total			97.5		%		80-120	10-AUG-18
Iron (Fe)-Total			93.8		%		80-120	10-AUG-18
Lead (Pb)-Total			100.8		%		80-120	10-AUG-18
Magnesium (Mg)-Total			98.9		%		80-120	10-AUG-18
Manganese (Mn)-Total			99.8		%		80-120	10-AUG-18
Molybdenum (Mo)-Total			99.6		%		80-120	10-AUG-18
Nickel (Ni)-Total			98.4		%		80-120	10-AUG-18
Potassium (K)-Total			97.4		%		80-120	10-AUG-18
Rubidium (Rb)-Total			99.5		%		80-120	10-AUG-18
Selenium (Se)-Total			99.7		%		80-120	10-AUG-18
Silicon (Si)-Total			99.9		%		60-140	10-AUG-18
Silver (Ag)-Total			97.5		%		80-120	10-AUG-18
Sodium (Na)-Total			101.5		%		80-120	10-AUG-18
Strontium (Sr)-Total			95.3		%		80-120	10-AUG-18
Sulfur (S)-Total			93.0		%		80-120	10-AUG-18
Thallium (Tl)-Total			97.9		%		80-120	10-AUG-18
Tellurium (Te)-Total			100.9		%		80-120	10-AUG-18
Thorium (Th)-Total			93.1		%		70-130	10-AUG-18
Tin (Sn)-Total			91.9		%		80-120	10-AUG-18
Titanium (Ti)-Total			96.9		%		80-120	10-AUG-18
Tungsten (W)-Total			91.6		%		80-120	10-AUG-18
Uranium (U)-Total			97.0		%		80-120	10-AUG-18
Vanadium (V)-Total			100.1		%		80-120	10-AUG-18
Zinc (Zn)-Total			93.8		%		80-120	10-AUG-18
Zirconium (Zr)-Total			93.2		%		80-120	10-AUG-18
WG2845592-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	10-AUG-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-1 MB								
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	10-AUG-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-AUG-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	10-AUG-18
Iron (Fe)-Total			<0.010		mg/L		0.01	10-AUG-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-AUG-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Potassium (K)-Total			<0.050		mg/L		0.05	10-AUG-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	10-AUG-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Silicon (Si)-Total			<0.10		mg/L		0.1	10-AUG-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	10-AUG-18
Sodium (Na)-Total			<0.050		mg/L		0.05	10-AUG-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	10-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	10-AUG-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	10-AUG-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-AUG-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	10-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-AUG-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-AUG-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-AUG-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	10-AUG-18
WG2845592-5 MS		**WG2845592-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	10-AUG-18
Antimony (Sb)-Total			103.1		%		70-130	10-AUG-18
Arsenic (As)-Total			102.9		%		70-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-5 MS		**WG2845592-6**						
Barium (Ba)-Total			N/A	MS-B	%		-	10-AUG-18
Beryllium (Be)-Total			99.8		%		70-130	10-AUG-18
Bismuth (Bi)-Total			96.2		%		70-130	10-AUG-18
Boron (B)-Total			93.5		%		70-130	10-AUG-18
Cadmium (Cd)-Total			100.6		%		70-130	10-AUG-18
Calcium (Ca)-Total			N/A	MS-B	%		-	10-AUG-18
Chromium (Cr)-Total			98.8		%		70-130	10-AUG-18
Cesium (Cs)-Total			95.1		%		70-130	10-AUG-18
Cobalt (Co)-Total			99.5		%		70-130	10-AUG-18
Copper (Cu)-Total			99.7		%		70-130	10-AUG-18
Iron (Fe)-Total			N/A	MS-B	%		-	10-AUG-18
Lead (Pb)-Total			96.9		%		70-130	10-AUG-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	10-AUG-18
Manganese (Mn)-Total			N/A	MS-B	%		-	10-AUG-18
Molybdenum (Mo)-Total			103.2		%		70-130	10-AUG-18
Nickel (Ni)-Total			98.6		%		70-130	10-AUG-18
Potassium (K)-Total			93.0		%		70-130	10-AUG-18
Rubidium (Rb)-Total			98.2		%		70-130	10-AUG-18
Selenium (Se)-Total			100.3		%		70-130	10-AUG-18
Silicon (Si)-Total			N/A	MS-B	%		-	10-AUG-18
Silver (Ag)-Total			96.5		%		70-130	10-AUG-18
Sodium (Na)-Total			N/A	MS-B	%		-	10-AUG-18
Strontium (Sr)-Total			N/A	MS-B	%		-	10-AUG-18
Sulfur (S)-Total			94.2		%		70-130	10-AUG-18
Thallium (Tl)-Total			96.7		%		70-130	10-AUG-18
Tellurium (Te)-Total			98.4		%		70-130	10-AUG-18
Thorium (Th)-Total			90.2		%		70-130	10-AUG-18
Tin (Sn)-Total			93.1		%		70-130	10-AUG-18
Titanium (Ti)-Total			90.6		%		70-130	10-AUG-18
Tungsten (W)-Total			92.4		%		70-130	10-AUG-18
Uranium (U)-Total			99.9		%		70-130	10-AUG-18
Vanadium (V)-Total			102.6		%		70-130	10-AUG-18
Zinc (Zn)-Total			92.5		%		70-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4166131								
WG2845592-5 MS		**WG2845592-6**						
Zirconium (Zr)-Total			88.5		%		70-130	10-AUG-18
NO2-IC-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Nitrite (as N)		0.044	0.044		mg/L	1.1	25	11-AUG-18
WG2846994-2 LCS								
Nitrite (as N)			100.8		%		70-130	11-AUG-18
WG2846994-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Nitrite (as N)			99.7		%		70-130	11-AUG-18
NO3-IC-WT	**Water**							
Batch R4167215								
WG2846994-4 DUP		**L2143439-4**						
Nitrate (as N)		0.829	0.831		mg/L	0.2	25	11-AUG-18
WG2846994-2 LCS								
Nitrate (as N)			100.6		%		70-130	11-AUG-18
WG2846994-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	11-AUG-18
WG2846994-5 MS		**L2143439-4**						
Nitrate (as N)			98.6		%		70-130	11-AUG-18
P-T-COL-WT	**Water**							
Batch R4169436								
WG2848285-3 DUP		**L2143439-2**						
Phosphorus, Total		0.0556	0.0559		mg/L	0.4	20	15-AUG-18
WG2848285-2 LCS								
Phosphorus, Total			94.0		%		80-120	15-AUG-18
WG2848285-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	15-AUG-18
WG2848285-4 MS		**L2143439-2**						
Phosphorus, Total			93.7		%		70-130	15-AUG-18
P-TD-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4170676								
WG2849114-3 DUP		**L2143440-1**						
Phosphorus (P)-Total	Dissolved	0.0378	0.0331		mg/L	13	20	16-AUG-18
WG2849114-2 LCS								
Phosphorus (P)-Total	Dissolved		93.4		%		80-120	16-AUG-18
WG2849114-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	16-AUG-18
WG2849114-4 MS		**L2143440-1**						
Phosphorus (P)-Total	Dissolved		93.5		%		70-130	16-AUG-18
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-2 LCS								
1-Methylnaphthalene			109.7		%		50-150	10-AUG-18
2-Methylnaphthalene			101.7		%		50-150	10-AUG-18
Acenaphthene			108.2		%		50-150	10-AUG-18
Acenaphthylene			109.0		%		50-150	10-AUG-18
Anthracene			121.5		%		60-130	10-AUG-18
Benzo(a)anthracene			127.8		%		60-130	10-AUG-18
Benzo(a)pyrene			109.6		%		50-150	10-AUG-18
Benzo(b)fluoranthene			110.8		%		50-150	10-AUG-18
Benzo(g,h,i)perylene			111.6		%		60-130	10-AUG-18
Benzo(k)fluoranthene			109.8		%		60-130	10-AUG-18
Chrysene			124.5		%		60-130	10-AUG-18
Dibenzo(ah)anthracene			116.0		%		60-130	10-AUG-18
Fluoranthene			112.5		%		60-130	10-AUG-18
Fluorene			113.2		%		50-150	10-AUG-18
Indeno(1,2,3-cd)pyrene			117.2		%		50-150	10-AUG-18
Naphthalene			98.1		%		50-150	10-AUG-18
Phenanthrene			112.7		%		50-150	10-AUG-18
Pyrene			113.3		%		50-150	10-AUG-18
WG2844553-3 LCSD		**WG2844553-2**						
1-Methylnaphthalene		109.7	117.7		%	7.0	50	10-AUG-18
2-Methylnaphthalene		101.7	114.7		%	12	50	10-AUG-18
Acenaphthene		108.2	111.7		%	3.2	50	10-AUG-18
Acenaphthylene		109.0	114.1		%	4.6	50	10-AUG-18
Anthracene		121.5	126.2		%	3.8	50	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-3 LCSD		**WG2844553-2**						
Benzo(a)anthracene		127.8	127.0		%	0.6	50	10-AUG-18
Benzo(a)pyrene		109.6	114.2		%	4.1	50	10-AUG-18
Benzo(b)fluoranthene		110.8	116.2		%	4.7	50	10-AUG-18
Benzo(g,h,i)perylene		111.6	116.1		%	3.9	50	10-AUG-18
Benzo(k)fluoranthene		109.8	115.0		%	4.6	50	10-AUG-18
Chrysene		124.5	125.8		%	1.1	50	10-AUG-18
Dibenzo(ah)anthracene		116.0	119.3		%	2.8	50	10-AUG-18
Fluoranthene		112.5	117.7		%	4.5	50	10-AUG-18
Fluorene		113.2	118.5		%	4.5	50	10-AUG-18
Indeno(1,2,3-cd)pyrene		117.2	121.2		%	3.4	50	10-AUG-18
Naphthalene		98.1	113.0		%	14	50	10-AUG-18
Phenanthrene		112.7	117.5		%	4.2	50	10-AUG-18
Pyrene		113.3	118.6		%	4.5	50	10-AUG-18
WG2844553-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	10-AUG-18
2-Methylnaphthalene			<0.020		ug/L		0.02	10-AUG-18
Acenaphthene			<0.020		ug/L		0.02	10-AUG-18
Acenaphthylene			<0.020		ug/L		0.02	10-AUG-18
Anthracene			<0.010		ug/L		0.01	10-AUG-18
Benzo(a)anthracene			<0.020		ug/L		0.02	10-AUG-18
Benzo(a)pyrene			<0.010		ug/L		0.01	10-AUG-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	10-AUG-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	10-AUG-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	10-AUG-18
Chrysene			<0.010		ug/L		0.01	10-AUG-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	10-AUG-18
Fluoranthene			<0.010		ug/L		0.01	10-AUG-18
Fluorene			<0.020		ug/L		0.02	10-AUG-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	10-AUG-18
Naphthalene			<0.050		ug/L		0.05	10-AUG-18
Phenanthrene			<0.020		ug/L		0.02	10-AUG-18
Pyrene			<0.020		ug/L		0.02	10-AUG-18
Surrogate: d8-Naphthalene			102.6		%		40-130	10-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4162668								
WG2844553-1 MB								
Surrogate: d10-Phenanthrene			103.2		%		40-130	10-AUG-18
Surrogate: d12-Chrysene			114.4		%		40-130	10-AUG-18
Surrogate: d10-Acenaphthene			99.0		%		40-130	10-AUG-18
PH-WT	**Water**							
Batch R4162565								
WG2844537-8 DUP		**WG2844537-7**						
pH		7.71	7.74	J	pH units	0.04	0.2	09-AUG-18
WG2844537-6 LCS								
pH			7.01		pH units		6.9-7.1	09-AUG-18
SOLIDS-TSS-WT	**Water**							
Batch R4167227								
WG2845996-3 DUP		**L2143607-1**						
Total Suspended Solids		306	315		mg/L	2.9	20	13-AUG-18
WG2845996-2 LCS								
Total Suspended Solids			98.3		%		85-115	13-AUG-18
WG2845996-1 MB								
Total Suspended Solids			<2.0		mg/L		2	13-AUG-18
TC-MF-WT	**Water**							
Batch R4166110								
WG2844734-3 DUP		**L2143439-3**						
Total Coliforms		96000	91000		CFU/100mL	5.3	65	10-AUG-18
WG2844734-1 MB								
Total Coliforms			0		CFU/100mL		1	10-AUG-18
TKN-WT	**Water**							
Batch R4168095								
WG2847380-7 DUP		**L2143439-1**						
Total Kjeldahl Nitrogen		1.20	1.35		mg/L	12	20	13-AUG-18
WG2847380-6 LCS								
Total Kjeldahl Nitrogen			97.0		%		75-125	13-AUG-18
WG2847380-5 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	13-AUG-18
WG2847380-8 MS		**L2143439-1**						
Total Kjeldahl Nitrogen			102.2		%		70-130	13-AUG-18

Quality Control Report

Workorder: L2143439 Report Date: 16-AUG-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2143439-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: laframboise.d@aquaforbeech.com

Email 2: cowlin.w@aquaforbeech.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2143439 COC

ALS Contact: Gayle

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
1	WQ-1	08-Aug-18	10:30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
2	WQ-2	"	11:15	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
3	WQ-3	"	11:25	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
4	WQ-4	"	12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R			12

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☒ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				22.2	17.7		

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
Andrea C.	Aug 8/18	17:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 20-AUG-18
Report Date: 27-AUG-18 12:05 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2149498

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2149498-1	WATER QUALITY-1 (WQ-1)	Anions and Nutrients	Phosphorus, Total	0.0607	0.01	mg/L
		Bacteriological Tests	E. Coli	1300	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.111	0.015	mg/L
			Copper (Cu)-Total	0.0015	0.001	mg/L
			Iron (Fe)-Total	0.363	0.3	mg/L
			Lead (Pb)-Total	0.00168	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.023	0.00002	ug/L
			Benzo(k)fluoranthene	0.014	0.0002	ug/L
			Chrysene	0.022	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.049	0.008	ug/L
L2149498-2	WATER QUALITY-2 (WQ-2)	Anions and Nutrients	Phosphorus, Total	0.0660	0.01	mg/L
		Bacteriological Tests	E. Coli	970	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.090	0.015	mg/L
			Copper (Cu)-Total	0.0016	0.001	mg/L
			Iron (Fe)-Total	0.363	0.3	mg/L
			Lead (Pb)-Total	0.00171	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.013	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.041	0.008	ug/L
L2149498-3	WATER QUALITY-3 (WQ-3)	Anions and Nutrients	Phosphorus, Total	0.0772	0.01	mg/L
		Bacteriological Tests	E. Coli	44000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.239	0.015	mg/L
			Copper (Cu)-Total	0.0046	0.001	mg/L
			Iron (Fe)-Total	0.533	0.3	mg/L
			Lead (Pb)-Total	0.00339	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.025	0.0004	ug/L
			Benzo(g,h,i)perylene	0.042	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2149498-3	WATER QUALITY-3 (WQ-3)	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	0.025	0.0002	ug/L
			Chrysene	0.057	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.170	0.008	ug/L
			Phenanthrene	0.102	0.03	ug/L
L2149498-4	WATER QUALITY-4 (WQ-4)	Anions and Nutrients	Phosphorus, Total	0.0882	0.01	mg/L
		Bacteriological Tests	E. Coli	12700	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.249	0.015	mg/L
			Copper (Cu)-Total	0.0067	0.001	mg/L
			Iron (Fe)-Total	0.782	0.3	mg/L
			Lead (Pb)-Total	0.00476	0.001	mg/L
			Zinc (Zn)-Total	0.0227	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.011	0.0008	ug/L
			Benzo(a)anthracene	0.053	0.0004	ug/L
			Benzo(g,h,i)perylene	0.071	0.00002	ug/L
			Benzo(k)fluoranthene	0.039	0.0002	ug/L
			Chrysene	0.106	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.301	0.008	ug/L
			Phenanthrene	0.174	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2149498-1	18-AUG-18	WATER QUALITY-1 (WQ-1)
				L2149498-2	18-AUG-18	WATER QUALITY-2 (WQ-2)
				L2149498-3	18-AUG-18	WATER QUALITY-3 (WQ-3)
				L2149498-4	18-AUG-18	WATER QUALITY-4 (WQ-4)
Conductivity	umhos/cm	-	-	971	956	259	569
Hardness (as CaCO3)	mg/L	-	-	194 HTC	187 HTC	81 HTC	147 HTC
pH	pH units	6.5-8.5	-	8.03	8.23	7.64	7.75
Total Suspended Solids	mg/L	-	-	19.7	15.4	15.5	22.1

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2149498-1 / Sample Date 18-AUG-18 / Sample ID WATER QUALITY-1 (WQ-1)	Lab ID L2149498-2 / Sample Date 18-AUG-18 / Sample ID WATER QUALITY-2 (WQ-2)	Lab ID L2149498-3 / Sample Date 18-AUG-18 / Sample ID WATER QUALITY-3 (WQ-3)	Lab ID L2149498-4 / Sample Date 18-AUG-18 / Sample ID WATER QUALITY-4 (WQ-4)
Chloride (Cl)	mg/L	-	-	220	218	53.2	106
Nitrate (as N)	mg/L	-	-	0.204	0.213	0.448	1.07
Nitrite (as N)	mg/L	-	-	0.017	0.017	0.016	0.020
Total Kjeldahl Nitrogen	mg/L	-	-	2.06	1.13	0.71	2.30
Total Nitrogen	mg/L	-	-	2.28	1.36	1.17	3.39
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0186	0.0160	0.0199	0.0315
Phosphorus, Total	mg/L	0.01	-	0.0607	0.0660	0.0772	0.0882

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2149498-1	L2149498-2	L2149498-3	L2149498-4
				Sample Date	18-AUG-18	18-AUG-18	18-AUG-18	18-AUG-18
				Sample ID	WATER QUALITY-1 (WQ-1)	WATER QUALITY-2 (WQ-2)	WATER QUALITY-3 (WQ-3)	WATER QUALITY-4 (WQ-4)
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2149498-1, 18-AUG-18, WATER QUALITY-1 (WQ-1)	L2149498-2, 18-AUG-18, WATER QUALITY-2 (WQ-2)	L2149498-3, 18-AUG-18, WATER QUALITY-3 (WQ-3)	L2149498-4, 18-AUG-18, WATER QUALITY-4 (WQ-4)
E. Coli	CFU/100mL	100	-	1300 DLM	970 DLM	44000 DLM	12700 DLM
Total Coliforms	CFU/100mL	-	-	53000 DLM	48000 DLM	119000 DLM	86000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2149498-1	18-AUG-18	WATER QUALITY-1 (WQ-1)
				L2149498-2	18-AUG-18	WATER QUALITY-2 (WQ-2)
				L2149498-3	18-AUG-18	WATER QUALITY-3 (WQ-3)
				L2149498-4	18-AUG-18	WATER QUALITY-4 (WQ-4)
Sodium Adsorption Ratio	SAR	-	-	3.81	3.86	1.47	2.08

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2149498-1	L2149498-2	L2149498-3	L2149498-4
				Sample Date	18-AUG-18	18-AUG-18	18-AUG-18	18-AUG-18
				Sample ID	WATER QUALITY-1 (WQ-1)	WATER QUALITY-2 (WQ-2)	WATER QUALITY-3 (WQ-3)	WATER QUALITY-4 (WQ-4)
Aluminum (Al)-Total	mg/L	0.015	-		0.111	0.090	0.239	0.249
Antimony (Sb)-Total	mg/L	0.02	-		0.00048	0.00047	0.00052	0.00071
Arsenic (As)-Total	mg/L	0.005	-		0.00097	0.00092	0.00064	0.00078
Barium (Ba)-Total	mg/L	-	-		0.0616	0.0607	0.0244	0.0459
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.038	0.038	0.020	0.021
Cadmium (Cd)-Total	mg/L	0.0001	-		<0.000010	<0.000010	0.000027	0.000031
Calcium (Ca)-Total	mg/L	-	-		51.9	50.0	24.9	44.4
Cesium (Cs)-Total	mg/L	-	-		0.000012	0.000011	0.000023	0.000021
Chromium (Cr)-Total	mg/L	-	-		<0.00050	<0.00050	0.00158	0.00151
Cobalt (Co)-Total	mg/L	0.0009	-		0.00012	<0.00010	0.00020	0.00023
Copper (Cu)-Total	mg/L	0.001	-		0.0015	0.0016	0.0046	0.0067
Iron (Fe)-Total	mg/L	0.3	-		0.363	0.363	0.533	0.782
Lead (Pb)-Total	mg/L	0.001	-		0.00168	0.00171	0.00339	0.00476
Magnesium (Mg)-Total	mg/L	-	-		15.5	15.0	4.67	8.82
Manganese (Mn)-Total	mg/L	-	-		0.0806	0.0784	0.0605	0.0950
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000874	0.000812	0.000634	0.000813
Nickel (Ni)-Total	mg/L	0.025	-		0.00083	0.00077	0.00121	0.00117
Potassium (K)-Total	mg/L	-	-		2.86	2.81	1.45	1.98
Rubidium (Rb)-Total	mg/L	-	-		0.00116	0.00109	0.00104	0.00114
Selenium (Se)-Total	mg/L	0.1	-		0.000408	0.000403	0.000228	0.000413
Silicon (Si)-Total	mg/L	-	-		4.21	4.05	1.55	2.63
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		122 DLHC	121 DLHC	30.6	58.0
Strontium (Sr)-Total	mg/L	-	-		0.243	0.234	0.124	0.148
Sulfur (S)-Total	mg/L	-	-		10.2	10.1	3.55	6.29
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2149498-1	18-AUG-18	WATER QUALITY-1 (WQ-1)
				L2149498-2	18-AUG-18	WATER QUALITY-2 (WQ-2)
				L2149498-3	18-AUG-18	WATER QUALITY-3 (WQ-3)
				L2149498-4	18-AUG-18	WATER QUALITY-4 (WQ-4)
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00010	0.00013	0.00019	0.00029
Titanium (Ti)-Total	mg/L	-	-	0.00324	0.00253	0.00733	0.00984
Tungsten (W)-Total	mg/L	0.03	-	0.00033	0.00032	0.00023	0.00108
Uranium (U)-Total	mg/L	0.005	-	0.000658	0.000647	0.000182	0.000380
Vanadium (V)-Total	mg/L	0.006	-	0.00131	0.00126	0.00171	0.00188
Zinc (Zn)-Total	mg/L	0.02	-	0.0047	0.0044	0.0144	0.0227
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

				Lab ID	L2149498-1	L2149498-2	L2149498-3	L2149498-4
				Sample Date	18-AUG-18	18-AUG-18	18-AUG-18	18-AUG-18
				Sample ID	WATER QUALITY-1 (WQ-1)	WATER QUALITY-2 (WQ-2)	WATER QUALITY-3 (WQ-3)	WATER QUALITY-4 (WQ-4)
		Guide Limits						
Analyte	Unit	#1	#2					
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50	0.73	0.53

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2149498-1	L2149498-2	L2149498-3	L2149498-4
Sample Date				18-AUG-18	18-AUG-18	18-AUG-18	18-AUG-18
Sample ID				WATER QUALITY-1 (WQ-1)	WATER QUALITY-2 (WQ-2)	WATER QUALITY-3 (WQ-3)	WATER QUALITY-4 (WQ-4)
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	0.023
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	0.011
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	0.025	0.053
Benzo(a)pyrene	ug/L	-	-	0.015	<0.010	0.031	0.060
Benzo(b)fluoranthene	ug/L	-	-	0.028	<0.020	0.074	0.136
Benzo(g,h,i)perylene	ug/L	0.00002	-	0.023	<0.020	0.042	0.071
Benzo(k)fluoranthene	ug/L	0.0002	-	0.014	<0.010	0.025	0.039
Chrysene	ug/L	0.0001	-	0.022	0.013	0.057	0.106
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.049	0.041	0.170	0.301
Fluorene	ug/L	0.2	-	<0.020	<0.020	0.022	0.034
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.025	<0.020	0.046	0.078
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	0.026	0.022	0.102	0.174
Pyrene	ug/L	-	-	0.033	0.024	0.110	0.206
Surrogate: d10-Acenaphthene	%	-	-	105.5	97.6	102.4	94.5
Surrogate: d12-Chrysene	%	-	-	114.9	104.9	112.4	105.5
Surrogate: d8-Naphthalene	%	-	-	107.1	100.6	107.2	100.6
Surrogate: d10-Phenanthrene	%	-	-	112.7	101.3	105.8	98.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TC-MF-WT	Water	Total Coliforms	SM 9222B
A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4181346								
WG2856380-15 DUP		**L2149350-34**						
Chloride (Cl)		12.1	12.1		mg/L	0.3	20	22-AUG-18
WG2856380-20 DUP		**L2150259-3**						
Chloride (Cl)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2856380-12 LCS								
Chloride (Cl)			101.6		%		90-110	22-AUG-18
WG2856380-17 LCS								
Chloride (Cl)			101.6		%		90-110	22-AUG-18
WG2856380-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	22-AUG-18
WG2856380-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	22-AUG-18
WG2856380-14 MS		**L2149350-34**						
Chloride (Cl)			102.2		%		75-125	22-AUG-18
WG2856380-19 MS		**L2150259-3**						
Chloride (Cl)			102.5		%		75-125	22-AUG-18
CN-FREE-CFA-WT	**Water**							
Batch R4179918								
WG2855464-12 DUP		**L2148288-1**						
Cyanide, Free		2.99	2.86		mg/L	4.2	20	21-AUG-18
WG2855464-8 DUP		**L2149418-7**						
Cyanide, Free		<0.020	<0.020	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2855464-10 LCS								
Cyanide, Free			110.4		%		80-120	21-AUG-18
WG2855464-6 LCS								
Cyanide, Free			110.3		%		80-120	21-AUG-18
WG2855464-5 MB								
Cyanide, Free			<0.0020		mg/L		0.002	21-AUG-18
WG2855464-9 MB								
Cyanide, Free			<0.0020		mg/L		0.002	21-AUG-18
WG2855464-11 MS		**L2148288-1**						
Cyanide, Free			N/A	MS-B	%		-	21-AUG-18
WG2855464-7 MS		**L2149418-7**						
Cyanide, Free			102.5		%		75-125	22-AUG-18
CR-CR6-PWQO-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4178834								
WG2854509-4 DUP		**WG2854509-3**						
Chromium, Hexavalent		0.62	0.51		ug/L	19	20	20-AUG-18
WG2854509-2 LCS								
Chromium, Hexavalent			98.6		%		80-120	20-AUG-18
WG2854509-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	20-AUG-18
WG2854509-5 MS		**WG2854509-3**						
Chromium, Hexavalent			96.8		%		70-130	20-AUG-18
EC-MF-WT	**Water**							
Batch R4178970								
WG2854127-3 DUP		**L2149498-4**						
E. Coli		12700	12400		CFU/100mL	2.4	65	21-AUG-18
WG2854127-1 MB								
E. Coli			0		CFU/100mL		1	21-AUG-18
EC-WT	**Water**							
Batch R4179829								
WG2854999-12 DUP		**WG2854999-11**						
Conductivity		2130	2160		umhos/cm	1.4	10	21-AUG-18
WG2854999-4 DUP		**WG2854999-3**						
Conductivity		661	655		umhos/cm	0.9	10	21-AUG-18
WG2854999-10 LCS								
Conductivity			100.2		%		90-110	21-AUG-18
WG2854999-2 LCS								
Conductivity			99.1		%		90-110	21-AUG-18
WG2854999-1 MB								
Conductivity			<3.0		umhos/cm		3	21-AUG-18
WG2854999-9 MB								
Conductivity			<3.0		umhos/cm		3	21-AUG-18
HG-T-CVAA-WT	**Water**							
Batch R4179219								
WG2855080-3 DUP		**L2149268-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-18
WG2855080-2 LCS								
Mercury (Hg)-Total			99.7		%		80-120	21-AUG-18
WG2855080-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	21-AUG-18
WG2855080-4 MS		**L2149418-9**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4179219								
WG2855080-4 MS		**L2149418-9**						
Mercury (Hg)-Total			99.8		%		70-130	21-AUG-18
MET-T-CCMS-WT	**Water**							
Batch R4179823								
WG2854938-4 DUP		**WG2854938-3**						
Aluminum (Al)-Total		0.072	0.073		mg/L	1.6	20	21-AUG-18
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-18
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-18
Barium (Ba)-Total		0.0220	0.0223		mg/L	1.3	20	21-AUG-18
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-18
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-18
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-AUG-18
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Calcium (Ca)-Total		365	360		mg/L	1.5	20	21-AUG-18
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-AUG-18
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-AUG-18
Cobalt (Co)-Total		0.0348	0.0360		mg/L	3.3	20	21-AUG-18
Copper (Cu)-Total		0.027	0.027		mg/L	0.9	20	21-AUG-18
Iron (Fe)-Total		2.71	2.80		mg/L	3.4	20	21-AUG-18
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-18
Magnesium (Mg)-Total		986	987		mg/L	0.2	20	21-AUG-18
Manganese (Mn)-Total		10.5	10.8		mg/L	2.1	20	21-AUG-18
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-18
Nickel (Ni)-Total		0.0402	0.0408		mg/L	1.5	20	21-AUG-18
Potassium (K)-Total		5.60	5.65		mg/L	0.8	20	21-AUG-18
Rubidium (Rb)-Total		0.0095	0.0101		mg/L	6.0	20	21-AUG-18
Selenium (Se)-Total		0.0100	0.0102		mg/L	1.4	20	21-AUG-18
Silicon (Si)-Total		<1.0	<1.0	RPD-NA	mg/L	N/A	20	21-AUG-18
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	21-AUG-18
Sodium (Na)-Total		5.81	5.78		mg/L	0.4	20	21-AUG-18
Strontium (Sr)-Total		0.751	0.750		mg/L	0.2	20	21-AUG-18
Sulfur (S)-Total		1780	1770		mg/L	0.6	25	21-AUG-18
Thallium (Tl)-Total		0.00017	0.00017		mg/L	1.7	20	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4179823								
WG2854938-4 DUP		**WG2854938-3**						
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	21-AUG-18
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	21-AUG-18
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-18
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	21-AUG-18
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-AUG-18
Uranium (U)-Total		0.00061	0.00061		mg/L	0.8	20	21-AUG-18
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-AUG-18
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	21-AUG-18
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	21-AUG-18
WG2854938-2 LCS								
Aluminum (Al)-Total			99.7		%		80-120	21-AUG-18
Antimony (Sb)-Total			100.6		%		80-120	21-AUG-18
Arsenic (As)-Total			99.5		%		80-120	21-AUG-18
Barium (Ba)-Total			104.2		%		80-120	21-AUG-18
Beryllium (Be)-Total			96.6		%		80-120	21-AUG-18
Bismuth (Bi)-Total			98.0		%		80-120	21-AUG-18
Boron (B)-Total			90.5		%		80-120	21-AUG-18
Cadmium (Cd)-Total			101.5		%		80-120	21-AUG-18
Calcium (Ca)-Total			96.8		%		80-120	21-AUG-18
Chromium (Cr)-Total			101.1		%		80-120	21-AUG-18
Cesium (Cs)-Total			97.6		%		80-120	21-AUG-18
Cobalt (Co)-Total			98.8		%		80-120	21-AUG-18
Copper (Cu)-Total			100.4		%		80-120	21-AUG-18
Iron (Fe)-Total			95.0		%		80-120	21-AUG-18
Lead (Pb)-Total			94.8		%		80-120	21-AUG-18
Magnesium (Mg)-Total			110.0		%		80-120	21-AUG-18
Manganese (Mn)-Total			98.8		%		80-120	21-AUG-18
Molybdenum (Mo)-Total			97.0		%		80-120	21-AUG-18
Nickel (Ni)-Total			99.4		%		80-120	21-AUG-18
Potassium (K)-Total			103.1		%		80-120	21-AUG-18
Rubidium (Rb)-Total			101.4		%		80-120	21-AUG-18
Selenium (Se)-Total			99.2		%		80-120	21-AUG-18
Silicon (Si)-Total			99.2		%		60-140	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4179823								
WG2854938-2 LCS								
Silver (Ag)-Total			97.6		%		80-120	21-AUG-18
Sodium (Na)-Total			105.7		%		80-120	21-AUG-18
Strontium (Sr)-Total			101.1		%		80-120	21-AUG-18
Sulfur (S)-Total			102.3		%		80-120	21-AUG-18
Thallium (Tl)-Total			93.5		%		80-120	21-AUG-18
Tellurium (Te)-Total			97.4		%		80-120	21-AUG-18
Thorium (Th)-Total			95.5		%		70-130	21-AUG-18
Tin (Sn)-Total			95.6		%		80-120	21-AUG-18
Titanium (Ti)-Total			97.4		%		80-120	21-AUG-18
Tungsten (W)-Total			90.9		%		80-120	21-AUG-18
Uranium (U)-Total			95.5		%		80-120	21-AUG-18
Vanadium (V)-Total			102.4		%		80-120	21-AUG-18
Zinc (Zn)-Total			91.1		%		80-120	21-AUG-18
Zirconium (Zr)-Total			92.9		%		80-120	21-AUG-18
WG2854938-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	21-AUG-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-AUG-18
Boron (B)-Total			<0.010		mg/L		0.01	21-AUG-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	21-AUG-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-AUG-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	21-AUG-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	21-AUG-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	21-AUG-18
Iron (Fe)-Total			<0.010		mg/L		0.01	21-AUG-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-AUG-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-AUG-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	21-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-AUG-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4179823								
WG2854938-1 MB								
Potassium (K)-Total			<0.050		mg/L		0.05	21-AUG-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	21-AUG-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-AUG-18
Silicon (Si)-Total			<0.10		mg/L		0.1	21-AUG-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	21-AUG-18
Sodium (Na)-Total			<0.050		mg/L		0.05	22-AUG-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	21-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	21-AUG-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	21-AUG-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	21-AUG-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-AUG-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	21-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	21-AUG-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-AUG-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-AUG-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	21-AUG-18
WG2854938-5 MS		**WG2854938-3**						
Aluminum (Al)-Total			91.2		%		70-130	21-AUG-18
Antimony (Sb)-Total			97.9		%		70-130	21-AUG-18
Arsenic (As)-Total			101.2		%		70-130	21-AUG-18
Barium (Ba)-Total			N/A	MS-B	%		-	21-AUG-18
Beryllium (Be)-Total			92.3		%		70-130	21-AUG-18
Bismuth (Bi)-Total			91.4		%		70-130	21-AUG-18
Boron (B)-Total			N/A	MS-B	%		-	21-AUG-18
Cadmium (Cd)-Total			96.0		%		70-130	21-AUG-18
Calcium (Ca)-Total			N/A	MS-B	%		-	21-AUG-18
Chromium (Cr)-Total			103.0		%		70-130	21-AUG-18
Cesium (Cs)-Total			98.6		%		70-130	21-AUG-18
Cobalt (Co)-Total			N/A	MS-B	%		-	21-AUG-18
Copper (Cu)-Total			N/A	MS-B	%		-	21-AUG-18
Iron (Fe)-Total			N/A	MS-B	%		-	21-AUG-18
Lead (Pb)-Total			90.0		%		70-130	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4179823								
WG2854938-5 MS		**WG2854938-3**						
Magnesium (Mg)-Total			N/A	MS-B	%		-	21-AUG-18
Manganese (Mn)-Total			N/A	MS-B	%		-	21-AUG-18
Molybdenum (Mo)-Total			102.8		%		70-130	21-AUG-18
Nickel (Ni)-Total			N/A	MS-B	%		-	21-AUG-18
Potassium (K)-Total			N/A	MS-B	%		-	21-AUG-18
Rubidium (Rb)-Total			N/A	MS-B	%		-	21-AUG-18
Selenium (Se)-Total			105.3		%		70-130	21-AUG-18
Silicon (Si)-Total			N/A	MS-B	%		-	21-AUG-18
Silver (Ag)-Total			92.4		%		70-130	21-AUG-18
Sodium (Na)-Total			N/A	MS-B	%		-	21-AUG-18
Strontium (Sr)-Total			N/A	MS-B	%		-	21-AUG-18
Sulfur (S)-Total			N/A	MS-B	%		-	21-AUG-18
Thallium (Tl)-Total			89.6		%		70-130	21-AUG-18
Tellurium (Te)-Total			97.0		%		70-130	21-AUG-18
Thorium (Th)-Total			93.1		%		70-130	21-AUG-18
Tin (Sn)-Total			95.7		%		70-130	21-AUG-18
Titanium (Ti)-Total			98.3		%		70-130	21-AUG-18
Tungsten (W)-Total			92.8		%		70-130	21-AUG-18
Uranium (U)-Total			N/A	MS-B	%		-	21-AUG-18
Vanadium (V)-Total			106.4		%		70-130	21-AUG-18
Zinc (Zn)-Total			91.0		%		70-130	21-AUG-18
Zirconium (Zr)-Total			95.5		%		70-130	21-AUG-18
NO2-IC-WT	**Water**							
Batch R4181346								
WG2856380-15 DUP		**L2149350-34**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	22-AUG-18
WG2856380-20 DUP		**L2150259-3**						
Nitrite (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	25	22-AUG-18
WG2856380-12 LCS								
Nitrite (as N)			100.0		%		70-130	22-AUG-18
WG2856380-17 LCS								
Nitrite (as N)			100.7		%		70-130	22-AUG-18
WG2856380-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	22-AUG-18
WG2856380-16 MB								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4181346								
WG2856380-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	22-AUG-18
WG2856380-14 MS		**L2149350-34**						
Nitrite (as N)			99.6		%		70-130	22-AUG-18
WG2856380-19 MS		**L2150259-3**						
Nitrite (as N)			101.0		%		70-130	22-AUG-18
NO3-IC-WT	**Water**							
Batch R4181346								
WG2856380-15 DUP		**L2149350-34**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	22-AUG-18
WG2856380-20 DUP		**L2150259-3**						
Nitrate (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	25	22-AUG-18
WG2856380-12 LCS								
Nitrate (as N)			101.0		%		70-130	22-AUG-18
WG2856380-17 LCS								
Nitrate (as N)			101.0		%		70-130	22-AUG-18
WG2856380-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	22-AUG-18
WG2856380-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	22-AUG-18
WG2856380-14 MS		**L2149350-34**						
Nitrate (as N)			98.1		%		70-130	22-AUG-18
WG2856380-19 MS		**L2150259-3**						
Nitrate (as N)			101.8		%		70-130	22-AUG-18
P-T-COL-WT	**Water**							
Batch R4180833								
WG2856869-3 DUP		**L2149498-4**						
Phosphorus, Total		0.0882	0.0832		mg/L	5.9	20	23-AUG-18
WG2856869-2 LCS								
Phosphorus, Total			90.3		%		80-120	23-AUG-18
WG2856869-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	23-AUG-18
WG2856869-4 MS		**L2149498-4**						
Phosphorus, Total			113.7		%		70-130	23-AUG-18
P-TD-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4180832								
WG2856893-3 DUP		**L2149498-3**						
Phosphorus (P)-Total	Dissolved	0.0199	0.0190		mg/L	4.3	20	23-AUG-18
WG2856893-2 LCS								
Phosphorus (P)-Total	Dissolved		90.5		%		80-120	23-AUG-18
WG2856893-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	23-AUG-18
WG2856893-4 MS		**L2149498-3**						
Phosphorus (P)-Total	Dissolved		95.0		%		70-130	23-AUG-18
PAH-PWQO-WT	**Water**							
Batch R4178997								
WG2854575-2 LCS								
1-Methylnaphthalene			93.9		%		50-150	21-AUG-18
2-Methylnaphthalene			90.9		%		50-150	21-AUG-18
Acenaphthene			94.5		%		50-150	21-AUG-18
Acenaphthylene			95.2		%		50-150	21-AUG-18
Anthracene			100.1		%		60-130	21-AUG-18
Benzo(a)anthracene			113.0		%		60-130	21-AUG-18
Benzo(a)pyrene			98.1		%		50-150	21-AUG-18
Benzo(b)fluoranthene			95.4		%		50-150	21-AUG-18
Benzo(g,h,i)perylene			98.8		%		60-130	21-AUG-18
Benzo(k)fluoranthene			101.7		%		60-130	21-AUG-18
Chrysene			112.3		%		60-130	21-AUG-18
Dibenzo(ah)anthracene			97.5		%		60-130	21-AUG-18
Fluoranthene			100.2		%		60-130	21-AUG-18
Fluorene			98.6		%		50-150	21-AUG-18
Indeno(1,2,3-cd)pyrene			105.8		%		50-150	21-AUG-18
Naphthalene			93.3		%		50-150	21-AUG-18
Phenanthrene			100.6		%		50-150	21-AUG-18
Pyrene			100.7		%		50-150	21-AUG-18
WG2854575-3 LCSD		**WG2854575-2**						
1-Methylnaphthalene		93.9	95.8		%	2.0	50	21-AUG-18
2-Methylnaphthalene		90.9	92.7		%	2.0	50	21-AUG-18
Acenaphthene		94.5	95.8		%	1.4	50	21-AUG-18
Acenaphthylene		95.2	96.0		%	0.8	50	21-AUG-18
Anthracene		100.1	93.4		%	6.9	50	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4178997								
WG2854575-3 LCSD		**WG2854575-2**						
Benzo(a)anthracene		113.0	115.0		%	1.8	50	21-AUG-18
Benzo(a)pyrene		98.1	99.4		%	1.3	50	21-AUG-18
Benzo(b)fluoranthene		95.4	96.8		%	1.4	50	21-AUG-18
Benzo(g,h,i)perylene		98.8	100.7		%	1.9	50	21-AUG-18
Benzo(k)fluoranthene		101.7	102.4		%	0.7	50	21-AUG-18
Chrysene		112.3	117.4		%	4.4	50	21-AUG-18
Dibenzo(ah)anthracene		97.5	98.7		%	1.2	50	21-AUG-18
Fluoranthene		100.2	102.5		%	2.3	50	21-AUG-18
Fluorene		98.6	99.8		%	1.2	50	21-AUG-18
Indeno(1,2,3-cd)pyrene		105.8	107.7		%	1.8	50	21-AUG-18
Naphthalene		93.3	95.4		%	2.3	50	21-AUG-18
Phenanthrene		100.6	100.7		%	0.1	50	21-AUG-18
Pyrene		100.7	102.7		%	2.0	50	21-AUG-18
WG2854575-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	21-AUG-18
2-Methylnaphthalene			<0.020		ug/L		0.02	21-AUG-18
Acenaphthene			<0.020		ug/L		0.02	21-AUG-18
Acenaphthylene			<0.020		ug/L		0.02	21-AUG-18
Anthracene			<0.010		ug/L		0.01	21-AUG-18
Benzo(a)anthracene			<0.020		ug/L		0.02	21-AUG-18
Benzo(a)pyrene			<0.010		ug/L		0.01	21-AUG-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	21-AUG-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	21-AUG-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	21-AUG-18
Chrysene			<0.010		ug/L		0.01	21-AUG-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	21-AUG-18
Fluoranthene			<0.010		ug/L		0.01	21-AUG-18
Fluorene			<0.020		ug/L		0.02	21-AUG-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	21-AUG-18
Naphthalene			<0.050		ug/L		0.05	21-AUG-18
Phenanthrene			<0.020		ug/L		0.02	21-AUG-18
Pyrene			<0.020		ug/L		0.02	21-AUG-18
Surrogate: d8-Naphthalene			95.9		%		40-130	21-AUG-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4178997								
WG2854575-1 MB								
Surrogate: d10-Phenanthrene			100.5		%		40-130	21-AUG-18
Surrogate: d12-Chrysene			102.5		%		40-130	21-AUG-18
Surrogate: d10-Acenaphthene			95.2		%		40-130	21-AUG-18
PH-WT	**Water**							
Batch R4179829								
WG2854999-12 DUP		**WG2854999-11**						
pH		7.76	7.73	J	pH units	0.03	0.2	21-AUG-18
WG2854999-4 DUP		**WG2854999-3**						
pH		7.69	7.75	J	pH units	0.06	0.2	21-AUG-18
WG2854999-10 LCS								
pH			7.00		pH units		6.9-7.1	21-AUG-18
WG2854999-2 LCS								
pH			7.01		pH units		6.9-7.1	21-AUG-18
SOLIDS-TSS-WT	**Water**							
Batch R4180946								
WG2856279-2 LCS								
Total Suspended Solids			101.2		%		85-115	23-AUG-18
WG2856279-1 MB								
Total Suspended Solids			<2.0		mg/L		2	23-AUG-18
TC-MF-WT	**Water**							
Batch R4178965								
WG2854120-3 DUP		**L2149498-3**						
Total Coliforms		119000	113000		CFU/100mL	5.2	65	21-AUG-18
WG2854120-1 MB								
Total Coliforms			0		CFU/100mL		1	21-AUG-18
TKN-WT	**Water**							
Batch R4181444								
WG2856923-3 DUP		**WG2856923-5**						
Total Kjeldahl Nitrogen		173	170		mg/L	1.7	20	23-AUG-18
WG2856923-2 LCS								
Total Kjeldahl Nitrogen			94.9		%		75-125	23-AUG-18
WG2856923-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	23-AUG-18
WG2856923-4 MS		**WG2856923-5**						
Total Kjeldahl Nitrogen			N/A	MS-B	%		70-130	23-AUG-18

Quality Control Report

Workorder: L2149498 Report Date: 27-AUG-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

L2149498-COFC

Canada Toll Free: 1 800 668 9878

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	laframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2149498

ALS Contact: Gayle **Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT, P-TD-COL-WT	PAH-PWQO-WT	PH-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	Water Quality -1 (WQ-1)	18-08-18	11:45	Water	R	R	R	R	R	R	R	R	R	R	R	R				12
	Water Quality -2 (WQ-2)	18-08-18	14:30	Water	R	R	R	R	R	R	R	R	R	R	R	R				12
	Water Quality -3 (WQ-3)	18-08-18	14:00	Water	R	R	R	R	R	R	R	R	R	R	R	R				12
	Water Quality -4 (WQ-4)	18-08-18	13:45	Water	R	R	R	R	R	R	R	R	R	R	R	R				12

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☐ | Ice Cubes ☒ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				5.6			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
							9-Aug-2018	9:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 25-SEP-18
Report Date: 05-OCT-18 10:56 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2170515

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers:
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170515-1	WQ-1	Anions and Nutrients	Phosphorus, Total	0.109	0.01	mg/L
		Bacteriological Tests	E. Coli	4600	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.367	0.015	mg/L
			Copper (Cu)-Total	0.0043	0.001	mg/L
			Iron (Fe)-Total	0.746	0.3	mg/L
			Lead (Pb)-Total	0.00278	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.012	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.028	0.008	ug/L
L2170515-2	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0723	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.102	0.015	mg/L
			Copper (Cu)-Total	0.0016	0.001	mg/L
			Iron (Fe)-Total	0.353	0.3	mg/L
			Lead (Pb)-Total	0.00323	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.010	0.0002	ug/L
			Chrysene	0.018	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.055	0.008	ug/L
L2170515-3	WQ-3	Anions and Nutrients	Phosphorus, Total	0.135	0.01	mg/L
		Bacteriological Tests	E. Coli	43000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.676	0.015	mg/L
			Copper (Cu)-Total	0.0067	0.001	mg/L
			Iron (Fe)-Total	1.40	0.3	mg/L
			Lead (Pb)-Total	0.00339	0.001	mg/L
			Zinc (Zn)-Total	0.0250	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2170515-3	WQ-3	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.034	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.100	0.008	ug/L
			Phenanthrene	0.056	0.03	ug/L
L2170515-4	WQ-4	Anions and Nutrients	Phosphorus, Total	0.133	0.01	mg/L
		Bacteriological Tests	E. Coli	19000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.367	0.015	mg/L
			Copper (Cu)-Total	0.0104	0.001	mg/L
			Iron (Fe)-Total	1.23	0.3	mg/L
			Lead (Pb)-Total	0.00563	0.001	mg/L
			Zinc (Zn)-Total	0.0362	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.014	0.0008	ug/L
			Benzo(a)anthracene	0.042	0.0004	ug/L
			Benzo(g,h,i)perylene	0.050	0.00002	ug/L
			Benzo(k)fluoranthene	0.036	0.0002	ug/L
			Chrysene	0.094	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.264	0.008	ug/L
			Phenanthrene	0.133	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2170515-1	25-SEP-18	WQ-1
				L2170515-2	25-SEP-18	WQ-2
				L2170515-3	25-SEP-18	WQ-3
				L2170515-4	25-SEP-18	WQ-4
Conductivity	umhos/cm	-	-	979	1180	947	370
Hardness (as CaCO3)	mg/L	-	-	220 HTC	240 HTC	214 HTC	88 HTC
pH	pH units	6.5-8.5	-	7.90	8.05	7.82	7.62
Total Suspended Solids	mg/L	-	-	41.9	13.1	26.6	24.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170515-1 / Sample Date: 25-SEP-18 / Sample ID: WQ-1	Lab ID: L2170515-2 / Sample Date: 25-SEP-18 / Sample ID: WQ-2	Lab ID: L2170515-3 / Sample Date: 25-SEP-18 / Sample ID: WQ-3	Lab ID: L2170515-4 / Sample Date: 25-SEP-18 / Sample ID: WQ-4
Chloride (Cl)	mg/L	-	-	206	273 DLDS	198	70.9
Nitrate (as N)	mg/L	-	-	0.291	0.47 DLDS	1.79	0.591
Nitrite (as N)	mg/L	-	-	0.015	<0.050 DLDS	0.033	0.014
Total Kjeldahl Nitrogen	mg/L	-	-	2.81	2.04	<1.5 DLM	<1.5 DLM
Total Nitrogen	mg/L	-	-	3.12	2.51	1.8	<1.5
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0164	0.0125	0.0480	0.0379
Phosphorus, Total	mg/L	0.01	-	0.109	0.0723	0.135	0.133

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Bacteriological Tests - WATER

			Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
			Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
E. Coli	CFU/100mL	100	-	4600 DLM	100 DLM	43000 DLM	19000 DLM
Total Coliforms	CFU/100mL	-	-	4800 DLM	5500 DLM	>200000 DLM	>200000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

		Guide Limits					
				Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Sodium Adsorption Ratio	SAR	-	-		3.25	3.98	3.14	1.81

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Aluminum (Al)-Total	mg/L	0.015	-		0.367	0.102	0.676	0.367
Antimony (Sb)-Total	mg/L	0.02	-		0.00054	0.00064	0.00078	0.00070
Arsenic (As)-Total	mg/L	0.005	-		0.00091	0.00078	0.00071	0.00062
Barium (Ba)-Total	mg/L	-	-		0.0708	0.0753	0.0603	0.0264
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.039	0.041	0.034	0.019
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000024	0.000022	0.000034	0.000051
Calcium (Ca)-Total	mg/L	-	-		60.7	66.1	62.1	25.8
Cesium (Cs)-Total	mg/L	-	-		0.000034	<0.000010	0.000066	0.000035
Chromium (Cr)-Total	mg/L	-	-		0.00084	0.00060	0.00177	0.00202
Cobalt (Co)-Total	mg/L	0.0009	-		0.00030	0.00011	0.00058	0.00029
Copper (Cu)-Total	mg/L	0.001	-		0.0043	0.0016	0.0067	0.0104
Iron (Fe)-Total	mg/L	0.3	-		0.746	0.353	1.40	1.23
Lead (Pb)-Total	mg/L	0.001	-		0.00278	0.00323	0.00339	0.00563
Magnesium (Mg)-Total	mg/L	-	-		16.7	18.3	14.2	5.74
Manganese (Mn)-Total	mg/L	-	-		0.0912	0.0486	0.0889	0.0803
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000840	0.000901	0.00101	0.00100
Nickel (Ni)-Total	mg/L	0.025	-		0.00130	0.00087	0.00183	0.00128
Potassium (K)-Total	mg/L	-	-		3.38	2.96	3.19	2.76
Rubidium (Rb)-Total	mg/L	-	-		0.00159	0.00096	0.00201	0.00179
Selenium (Se)-Total	mg/L	0.1	-		0.000420	0.000590	0.000609	0.000188
Silicon (Si)-Total	mg/L	-	-		3.11	2.77	3.93	1.90
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		111 DLHC	142 DLHC	105 DLHC	39.0
Strontium (Sr)-Total	mg/L	-	-		0.287	0.291	0.238	0.123
Sulfur (S)-Total	mg/L	-	-		11.9	14.1	10.3	4.58
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	0.000012	0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2170515-1	L2170515-2	L2170515-3	L2170515-4
				25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				WQ-1	WQ-2	WQ-3	WQ-4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00022	0.00026	0.00052	0.00057
Titanium (Ti)-Total	mg/L	-	-	0.00970	0.00292	0.0209	0.0126
Tungsten (W)-Total	mg/L	0.03	-	0.00018	0.00020	<0.00010	0.00011
Uranium (U)-Total	mg/L	0.005	-	0.000831	0.00108	0.000839	0.000180
Vanadium (V)-Total	mg/L	0.006	-	0.00154	0.00100	0.00244	0.00179
Zinc (Zn)-Total	mg/L	0.02	-	0.0117	0.0063	0.0250	0.0362
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	0.00047	0.00045

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits					
				Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
				Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Chromium, Hexavalent	ug/L	1	-		<0.50	<0.50	0.51	0.90

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2170515-1 Sample Date: 25-SEP-18 Sample ID: WQ-1	Lab ID: L2170515-2 Sample Date: 25-SEP-18 Sample ID: WQ-2	Lab ID: L2170515-3 Sample Date: 25-SEP-18 Sample ID: WQ-3	Lab ID: L2170515-4 Sample Date: 25-SEP-18 Sample ID: WQ-4
Acetone	ug/L	-	-	<30 VTHS	<30	<30	<30 VTHS
Benzene	ug/L	100	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Bromodichloromethane	ug/L	200	-	<2.0 VTHS	<2.0	<2.0	<2.0 VTHS
Bromoform	ug/L	60	-	<5.0 VTHS	<5.0	<5.0	<5.0 VTHS
Bromomethane	ug/L	-	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Carbon tetrachloride	ug/L	-	-	<0.20 VTHS	<0.20	<0.20	<0.20 VTHS
Chlorobenzene	ug/L	15	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Dibromochloromethane	ug/L	40	-	<2.0 VTHS	<2.0	<2.0	<2.0 VTHS
Chloroform	ug/L	-	-	<1.0 VTHS	<1.0	<1.0	<1.0 VTHS
1,2-Dibromoethane	ug/L	5	-	<0.20 VTHS	<0.20	<0.20	<0.20 VTHS
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,4-Dichlorobenzene	ug/L	4	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Dichlorodifluoromethane	ug/L	-	-	<2.0 VTHS	<2.0	<2.0	<2.0 VTHS
1,1-Dichloroethane	ug/L	200	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,2-Dichloroethane	ug/L	100	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,1-Dichloroethylene	ug/L	40	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50 VTHS	<0.50	0.66	1.06 VTHS
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Methylene Chloride	ug/L	100	-	<5.0 VTHS	<5.0	<5.0	<5.0 VTHS
1,2-Dichloropropane	ug/L	0.7	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 VTHS	<0.30	<0.30	<0.30 VTHS
trans-1,3-Dichloropropene	ug/L	7	-	<0.30 VTHS	<0.30	<0.30	<0.30 VTHS
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
n-Hexane	ug/L	-	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Methyl Ethyl Ketone	ug/L	400	-	<20 VTHS	<20	<20	<20 VTHS
Methyl Isobutyl Ketone	ug/L	-	-	<20 VTHS	<20	<20	<20 VTHS
MTBE	ug/L	-	-	<2.0 VTHS	<2.0	<2.0	<2.0 VTHS
Styrene	ug/L	4	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2170515-1	L2170515-2	L2170515-3	L2170515-4
			Sample Date	25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Tetrachloroethylene	ug/L	50	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Toluene	ug/L	0.8	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,1,1-Trichloroethane	ug/L	10	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
1,1,2-Trichloroethane	ug/L	800	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Trichloroethylene	ug/L	20	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
Trichlorofluoromethane	ug/L	-	-	<5.0 VTHS	<5.0	<5.0	<5.0 VTHS
Vinyl chloride	ug/L	600	-	<0.50 VTHS	<0.50	<0.50	<0.50 VTHS
o-Xylene	ug/L	40	-	<0.30 VTHS	<0.30	<0.30	<0.30 VTHS
m+p-Xylenes	ug/L	2	-	<0.40 VTHS	<0.40	<0.40	<0.40 VTHS
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	92.1	94.7	93.8	92.7
Surrogate: 1,4-Difluorobenzene	%	-	-	99.0	101.0	99.3	98.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2170515-1	25-SEP-18	WQ-1
				L2170515-2	25-SEP-18	WQ-2
				L2170515-3	25-SEP-18	WQ-3
				L2170515-4	25-SEP-18	WQ-4
F1 (C6-C10)	ug/L	-	-	<25 VTHS	<25	<25	<25 VTHS
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F3-PAH	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	99.2	96.7	99.8	96.3
Surrogate: 3,4-Dichlorotoluene	%	-	-	75.2	73.3	73.9	79.2

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2170515-1	L2170515-2	L2170515-3	L2170515-4
Sample Date				25-SEP-18	25-SEP-18	25-SEP-18	25-SEP-18
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	0.057
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	0.014
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	0.042
Benzo(a)pyrene	ug/L	-	-	<0.010	0.011	<0.010	0.039
Benzo(b)fluoranthene	ug/L	-	-	<0.020	0.028	0.033	0.120
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	0.050
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	0.010	<0.010	0.036
Chrysene	ug/L	0.0001	-	0.012	0.018	0.034	0.094
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.028	0.055	0.100	0.264
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	0.046
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	0.054
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	0.056	0.133
Pyrene	ug/L	-	-	0.024	0.044	0.070	0.176
Surrogate: d10-Acenaphthene	%	-	-	101.0	110.9	99.2	103.0
Surrogate: d12-Chrysene	%	-	-	102.3	115.7	103.9	110.4
Surrogate: d8-Naphthalene	%	-	-	107.2	118.0	105.4	109.1
Surrogate: d10-Phenanthrene	%	-	-	105.9	116.5	103.8	107.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
VTHS	Volatile test was conducted on sample with headspace. Results may be biased low.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P B E

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Reference Information

WT ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2170515 Report Date: 05-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Chloride (Cl)		70.9	70.8		mg/L	0.1	20	28-SEP-18
WG2889777-4 DUP		**WG2889777-3**						
Chloride (Cl)		117	117		mg/L	0.1	20	28-SEP-18
WG2889777-2 LCS								
Chloride (Cl)			100.3		%		90-110	28-SEP-18
WG2889777-7 LCS								
Chloride (Cl)			100.1		%		90-110	28-SEP-18
WG2889777-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	28-SEP-18
WG2889777-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	28-SEP-18
WG2889777-5 MS		**WG2889777-3**						
Chloride (Cl)			N/A	MS-B	%		-	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Chloride (Cl)			100.2		%		75-125	28-SEP-18
CN-FREE-CFA-WT	**Water**							
Batch R4245670								
WG2887461-3 DUP		**L2170515-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887461-2 LCS								
Cyanide, Free			96.5		%		80-120	26-SEP-18
WG2887461-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	26-SEP-18
WG2887461-4 MS		**L2170515-1**						
Cyanide, Free			86.1		%		75-125	26-SEP-18
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4251082								
WG2889578-4 DUP		**WG2889578-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	28-SEP-18
WG2889578-9 DUP		**WG2889578-8**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	28-SEP-18
WG2889578-2 LCS								
Chromium, Hexavalent			99.6		%		80-120	28-SEP-18
WG2889578-7 LCS								
Chromium, Hexavalent			99.5		%		80-120	28-SEP-18
WG2889578-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4251082								
WG2889578-6 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	28-SEP-18
WG2889578-10 MS		**WG2889578-8**						
Chromium, Hexavalent			95.9		%		70-130	28-SEP-18
WG2889578-5 MS		**WG2889578-3**						
Chromium, Hexavalent			95.7		%		70-130	28-SEP-18
EC-MF-WT	**Water**							
Batch R4246827								
WG2887262-3 DUP		**L2170520-9**						
E. Coli		3900	3700		CFU/100mL	5.3	65	27-SEP-18
WG2887262-1 MB								
E. Coli			0		CFU/100mL		1	27-SEP-18
EC-WT	**Water**							
Batch R4245236								
WG2886889-8 DUP		**WG2886889-7**						
Conductivity		2300	2300		umhos/cm	0.0	10	26-SEP-18
WG2886889-6 LCS								
Conductivity			100.1		%		90-110	26-SEP-18
WG2886889-5 MB								
Conductivity			<3.0		umhos/cm		3	26-SEP-18
F1-HS-511-WT	**Water**							
Batch R4249368								
WG2888166-4 DUP		**WG2888166-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	28-SEP-18
WG2888166-1 LCS								
F1 (C6-C10)			85.4		%		80-120	28-SEP-18
WG2888166-2 MB								
F1 (C6-C10)			<25		ug/L		25	28-SEP-18
Surrogate: 3,4-Dichlorotoluene			66.7		%		60-140	28-SEP-18
WG2888166-5 MS		**WG2888166-3**						
F1 (C6-C10)			81.8		%		60-140	28-SEP-18
F2-F4-511-WT	**Water**							
Batch R4251008								
WG2887995-2 LCS								
F2 (C10-C16)			95.1		%		70-130	27-SEP-18
F3 (C16-C34)			100.2		%		70-130	27-SEP-18
F4 (C34-C50)			108.4		%		70-130	27-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT	**Water**							
Batch R4251008								
WG2887995-3 LCSD		**WG2887995-2**						
F2 (C10-C16)		95.1	93.6		%	1.6	50	27-SEP-18
F3 (C16-C34)		100.2	98.4		%	1.8	50	27-SEP-18
F4 (C34-C50)		108.4	104.7		%	3.5	50	27-SEP-18
WG2887995-1 MB								
F2 (C10-C16)			<100		ug/L		100	27-SEP-18
F3 (C16-C34)			<250		ug/L		250	27-SEP-18
F4 (C34-C50)			<250		ug/L		250	27-SEP-18
Surrogate: 2-Bromobenzotrifluoride			87.4		%		60-140	27-SEP-18
HG-T-CVAA-WT	**Water**							
Batch R4242850								
WG2887067-3 DUP		**L2169655-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887067-2 LCS								
Mercury (Hg)-Total			100.0		%		80-120	26-SEP-18
WG2887067-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	26-SEP-18
WG2887067-4 MS		**L2169900-1**						
Mercury (Hg)-Total			95.5		%		70-130	26-SEP-18
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-4 DUP		**WG2886705-3**						
Aluminum (Al)-Total		0.367	0.366		mg/L	0.4	20	26-SEP-18
Antimony (Sb)-Total		0.00054	0.00051		mg/L	6.7	20	26-SEP-18
Arsenic (As)-Total		0.00091	0.00086		mg/L	5.1	20	26-SEP-18
Barium (Ba)-Total		0.0708	0.0707		mg/L	0.1	20	26-SEP-18
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-SEP-18
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-SEP-18
Boron (B)-Total		0.039	0.039		mg/L	0.9	20	26-SEP-18
Cadmium (Cd)-Total		0.0000236	0.0000241		mg/L	2.1	20	26-SEP-18
Calcium (Ca)-Total		60.7	61.5		mg/L	1.2	20	26-SEP-18
Chromium (Cr)-Total		0.00084	0.00093		mg/L	9.8	20	26-SEP-18
Cesium (Cs)-Total		0.000034	0.000034		mg/L	0.3	20	26-SEP-18
Cobalt (Co)-Total		0.00030	0.00030		mg/L	0.6	20	26-SEP-18
Copper (Cu)-Total		0.0043	0.0042		mg/L	2.9	20	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-4 DUP		**WG2886705-3**						
Iron (Fe)-Total		0.746	0.760		mg/L	1.8	20	26-SEP-18
Lead (Pb)-Total		0.00278	0.00277		mg/L	0.6	20	26-SEP-18
Magnesium (Mg)-Total		16.7	16.7		mg/L	0.1	20	26-SEP-18
Manganese (Mn)-Total		0.0912	0.0916		mg/L	0.4	20	26-SEP-18
Molybdenum (Mo)-Total		0.000840	0.000854		mg/L	1.7	20	26-SEP-18
Nickel (Ni)-Total		0.00130	0.00125		mg/L	4.2	20	26-SEP-18
Potassium (K)-Total		3.38	3.57		mg/L	5.5	20	26-SEP-18
Rubidium (Rb)-Total		0.00159	0.00154		mg/L	2.8	20	26-SEP-18
Selenium (Se)-Total		0.000420	0.000402		mg/L	4.3	20	26-SEP-18
Silicon (Si)-Total		3.11	3.05		mg/L	1.7	20	26-SEP-18
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-SEP-18
Sodium (Na)-Total		111	110		mg/L	0.9	20	26-SEP-18
Strontium (Sr)-Total		0.287	0.274		mg/L	4.9	20	26-SEP-18
Sulfur (S)-Total		11.9	11.5		mg/L	3.3	25	26-SEP-18
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-SEP-18
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	26-SEP-18
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	26-SEP-18
Tin (Sn)-Total		0.00022	0.00021		mg/L	3.8	20	26-SEP-18
Titanium (Ti)-Total		0.00970	0.00947		mg/L	2.3	20	26-SEP-18
Tungsten (W)-Total		0.00018	0.00018		mg/L	1.4	20	26-SEP-18
Uranium (U)-Total		0.000831	0.000823		mg/L	1.0	20	26-SEP-18
Vanadium (V)-Total		0.00154	0.00146		mg/L	5.6	20	26-SEP-18
Zinc (Zn)-Total		0.0117	0.0114		mg/L	2.5	20	26-SEP-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2886705-2 LCS								
Aluminum (Al)-Total			100.3		%		80-120	26-SEP-18
Antimony (Sb)-Total			99.1		%		80-120	26-SEP-18
Arsenic (As)-Total			99.7		%		80-120	26-SEP-18
Barium (Ba)-Total			98.2		%		80-120	26-SEP-18
Beryllium (Be)-Total			97.2		%		80-120	26-SEP-18
Bismuth (Bi)-Total			98.7		%		80-120	26-SEP-18
Boron (B)-Total			94.1		%		80-120	26-SEP-18
Cadmium (Cd)-Total			102.2		%		80-120	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-2 LCS								
Calcium (Ca)-Total			98.5		%		80-120	26-SEP-18
Chromium (Cr)-Total			99.4		%		80-120	26-SEP-18
Cesium (Cs)-Total			102.2		%		80-120	26-SEP-18
Cobalt (Co)-Total			98.5		%		80-120	26-SEP-18
Copper (Cu)-Total			99.3		%		80-120	26-SEP-18
Iron (Fe)-Total			99.6		%		80-120	26-SEP-18
Lead (Pb)-Total			96.3		%		80-120	26-SEP-18
Magnesium (Mg)-Total			100.1		%		80-120	26-SEP-18
Manganese (Mn)-Total			100.2		%		80-120	26-SEP-18
Molybdenum (Mo)-Total			101.2		%		80-120	26-SEP-18
Nickel (Ni)-Total			99.2		%		80-120	26-SEP-18
Potassium (K)-Total			93.8		%		80-120	26-SEP-18
Rubidium (Rb)-Total			103.6		%		80-120	26-SEP-18
Selenium (Se)-Total			101.8		%		80-120	26-SEP-18
Silicon (Si)-Total			98.9		%		60-140	26-SEP-18
Silver (Ag)-Total			99.7		%		80-120	26-SEP-18
Sodium (Na)-Total			99.6		%		80-120	26-SEP-18
Strontium (Sr)-Total			106.4		%		80-120	26-SEP-18
Sulfur (S)-Total			91.3		%		80-120	26-SEP-18
Thallium (Tl)-Total			95.2		%		80-120	26-SEP-18
Tellurium (Te)-Total			97.7		%		80-120	26-SEP-18
Thorium (Th)-Total			95.2		%		70-130	26-SEP-18
Tin (Sn)-Total			100.0		%		80-120	26-SEP-18
Titanium (Ti)-Total			95.8		%		80-120	26-SEP-18
Tungsten (W)-Total			92.9		%		80-120	26-SEP-18
Uranium (U)-Total			97.4		%		80-120	26-SEP-18
Vanadium (V)-Total			100.7		%		80-120	26-SEP-18
Zinc (Zn)-Total			96.3		%		80-120	26-SEP-18
Zirconium (Zr)-Total			102.0		%		80-120	26-SEP-18
WG2886705-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	26-SEP-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-1 MB								
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Boron (B)-Total			<0.010		mg/L		0.01	26-SEP-18
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	26-SEP-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-SEP-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Copper (Cu)-Total			<0.0010		mg/L		0.001	26-SEP-18
Iron (Fe)-Total			<0.010		mg/L		0.01	26-SEP-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-SEP-18
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Potassium (K)-Total			<0.050		mg/L		0.05	26-SEP-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	26-SEP-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Silicon (Si)-Total			<0.10		mg/L		0.1	26-SEP-18
Silver (Ag)-Total			<0.000050		mg/L		0.00005	26-SEP-18
Sodium (Na)-Total			<0.050		mg/L		0.05	26-SEP-18
Strontium (Sr)-Total			<0.0010		mg/L		0.001	26-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	26-SEP-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	26-SEP-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-SEP-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	26-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-SEP-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-SEP-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-SEP-18
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	26-SEP-18
WG2886705-5 MS		**WG2886705-6**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-5 MS		**WG2886705-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	26-SEP-18
Antimony (Sb)-Total			95.2		%		70-130	26-SEP-18
Arsenic (As)-Total			92.3		%		70-130	26-SEP-18
Barium (Ba)-Total			N/A	MS-B	%		-	26-SEP-18
Beryllium (Be)-Total			85.2		%		70-130	26-SEP-18
Bismuth (Bi)-Total			86.8		%		70-130	26-SEP-18
Boron (B)-Total			80.4		%		70-130	26-SEP-18
Cadmium (Cd)-Total			91.7		%		70-130	26-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	26-SEP-18
Chromium (Cr)-Total			91.2		%		70-130	26-SEP-18
Cesium (Cs)-Total			92.5		%		70-130	26-SEP-18
Cobalt (Co)-Total			88.8		%		70-130	26-SEP-18
Copper (Cu)-Total			88.4		%		70-130	26-SEP-18
Iron (Fe)-Total			N/A	MS-B	%		-	26-SEP-18
Lead (Pb)-Total			85.0		%		70-130	26-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-SEP-18
Manganese (Mn)-Total			N/A	MS-B	%		-	26-SEP-18
Molybdenum (Mo)-Total			95.5		%		70-130	26-SEP-18
Nickel (Ni)-Total			87.6		%		70-130	26-SEP-18
Potassium (K)-Total			N/A	MS-B	%		-	26-SEP-18
Rubidium (Rb)-Total			92.4		%		70-130	26-SEP-18
Selenium (Se)-Total			93.9		%		70-130	26-SEP-18
Silicon (Si)-Total			N/A	MS-B	%		-	26-SEP-18
Silver (Ag)-Total			87.2		%		70-130	26-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	26-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	26-SEP-18
Sulfur (S)-Total			N/A	MS-B	%		-	26-SEP-18
Thallium (Tl)-Total			86.7		%		70-130	26-SEP-18
Tellurium (Te)-Total			84.7		%		70-130	26-SEP-18
Thorium (Th)-Total			79.0		%		70-130	26-SEP-18
Tin (Sn)-Total			90.7		%		70-130	26-SEP-18
Titanium (Ti)-Total			90.7		%		70-130	26-SEP-18
Tungsten (W)-Total			87.6		%		70-130	26-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4242695								
WG2886705-5 MS		**WG2886705-6**						
Uranium (U)-Total			N/A	MS-B	%		-	26-SEP-18
Vanadium (V)-Total			93.9		%		70-130	26-SEP-18
Zinc (Zn)-Total			86.9		%		70-130	26-SEP-18
Zirconium (Zr)-Total			74.0		%		70-130	26-SEP-18
NO2-IC-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Nitrite (as N)		0.015	0.014		mg/L	1.9	25	28-SEP-18
WG2889777-4 DUP		**WG2889777-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	28-SEP-18
WG2889777-2 LCS								
Nitrite (as N)			102.8		%		70-130	28-SEP-18
WG2889777-7 LCS								
Nitrite (as N)			105.1		%		70-130	28-SEP-18
WG2889777-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	28-SEP-18
WG2889777-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	28-SEP-18
WG2889777-5 MS		**WG2889777-3**						
Nitrite (as N)			102.9		%		70-130	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Nitrite (as N)			102.8		%		70-130	28-SEP-18
NO3-IC-WT	**Water**							
Batch R4255227								
WG2889777-10 DUP		**WG2889777-8**						
Nitrate (as N)		0.595	0.598		mg/L	0.6	25	28-SEP-18
WG2889777-4 DUP		**WG2889777-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	28-SEP-18
WG2889777-2 LCS								
Nitrate (as N)			101.0		%		70-130	28-SEP-18
WG2889777-7 LCS								
Nitrate (as N)			100.9		%		70-130	28-SEP-18
WG2889777-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	28-SEP-18
WG2889777-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4255227								
WG2889777-5 MS		**WG2889777-3**						
Nitrate (as N)			99.3		%		70-130	28-SEP-18
WG2889777-9 MS		**WG2889777-8**						
Nitrate (as N)			102.7		%		70-130	28-SEP-18
P-T-COL-WT	**Water**							
Batch R4252009								
WG2889947-3 DUP		**L2169900-1**						
Phosphorus, Total		0.848	0.891		mg/L	4.9	20	30-SEP-18
WG2889947-2 LCS								
Phosphorus, Total			95.3		%		80-120	30-SEP-18
WG2889947-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	30-SEP-18
WG2889947-4 MS		**L2169900-1**						
Phosphorus, Total			N/A	MS-B	%		-	30-SEP-18
P-TD-COL-WT	**Water**							
Batch R4252006								
WG2889948-3 DUP		**L2170515-2**						
Phosphorus (P)-Total	Dissolved	0.0125	0.0122		mg/L	2.7	20	30-SEP-18
WG2889948-2 LCS								
Phosphorus (P)-Total	Dissolved		95.8		%		80-120	30-SEP-18
WG2889948-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	30-SEP-18
WG2889948-4 MS		**L2170515-2**						
Phosphorus (P)-Total	Dissolved		97.9		%		70-130	30-SEP-18
PAH-PWQO-WT	**Water**							
Batch R4259731								
WG2887995-2 LCS								
1-Methylnaphthalene			90.1		%		50-150	04-OCT-18
2-Methylnaphthalene			92.4		%		50-150	04-OCT-18
Acenaphthene			91.8		%		50-150	04-OCT-18
Acenaphthylene			94.9		%		50-150	04-OCT-18
Anthracene			98.6		%		60-130	04-OCT-18
Benzo(a)anthracene			115.4		%		60-130	04-OCT-18
Benzo(a)pyrene			100.2		%		50-150	04-OCT-18
Benzo(b)fluoranthene			110.2		%		50-150	04-OCT-18
Benzo(g,h,i)perylene			97.5		%		60-130	04-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4259731								
WG2887995-2 LCS								
Benzo(k)fluoranthene			101.4		%		60-130	04-OCT-18
Chrysene			109.0		%		60-130	04-OCT-18
Dibenzo(ah)anthracene			102.2		%		60-130	04-OCT-18
Fluoranthene			103.8		%		60-130	04-OCT-18
Fluorene			98.1		%		50-150	04-OCT-18
Indeno(1,2,3-cd)pyrene			110.2		%		50-150	04-OCT-18
Naphthalene			102.6		%		50-150	04-OCT-18
Phenanthrene			102.3		%		50-150	04-OCT-18
Pyrene			104.6		%		50-150	04-OCT-18
WG2887995-3 LCSD		**WG2887995-2**						
1-Methylnaphthalene		90.1	88.3		%	2.0	50	04-OCT-18
2-Methylnaphthalene		92.4	91.0		%	1.5	50	04-OCT-18
Acenaphthene		91.8	89.9		%	2.1	50	04-OCT-18
Acenaphthylene		94.9	93.0		%	2.0	50	04-OCT-18
Anthracene		98.6	97.1		%	1.5	50	04-OCT-18
Benzo(a)anthracene		115.4	113.7		%	1.5	50	04-OCT-18
Benzo(a)pyrene		100.2	97.8		%	2.3	50	04-OCT-18
Benzo(b)fluoranthene		110.2	106.9		%	3.1	50	04-OCT-18
Benzo(g,h,i)perylene		97.5	97.8		%	0.2	50	04-OCT-18
Benzo(k)fluoranthene		101.4	100.1		%	1.3	50	04-OCT-18
Chrysene		109.0	110.2		%	1.1	50	04-OCT-18
Dibenzo(ah)anthracene		102.2	101.4		%	0.8	50	04-OCT-18
Fluoranthene		103.8	102.7		%	1.1	50	04-OCT-18
Fluorene		98.1	97.1		%	1.0	50	04-OCT-18
Indeno(1,2,3-cd)pyrene		110.2	108.5		%	1.6	50	04-OCT-18
Naphthalene		102.6	99.9		%	2.6	50	04-OCT-18
Phenanthrene		102.3	100.9		%	1.4	50	04-OCT-18
Pyrene		104.6	103.2		%	1.3	50	04-OCT-18
WG2887995-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
2-Methylnaphthalene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthene			<0.020		ug/L		0.02	04-OCT-18
Acenaphthylene			<0.020		ug/L		0.02	04-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4259731								
WG2887995-1 MB								
Anthracene			<0.010		ug/L		0.01	04-OCT-18
Benzo(a)anthracene			<0.020		ug/L		0.02	04-OCT-18
Benzo(a)pyrene			<0.010		ug/L		0.01	04-OCT-18
Benzo(b)fluoranthene			<0.020		ug/L		0.02	04-OCT-18
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	04-OCT-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	04-OCT-18
Chrysene			<0.010		ug/L		0.01	04-OCT-18
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	04-OCT-18
Fluoranthene			<0.010		ug/L		0.01	04-OCT-18
Fluorene			<0.020		ug/L		0.02	04-OCT-18
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	04-OCT-18
Naphthalene			0.070	B	ug/L		0.05	04-OCT-18
Phenanthrene			<0.020		ug/L		0.02	04-OCT-18
Pyrene			<0.020		ug/L		0.02	04-OCT-18
Surrogate: d8-Naphthalene			100.6		%		40-130	04-OCT-18
Surrogate: d10-Phenanthrene			99.4		%		40-130	04-OCT-18
Surrogate: d12-Chrysene			98.0		%		40-130	04-OCT-18
Surrogate: d10-Acenaphthene			94.1		%		40-130	04-OCT-18
PH-WT	**Water**							
Batch R4245236								
WG2886889-8 DUP		**WG2886889-7**						
pH		7.76	7.78	J	pH units	0.02	0.2	26-SEP-18
WG2886889-6 LCS								
pH			7.01		pH units		6.9-7.1	26-SEP-18
SOLIDS-TSS-WT	**Water**							
Batch R4249687								
WG2888278-3 DUP		**L2170520-3**						
Total Suspended Solids		10.4	11.2		mg/L	7.4	20	28-SEP-18
WG2888278-2 LCS								
Total Suspended Solids			99.5		%		85-115	28-SEP-18
WG2888278-1 MB								
Total Suspended Solids			<2.0		mg/L		2	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4249761								
WG2888270-3 DUP		**L2170307-1**						
Total Suspended Solids		99.0	97.0		mg/L	2.0	20	28-SEP-18
WG2888270-2 LCS								
Total Suspended Solids			98.9		%		85-115	28-SEP-18
WG2888270-1 MB								
Total Suspended Solids			<2.0		mg/L		2	28-SEP-18
TC-MF-WT	**Water**							
Batch R4249857								
WG2887270-3 DUP		**L2170520-5**						
Total Coliforms		132000	128000		CFU/100mL	3.1	65	27-SEP-18
WG2887270-1 MB								
Total Coliforms			0		CFU/100mL		1	27-SEP-18
TKN-WT	**Water**							
Batch R4258963								
WG2892086-2 LCS								
Total Kjeldahl Nitrogen			93.1		%		75-125	03-OCT-18
WG2892086-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	03-OCT-18
Batch R4259941								
WG2893615-3 DUP		**L2172729-9**						
Total Kjeldahl Nitrogen		0.80	0.80		mg/L	0.3	20	04-OCT-18
WG2893615-2 LCS								
Total Kjeldahl Nitrogen			111.8		%		75-125	04-OCT-18
WG2893615-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	04-OCT-18
WG2893615-4 MS		**L2172729-9**						
Total Kjeldahl Nitrogen			90.3		%		70-130	04-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-4 DUP		**WG2888166-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-4 DUP		**WG2888166-3**						
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	28-SEP-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	28-SEP-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	28-SEP-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	28-SEP-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	28-SEP-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	28-SEP-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	28-SEP-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	28-SEP-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	28-SEP-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	28-SEP-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	28-SEP-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	28-SEP-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	28-SEP-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	28-SEP-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	28-SEP-18
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Toluene		0.58	0.58		ug/L	0.0	30	28-SEP-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	28-SEP-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
Trichlorofluoromethane		<5.0	<5.0		ug/L			28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-4 DUP		**WG2888166-3**						
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	28-SEP-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-SEP-18
WG2888166-1 LCS								
1,1,1,2-Tetrachloroethane			112.2		%		70-130	28-SEP-18
1,1,2,2-Tetrachloroethane			110.4		%		70-130	28-SEP-18
1,1,1-Trichloroethane			117.5		%		70-130	28-SEP-18
1,1,2-Trichloroethane			110.5		%		70-130	28-SEP-18
1,1-Dichloroethane			121.3		%		70-130	28-SEP-18
1,1-Dichloroethylene			113.2		%		70-130	28-SEP-18
1,2-Dibromoethane			108.7		%		70-130	28-SEP-18
1,2-Dichlorobenzene			116.3		%		70-130	28-SEP-18
1,2-Dichloroethane			116.7		%		70-130	28-SEP-18
1,2-Dichloropropane			116.1		%		70-130	28-SEP-18
1,3-Dichlorobenzene			116.4		%		70-130	28-SEP-18
1,4-Dichlorobenzene			117.9		%		70-130	28-SEP-18
Acetone			120.5		%		60-140	28-SEP-18
Benzene			118.7		%		70-130	28-SEP-18
Bromodichloromethane			117.9		%		70-130	28-SEP-18
Bromoform			104.8		%		70-130	28-SEP-18
Bromomethane			89.9		%		60-140	28-SEP-18
Carbon tetrachloride			118.8		%		70-130	28-SEP-18
Chlorobenzene			115.9		%		70-130	28-SEP-18
Chloroform			119.0		%		70-130	28-SEP-18
cis-1,2-Dichloroethylene			113.7		%		70-130	28-SEP-18
cis-1,3-Dichloropropene			111.7		%		70-130	28-SEP-18
Dibromochloromethane			109.6		%		70-130	28-SEP-18
Dichlorodifluoromethane			107.9		%		50-140	28-SEP-18
Ethylbenzene			114.5		%		70-130	28-SEP-18
n-Hexane			134.1	MES	%		70-130	28-SEP-18
m+p-Xylenes			112.3		%		70-130	28-SEP-18
Methyl Ethyl Ketone			106.7		%		60-140	28-SEP-18
Methyl Isobutyl Ketone			114.0		%		60-140	28-SEP-18
Methylene Chloride			117.0		%		70-130	28-SEP-18
MTBE			111.7		%		70-130	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-1 LCS								
o-Xylene			112.5		%		70-130	28-SEP-18
Styrene			112.4		%		70-130	28-SEP-18
Tetrachloroethylene			113.2		%		70-130	28-SEP-18
Toluene			108.8		%		70-130	28-SEP-18
trans-1,2-Dichloroethylene			117.1		%		70-130	28-SEP-18
trans-1,3-Dichloropropene			103.8		%		70-130	28-SEP-18
Trichloroethylene			119.4		%		70-130	28-SEP-18
Trichlorofluoromethane			129.0		%		60-140	28-SEP-18
Vinyl chloride			106.3		%		60-140	28-SEP-18
WG2888166-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1-Dichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
1,2-Dibromoethane			<0.20		ug/L		0.2	28-SEP-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
1,2-Dichloroethane			<0.50		ug/L		0.5	28-SEP-18
1,2-Dichloropropane			<0.50		ug/L		0.5	28-SEP-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	28-SEP-18
Acetone			<30		ug/L		30	28-SEP-18
Benzene			<0.50		ug/L		0.5	28-SEP-18
Bromodichloromethane			<2.0		ug/L		2	28-SEP-18
Bromoform			<5.0		ug/L		5	28-SEP-18
Bromomethane			<0.50		ug/L		0.5	28-SEP-18
Carbon tetrachloride			<0.20		ug/L		0.2	28-SEP-18
Chlorobenzene			<0.50		ug/L		0.5	28-SEP-18
Chloroform			<1.0		ug/L		1	28-SEP-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	28-SEP-18
Dibromochloromethane			<2.0		ug/L		2	28-SEP-18
Dichlorodifluoromethane			<2.0		ug/L		2	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-2 MB								
Ethylbenzene			<0.50		ug/L		0.5	28-SEP-18
n-Hexane			<0.50		ug/L		0.5	28-SEP-18
m+p-Xylenes			<0.40		ug/L		0.4	28-SEP-18
Methyl Ethyl Ketone			<20		ug/L		20	28-SEP-18
Methyl Isobutyl Ketone			<20		ug/L		20	28-SEP-18
Methylene Chloride			<5.0		ug/L		5	28-SEP-18
MTBE			<2.0		ug/L		2	28-SEP-18
o-Xylene			<0.30		ug/L		0.3	28-SEP-18
Styrene			<0.50		ug/L		0.5	28-SEP-18
Tetrachloroethylene			<0.50		ug/L		0.5	28-SEP-18
Toluene			<0.50		ug/L		0.5	28-SEP-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	28-SEP-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	28-SEP-18
Trichloroethylene			<0.50		ug/L		0.5	28-SEP-18
Trichlorofluoromethane			<5.0		ug/L		5	28-SEP-18
Vinyl chloride			<0.50		ug/L		0.5	28-SEP-18
Surrogate: 1,4-Difluorobenzene			99.7		%		70-130	28-SEP-18
Surrogate: 4-Bromofluorobenzene			93.6		%		70-130	28-SEP-18
WG2888166-5 MS		**WG2888166-3**						
1,1,1,2-Tetrachloroethane			109.7		%		50-140	28-SEP-18
1,1,2,2-Tetrachloroethane			106.3		%		50-140	28-SEP-18
1,1,1-Trichloroethane			114.7		%		50-140	28-SEP-18
1,1,2-Trichloroethane			107.6		%		50-140	28-SEP-18
1,1-Dichloroethane			116.7		%		50-140	28-SEP-18
1,1-Dichloroethylene			108.7		%		50-140	28-SEP-18
1,2-Dibromoethane			105.9		%		50-140	28-SEP-18
1,2-Dichlorobenzene			115.3		%		50-140	28-SEP-18
1,2-Dichloroethane			111.6		%		50-140	28-SEP-18
1,2-Dichloropropane			112.0		%		50-140	28-SEP-18
1,3-Dichlorobenzene			116.2		%		50-140	28-SEP-18
1,4-Dichlorobenzene			116.9		%		50-140	28-SEP-18
Acetone			127.1		%		50-140	28-SEP-18
Benzene			115.2		%		50-140	28-SEP-18
Bromodichloromethane			114.7		%		50-140	28-SEP-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4249368								
WG2888166-5 MS		**WG2888166-3**						
Bromoform			102.3		%		50-140	28-SEP-18
Bromomethane			85.2		%		50-140	28-SEP-18
Carbon tetrachloride			114.8		%		50-140	28-SEP-18
Chlorobenzene			113.5		%		50-140	28-SEP-18
Chloroform			115.5		%		50-140	28-SEP-18
cis-1,2-Dichloroethylene			111.7		%		50-140	28-SEP-18
cis-1,3-Dichloropropene			112.5		%		50-140	28-SEP-18
Dibromochloromethane			107.4		%		50-140	28-SEP-18
Dichlorodifluoromethane			110.7		%		50-140	28-SEP-18
Ethylbenzene			112.4		%		50-140	28-SEP-18
n-Hexane			126.9		%		50-140	28-SEP-18
m+p-Xylenes			110.0		%		50-140	28-SEP-18
Methyl Ethyl Ketone			105.2		%		50-140	28-SEP-18
Methyl Isobutyl Ketone			110.1		%		50-140	28-SEP-18
Methylene Chloride			111.7		%		50-140	28-SEP-18
MTBE			112.7		%		50-140	28-SEP-18
o-Xylene			110.8		%		50-140	28-SEP-18
Styrene			109.1		%		50-140	28-SEP-18
Tetrachloroethylene			113.6		%		50-140	28-SEP-18
Toluene			106.0		%		50-140	28-SEP-18
trans-1,2-Dichloroethylene			113.2		%		50-140	28-SEP-18
trans-1,3-Dichloropropene			102.1		%		50-140	28-SEP-18
Trichloroethylene			116.4		%		50-140	28-SEP-18
Trichlorofluoromethane			124.0		%		50-140	28-SEP-18
Vinyl chloride			102.7		%		50-140	28-SEP-18

Quality Control Report

Workorder: L2170515 Report Date: 05-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

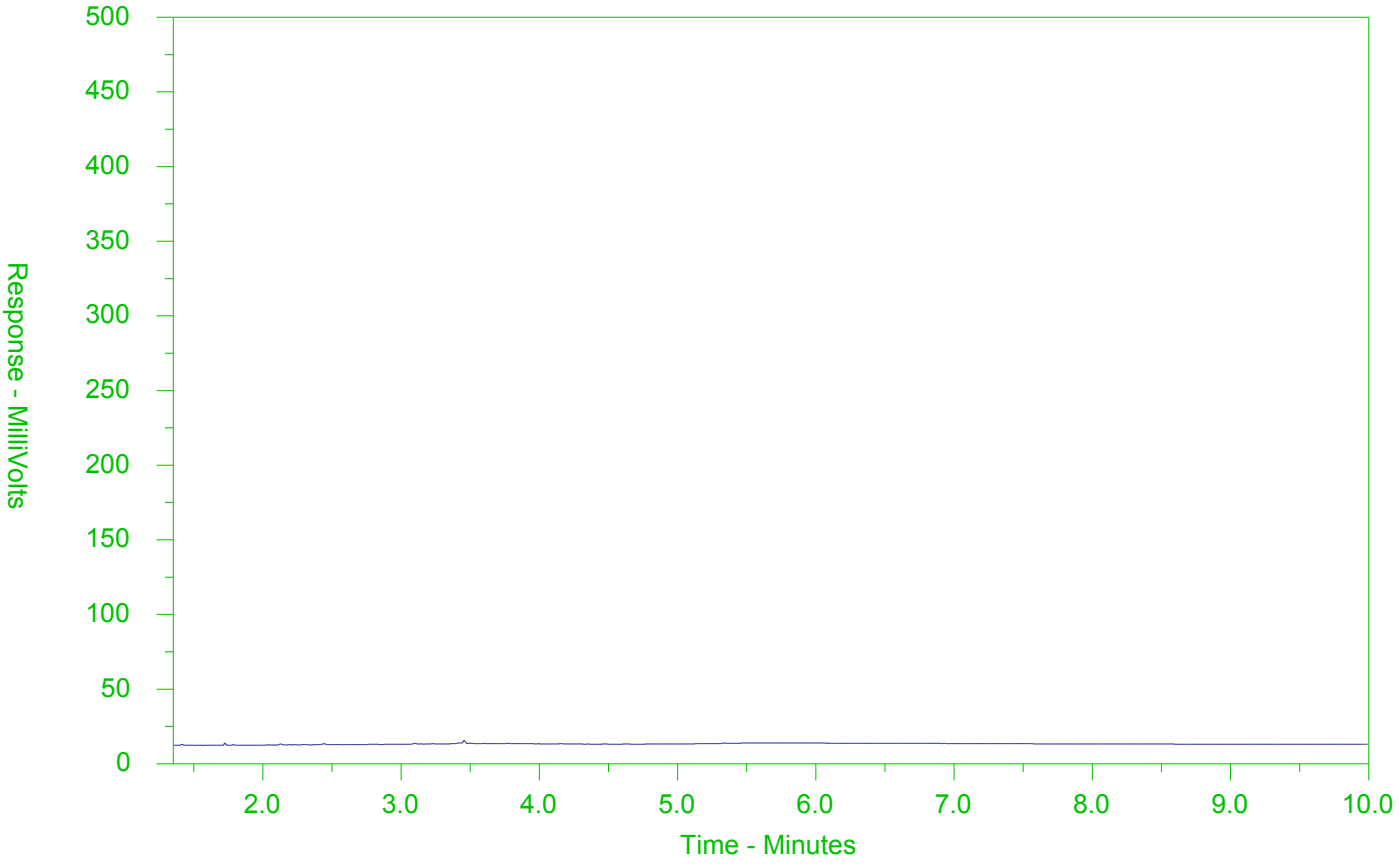
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170515-1
Client Sample ID: WQ-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

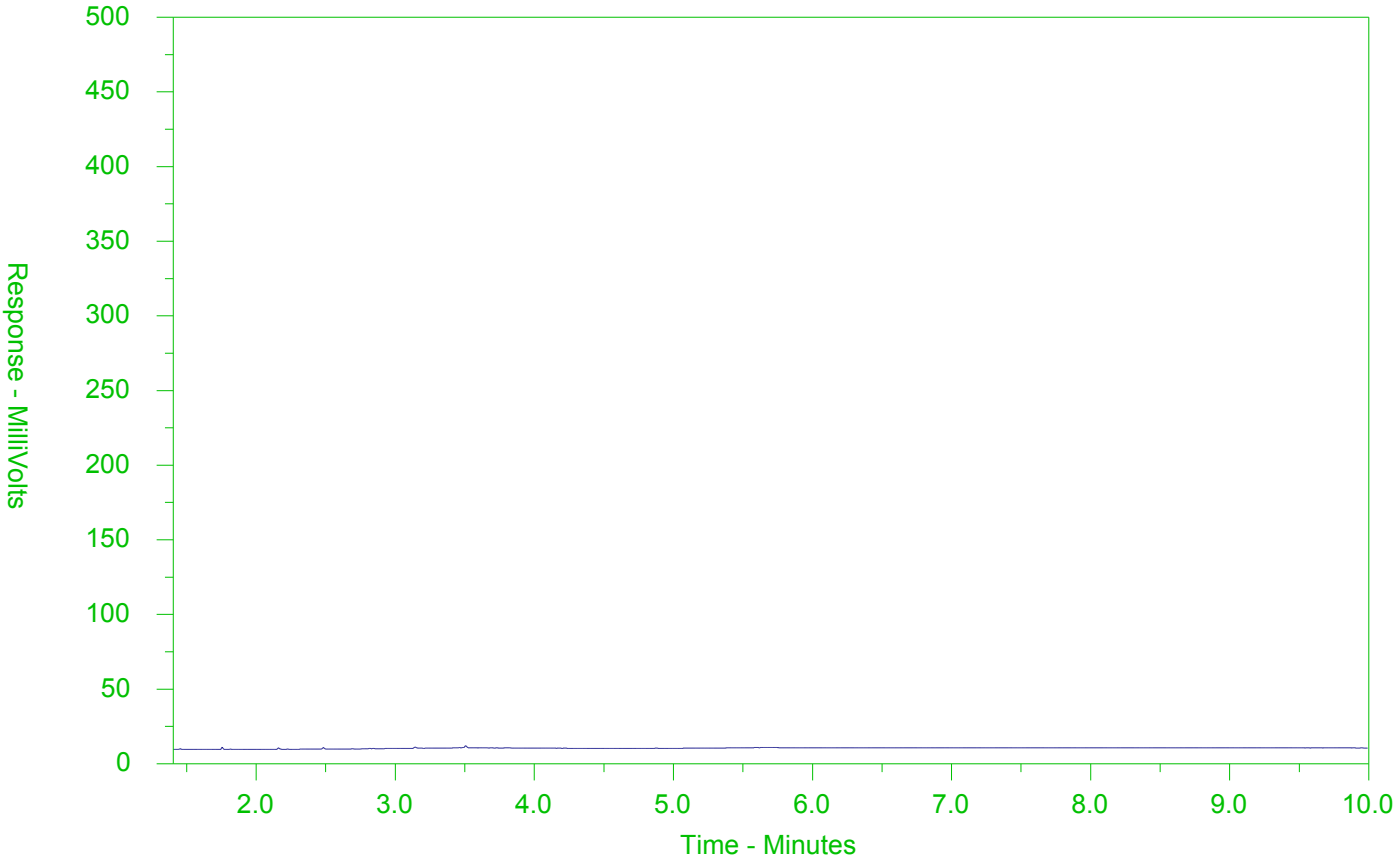
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170515-2
Client Sample ID: WQ-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

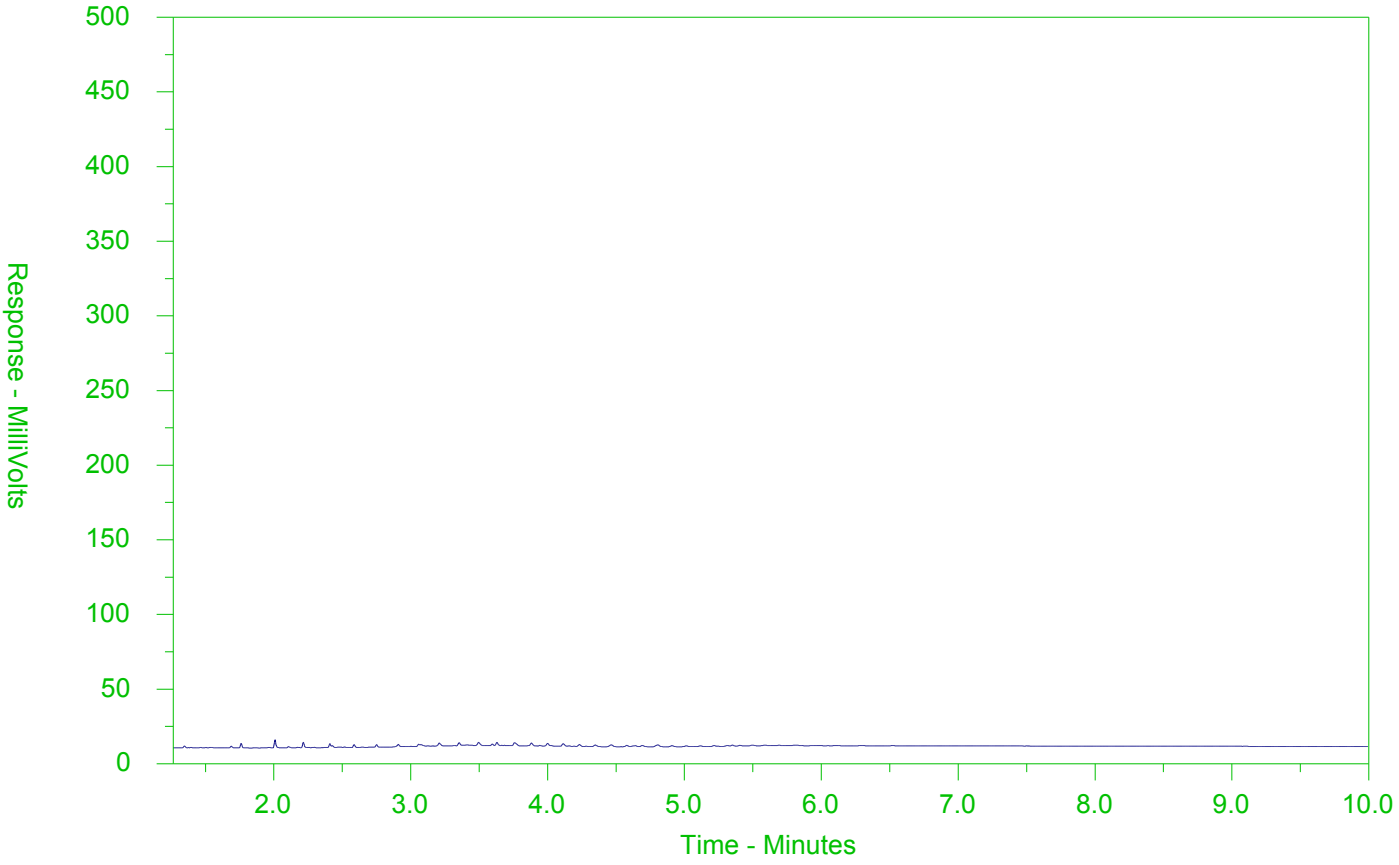
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170515-3
Client Sample ID: WQ-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

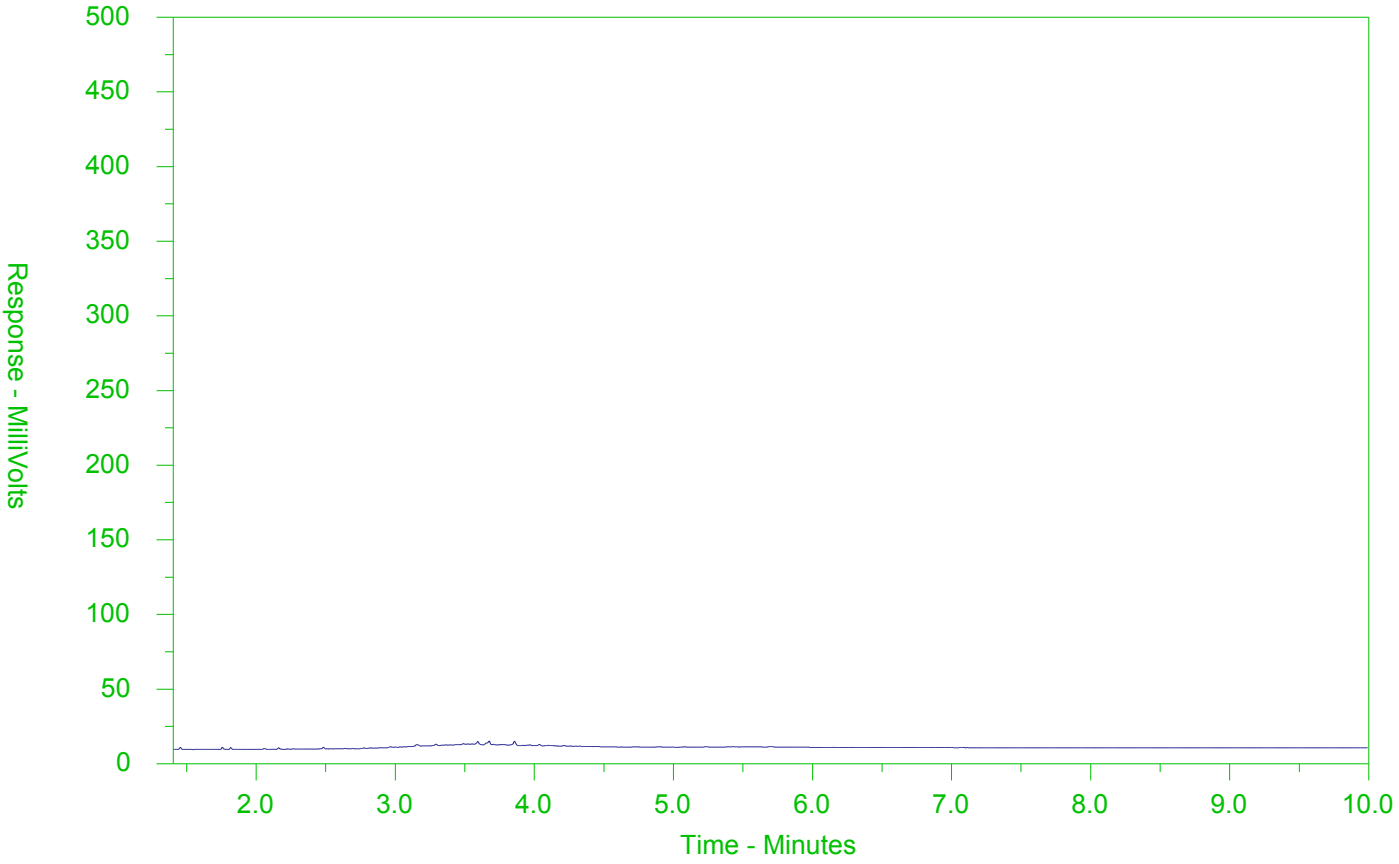
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2170515-4
Client Sample ID: WQ-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2170515-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519-224-3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: laframboise.d@aquaforbeech.com
Email 2: cowlin.w@aquaforbeech.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Project Information

ALS Account # / Quote #: Q67885
Job #: MOHAWK LAKE
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2170515
ALS Contact: Gayle
Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	CL-IC-N-WT	CN-FREE-CFA-WT	EC-WT, PH-WT	ETL-SAR-CALC-WT, HARDNESS-CALC-WT	MET-ONT-PWQO-P-WT	N-TOT-WT	P-T-COL-WT,P-TD-COL-WT	PAH-PWQO-WT	SOLIDS-TSS-WT	TC,EC-MF-WT	VOC,F1-F4	OCP, PCB	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	WQ-1	25-09-18	11h00	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-2	25-09-18	10h40	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-3	25-09-18	10h30	Water	R	R	R	R	R	R	R	R	R	R	R	R			12
	WQ-4	25-09-18	10h05	Water	R	R	R	R	R	R	R	R	R	R	R	R			12

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				15.1			

SHIPMENT RELEASE (client use)

Released by: François Polly Date: Sept 25 2018 Time: 15:08

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: SB Date: 09/25/18 Time: 3:20 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 25-SEP-18
Report Date: 03-OCT-18 14:22 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2170511

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 17-727851
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Polychlorinated Biphenyls (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2170511-1 / 25-SEP-18 / 10:40 / **WQ-1**	L2170511-2 / 25-SEP-18 / 11:00 / **WQ-2**	L2170511-3 / 25-SEP-18 / 10:30 / **WQ-3**	L2170511-4 / 25-SEP-18 / 10:45 / **WQ-4**
Aroclor 1242	ug/L		<0.020	<0.020	<0.020	<0.020
Aroclor 1248	ug/L		<0.020	<0.020	<0.020	<0.020
Aroclor 1254	ug/L		<0.020	<0.020	<0.020	<0.020
Aroclor 1260	ug/L		<0.020	<0.020	<0.020	<0.020
Total PCBs	ug/L		<0.040	<0.040	<0.040	<0.040
Surrogate: 2-fluorobiphenyl	%		83.4	77.6	76.4	90.1

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Organochlorine Pesticides (WATER)

Analyte	Unit	ALS ID / Sampled Date / Sampled Time / Sample ID	L2170511-1 25-SEP-18 10:40 **WQ-1**	L2170511-2 25-SEP-18 11:00 **WQ-2**	L2170511-3 25-SEP-18 10:30 **WQ-3**	L2170511-4 25-SEP-18 10:45 **WQ-4**
Aldrin	ug/L		<0.010	<0.010	<0.010	<0.010
gamma-hexachlorocyclohexane	ug/L		<0.010	<0.010	<0.010	<0.010
a-chlordane	ug/L		<0.040	<0.040	<0.040	<0.040
Chlordane (Total)	ug/L		<0.057	<0.057	<0.057	<0.057
g-chlordane	ug/L		<0.040	<0.040	<0.040	<0.040
o,p-DDD	ug/L		<0.030	<0.030	<0.060 RRR	<0.075 RRR
pp-DDD	ug/L		<0.030	<0.030	<0.060 RRR	<0.075 RRR
Total DDD	ug/L		<0.042	<0.042	<0.085	<0.11
o,p-DDE	ug/L		<0.016 DLM	<0.016 DLM	<0.0080	<0.0080
pp-DDE	ug/L		<0.016 DLM	<0.016 DLM	<0.0080	<0.0080
Total DDE	ug/L		<0.023	<0.023	<0.011	<0.011
op-DDT	ug/L		<0.030	<0.030	<0.060 RRR	<0.075 RRR
pp-DDT	ug/L		<0.030	<0.030	<0.060 RRR	<0.075 RRR
Total DDT	ug/L		<0.042	<0.042	<0.085	<0.11
Dieldrin	ug/L		<0.050	<0.050	<0.10 RRR	<0.13 RRR
Endosulfan I	ug/L		<0.030	<0.030	<0.030	<0.030
Endosulfan II	ug/L		<0.030	<0.030	<0.060 RRR	<0.075 RRR
Endosulfan (Total)	ug/L		<0.042	<0.042	<0.067	<0.081
Endrin	ug/L		<0.040	<0.040	<0.080 RRR	<0.10 RRR
Heptachlor	ug/L		<0.010	<0.010	<0.010	<0.010
Heptachlor Epoxide	ug/L		<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene	ug/L		<0.010	<0.010	<0.010	<0.010
Hexachlorobutadiene	ug/L		<0.010	<0.010	<0.010	<0.010
Hexachloroethane	ug/L		<0.010	<0.010	<0.010	<0.010
Methoxychlor	ug/L		<0.050	<0.050	<0.10 RRR	<0.13 RRR
Surrogate: 2-Fluorobiphenyl	%		65.2	64.8	57.5	56.1
Surrogate: d14-Terphenyl	%		73.9	61.1	44.0 SOL:MI	42.7 SOL:MI

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2170511-3	Water	Note: RRR: Surrogate recovery below ALS DQO. Detection limits have been adjusted.	
L2170511-4	Water	Note: RRR: Surrogate recovery below ALS DQO. Detection limits have been adjusted.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
SOL:MI	Surrogate recovery outside acceptable limits due to matrix interference
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CHLORDANE-T-CALC-WT	Water	Chlordane Total sums	CALCULATION
Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS.			
DDD-DDE-DDT-CALC-WT	Water	DDD, DDE, DDT sums	CALCULATION
Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS.			
ENDOSULFAN-T-CALC-WT	Water	Endosulfan Total sums	CALCULATION
Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS.			
PCB-511-WT	Water	PCB-O. Reg 153/04 (July 2011)	SW846 3510/8082
Aqueous samples are extracted, then concentrated, reconstituted, and analyzed by GC/MS. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
PEST-OC-511-WT	Water	OC Pesticides-O. Reg 153/04 (July 2011)	SW846 8270 (511)
Aqueous sample is extracted by liquid/liquid extraction with a solvent mix. After extraction, a number of clean up techniques may be applied, depending on the sample matrix and analyzed by GC/MS. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).			

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

17-727851

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2170511-COFC

COC Number: 17 - 727851

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AQUAFOR BEECH LTD	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	DARCY LAFRAMBOISE	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	519 - 224 - 3740	☑ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E-100%] ☐ / Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	55 Regal Road, Unit 3	Email 1 or Fax laframboise.d@aquaforbeech	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	GUELPH, ONT	Email 2 cowlin.w@aquaforbeech.com	
Postal Code:	N1K 1B6	Email 3	

Invoice To		Invoice Distribution	
	Same as Report To ☑ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ YES ☐ NO		
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2170511	ALS Contact: GB	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	DOC (F/P)	PCB (F/P)	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	WQ-1	25-09-18	10h40	Water	✓	✓			3
	WQ-2	25-09-18	11h00	Water	✓	✓			3
	WQ-3	25-09-18	10h30	Water	✓	✓			3
	WQ-4	25-09-18	10h45	Water	✓	✓			3

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated ☐				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				15.1			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Francois Paille	Date: Sept 25th 2018	Time: 15h30	Received by:	Date:	Time:	Received by: SB	Date: 09/25/18	Time: 3:20 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 12-OCT-18
Report Date: 22-OCT-18 08:58 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2180381

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-728026
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
(No parameter exceedances)						

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2180381-1	L2180381-2	L2180381-3	L2180381-4
				Sample Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
				Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits						
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	1.17	0.80
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2180381-1	L2180381-2	L2180381-3	L2180381-4
			Sample Date	12-OCT-18	12-OCT-18	12-OCT-18	12-OCT-18
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	97.1	97.8	98.6	96.8
Surrogate: 1,4-Difluorobenzene	%	-	-	98.7	98.5	99.1	98.1

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2180381-1	12-OCT-18	WQ1
				L2180381-2	12-OCT-18	WQ2
				L2180381-3	12-OCT-18	WQ3
				L2180381-4	12-OCT-18	WQ4
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	520	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	520	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	97.4	98.0	89.9	94.7
Surrogate: 3,4-Dichlorotoluene	%	-	-	78.7	79.8	78.9	81.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

Chain of Custody Numbers:

17-728026

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2180381 Report Date: 22-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4289444								
WG2908598-4 DUP		**WG2908598-3**						
F1 (C6-C10)		57	54		ug/L	5.8	30	22-OCT-18
WG2908598-1 LCS								
F1 (C6-C10)			95.7		%		80-120	20-OCT-18
WG2908598-2 MB								
F1 (C6-C10)			<25		ug/L		25	20-OCT-18
Surrogate: 3,4-Dichlorotoluene			81.4		%		60-140	20-OCT-18
WG2908598-5 MS		**WG2908598-3**						
F1 (C6-C10)			91.9		%		60-140	22-OCT-18
Batch R4290107								
WG2908062-4 DUP		**WG2908062-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	22-OCT-18
WG2908062-1 LCS								
F1 (C6-C10)			94.9		%		80-120	22-OCT-18
WG2908062-2 MB								
F1 (C6-C10)			<25		ug/L		25	22-OCT-18
Surrogate: 3,4-Dichlorotoluene			89.4		%		60-140	22-OCT-18
WG2908062-5 MS		**WG2908062-3**						
F1 (C6-C10)			85.9		%		60-140	22-OCT-18
F2-F4-511-WT	**Water**							
Batch R4281708								
WG2904169-2 LCS								
F2 (C10-C16)			105.6		%		70-130	16-OCT-18
F3 (C16-C34)			109.9		%		70-130	16-OCT-18
F4 (C34-C50)			102.9		%		70-130	16-OCT-18
WG2904169-1 MB								
F2 (C10-C16)			<100		ug/L		100	16-OCT-18
F3 (C16-C34)			<250		ug/L		250	16-OCT-18
F4 (C34-C50)			<250		ug/L		250	16-OCT-18
Surrogate: 2-Bromobenzotrifluoride			82.9		%		60-140	16-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-4 DUP		**WG2908598-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-4 DUP		**WG2908598-3**						
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	20-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
Bromodichloromethane		3.9	4.0		ug/L	2.6	30	20-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	20-OCT-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	20-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
Chloroform		22.7	22.8		ug/L	0.5	30	20-OCT-18
cis-1,2-Dichloroethylene		6.38	6.29		ug/L	1.4	30	20-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	20-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	20-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	20-OCT-18
Ethylbenzene		2.71	2.71		ug/L	0.0	30	20-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
m+p-Xylenes		10.3	10.2		ug/L	0.4	30	20-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	20-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	20-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	20-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	20-OCT-18
o-Xylene		4.24	4.28		ug/L	0.9	30	20-OCT-18
Styrene		0.54	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
Tetrachloroethylene		17.0	17.1		ug/L	0.3	30	20-OCT-18
Toluene		7.56	7.60		ug/L	0.5	30	20-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	20-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30		ug/L			20-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-4 DUP		**WG2908598-3**						
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	20-OCT-18
Trichloroethylene		1.78	1.66		ug/L	7.0	30	20-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	20-OCT-18
Vinyl chloride		1.22	1.30		ug/L	6.3	30	20-OCT-18
WG2908598-1 LCS								
1,1,1,2-Tetrachloroethane			112.7		%		70-130	20-OCT-18
1,1,2,2-Tetrachloroethane			117.0		%		70-130	20-OCT-18
1,1,1-Trichloroethane			106.3		%		70-130	20-OCT-18
1,1,2-Trichloroethane			111.9		%		70-130	20-OCT-18
1,1-Dichloroethane			108.9		%		70-130	20-OCT-18
1,1-Dichloroethylene			101.4		%		70-130	20-OCT-18
1,2-Dibromoethane			112.8		%		70-130	20-OCT-18
1,2-Dichlorobenzene			109.0		%		70-130	20-OCT-18
1,2-Dichloroethane			117.9		%		70-130	20-OCT-18
1,2-Dichloropropane			111.6		%		70-130	20-OCT-18
1,3-Dichlorobenzene			104.3		%		70-130	20-OCT-18
1,4-Dichlorobenzene			106.0		%		70-130	20-OCT-18
Acetone			127.5		%		60-140	20-OCT-18
Benzene			109.4		%		70-130	20-OCT-18
Bromodichloromethane			111.8		%		70-130	20-OCT-18
Bromoform			112.4		%		70-130	20-OCT-18
Bromomethane			89.4		%		60-140	20-OCT-18
Carbon tetrachloride			104.1		%		70-130	20-OCT-18
Chlorobenzene			106.7		%		70-130	20-OCT-18
Chloroform			109.7		%		70-130	20-OCT-18
cis-1,2-Dichloroethylene			108.1		%		70-130	20-OCT-18
cis-1,3-Dichloropropene			113.6		%		70-130	20-OCT-18
Dibromochloromethane			110.4		%		70-130	20-OCT-18
Dichlorodifluoromethane			145.0	MES	%		50-140	20-OCT-18
Ethylbenzene			109.6		%		70-130	20-OCT-18
n-Hexane			99.7		%		70-130	20-OCT-18
m+p-Xylenes			107.7		%		70-130	20-OCT-18
Methyl Ethyl Ketone			123.7		%		60-140	20-OCT-18
Methyl Isobutyl Ketone			116.5				60-140	

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-1 LCS								
Methyl Isobutyl Ketone			116.5		%		60-140	20-OCT-18
Methylene Chloride			114.4		%		70-130	20-OCT-18
MTBE			109.0		%		70-130	20-OCT-18
o-Xylene			109.1		%		70-130	20-OCT-18
Styrene			111.8		%		70-130	20-OCT-18
Tetrachloroethylene			100.0		%		70-130	20-OCT-18
Toluene			101.8		%		70-130	20-OCT-18
trans-1,2-Dichloroethylene			106.0		%		70-130	20-OCT-18
trans-1,3-Dichloropropene			116.6		%		70-130	20-OCT-18
Trichloroethylene			108.0		%		70-130	20-OCT-18
Trichlorofluoromethane			117.3		%		60-140	20-OCT-18
Vinyl chloride			111.8		%		60-140	20-OCT-18
WG2908598-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	20-OCT-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	20-OCT-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	20-OCT-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	20-OCT-18
1,1-Dichloroethane			<0.50		ug/L		0.5	20-OCT-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	20-OCT-18
1,2-Dibromoethane			<0.20		ug/L		0.2	20-OCT-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	20-OCT-18
1,2-Dichloroethane			<0.50		ug/L		0.5	20-OCT-18
1,2-Dichloropropane			<0.50		ug/L		0.5	20-OCT-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	20-OCT-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	20-OCT-18
Acetone			<30		ug/L		30	20-OCT-18
Benzene			<0.50		ug/L		0.5	20-OCT-18
Bromodichloromethane			<2.0		ug/L		2	20-OCT-18
Bromoform			<5.0		ug/L		5	20-OCT-18
Bromomethane			<0.50		ug/L		0.5	20-OCT-18
Carbon tetrachloride			<0.20		ug/L		0.2	20-OCT-18
Chlorobenzene			<0.50		ug/L		0.5	20-OCT-18
Chloroform			<1.0		ug/L		1	20-OCT-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	20-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-2 MB								
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	20-OCT-18
Dibromochloromethane			<2.0		ug/L		2	20-OCT-18
Dichlorodifluoromethane			<2.0		ug/L		2	20-OCT-18
Ethylbenzene			<0.50		ug/L		0.5	20-OCT-18
n-Hexane			<0.50		ug/L		0.5	20-OCT-18
m+p-Xylenes			<0.40		ug/L		0.4	20-OCT-18
Methyl Ethyl Ketone			<20		ug/L		20	20-OCT-18
Methyl Isobutyl Ketone			<20		ug/L		20	20-OCT-18
Methylene Chloride			<5.0		ug/L		5	20-OCT-18
MTBE			<2.0		ug/L		2	20-OCT-18
o-Xylene			<0.30		ug/L		0.3	20-OCT-18
Styrene			<0.50		ug/L		0.5	20-OCT-18
Tetrachloroethylene			<0.50		ug/L		0.5	20-OCT-18
Toluene			<0.50		ug/L		0.5	20-OCT-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	20-OCT-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	20-OCT-18
Trichloroethylene			<0.50		ug/L		0.5	20-OCT-18
Trichlorofluoromethane			<5.0		ug/L		5	20-OCT-18
Vinyl chloride			<0.50		ug/L		0.5	20-OCT-18
Surrogate: 1,4-Difluorobenzene			100.0		%		70-130	20-OCT-18
Surrogate: 4-Bromofluorobenzene			98.1		%		70-130	20-OCT-18
WG2908598-5 MS		**WG2908598-3**						
1,1,1,2-Tetrachloroethane			112.0		%		50-140	20-OCT-18
1,1,2,2-Tetrachloroethane			108.8		%		50-140	20-OCT-18
1,1,1-Trichloroethane			108.7		%		50-140	20-OCT-18
1,1,2-Trichloroethane			109.0		%		50-140	20-OCT-18
1,1-Dichloroethane			108.5		%		50-140	20-OCT-18
1,1-Dichloroethylene			104.5		%		50-140	20-OCT-18
1,2-Dibromoethane			109.2		%		50-140	20-OCT-18
1,2-Dichlorobenzene			109.0		%		50-140	20-OCT-18
1,2-Dichloroethane			115.1		%		50-140	20-OCT-18
1,2-Dichloropropane			110.9		%		50-140	20-OCT-18
1,3-Dichlorobenzene			105.6		%		50-140	20-OCT-18
1,4-Dichlorobenzene			107.8		%		50-140	20-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4289444								
WG2908598-5 MS		**WG2908598-3**						
Acetone			N/A	MS-B	%		-	20-OCT-18
Benzene			110.4		%		50-140	20-OCT-18
Bromodichloromethane			110.8		%		50-140	20-OCT-18
Bromoform			107.1		%		50-140	20-OCT-18
Bromomethane			88.5		%		50-140	20-OCT-18
Carbon tetrachloride			106.7		%		50-140	20-OCT-18
Chlorobenzene			106.7		%		50-140	20-OCT-18
Chloroform			111.1		%		50-140	20-OCT-18
cis-1,2-Dichloroethylene			107.5		%		50-140	20-OCT-18
cis-1,3-Dichloropropene			105.3		%		50-140	20-OCT-18
Dibromochloromethane			108.0		%		50-140	20-OCT-18
Dichlorodifluoromethane			138.2		%		50-140	20-OCT-18
Ethylbenzene			111.0		%		50-140	20-OCT-18
n-Hexane			102.8		%		50-140	20-OCT-18
m+p-Xylenes			109.2		%		50-140	20-OCT-18
Methyl Ethyl Ketone			106.7		%		50-140	20-OCT-18
Methyl Isobutyl Ketone			107.3		%		50-140	20-OCT-18
Methylene Chloride			114.2		%		50-140	20-OCT-18
MTBE			108.7		%		50-140	20-OCT-18
o-Xylene			109.2		%		50-140	20-OCT-18
Styrene			109.3		%		50-140	20-OCT-18
Tetrachloroethylene			103.1		%		50-140	20-OCT-18
Toluene			103.6		%		50-140	20-OCT-18
trans-1,2-Dichloroethylene			107.3		%		50-140	20-OCT-18
trans-1,3-Dichloropropene			107.4		%		50-140	20-OCT-18
Trichloroethylene			108.9		%		50-140	20-OCT-18
Trichlorofluoromethane			120.6		%		50-140	20-OCT-18
Vinyl chloride			113.6		%		50-140	20-OCT-18

Quality Control Report

Workorder: L2180381 Report Date: 22-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

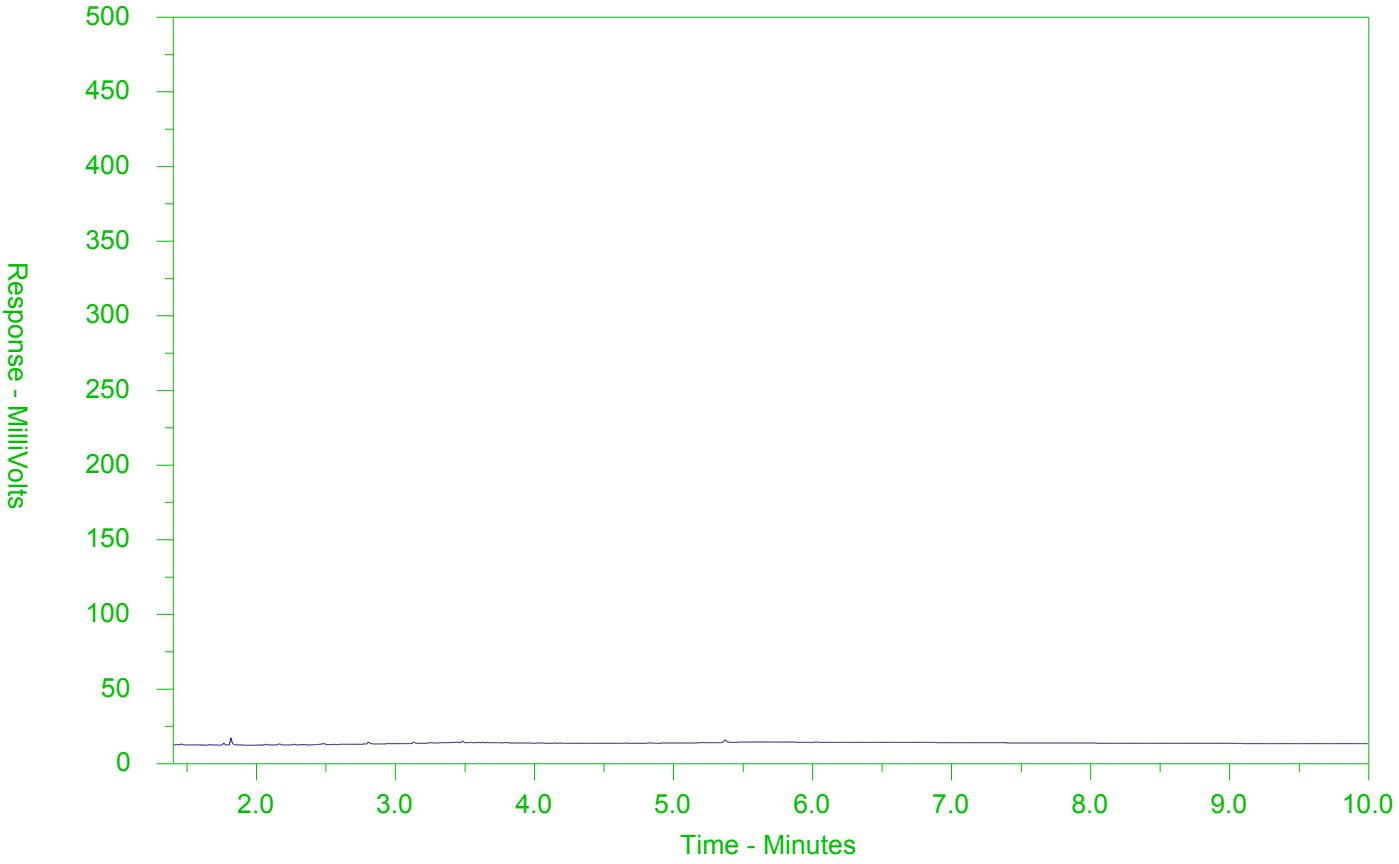
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180381-1
Client Sample ID: WQ1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

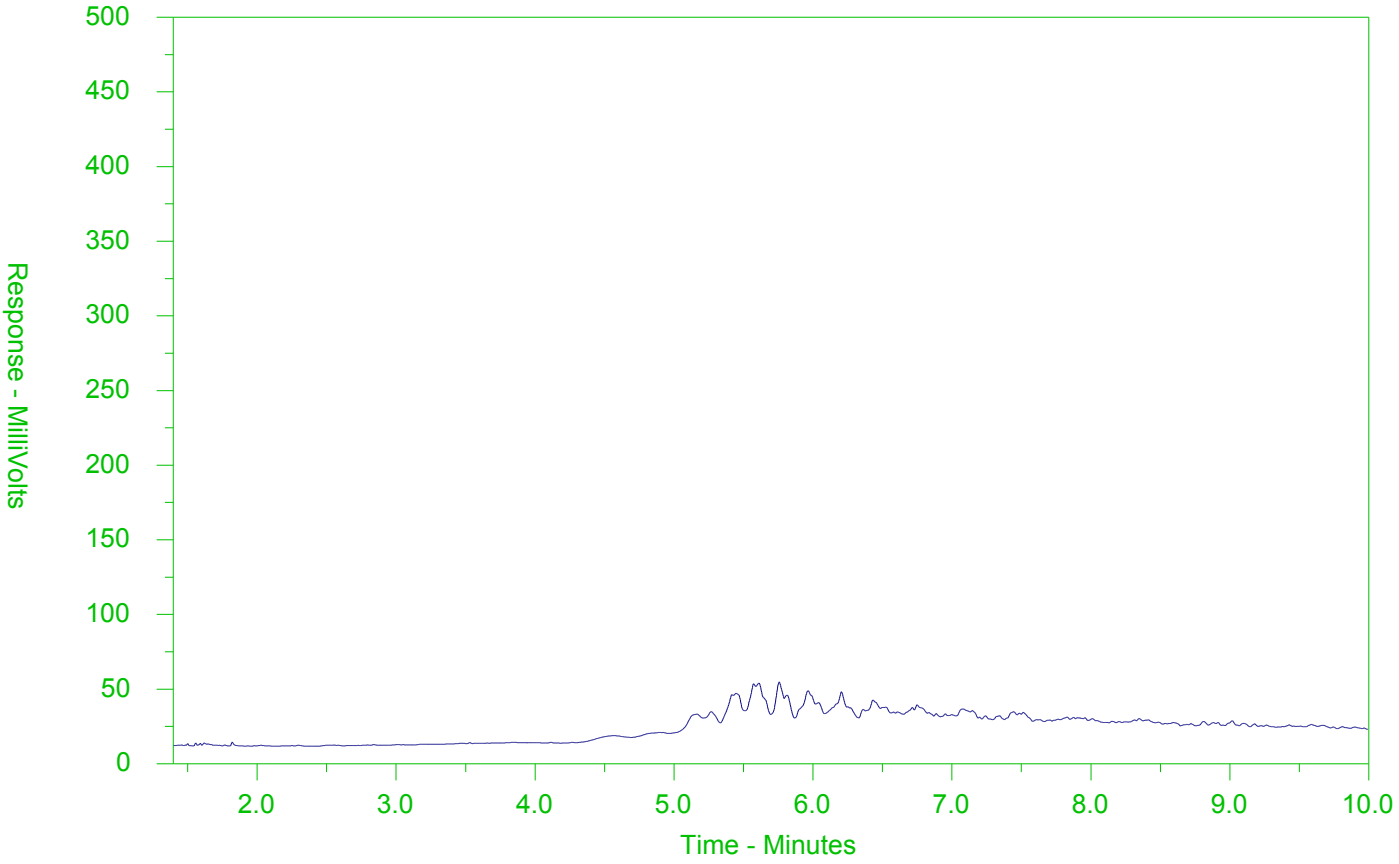
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180381-2
Client Sample ID: WQ2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

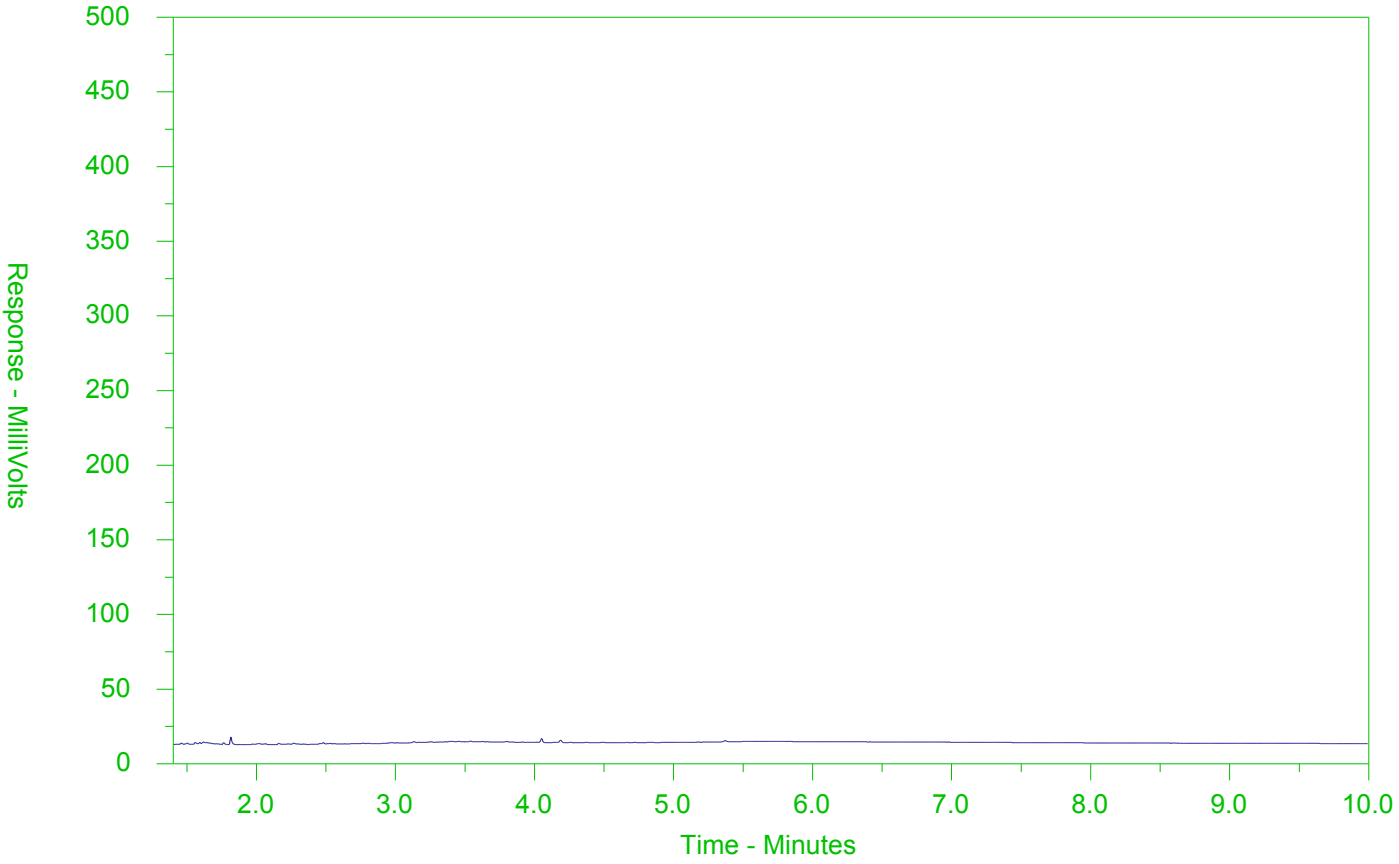
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180381-3
Client Sample ID: WQ3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

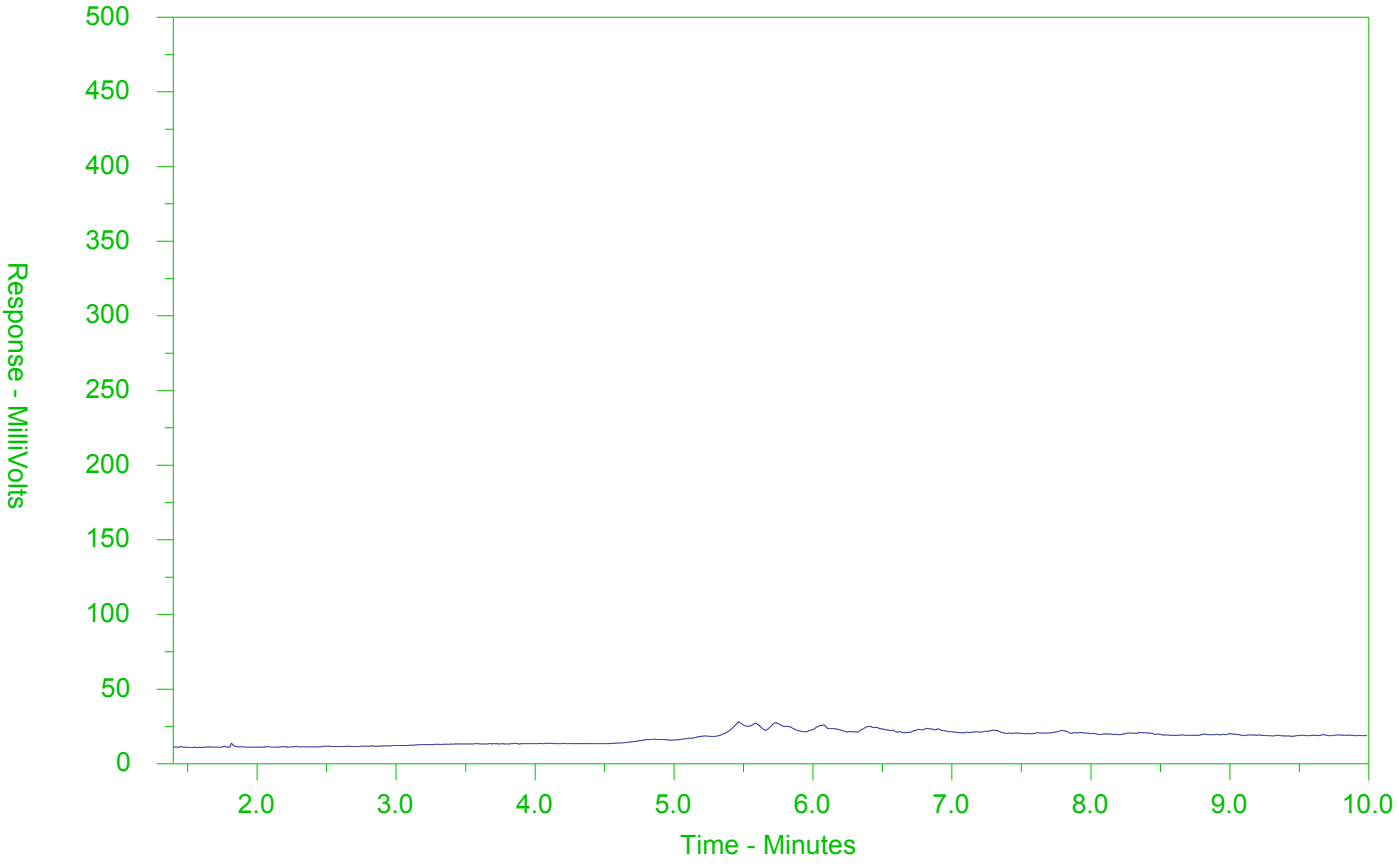
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2180381-4
Client Sample ID: WQ4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2180381-COFC

COC Number: 17 - 728026

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LIMITED
Contact:	DARCY LAFRAMBOISE
Phone:	519 - 224 - 3740
	Company address below will appear on the final report
Street:	55 REGAL ROAD, UNIT 3
City/Province:	GUELPH, ONTARIO
Postal Code:	N1K 1B6

Report Format / Distribution	
Select Report Format:	[X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	ldframboise.d@aquaforbeech.com
Email 2	cowlin.w@aquaforbeech.com
Email 3	

Invoice To		
	Same as Report To	[X] YES [ ] NO
	Copy of Invoice with Report	[X] YES [ ] NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2180381 120

ALS Contact: | Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOC/BTEX/F1	F2 - F4	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	WQ1	12-OCT-18	16:35	Water	R	R			
2	WQ2	12-OCT-18	16:05	Water	R	R			
3	WQ3	12-OCT-18	16:00	Water	R	R			
4	WQ4	12-OCT-18	15:55	Water	R	R			
(5)									

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	
Are samples for human consumption/ use? [ ] YES [X] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	[ ]	SIF Observations	Yes [ ]	No	[ ]
Ice Packs [ ]	Ice Cubes [ ]	Custody seal intact	Yes [ ]	No	[ ]
Cooling Initiated	[ ]				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				9.3	9.7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
							12-Oct-18	18:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SIF.

AQUAFOR BEECH LIMITED
ATTN: Darcy Laframboise
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 16-OCT-18
Report Date: 19-OCT-18 08:22 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2181898

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-728101
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit

Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO

(No parameter exceedances)

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2181898-1	L2181898-2	L2181898-3	L2181898-4
			Sample Date	16-OCT-18	16-OCT-18	16-OCT-18	16-OCT-18
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
Acetone	ug/L	-	-	<30	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	0.93	1.03
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2181898-1	L2181898-2	L2181898-3	L2181898-4
				Sample Date	16-OCT-18	16-OCT-18	16-OCT-18	16-OCT-18
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits						
Analyte	Unit	#1	#2					
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	98.3	98.6	98.1	98.6
Surrogate: 1,4-Difluorobenzene	%	-	-	99.5	99.0	98.7	99.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2181898-1	L2181898-2	L2181898-3	L2181898-4
				16-OCT-18	16-OCT-18	16-OCT-18	16-OCT-18
				WQ-1	WQ-2	WQ-3	WQ-4
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	97.2	95.7	94.7	94.6
Surrogate: 3,4-Dichlorotoluene	%	-	-	83.7	76.2	80.2	71.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

Chain of Custody Numbers:

17-728101

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2181898 Report Date: 19-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4287615								
WG2902736-4 DUP		**WG2902736-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	19-OCT-18
WG2902736-1 LCS								
F1 (C6-C10)			99.2		%		80-120	19-OCT-18
WG2902736-2 MB								
F1 (C6-C10)			<25		ug/L		25	19-OCT-18
Surrogate: 3,4-Dichlorotoluene			97.2		%		60-140	19-OCT-18
WG2902736-5 MS		**WG2902736-3**						
F1 (C6-C10)			92.8		%		60-140	19-OCT-18
F2-F4-511-WT	**Water**							
Batch R4284473								
WG2905542-2 LCS								
F2 (C10-C16)			101.5		%		70-130	17-OCT-18
F3 (C16-C34)			104.8		%		70-130	17-OCT-18
F4 (C34-C50)			113.2		%		70-130	17-OCT-18
WG2905542-3 LCSD		**WG2905542-2**						
F2 (C10-C16)		101.5	101.9		%	0.4	50	17-OCT-18
F3 (C16-C34)		104.8	101.8		%	2.8	50	17-OCT-18
F4 (C34-C50)		113.2	118.5		%	4.5	50	17-OCT-18
WG2905542-1 MB								
F2 (C10-C16)			<100		ug/L		100	17-OCT-18
F3 (C16-C34)			<250		ug/L		250	17-OCT-18
F4 (C34-C50)			<250		ug/L		250	17-OCT-18
Surrogate: 2-Bromobenzotrifluoride			102.4		%		60-140	17-OCT-18
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-4 DUP		**WG2902736-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	19-OCT-18
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-4 DUP		**WG2902736-3**						
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	19-OCT-18
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	19-OCT-18
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	19-OCT-18
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	19-OCT-18
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	19-OCT-18
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	19-OCT-18
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	19-OCT-18
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	19-OCT-18
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	19-OCT-18
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	19-OCT-18
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	19-OCT-18
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	19-OCT-18
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	19-OCT-18
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	19-OCT-18
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	19-OCT-18
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	19-OCT-18
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	19-OCT-18
WG2902736-1 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-1 LCS								
1,1,1,2-Tetrachloroethane			107.5		%		70-130	19-OCT-18
1,1,2,2-Tetrachloroethane			102.1		%		70-130	19-OCT-18
1,1,1-Trichloroethane			112.4		%		70-130	19-OCT-18
1,1,2-Trichloroethane			104.4		%		70-130	19-OCT-18
1,1-Dichloroethane			110.5		%		70-130	19-OCT-18
1,1-Dichloroethylene			111.2		%		70-130	19-OCT-18
1,2-Dibromoethane			110.9		%		70-130	19-OCT-18
1,2-Dichlorobenzene			109.5		%		70-130	19-OCT-18
1,2-Dichloroethane			107.7		%		70-130	19-OCT-18
1,2-Dichloropropane			106.9		%		70-130	19-OCT-18
1,3-Dichlorobenzene			111.3		%		70-130	19-OCT-18
1,4-Dichlorobenzene			111.8		%		70-130	19-OCT-18
Acetone			112.4		%		60-140	19-OCT-18
Benzene			110.2		%		70-130	19-OCT-18
Bromodichloromethane			108.2		%		70-130	19-OCT-18
Bromoform			112.4		%		70-130	19-OCT-18
Bromomethane			91.1		%		60-140	19-OCT-18
Carbon tetrachloride			111.8		%		70-130	19-OCT-18
Chlorobenzene			108.8		%		70-130	19-OCT-18
Chloroform			109.8		%		70-130	19-OCT-18
cis-1,2-Dichloroethylene			107.2		%		70-130	19-OCT-18
cis-1,3-Dichloropropene			103.3		%		70-130	19-OCT-18
Dibromochloromethane			106.0		%		70-130	19-OCT-18
Dichlorodifluoromethane			161.7	LCS-H	%		50-140	19-OCT-18
Ethylbenzene			111.4		%		70-130	19-OCT-18
n-Hexane			109.9		%		70-130	19-OCT-18
m+p-Xylenes			110.6		%		70-130	19-OCT-18
Methyl Ethyl Ketone			111.5		%		60-140	19-OCT-18
Methyl Isobutyl Ketone			104.2		%		60-140	19-OCT-18
Methylene Chloride			109.1		%		70-130	19-OCT-18
MTBE			109.1		%		70-130	19-OCT-18
o-Xylene			110.3		%		70-130	19-OCT-18
Styrene			111.8		%		70-130	19-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-1 LCS								
Tetrachloroethylene			112.4		%		70-130	19-OCT-18
Toluene			110.2		%		70-130	19-OCT-18
trans-1,2-Dichloroethylene			111.0		%		70-130	19-OCT-18
trans-1,3-Dichloropropene			101.4		%		70-130	19-OCT-18
Trichloroethylene			113.4		%		70-130	19-OCT-18
Trichlorofluoromethane			126.1		%		60-140	19-OCT-18
Vinyl chloride			119.5		%		60-140	19-OCT-18
WG2902736-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	19-OCT-18
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	19-OCT-18
1,1,1-Trichloroethane			<0.50		ug/L		0.5	19-OCT-18
1,1,2-Trichloroethane			<0.50		ug/L		0.5	19-OCT-18
1,1-Dichloroethane			<0.50		ug/L		0.5	19-OCT-18
1,1-Dichloroethylene			<0.50		ug/L		0.5	19-OCT-18
1,2-Dibromoethane			<0.20		ug/L		0.2	19-OCT-18
1,2-Dichlorobenzene			<0.50		ug/L		0.5	19-OCT-18
1,2-Dichloroethane			<0.50		ug/L		0.5	19-OCT-18
1,2-Dichloropropane			<0.50		ug/L		0.5	19-OCT-18
1,3-Dichlorobenzene			<0.50		ug/L		0.5	19-OCT-18
1,4-Dichlorobenzene			<0.50		ug/L		0.5	19-OCT-18
Acetone			<30		ug/L		30	19-OCT-18
Benzene			<0.50		ug/L		0.5	19-OCT-18
Bromodichloromethane			<2.0		ug/L		2	19-OCT-18
Bromoform			<5.0		ug/L		5	19-OCT-18
Bromomethane			<0.50		ug/L		0.5	19-OCT-18
Carbon tetrachloride			<0.20		ug/L		0.2	19-OCT-18
Chlorobenzene			<0.50		ug/L		0.5	19-OCT-18
Chloroform			<1.0		ug/L		1	19-OCT-18
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	19-OCT-18
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	19-OCT-18
Dibromochloromethane			<2.0		ug/L		2	19-OCT-18
Dichlorodifluoromethane			<2.0		ug/L		2	19-OCT-18
Ethylbenzene			<0.50		ug/L		0.5	19-OCT-18
n-Hexane			<0.50		ug/L		0.5	19-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-2 MB								
m+p-Xylenes			<0.40		ug/L		0.4	19-OCT-18
Methyl Ethyl Ketone			<20		ug/L		20	19-OCT-18
Methyl Isobutyl Ketone			<20		ug/L		20	19-OCT-18
Methylene Chloride			<5.0		ug/L		5	19-OCT-18
MTBE			<2.0		ug/L		2	19-OCT-18
o-Xylene			<0.30		ug/L		0.3	19-OCT-18
Styrene			<0.50		ug/L		0.5	19-OCT-18
Tetrachloroethylene			<0.50		ug/L		0.5	19-OCT-18
Toluene			<0.50		ug/L		0.5	19-OCT-18
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	19-OCT-18
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	19-OCT-18
Trichloroethylene			<0.50		ug/L		0.5	19-OCT-18
Trichlorofluoromethane			<5.0		ug/L		5	19-OCT-18
Vinyl chloride			<0.50		ug/L		0.5	19-OCT-18
Surrogate: 1,4-Difluorobenzene			98.9		%		70-130	19-OCT-18
Surrogate: 4-Bromofluorobenzene			97.9		%		70-130	19-OCT-18
WG2902736-5 MS		**WG2902736-3**						
1,1,1,2-Tetrachloroethane			107.9		%		50-140	19-OCT-18
1,1,2,2-Tetrachloroethane			109.6		%		50-140	19-OCT-18
1,1,1-Trichloroethane			110.5		%		50-140	19-OCT-18
1,1,2-Trichloroethane			108.1		%		50-140	19-OCT-18
1,1-Dichloroethane			111.6		%		50-140	19-OCT-18
1,1-Dichloroethylene			107.0		%		50-140	19-OCT-18
1,2-Dibromoethane			116.3		%		50-140	19-OCT-18
1,2-Dichlorobenzene			109.0		%		50-140	19-OCT-18
1,2-Dichloroethane			112.1		%		50-140	19-OCT-18
1,2-Dichloropropane			109.6		%		50-140	19-OCT-18
1,3-Dichlorobenzene			108.0		%		50-140	19-OCT-18
1,4-Dichlorobenzene			109.3		%		50-140	19-OCT-18
Acetone			122.2		%		50-140	19-OCT-18
Benzene			110.1		%		50-140	19-OCT-18
Bromodichloromethane			110.7		%		50-140	19-OCT-18
Bromoform			116.0		%		50-140	19-OCT-18
Bromomethane			86.9		%		50-140	19-OCT-18

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4287615								
WG2902736-5 MS		**WG2902736-3**						
Carbon tetrachloride			109.2		%		50-140	19-OCT-18
Chlorobenzene			107.9		%		50-140	19-OCT-18
Chloroform			111.2		%		50-140	19-OCT-18
cis-1,2-Dichloroethylene			108.6		%		50-140	19-OCT-18
cis-1,3-Dichloropropene			105.5		%		50-140	19-OCT-18
Dibromochloromethane			109.0		%		50-140	19-OCT-18
Dichlorodifluoromethane			131.5		%		50-140	19-OCT-18
Ethylbenzene			107.9		%		50-140	19-OCT-18
n-Hexane			103.4		%		50-140	19-OCT-18
m+p-Xylenes			107.3		%		50-140	19-OCT-18
Methyl Ethyl Ketone			113.5		%		50-140	19-OCT-18
Methyl Isobutyl Ketone			116.8		%		50-140	19-OCT-18
Methylene Chloride			110.8		%		50-140	19-OCT-18
MTBE			108.7		%		50-140	19-OCT-18
o-Xylene			108.3		%		50-140	19-OCT-18
Styrene			110.8		%		50-140	19-OCT-18
Tetrachloroethylene			106.8		%		50-140	19-OCT-18
Toluene			107.6		%		50-140	19-OCT-18
trans-1,2-Dichloroethylene			109.6		%		50-140	19-OCT-18
trans-1,3-Dichloropropene			103.6		%		50-140	19-OCT-18
Trichloroethylene			111.3		%		50-140	19-OCT-18
Trichlorofluoromethane			119.0		%		50-140	19-OCT-18
Vinyl chloride			108.8		%		50-140	19-OCT-18

Quality Control Report

Workorder: L2181898 Report Date: 19-OCT-18

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Darcy Laframboise

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

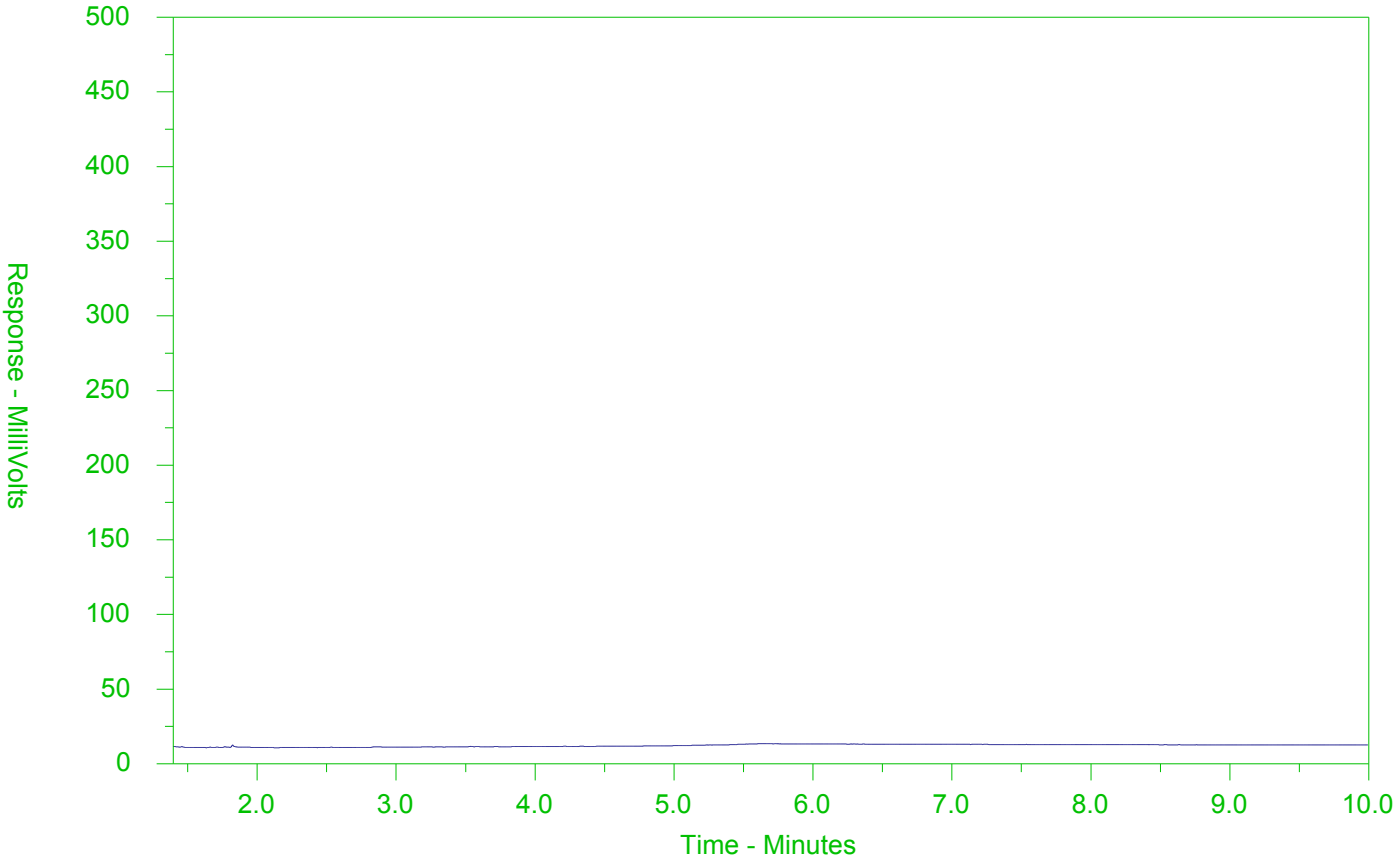
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2181898-1
Client Sample ID: WQ-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

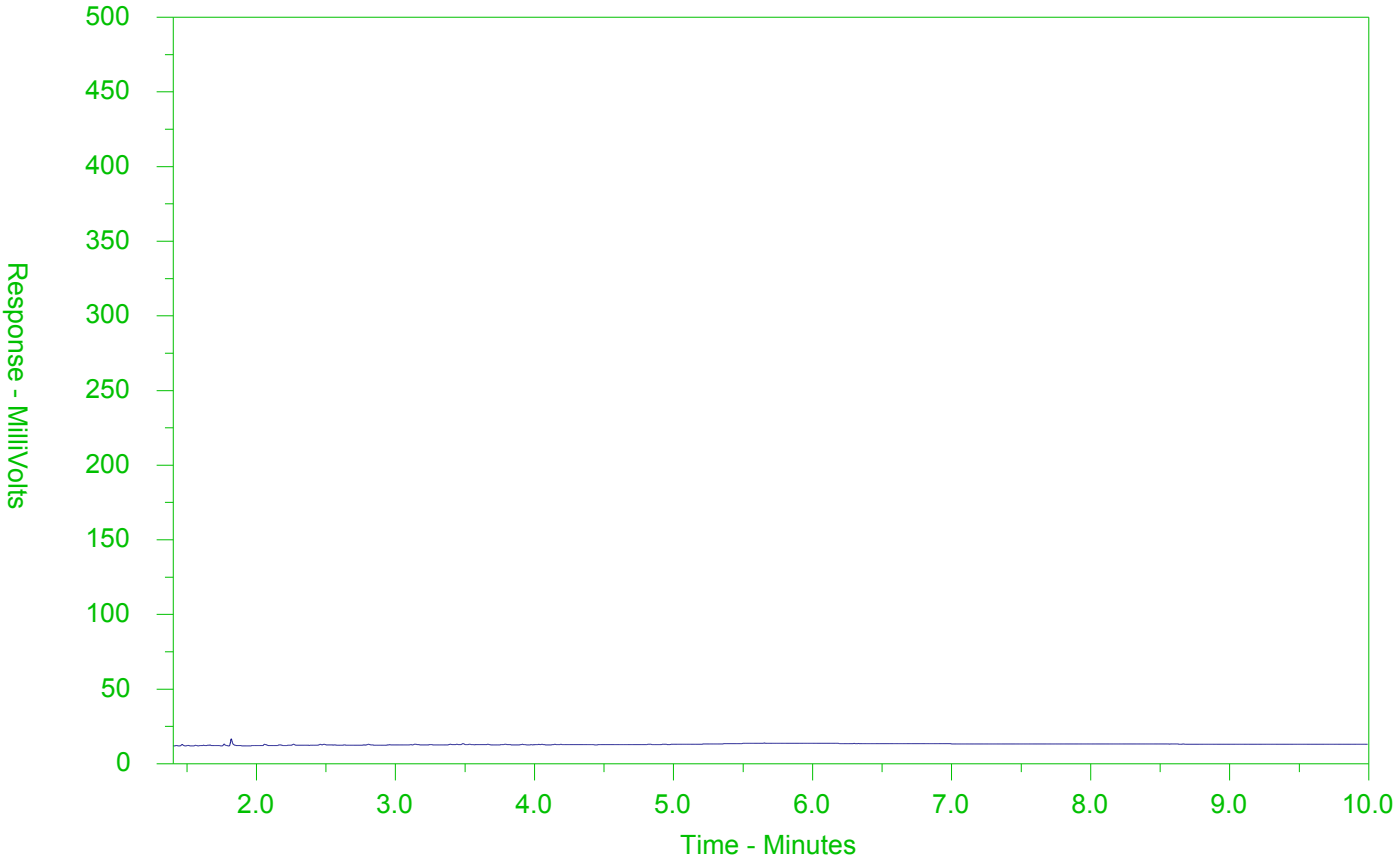
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2181898-2
Client Sample ID: WQ-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

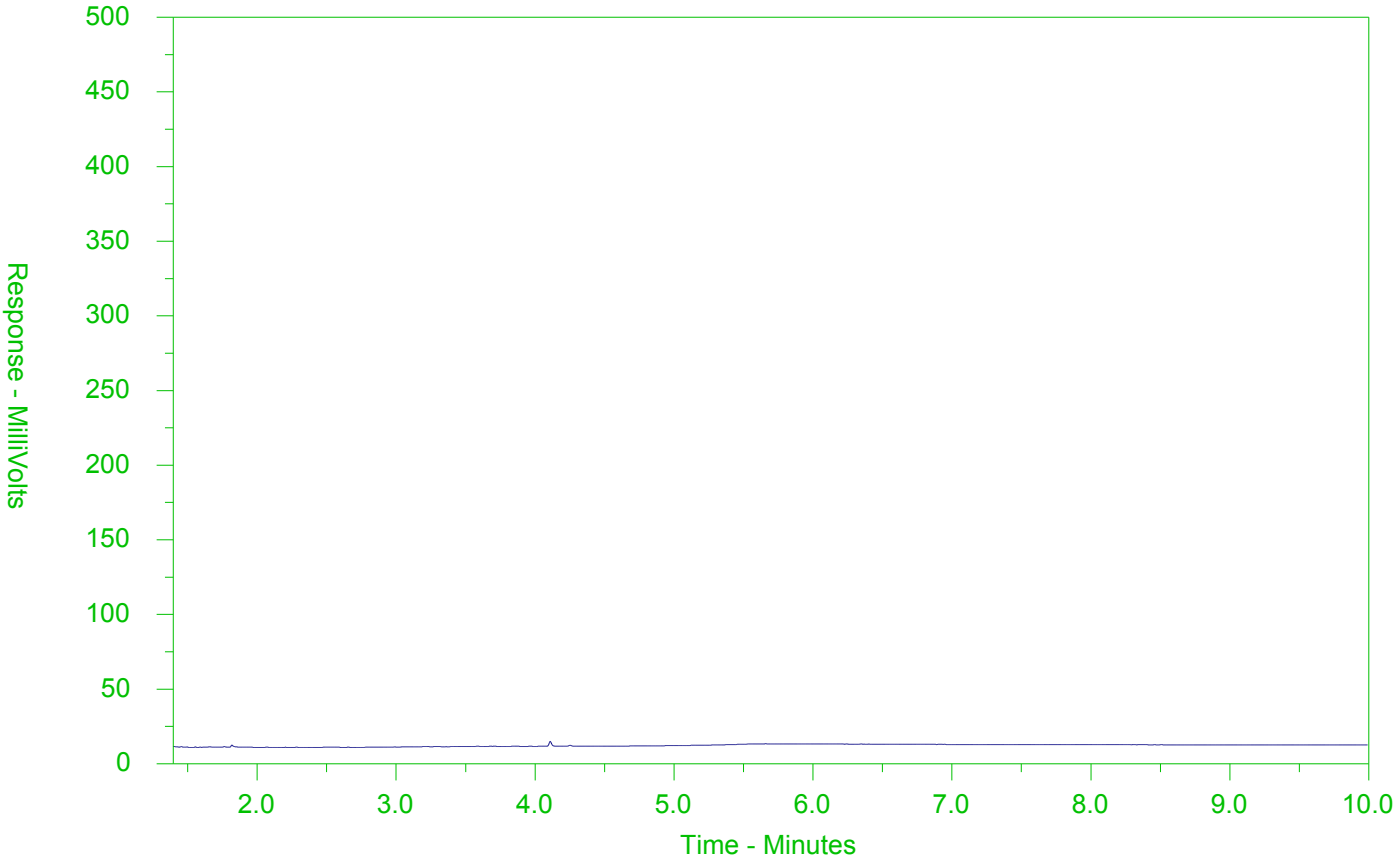
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2181898-3
Client Sample ID: WQ-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

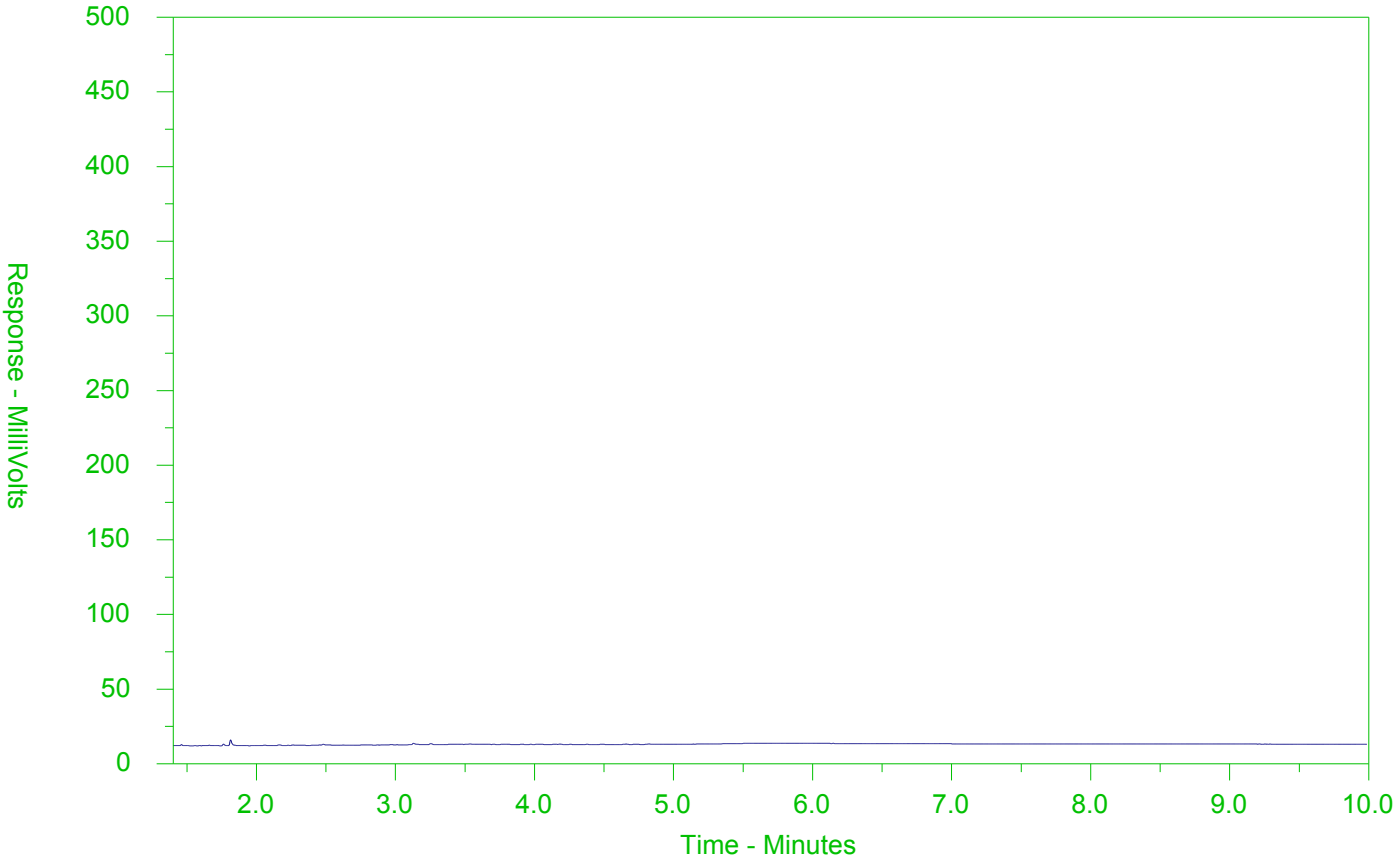
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2181898-4
Client Sample ID: WQ-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2181898-COFC

COC Number: 17 - 728101

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AQUAFOR BEECH LIMITED	Select Report Format: [x] PDF [ ] EXCEL [ ] EDD (DIGITAL)	Regular [R] [x] Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	DARCY LAFRAMBOISE	Quality Control (QC) Report with Report [x] YES [ ] NO	PRIORITY (Business Days): 4 day [P4-20%] [ ]; 3 day [P3-25%] [ ]; 2 day [P2-50%] [x]
Phone:	519-224-3740	[x] Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E-100%] [ ]; Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)] [ ]
	Company address below will appear on the final report	Select Distribution: [x] EMAIL [ ] MAIL [ ] FAX	
Street:	55 Regal Road, Unit 3	Email 1 or Fax laframboise.d@aquaforbeech.com	Date and Time Required for all E&P TATs: Friday Oct 19th.
City/Province:	Guelph, ONT	Email 2 cowlin.w@aquaforbeech.com	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	N1K 1B6	Email 3	
Invoice To	Same as Report To [x] YES [ ] NO	Invoice Distribution	Analysis Request
	Copy of Invoice with Report [x] YES [ ] NO	Select Invoice Distribution: [ ] EMAIL [ ] MAIL [ ] FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	LQ1818981 8 16C.	ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F2-F4	VOC/BTEX/F1	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	WQ-1	16/10/18	15:15	water	R	R			4
2	WQ-2	16/10/18	15:25	water	R	R			4
3	WQ-3	16/10/18	15:31	water	R	R			4
4	WQ-4	16/10/18	15:43	water	R	R			4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [x] NO	- Report due Friday Oct 19
Are samples for human consumption/ use? [ ] YES [x] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	[x]	SIF Observations	Yes [ ]	No	[ ]
Ice Packs	[x]	Ice Cubes [ ]	Custody seal intact	Yes [ ]	No [ ]
Cooling Initiated	[ ]				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				7.4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Meagan Lodwick	Date: OCT. 16/2018	Time: 5:05	Received by:	Date:	Time:	Received by: RH	Date: 16 OCT 18	Time: 1705.

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AQUAFOR BEECH LIMITED
ATTN: WILL COWLIN
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 16-APR-19
Report Date: 23-APR-19 11:12 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2258748

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-623597
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2258748-1	WQ1	Anions and Nutrients	Phosphorus, Total	0.171	0.01	mg/L
		Bacteriological Tests	E. Coli	710	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.853	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Iron (Fe)-Total	1.50	0.3	mg/L
			Lead (Pb)-Total	0.00686	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	0.039	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	0.022	0.00002	ug/L
			Benzo(k)fluoranthene	0.016	0.0002	ug/L
			Chrysene	0.042	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.175	0.008	ug/L
			Phenanthrene	0.078	0.03	ug/L
L2258748-2	WQ2	Anions and Nutrients	Phosphorus, Total	0.0513	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.175	0.015	mg/L
			Cobalt (Co)-Total	<0.0010	0.0009	mg/L
			Copper (Cu)-Total	<0.010	0.001	mg/L
			Iron (Fe)-Total	0.34	0.3	mg/L
			Lead (Pb)-Total	0.00238	0.001	mg/L
			Silver (Ag)-Total	<0.00050	0.0001	mg/L
			Zinc (Zn)-Total	<0.030	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.025	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.076	0.008	ug/L
L2258748-3	WQ3	Anions and Nutrients	Phosphorus, Total	0.0718	0.01	mg/L
		Bacteriological Tests	E. Coli	570	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.275	0.015	mg/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2258748-3	WQ3	Total Metals	Copper (Cu)-Total	0.0041	0.001	mg/L
			Iron (Fe)-Total	0.535	0.3	mg/L
			Lead (Pb)-Total	0.00268	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.024	0.0004	ug/L
			Benzo(g,h,i)perylene	0.029	0.00002	ug/L
			Benzo(k)fluoranthene	0.019	0.0002	ug/L
			Chrysene	0.047	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.158	0.008	ug/L
			Phenanthrene	0.077	0.03	ug/L
L2258748-4	WQ4	Anions and Nutrients	Phosphorus, Total	0.0592	0.01	mg/L
		Cyanides	Cyanide, Free	0.0059	0.005	mg/L
		Total Metals	Aluminum (Al)-Total	0.275	0.015	mg/L
			Copper (Cu)-Total	0.0055	0.001	mg/L
			Iron (Fe)-Total	0.688	0.3	mg/L
			Lead (Pb)-Total	0.00365	0.001	mg/L
			Zinc (Zn)-Total	0.0269	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.013	0.0002	ug/L
			Chrysene	0.041	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.200	0.008	ug/L
			Phenanthrene	0.098	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2258748-1 15-APR-19 WQ1	L2258748-2 15-APR-19 WQ2	L2258748-3 15-APR-19 WQ3	L2258748-4 15-APR-19 WQ4
Conductivity	umhos/cm	-	-	1660	2360	1090	955
Hardness (as CaCO3)	mg/L	-	-	233 HTC	261 HTC	176 HTC	220 HTC
pH	pH units	6.5-8.5	-	8.14	8.24	7.99	8.00
Total Suspended Solids	mg/L	-	-	98.4	13.6	16.0	24.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2258748-1	15-APR-19	WQ1
				L2258748-2	15-APR-19	WQ2
				L2258748-3	15-APR-19	WQ3
				L2258748-4	15-APR-19	WQ4
Chloride (Cl)	mg/L	-	-	483 DLDS	717 DLDS	277	206
Nitrate (as N)	mg/L	-	-	1.36 DLDS	1.43 DLDS	1.06	1.75
Nitrite (as N)	mg/L	-	-	<0.050 DLDS	<0.050 DLDS	0.014	0.016
Total Kjeldahl Nitrogen	mg/L	-	-	0.41	0.35	0.37	0.66
Total Nitrogen	mg/L	-	-	1.77	1.78	1.44	2.43
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0109	0.0091	0.0053	0.0112
Phosphorus, Total	mg/L	0.01	-	0.171	0.0513	0.0718	0.0592

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

			Lab ID	L2258748-1	L2258748-2	L2258748-3	L2258748-4
			Sample Date	15-APR-19	15-APR-19	15-APR-19	15-APR-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	0.0022	0.0059

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2258748-1	15-APR-19	WQ1
				L2258748-2	15-APR-19	WQ2
				L2258748-3	15-APR-19	WQ3
				L2258748-4	15-APR-19	WQ4
E. Coli	CFU/100mL	100	-	710 DLM	100 DLM	570 DLM	60 DLM
Total Coliforms	CFU/100mL	-	-	12000 DLM	2200 DLM	5400 DLM	2100 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2258748-1	L2258748-2	L2258748-3	L2258748-4
				15-APR-19	15-APR-19	15-APR-19	15-APR-19
				WQ1	WQ2	WQ3	WQ4
Sodium Adsorption Ratio	SAR	-	-	7.83	11.0	5.41	3.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2258748-1 15-APR-19 WQ1	L2258748-2 15-APR-19 WQ2	L2258748-3 15-APR-19 WQ3	L2258748-4 15-APR-19 WQ4
Aluminum (Al)-Total	mg/L	0.015	-	0.853 DLHC	0.175 DLHC	0.275	0.275
Antimony (Sb)-Total	mg/L	0.02	-	<0.0010 DLHC	<0.0010 DLHC	0.00044	0.00056
Arsenic (As)-Total	mg/L	0.005	-	<0.0010 DLHC	<0.0010 DLHC	0.00046	0.00046
Barium (Ba)-Total	mg/L	-	-	0.0636 DLHC	0.0678 DLHC	0.0381	0.0478
Beryllium (Be)-Total	mg/L	0.011	-	<0.0010 DLHC	<0.0010 DLHC	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	<0.00050 DLHC	<0.00050 DLHC	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-	<0.10 DLHC	<0.10 DLHC	0.026	0.027
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000059 DLHC	<0.000050 DLHC	0.000023	0.000030
Calcium (Ca)-Total	mg/L	-	-	68.4 DLHC	75.6 DLHC	52.6	64.7
Cesium (Cs)-Total	mg/L	-	-	<0.00010 DLHC	<0.00010 DLHC	0.000025	0.000027
Chromium (Cr)-Total	mg/L	-	-	<0.0050 DLHC	<0.0050 DLHC	0.00165	0.00216
Cobalt (Co)-Total	mg/L	0.0009	-	<0.0010 DLHC	<0.0010 DLHC	0.00024	0.00024
Copper (Cu)-Total	mg/L	0.001	-	<0.010 DLHC	<0.010 DLHC	0.0041	0.0055
Iron (Fe)-Total	mg/L	0.3	-	1.50 DLHC	0.34 DLHC	0.535	0.688
Lead (Pb)-Total	mg/L	0.001	-	0.00686 DLHC	0.00238 DLHC	0.00268	0.00365
Magnesium (Mg)-Total	mg/L	-	-	15.1 DLHC	17.6 DLHC	10.9	14.3
Manganese (Mn)-Total	mg/L	-	-	0.132 DLHC	0.0726 DLHC	0.0577	0.0486
Mercury (Hg)-Total	mg/L	0.0002	-	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-	0.00061 DLHC	0.00064 DLHC	0.000621	0.000760
Nickel (Ni)-Total	mg/L	0.025	-	<0.0050 DLHC	<0.0050 DLHC	0.00125	0.00129
Potassium (K)-Total	mg/L	-	-	2.21 DLHC	2.50 DLHC	1.58	1.90
Rubidium (Rb)-Total	mg/L	-	-	<0.0020 DLHC	<0.0020 DLHC	0.00095	0.00100
Selenium (Se)-Total	mg/L	0.1	-	<0.00050 DLHC	<0.00050 DLHC	0.000400	0.000561
Silicon (Si)-Total	mg/L	-	-	3.5 DLHC	2.8 DLHC	2.36	3.01
Silver (Ag)-Total	mg/L	0.0001	-	<0.00050 DLHC	<0.00050 DLHC	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-	274 DLHC	409 DLHC	165 DLHC	120 DLHC
Strontium (Sr)-Total	mg/L	-	-	0.260 DLHC	0.318 DLHC	0.236	0.266
Sulfur (S)-Total	mg/L	-	-	11.8 DLHC	15.2 DLHC	9.83	12.7
Tellurium (Te)-Total	mg/L	-	-	<0.0020 DLHC	<0.0020 DLHC	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-	<0.00010 DLHC	<0.00010 DLHC	<0.000010	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2258748-1 15-APR-19 WQ1	L2258748-2 15-APR-19 WQ2	L2258748-3 15-APR-19 WQ3	L2258748-4 15-APR-19 WQ4
Thorium (Th)-Total	mg/L	-	-	<0.0010 DLHC	<0.0010 DLHC	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.0010 DLHC	<0.0010 DLHC	0.00020	0.00024
Titanium (Ti)-Total	mg/L	-	-	0.0230 DLHC	<0.0050 DLUI	0.00917	0.00980
Tungsten (W)-Total	mg/L	0.03	-	<0.0010 DLHC	<0.0010 DLHC	0.00030	0.00066
Uranium (U)-Total	mg/L	0.005	-	0.00074 DLHC	0.00087 DLHC	0.000552	0.000768
Vanadium (V)-Total	mg/L	0.006	-	<0.0050 DLHC	<0.0050 DLHC	0.00126	0.00126
Zinc (Zn)-Total	mg/L	0.02	-	0.039 DLHC	<0.030 DLHC	0.0199	0.0269
Zirconium (Zr)-Total	mg/L	0.004	-	<0.0030 DLHC	<0.0030 DLHC	<0.00030	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits					
				Lab ID	L2258748-1	L2258748-2	L2258748-3	L2258748-4
				Sample Date	15-APR-19	15-APR-19	15-APR-19	15-APR-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Analyte	Unit	#1	#2					
Chromium, Hexavalent	ug/L	1	-		0.67	0.58	0.77	0.73

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2258748-1	L2258748-2	L2258748-3	L2258748-4
				Sample Date	15-APR-19	15-APR-19	15-APR-19	15-APR-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits						
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30 OWP	<30	<30	<30	
Benzene	ug/L	100	-	<0.50 OWP	<0.50	<0.50	<0.50	
Bromodichloromethane	ug/L	200	-	<2.0 OWP	<2.0	<2.0	<2.0	
Bromoform	ug/L	60	-	<5.0 OWP	<5.0	<5.0	<5.0	
Bromomethane	ug/L	-	-	<0.50 OWP	<0.50	<0.50	<0.50	
Carbon tetrachloride	ug/L	-	-	<0.20 OWP	<0.20	<0.20	<0.20	
Chlorobenzene	ug/L	15	-	<0.50 OWP	<0.50	<0.50	<0.50	
Dibromochloromethane	ug/L	40	-	<2.0 OWP	<2.0	<2.0	<2.0	
Chloroform	ug/L	-	-	<1.0 OWP	<1.0	<1.0	<1.0	
1,2-Dibromoethane	ug/L	5	-	<0.20 OWP	<0.20	<0.20	<0.20	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50 OWP	<0.50	<0.50	<0.50	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50 OWP	<0.50	<0.50	<0.50	
1,4-Dichlorobenzene	ug/L	4	-	<0.50 OWP	<0.50	<0.50	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<2.0 OWP	<2.0	<2.0	<2.0	
1,1-Dichloroethane	ug/L	200	-	<0.50 OWP	<0.50	<0.50	<0.50	
1,2-Dichloroethane	ug/L	100	-	<0.50 OWP	<0.50	<0.50	<0.50	
1,1-Dichloroethylene	ug/L	40	-	<0.50 OWP	<0.50	<0.50	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	0.91 OWP	0.65	2.23	7.20	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50 OWP	<0.50	<0.50	<0.50	
Methylene Chloride	ug/L	100	-	<5.0 OWP	<5.0	<5.0	<5.0	
1,2-Dichloropropane	ug/L	0.7	-	<0.50 OWP	<0.50	<0.50	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30 OWP	<0.30	<0.30	<0.30	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30 OWP	<0.30	<0.30	<0.30	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Ethylbenzene	ug/L	8	-	<0.50 OWP	<0.50	<0.50	<0.50	
n-Hexane	ug/L	-	-	<0.50 OWP	<0.50	<0.50	<0.50	
Methyl Ethyl Ketone	ug/L	400	-	<20 OWP	<20	<20	<20	
Methyl Isobutyl Ketone	ug/L	-	-	<20 OWP	<20	<20	<20	
MTBE	ug/L	-	-	<2.0 OWP	<2.0	<2.0	<2.0	
Styrene	ug/L	4	-	<0.50 OWP	<0.50	<0.50	<0.50	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2258748-1 15-APR-19 WQ1	L2258748-2 15-APR-19 WQ2	L2258748-3 15-APR-19 WQ3	L2258748-4 15-APR-19 WQ4
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50 OWP	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50 OWP	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50 OWP	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50 OWP	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50 OWP	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50 OWP	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50 OWP	<0.50	0.51	1.83
Trichlorofluoromethane	ug/L	-	-	<5.0 OWP	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50 OWP	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30 OWP	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40 OWP	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	93.7	91.2	94.2	94.2
Surrogate: 1,4-Difluorobenzene	%	-	-	96.5	96.7	96.7	97.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2258748-1	15-APR-19	WQ1
				L2258748-2	15-APR-19	WQ2
				L2258748-3	15-APR-19	WQ3
				L2258748-4	15-APR-19	WQ4
F1 (C6-C10)	ug/L	-	-	<25 OWP	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F3-PAH	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	93.9	86.7	91.2	88.0
Surrogate: 3,4-Dichlorotoluene	%	-	-	97.4	90.6	100.6	93.1

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2258748-1	L2258748-2	L2258748-3	L2258748-4
Sample Date				15-APR-19	15-APR-19	15-APR-19	15-APR-19
Sample ID				WQ1	WQ2	WQ3	WQ4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	0.024	<0.020
Benzo(a)pyrene	ug/L	-	-	0.018	<0.010	0.024	0.016
Benzo(b)fluoranthene	ug/L	-	-	0.048	0.022	0.061	0.038
Benzo(g,h,i)perylene	ug/L	0.00002	-	0.022	<0.020	0.029	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	0.016	<0.010	0.019	0.013
Chrysene	ug/L	0.0001	-	0.042	<0.025 DLQ	0.047	0.041
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.175	0.076	0.158	0.200
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	0.021	<0.020	0.031	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	0.078	0.027	0.077	0.098
Pyrene	ug/L	-	-	0.112	0.047	0.104	0.122
Surrogate: d10-Acenaphthene	%	-	-	106.6	95.8	104.1	104.6
Surrogate: d12-Chrysene	%	-	-	108.2	97.5	105.7	106.4
Surrogate: d8-Naphthalene	%	-	-	112.4	102.0	107.7	109.8
Surrogate: d10-Phenanthrene	%	-	-	111.7	100.5	108.9	109.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
OWP	Organic water sample contained visible sediment (must be included as part of analysis). Measured concentrations of organic substances in water can be biased high due to presence of

Reference Information

sediment.

DLHC Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT Water F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Water F2-F4-O.Reg 153/04 (July 2011) EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT Water Hardness APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT Water Total P in Water by Colour APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT Water Total Dissolved P in Water by Colour APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PAH-PWQO-WT Water PWQO Polyaromatic Hydrocarbons SW846 8270

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		(PAHs)	

Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TC-MF-WT	Water	Total Coliforms	SM 9222B

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-623597

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2258748 Report Date: 23-APR-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4605540								
WG3029647-20 DUP		**WG3029647-18**						
Chloride (Cl)		205	205		mg/L	0.1	20	17-APR-19
WG3029647-17 LCS								
Chloride (Cl)			101.3		%		90-110	17-APR-19
WG3029647-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-APR-19
WG3029647-19 MS		**WG3029647-18**						
Chloride (Cl)			N/A	MS-B	%		-	17-APR-19
CN-FREE-CFA-WT	**Water**							
Batch R4605139								
WG3029274-3 DUP		**L2258748-1**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-APR-19
WG3029274-2 LCS								
Cyanide, Free			94.7		%		80-120	17-APR-19
WG3029274-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	17-APR-19
WG3029274-4 MS		**L2258748-1**						
Cyanide, Free			92.7		%		75-125	17-APR-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4605097								
WG3029327-4 DUP		**WG3029327-3**						
Chromium, Hexavalent		243	238		ug/L	1.9	20	17-APR-19
WG3029327-2 LCS								
Chromium, Hexavalent			100.1		%		80-120	17-APR-19
WG3029327-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	17-APR-19
WG3029327-5 MS		**WG3029327-3**						
Chromium, Hexavalent			N/A	MS-B	%		-	17-APR-19
EC-MF-WT	**Water**							
Batch R4605348								
WG3029311-3 DUP		**L2258954-1**						
E. Coli		1	0	J	CFU/100mL	1	2	18-APR-19
WG3029311-1 MB								
E. Coli			0		CFU/100mL		1	18-APR-19
EC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4603606								
WG3029141-8 DUP		**WG3029141-7**						
Conductivity		1900	1910		umhos/cm	0.5	10	17-APR-19
WG3029141-6 LCS								
Conductivity			94.4		%		90-110	17-APR-19
WG3029141-5 MB								
Conductivity			<3.0		umhos/cm		3	17-APR-19
F1-HS-511-WT	**Water**							
Batch R4605082								
WG3028250-4 DUP		**WG3028250-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	18-APR-19
WG3028250-1 LCS								
F1 (C6-C10)			101.1		%		80-120	18-APR-19
WG3028250-2 MB								
F1 (C6-C10)			<25		ug/L		25	18-APR-19
Surrogate: 3,4-Dichlorotoluene			103.2		%		60-140	18-APR-19
WG3028250-5 MS		**WG3028250-3**						
F1 (C6-C10)			95.6		%		60-140	18-APR-19
F2-F4-511-WT	**Water**							
Batch R4605259								
WG3029158-2 LCS								
F2 (C10-C16)			90.9		%		70-130	17-APR-19
F3 (C16-C34)			92.1		%		70-130	17-APR-19
F4 (C34-C50)			97.4		%		70-130	17-APR-19
WG3029158-1 MB								
F2 (C10-C16)			<100		ug/L		100	17-APR-19
F3 (C16-C34)			<250		ug/L		250	17-APR-19
F4 (C34-C50)			<250		ug/L		250	17-APR-19
Surrogate: 2-Bromobenzotrifluoride			82.5		%		60-140	17-APR-19
HG-T-CVAA-WT	**Water**							
Batch R4605339								
WG3030242-6 DUP		**WG3030242-5**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	18-APR-19
WG3030242-4 LCS								
Mercury (Hg)-Total			98.1		%		80-120	18-APR-19
WG3030242-3 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	18-APR-19
WG3030242-8 MS		**WG3030242-7**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4605339								
WG3030242-8 MS		**WG3030242-7**						
Mercury (Hg)-Total			93.6		%		70-130	18-APR-19
MET-T-CCMS-WT	**Water**							
Batch R4603451								
WG3029055-4 DUP		**WG3029055-3**						
Aluminum (Al)-Total		0.432	0.459		mg/L	6.2	20	17-APR-19
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-APR-19
Arsenic (As)-Total		0.0010	0.0012		mg/L	16	20	17-APR-19
Barium (Ba)-Total		0.384	0.375		mg/L	2.3	20	17-APR-19
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-APR-19
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-APR-19
Boron (B)-Total		0.21	0.21		mg/L	0.1	20	17-APR-19
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-APR-19
Calcium (Ca)-Total		114	115		mg/L	0.8	20	17-APR-19
Chromium (Cr)-Total		0.0074	0.0075		mg/L	1.8	20	17-APR-19
Cesium (Cs)-Total		0.00043	0.00045		mg/L	3.6	20	17-APR-19
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-APR-19
Copper (Cu)-Total		0.017	0.018		mg/L	1.3	20	17-APR-19
Iron (Fe)-Total		0.67	0.64		mg/L	5.0	20	17-APR-19
Lead (Pb)-Total		0.00344	0.00339		mg/L	1.4	20	17-APR-19
Magnesium (Mg)-Total		19.8	19.8		mg/L	0.3	20	17-APR-19
Manganese (Mn)-Total		0.0618	0.0603		mg/L	2.4	20	17-APR-19
Molybdenum (Mo)-Total		0.00529	0.00538		mg/L	1.6	20	17-APR-19
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-APR-19
Potassium (K)-Total		68.0	67.3		mg/L	1.1	20	17-APR-19
Rubidium (Rb)-Total		0.128	0.127		mg/L	1.2	20	17-APR-19
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-APR-19
Silicon (Si)-Total		6.5	6.6		mg/L	2.0	20	17-APR-19
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-APR-19
Sodium (Na)-Total		353	358		mg/L	1.4	20	17-APR-19
Strontium (Sr)-Total		3.05	3.08		mg/L	1.0	20	17-APR-19
Sulfur (S)-Total		30.4	29.6		mg/L	2.5	25	17-APR-19
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4603451								
WG3029055-4 DUP		**WG3029055-3**						
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-APR-19
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	17-APR-19
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-APR-19
Titanium (Ti)-Total		<0.020	0.0164		mg/L	12	20	17-APR-19
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-APR-19
Uranium (U)-Total		0.00080	0.00084		mg/L	4.6	20	17-APR-19
Vanadium (V)-Total		0.0080	0.0078		mg/L	2.8	20	17-APR-19
Zinc (Zn)-Total		0.068	0.069		mg/L	0.5	20	17-APR-19
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-APR-19
WG3029055-2 LCS								
Aluminum (Al)-Total			103.3		%		80-120	17-APR-19
Antimony (Sb)-Total			104.4		%		80-120	17-APR-19
Arsenic (As)-Total			97.5		%		80-120	17-APR-19
Barium (Ba)-Total			97.9		%		80-120	17-APR-19
Beryllium (Be)-Total			100.1		%		80-120	17-APR-19
Bismuth (Bi)-Total			100.5		%		80-120	17-APR-19
Boron (B)-Total			98.8		%		80-120	17-APR-19
Cadmium (Cd)-Total			91.8		%		80-120	17-APR-19
Calcium (Ca)-Total			99.8		%		80-120	17-APR-19
Chromium (Cr)-Total			98.9		%		80-120	17-APR-19
Cesium (Cs)-Total			98.3		%		80-120	17-APR-19
Cobalt (Co)-Total			96.8		%		80-120	17-APR-19
Copper (Cu)-Total			95.7		%		80-120	17-APR-19
Iron (Fe)-Total			97.6		%		80-120	17-APR-19
Lead (Pb)-Total			99.5		%		80-120	17-APR-19
Magnesium (Mg)-Total			99.6		%		80-120	17-APR-19
Manganese (Mn)-Total			101.4		%		80-120	17-APR-19
Molybdenum (Mo)-Total			101.1		%		80-120	17-APR-19
Nickel (Ni)-Total			97.3		%		80-120	17-APR-19
Potassium (K)-Total			96.8		%		80-120	17-APR-19
Rubidium (Rb)-Total			102.0		%		80-120	17-APR-19
Selenium (Se)-Total			97.3		%		80-120	17-APR-19
Silicon (Si)-Total			104.4		%		60-140	17-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4603451								
WG3029055-2 LCS								
Silver (Ag)-Total			100.9		%		80-120	17-APR-19
Sodium (Na)-Total			101.1		%		80-120	17-APR-19
Strontium (Sr)-Total			97.0		%		80-120	17-APR-19
Sulfur (S)-Total			98.8		%		80-120	17-APR-19
Thallium (Tl)-Total			97.2		%		80-120	17-APR-19
Tellurium (Te)-Total			96.6		%		80-120	17-APR-19
Thorium (Th)-Total			94.5		%		70-130	17-APR-19
Tin (Sn)-Total			94.1		%		80-120	17-APR-19
Titanium (Ti)-Total			95.9		%		80-120	17-APR-19
Tungsten (W)-Total			94.3		%		80-120	17-APR-19
Uranium (U)-Total			96.8		%		80-120	17-APR-19
Vanadium (V)-Total			100.0		%		80-120	17-APR-19
Zinc (Zn)-Total			94.9		%		80-120	17-APR-19
Zirconium (Zr)-Total			96.8		%		80-120	17-APR-19
WG3029055-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	17-APR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-APR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-APR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-APR-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	17-APR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	17-APR-19
Boron (B)-Total			<0.010		mg/L		0.01	17-APR-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	17-APR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-APR-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	17-APR-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	17-APR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-APR-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	17-APR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	17-APR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	17-APR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	17-APR-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	17-APR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-APR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4603451								
WG3029055-1 MB								
Potassium (K)-Total			<0.050		mg/L		0.05	17-APR-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	17-APR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-APR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	17-APR-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	17-APR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	17-APR-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	17-APR-19
Sulfur (S)-Total			<0.50		mg/L		0.5	17-APR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	17-APR-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	17-APR-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	17-APR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-APR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-APR-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	17-APR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	17-APR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-APR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-APR-19
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	17-APR-19
WG3029055-5 MS		**WG3029055-6**						
Aluminum (Al)-Total			N/A	MS-B	%		-	17-APR-19
Antimony (Sb)-Total			95.7		%		70-130	17-APR-19
Arsenic (As)-Total			97.2		%		70-130	17-APR-19
Barium (Ba)-Total			N/A	MS-B	%		-	17-APR-19
Beryllium (Be)-Total			97.6		%		70-130	17-APR-19
Bismuth (Bi)-Total			91.2		%		70-130	17-APR-19
Boron (B)-Total			N/A	MS-B	%		-	17-APR-19
Cadmium (Cd)-Total			91.5		%		70-130	17-APR-19
Calcium (Ca)-Total			N/A	MS-B	%		-	17-APR-19
Chromium (Cr)-Total			N/A	MS-B	%		-	17-APR-19
Cesium (Cs)-Total			93.2		%		70-130	17-APR-19
Cobalt (Co)-Total			91.7		%		70-130	17-APR-19
Copper (Cu)-Total			N/A	MS-B	%		-	17-APR-19
Iron (Fe)-Total			N/A	MS-B	%		-	17-APR-19
Lead (Pb)-Total			90.0		%		70-130	17-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4603451								
WG3029055-5 MS		**WG3029055-6**						
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-APR-19
Manganese (Mn)-Total			97.5		%		70-130	17-APR-19
Molybdenum (Mo)-Total			N/A	MS-B	%		-	17-APR-19
Nickel (Ni)-Total			94.4		%		70-130	17-APR-19
Potassium (K)-Total			N/A	MS-B	%		-	17-APR-19
Rubidium (Rb)-Total			N/A	MS-B	%		-	17-APR-19
Selenium (Se)-Total			92.4		%		70-130	17-APR-19
Silicon (Si)-Total			N/A	MS-B	%		-	17-APR-19
Silver (Ag)-Total			92.9		%		70-130	17-APR-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-APR-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-APR-19
Sulfur (S)-Total			N/A	MS-B	%		-	17-APR-19
Thallium (Tl)-Total			88.5		%		70-130	17-APR-19
Tellurium (Te)-Total			75.3		%		70-130	17-APR-19
Thorium (Th)-Total			82.3		%		70-130	17-APR-19
Tin (Sn)-Total			93.0		%		70-130	17-APR-19
Titanium (Ti)-Total			94.6		%		70-130	17-APR-19
Tungsten (W)-Total			91.7		%		70-130	17-APR-19
Uranium (U)-Total			N/A	MS-B	%		-	17-APR-19
Vanadium (V)-Total			N/A	MS-B	%		-	17-APR-19
Zinc (Zn)-Total			N/A	MS-B	%		-	17-APR-19
Zirconium (Zr)-Total			75.4		%		70-130	17-APR-19
NO2-IC-WT	**Water**							
Batch R4605540								
WG3029647-20 DUP		**WG3029647-18**						
Nitrite (as N)		0.016	0.016		mg/L	2.1	20	17-APR-19
WG3029647-17 LCS								
Nitrite (as N)			102.8		%		90-110	17-APR-19
WG3029647-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	17-APR-19
WG3029647-19 MS		**WG3029647-18**						
Nitrite (as N)			100.3		%		75-125	17-APR-19
NO3-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4605540								
WG3029647-20 DUP		**WG3029647-18**						
Nitrate (as N)		1.76	1.75		mg/L	0.6	20	17-APR-19
WG3029647-17 LCS								
Nitrate (as N)			101.6		%		90-110	17-APR-19
WG3029647-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	17-APR-19
WG3029647-19 MS		**WG3029647-18**						
Nitrate (as N)			99.0		%		75-125	17-APR-19
P-T-COL-WT	**Water**							
Batch R4605243								
WG3029816-3 DUP		**L2258494-1**						
Phosphorus, Total		0.144	0.144		mg/L	0.4	20	18-APR-19
WG3029816-2 LCS								
Phosphorus, Total			102.2		%		80-120	18-APR-19
WG3029816-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	18-APR-19
WG3029816-4 MS		**L2258494-1**						
Phosphorus, Total			N/A	MS-B	%		-	18-APR-19
P-TD-COL-WT	**Water**							
Batch R4605245								
WG3029863-3 DUP		**L2258748-3**						
Phosphorus (P)-Total	Dissolved	0.0053	0.0064		mg/L	20	20	18-APR-19
WG3029863-2 LCS								
Phosphorus (P)-Total	Dissolved		107.0		%		80-120	18-APR-19
WG3029863-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	18-APR-19
WG3029863-4 MS		**L2258748-3**						
Phosphorus (P)-Total	Dissolved		91.6		%		70-130	18-APR-19
PAH-PWQO-WT	**Water**							
Batch R4605278								
WG3029158-2 LCS								
1-Methylnaphthalene			97.4		%		50-150	18-APR-19
2-Methylnaphthalene			95.0		%		50-150	18-APR-19
Acenaphthene			101.8		%		50-150	18-APR-19
Acenaphthylene			96.6		%		50-150	18-APR-19
Anthracene			103.3		%		60-130	18-APR-19
Benzo(a)anthracene			108.2		%		60-130	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4605278								
WG3029158-2 LCS								
Benzo(a)pyrene			100.5		%		50-150	18-APR-19
Benzo(b)fluoranthene			95.1		%		50-150	18-APR-19
Benzo(g,h,i)perylene			101.2		%		60-130	18-APR-19
Benzo(k)fluoranthene			99.3		%		60-130	18-APR-19
Chrysene			97.6		%		60-130	18-APR-19
Dibenzo(ah)anthracene			99.5		%		60-130	18-APR-19
Fluoranthene			102.8		%		60-130	18-APR-19
Fluorene			101.4		%		50-150	18-APR-19
Indeno(1,2,3-cd)pyrene			103.4		%		50-150	18-APR-19
Naphthalene			97.6		%		50-150	18-APR-19
Phenanthrene			104.1		%		50-150	18-APR-19
Pyrene			104.3		%		50-150	18-APR-19
WG3029158-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	18-APR-19
2-Methylnaphthalene			<0.020		ug/L		0.02	18-APR-19
Acenaphthene			<0.020		ug/L		0.02	18-APR-19
Acenaphthylene			<0.020		ug/L		0.02	18-APR-19
Anthracene			<0.010		ug/L		0.01	18-APR-19
Benzo(a)anthracene			<0.020		ug/L		0.02	18-APR-19
Benzo(a)pyrene			<0.010		ug/L		0.01	18-APR-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	18-APR-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	18-APR-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	18-APR-19
Chrysene			<0.010		ug/L		0.01	18-APR-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	18-APR-19
Fluoranthene			<0.010		ug/L		0.01	18-APR-19
Fluorene			<0.020		ug/L		0.02	18-APR-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	18-APR-19
Naphthalene			<0.050		ug/L		0.05	18-APR-19
Phenanthrene			<0.020		ug/L		0.02	18-APR-19
Pyrene			<0.020		ug/L		0.02	18-APR-19
Surrogate: d8-Naphthalene			97.4		%		40-130	18-APR-19
Surrogate: d10-Phenanthrene			96.9		%		40-130	18-APR-19
Surrogate: d12-Chrysene			94.6		%		40-130	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4605278								
WG3029158-1 MB								
Surrogate: d10-Acenaphthene			94.7		%		40-130	18-APR-19
PH-WT	**Water**							
Batch R4603606								
WG3029141-8 DUP		**WG3029141-7**						
pH		7.62	7.58	J	pH units	0.04	0.2	17-APR-19
WG3029141-6 LCS								
pH			7.00		pH units		6.9-7.1	17-APR-19
SOLIDS-TSS-WT	**Water**							
Batch R4606036								
WG3030172-3 DUP		**L2258744-7**						
Total Suspended Solids		5490	5490		mg/L	0.1	20	19-APR-19
WG3030172-2 LCS								
Total Suspended Solids			99.5		%		85-115	19-APR-19
WG3030172-1 MB								
Total Suspended Solids			<2.0		mg/L		2	19-APR-19
TC-MF-WT	**Water**							
Batch R4605106								
WG3029303-3 DUP		**L2258568-3**						
Total Coliforms		0	<10	RPD-NA	CFU/100mL	N/A	65	18-APR-19
WG3029303-1 MB								
Total Coliforms			0		CFU/100mL		1	18-APR-19
TKN-WT	**Water**							
Batch R4604872								
WG3029132-3 DUP		**L2258382-1**						
Total Kjeldahl Nitrogen		1.82	1.74		mg/L	4.4	20	17-APR-19
WG3029132-2 LCS								
Total Kjeldahl Nitrogen			101.1		%		75-125	17-APR-19
WG3029132-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	17-APR-19
WG3029132-4 MS		**L2258382-1**						
Total Kjeldahl Nitrogen			105.6		%		70-130	17-APR-19
Batch R4605292								
WG3029709-3 DUP		**L2258748-4**						
Total Kjeldahl Nitrogen		0.66	0.56		mg/L	17	20	18-APR-19
WG3029709-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
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Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4605292								
WG3029709-2 LCS								
Total Kjeldahl Nitrogen			114.5		%		75-125	18-APR-19
WG3029709-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	18-APR-19
WG3029709-4 MS		**L2258748-4**						
Total Kjeldahl Nitrogen			102.2		%		70-130	18-APR-19
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-4 DUP		**WG3028250-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-APR-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	18-APR-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-APR-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-APR-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-APR-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	18-APR-19
cis-1,2-Dichloroethylene		2.23	2.19		ug/L	1.8	30	18-APR-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-APR-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-APR-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-APR-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-4 DUP		**WG3028250-3**						
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-APR-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-APR-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-APR-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-APR-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-APR-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-APR-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-APR-19
Trichloroethylene		0.51	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-APR-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-APR-19
WG3028250-1 LCS								
1,1,1,2-Tetrachloroethane			95.3		%		70-130	18-APR-19
1,1,2,2-Tetrachloroethane			89.4		%		70-130	18-APR-19
1,1,1-Trichloroethane			103.1		%		70-130	18-APR-19
1,1,2-Trichloroethane			91.2		%		70-130	18-APR-19
1,1-Dichloroethane			104.5		%		70-130	18-APR-19
1,1-Dichloroethylene			111.9		%		70-130	18-APR-19
1,2-Dibromoethane			90.3		%		70-130	18-APR-19
1,2-Dichlorobenzene			99.7		%		70-130	18-APR-19
1,2-Dichloroethane			91.0		%		70-130	18-APR-19
1,2-Dichloropropane			96.7		%		70-130	18-APR-19
1,3-Dichlorobenzene			105.4		%		70-130	18-APR-19
1,4-Dichlorobenzene			103.9		%		70-130	18-APR-19
Acetone			79.6		%		60-140	18-APR-19
Benzene			101.7		%		70-130	18-APR-19
Bromodichloromethane			94.5		%		70-130	18-APR-19
Bromoform			86.0		%		70-130	18-APR-19
Bromomethane			110.7		%		60-140	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-1 LCS								
Carbon tetrachloride			103.8		%		70-130	18-APR-19
Chlorobenzene			98.2		%		70-130	18-APR-19
Chloroform			98.5		%		70-130	18-APR-19
cis-1,2-Dichloroethylene			97.5		%		70-130	18-APR-19
cis-1,3-Dichloropropene			94.2		%		70-130	18-APR-19
Dibromochloromethane			91.9		%		70-130	18-APR-19
Dichlorodifluoromethane			112.8		%		50-140	18-APR-19
Ethylbenzene			108.0		%		70-130	18-APR-19
n-Hexane			110.8		%		70-130	18-APR-19
m+p-Xylenes			107.7		%		70-130	18-APR-19
Methyl Ethyl Ketone			73.4		%		60-140	18-APR-19
Methyl Isobutyl Ketone			80.4		%		60-140	18-APR-19
Methylene Chloride			98.7		%		70-130	18-APR-19
MTBE			101.4		%		70-130	18-APR-19
o-Xylene			106.2		%		70-130	18-APR-19
Styrene			107.8		%		70-130	18-APR-19
Tetrachloroethylene			105.2		%		70-130	18-APR-19
Toluene			99.5		%		70-130	18-APR-19
trans-1,2-Dichloroethylene			103.8		%		70-130	18-APR-19
trans-1,3-Dichloropropene			91.0		%		70-130	18-APR-19
Trichloroethylene			103.9		%		70-130	18-APR-19
Trichlorofluoromethane			113.2		%		60-140	18-APR-19
Vinyl chloride			94.0		%		60-140	18-APR-19
WG3028250-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	18-APR-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	18-APR-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	18-APR-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	18-APR-19
1,1-Dichloroethane			<0.50		ug/L		0.5	18-APR-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	18-APR-19
1,2-Dibromoethane			<0.20		ug/L		0.2	18-APR-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	18-APR-19
1,2-Dichloroethane			<0.50		ug/L		0.5	18-APR-19
1,2-Dichloropropane			<0.50		ug/L		0.5	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-2 MB								
1,3-Dichlorobenzene			<0.50		ug/L		0.5	18-APR-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	18-APR-19
Acetone			<30		ug/L		30	18-APR-19
Benzene			<0.50		ug/L		0.5	18-APR-19
Bromodichloromethane			<2.0		ug/L		2	18-APR-19
Bromoform			<5.0		ug/L		5	18-APR-19
Bromomethane			<0.50		ug/L		0.5	18-APR-19
Carbon tetrachloride			<0.20		ug/L		0.2	18-APR-19
Chlorobenzene			<0.50		ug/L		0.5	18-APR-19
Chloroform			<1.0		ug/L		1	18-APR-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-APR-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	18-APR-19
Dibromochloromethane			<2.0		ug/L		2	18-APR-19
Dichlorodifluoromethane			<2.0		ug/L		2	18-APR-19
Ethylbenzene			<0.50		ug/L		0.5	18-APR-19
n-Hexane			<0.50		ug/L		0.5	18-APR-19
m+p-Xylenes			<0.40		ug/L		0.4	18-APR-19
Methyl Ethyl Ketone			<20		ug/L		20	18-APR-19
Methyl Isobutyl Ketone			<20		ug/L		20	18-APR-19
Methylene Chloride			<5.0		ug/L		5	18-APR-19
MTBE			<2.0		ug/L		2	18-APR-19
o-Xylene			<0.30		ug/L		0.3	18-APR-19
Styrene			<0.50		ug/L		0.5	18-APR-19
Tetrachloroethylene			<0.50		ug/L		0.5	18-APR-19
Toluene			<0.50		ug/L		0.5	18-APR-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-APR-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	18-APR-19
Trichloroethylene			<0.50		ug/L		0.5	18-APR-19
Trichlorofluoromethane			<5.0		ug/L		5	18-APR-19
Vinyl chloride			<0.50		ug/L		0.5	18-APR-19
Surrogate: 1,4-Difluorobenzene			98.1		%		70-130	18-APR-19
Surrogate: 4-Bromofluorobenzene			92.5		%		70-130	18-APR-19
WG3028250-5 MS		**WG3028250-3**						
1,1,1,2-Tetrachloroethane			98.8		%		50-140	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-5 MS		**WG3028250-3**						
1,1,2,2-Tetrachloroethane			91.2		%		50-140	18-APR-19
1,1,1-Trichloroethane			106.8		%		50-140	18-APR-19
1,1,2-Trichloroethane			92.7		%		50-140	18-APR-19
1,1-Dichloroethane			124.8		%		50-140	18-APR-19
1,1-Dichloroethylene			108.8		%		50-140	18-APR-19
1,2-Dibromoethane			90.6		%		50-140	18-APR-19
1,2-Dichlorobenzene			99.2		%		50-140	18-APR-19
1,2-Dichloroethane			92.6		%		50-140	18-APR-19
1,2-Dichloropropane			97.4		%		50-140	18-APR-19
1,3-Dichlorobenzene			101.3		%		50-140	18-APR-19
1,4-Dichlorobenzene			99.2		%		50-140	18-APR-19
Acetone			86.7		%		50-140	18-APR-19
Benzene			102.2		%		50-140	18-APR-19
Bromodichloromethane			97.5		%		50-140	18-APR-19
Bromoform			88.3		%		50-140	18-APR-19
Bromomethane			103.7		%		50-140	18-APR-19
Carbon tetrachloride			108.4		%		50-140	18-APR-19
Chlorobenzene			97.8		%		50-140	18-APR-19
Chloroform			101.3		%		50-140	18-APR-19
cis-1,2-Dichloroethylene			98.1		%		50-140	18-APR-19
cis-1,3-Dichloropropene			86.9		%		50-140	18-APR-19
Dibromochloromethane			95.0		%		50-140	18-APR-19
Dichlorodifluoromethane			90.0		%		50-140	18-APR-19
Ethylbenzene			106.2		%		50-140	18-APR-19
n-Hexane			105.6		%		50-140	18-APR-19
m+p-Xylenes			105.4		%		50-140	18-APR-19
Methyl Ethyl Ketone			74.7		%		50-140	18-APR-19
Methyl Isobutyl Ketone			79.0		%		50-140	18-APR-19
Methylene Chloride			98.7		%		50-140	18-APR-19
MTBE			101.4		%		50-140	18-APR-19
o-Xylene			105.9		%		50-140	18-APR-19
Styrene			105.4		%		50-140	18-APR-19
Tetrachloroethylene			102.8		%		50-140	18-APR-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4605082								
WG3028250-5 MS		**WG3028250-3**						
Toluene			98.4		%		50-140	18-APR-19
trans-1,2-Dichloroethylene			96.9		%		50-140	18-APR-19
trans-1,3-Dichloropropene			82.0		%		50-140	18-APR-19
Trichloroethylene			103.1		%		50-140	18-APR-19
Trichlorofluoromethane			112.8		%		50-140	18-APR-19
Vinyl chloride			85.3		%		50-140	18-APR-19

Quality Control Report

Workorder: L2258748 Report Date: 23-APR-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2258748-COFC

COC Number: 17 - 623597

Page of

Report To	Contact and company name below will appear on the final report	Report Format	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AQUAFOR BEECH LTD	Select Report Format: [X] PDF [ ] EXCEL [ ] EDD (DIGITAL)	Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	WILL COWLIN	Quality Control (QC) Report with Report [X] YES [ ] NO	PRIORITY (Business Days): 4 day [P4-20%] [ ]; 3 day [P3-25%] [ ]; 2 day [P2-50%] [ ]
Phone:	519-803-7834	[X] Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E-100%] [ ]; Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]
	Company address below will appear on the final report	Select Distribution: [X] EMAIL [ ] MAIL [ ] FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	55 REGAL RD, UNIT 3	Email 1 or Fax COWLIN.W@AQUAFORBEECH.COM	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	GUELPH, ONT	Email 2 BORDI.M@AQUAFORBEECH.COM	
Postal Code:	N1K 1B6	Email 3	

Invoice To		Invoice Distribution	
	Same as Report To [X] YES [ ] NO		
	Copy of Invoice with Report [X] YES [ ] NO	Select Invoice Distribution: [ ] EMAIL [ ] MAIL [ ] FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q67885	AFE/Cost Center:	PO#
Job #:	MOHAWK LAKE	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2258748	ALS Contact: Gayle Braun	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs / BTEX	TKN / TP	Total Coliforms / E.Coli	Metals	PAHs	Hydrocarbons F1-PH	Chromium 6+	SAR	TSS, pH, hardness, conductivity	Anions & Nutrients	Cyanides	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	WQ1	15-04-19		WATER	X	X	X	X	X	X	X	X	X	X	X			
	WQ2	15-04-19		WATER	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓			
	WQ3	15-04-19		WATER														
	WQ4	15-04-19		WATER														

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [ ] NO	
Are samples for human consumption/ use? [ ] YES [ ] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ]	SIF Observations	Yes [ ]	No [ ]		
Ice Packs [✓]	Ice Cubes [ ]	Custody seal intact	Yes [ ]	No [ ]	
Cooling Initiated [ ]					

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				6.7			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: TM	Date: Apr 16/19	Time: 14:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AQUAFOR BEECH LIMITED
ATTN: WILL COWLIN
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 01-MAY-19
Report Date: 10-MAY-19 11:28 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2266155

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 17-684121
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2266155-1	WQ1	Anions and Nutrients	Phosphorus, Total	0.0532	0.01	mg/L
		Bacteriological Tests	E. Coli	150	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.122	0.015	mg/L
			Copper (Cu)-Total	0.0019	0.001	mg/L
			Lead (Pb)-Total	0.00170	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.023	0.008	ug/L
L2266155-2	WQ2	Anions and Nutrients	Phosphorus, Total	0.0317	0.01	mg/L
		Bacteriological Tests	E. Coli	350	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.067	0.015	mg/L
			Copper (Cu)-Total	0.0016	0.001	mg/L
			Lead (Pb)-Total	0.00212	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.013	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.047	0.008	ug/L
L2266155-3	WQ3	Anions and Nutrients	Phosphorus, Total	0.0695	0.01	mg/L
		Bacteriological Tests	E. Coli	750	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.709	0.015	mg/L
			Copper (Cu)-Total	0.0060	0.001	mg/L
			Iron (Fe)-Total	1.05	0.3	mg/L
			Lead (Pb)-Total	0.00632	0.001	mg/L
			Zinc (Zn)-Total	0.0317	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.030	0.0004	ug/L
			Benzo(g,h,i)perylene	0.035	0.00002	ug/L
			Benzo(k)fluoranthene	0.026	0.0002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2266155-3	WQ3	Polycyclic Aromatic Hydrocarbons	Chrysene	0.056	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.183	0.008	ug/L
			Phenanthrene	0.097	0.03	ug/L
L2266155-4	WQ4	Anions and Nutrients	Phosphorus, Total	0.0785	0.01	mg/L
		Bacteriological Tests	E. Coli	300	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.414	0.015	mg/L
			Copper (Cu)-Total	0.0068	0.001	mg/L
			Iron (Fe)-Total	0.870	0.3	mg/L
			Lead (Pb)-Total	0.00622	0.001	mg/L
			Zinc (Zn)-Total	0.0344	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.013	0.0008	ug/L
			Benzo(a)anthracene	<0.070	0.0004	ug/L
			Benzo(g,h,i)perylene	0.099	0.00002	ug/L
			Benzo(k)fluoranthene	0.054	0.0002	ug/L
			Chrysene	0.154	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.399	0.008	ug/L
			Phenanthrene	0.159	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2266155-1 01-MAY-19 WQ1	L2266155-2 01-MAY-19 WQ2	L2266155-3 01-MAY-19 WQ3	L2266155-4 01-MAY-19 WQ4
Conductivity	umhos/cm	-	-	1280	1680	261	317
Hardness (as CaCO3)	mg/L	-	-	305 HTC	267 HTC	65.8 HTC	82.0 HTC
pH	pH units	6.5-8.5	-	8.19	8.30	7.88	7.91
Total Suspended Solids	mg/L	-	-	12.6	11.6	50.8	28.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2266155-1 / Sample Date 01-MAY-19 / Sample ID WQ1	Lab ID L2266155-2 / Sample Date 01-MAY-19 / Sample ID WQ2	Lab ID L2266155-3 / Sample Date 01-MAY-19 / Sample ID WQ3	Lab ID L2266155-4 / Sample Date 01-MAY-19 / Sample ID WQ4
Chloride (Cl)	mg/L	-	-	245 DLDS	401 DLDS	43.6	52.6
Nitrate (as N)	mg/L	-	-	4.77 DLDS	1.30 DLDS	0.471	0.665
Nitrite (as N)	mg/L	-	-	<0.050 DLDS	<0.050 DLDS	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L	-	-	0.90	1.88	0.61	1.07
Total Nitrogen	mg/L	-	-	5.67	3.18	1.08	1.74
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0056	0.0078	0.0172	0.0207
Phosphorus, Total	mg/L	0.01	-	0.0532	0.0317	0.0695	0.0785

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Lab ID	L2266155-1	L2266155-2	L2266155-3	L2266155-4
		Sample Date	01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
		Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits				
Analyte	Unit	#1	#2			
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	0.0029

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2266155-1 / Sample Date: 01-MAY-19 / Sample ID: WQ1	Lab ID: L2266155-2 / Sample Date: 01-MAY-19 / Sample ID: WQ2	Lab ID: L2266155-3 / Sample Date: 01-MAY-19 / Sample ID: WQ3	Lab ID: L2266155-4 / Sample Date: 01-MAY-19 / Sample ID: WQ4
E. Coli	CFU/100mL	100	-	150 DLM	350 DLM	750 DLM	300 DLM
Total Coliforms	CFU/100mL	-	-	500 DLM	3800 DLM	18000 DLM	17000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

			Lab ID	L2266155-1	L2266155-2	L2266155-3	L2266155-4
			Sample Date	01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
Sodium Adsorption Ratio	SAR	-	-	4.97	6.43	1.37	1.51

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2266155-1	L2266155-2	L2266155-3	L2266155-4
				Sample Date	01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Aluminum (Al)-Total	mg/L	0.015	-		0.122	0.067	0.709	0.414
Antimony (Sb)-Total	mg/L	0.02	-		0.00033	0.00043	0.00042	0.00050
Arsenic (As)-Total	mg/L	0.005	-		0.00068	0.00041	0.00069	0.00058
Barium (Ba)-Total	mg/L	-	-		0.0697	0.0666	0.0178	0.0207
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.044	0.041	0.010	0.011
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000011	0.000012	0.000045	0.000042
Calcium (Ca)-Total	mg/L	-	-		87.7	76.5	19.9	25.1
Cesium (Cs)-Total	mg/L	-	-		0.000011	<0.000010	0.000062	0.000041
Chromium (Cr)-Total	mg/L	-	-		0.00057	<0.00050	0.00208	0.00222
Cobalt (Co)-Total	mg/L	0.0009	-		0.00011	<0.00010	0.00039	0.00026
Copper (Cu)-Total	mg/L	0.001	-		0.0019	0.0016	0.0060	0.0068
Iron (Fe)-Total	mg/L	0.3	-		0.252	0.220	1.05	0.870
Lead (Pb)-Total	mg/L	0.001	-		0.00170	0.00212	0.00632	0.00622
Magnesium (Mg)-Total	mg/L	-	-		20.9	18.6	3.89	4.71
Manganese (Mn)-Total	mg/L	-	-		0.0515	0.0585	0.0603	0.0505
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	0.000011	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000875	0.000733	0.000344	0.000405
Nickel (Ni)-Total	mg/L	0.025	-		0.00062	0.00064	0.00127	0.00113
Potassium (K)-Total	mg/L	-	-		2.75	2.64	0.874	0.926
Rubidium (Rb)-Total	mg/L	-	-		0.00087	0.00067	0.00143	0.00105
Selenium (Se)-Total	mg/L	0.1	-		0.000453	0.000595	0.000224	0.000332
Silicon (Si)-Total	mg/L	-	-		4.33	3.15	1.77	1.52
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		200 DLHC	242 DLHC	25.6	31.4
Strontium (Sr)-Total	mg/L	-	-		0.328	0.300	0.0934	0.0984
Sulfur (S)-Total	mg/L	-	-		15.6	15.0	3.05	3.93
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	0.000011	<0.000010

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2266155-1 01-MAY-19 WQ1	L2266155-2 01-MAY-19 WQ2	L2266155-3 01-MAY-19 WQ3	L2266155-4 01-MAY-19 WQ4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00010	<0.00010	0.00037	0.00036
Titanium (Ti)-Total	mg/L	-	-	0.00343	0.00218	0.0211	0.0144
Tungsten (W)-Total	mg/L	0.03	-	0.00013	0.00016	0.00017	0.00035
Uranium (U)-Total	mg/L	0.005	-	0.000951	0.00100	0.000185	0.000230
Vanadium (V)-Total	mg/L	0.006	-	0.00097	0.00092	0.00205	0.00164
Zinc (Zn)-Total	mg/L	0.02	-	0.0166	0.0058	0.0317	0.0344
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	0.00033	<0.00030

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Lab ID	L2266155-1	L2266155-2	L2266155-3	L2266155-4
		Sample Date	01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
		Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits				
Analyte	Unit	#1	#2			
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50	0.66	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2266155-1 / Sample Date 01-MAY-19 / Sample ID WQ1	Lab ID L2266155-2 / Sample Date 01-MAY-19 / Sample ID WQ2	Lab ID L2266155-3 / Sample Date 01-MAY-19 / Sample ID WQ3	Lab ID L2266155-4 / Sample Date 01-MAY-19 / Sample ID WQ4
Acetone	ug/L	-	-	<30	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	1.22	1.75	2.86
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2266155-1 / Sample Date 01-MAY-19 / Sample ID WQ1	Lab ID L2266155-2 / Sample Date 01-MAY-19 / Sample ID WQ2	Lab ID L2266155-3 / Sample Date 01-MAY-19 / Sample ID WQ3	Lab ID L2266155-4 / Sample Date 01-MAY-19 / Sample ID WQ4
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	0.64
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	99.8	99.8	98.1	98.6
Surrogate: 1,4-Difluorobenzene	%	-	-	102.9	102.6	102.5	102.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

			Lab ID	L2266155-1	L2266155-2	L2266155-3	L2266155-4
			Sample Date	01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F3-PAH	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	87.1	89.1	86.1	89.5
Surrogate: 3,4-Dichlorotoluene	%	-	-	88.2	93.1	99.7	100.6

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2266155-1	L2266155-2	L2266155-3	L2266155-4
Sample Date				01-MAY-19	01-MAY-19	01-MAY-19	01-MAY-19
Sample ID				WQ1	WQ2	WQ3	WQ4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	0.013 R
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.030 RRR	<0.070 RRR
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010	0.028	0.066
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020	0.067	0.175
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	0.035	0.099
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	0.026	0.054
Chrysene	ug/L	0.0001	-	<0.010	0.013	0.056	0.154
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.023	0.047	0.183	0.399
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	0.042	0.120
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	0.097	0.159
Pyrene	ug/L	-	-	<0.020	0.030	0.131	0.267
Surrogate: d10-Acenaphthene	%	-	-	101.9	94.5	95.7	94.8
Surrogate: d12-Chrysene	%	-	-	138.8 SURR-ND	97.8	103.7	107.3
Surrogate: d8-Naphthalene	%	-	-	85.9	108.3	116.4	100.8
Surrogate: d10-Phenanthrene	%	-	-	105.1	109.4	128.8	107.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2266155-3	Water	Note: RRR: detection limit raised due to bias high analyte response in the laboratory control sample.	
L2266155-4	Water	Note: RRR: detection limit raised due to bias high analyte response in the laboratory control sample.	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated	CCME CWS-PHC, Pub #1310, Dec 2001-L

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Parameters

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-684121

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2266155 Report Date: 10-MAY-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4625685								
WG3042630-4 DUP		**WG3042630-3**						
Chloride (Cl)		52.2	52.6		mg/L	0.7	20	06-MAY-19
WG3042630-2 LCS								
Chloride (Cl)			100.6		%		90-110	06-MAY-19
WG3042630-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-MAY-19
WG3042630-5 MS		**WG3042630-3**						
Chloride (Cl)			101.7		%		75-125	06-MAY-19
CN-FREE-CFA-WT	**Water**							
Batch R4621954								
WG3039965-2 LCS								
Cyanide, Free			100.0		%		80-120	02-MAY-19
WG3039965-1 MB								
Cyanide, Free			<0.0020		mg/L		0.002	02-MAY-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4623166								
WG3041178-4 DUP		**WG3041178-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	03-MAY-19
WG3041178-2 LCS								
Chromium, Hexavalent			95.7		%		80-120	03-MAY-19
WG3041178-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	03-MAY-19
WG3041178-5 MS		**WG3041178-3**						
Chromium, Hexavalent			89.3		%		70-130	03-MAY-19
EC-MF-WT	**Water**							
Batch R4622189								
WG3040179-1 MB								
E. Coli			0		CFU/100mL		1	03-MAY-19
EC-WT	**Water**							
Batch R4620891								
WG3039680-16 DUP		**WG3039680-15**						
Conductivity		1430	1430		umhos/cm	0.1	10	02-MAY-19
WG3039680-14 LCS								
Conductivity			98.4		%		90-110	02-MAY-19
WG3039680-13 MB								
Conductivity			<3.0		umhos/cm		3	02-MAY-19

Quality Control Report

Workorder: L2266155 Report Date: 10-MAY-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4627291								
WG3042965-4 DUP		**WG3042965-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	08-MAY-19
WG3042965-1 LCS								
F1 (C6-C10)			100.8		%		80-120	07-MAY-19
WG3042965-2 MB								
F1 (C6-C10)			<25		ug/L		25	07-MAY-19
Surrogate: 3,4-Dichlorotoluene			106.5		%		60-140	07-MAY-19
WG3042965-5 MS		**WG3042965-3**						
F1 (C6-C10)			80.4		%		60-140	08-MAY-19
F2-F4-511-WT	**Water**							
Batch R4621939								
WG3039709-2 LCS								
F2 (C10-C16)			95.7		%		70-130	02-MAY-19
F3 (C16-C34)			91.2		%		70-130	02-MAY-19
F4 (C34-C50)			111.4		%		70-130	02-MAY-19
WG3039709-1 MB								
F2 (C10-C16)			<100		ug/L		100	02-MAY-19
F3 (C16-C34)			<250		ug/L		250	02-MAY-19
F4 (C34-C50)			<250		ug/L		250	02-MAY-19
Surrogate: 2-Bromobenzotrifluoride			78.4		%		60-140	02-MAY-19
HG-T-CVAA-WT	**Water**							
Batch R4620473								
WG3039822-3 DUP		**L2266155-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	02-MAY-19
WG3039822-2 LCS								
Mercury (Hg)-Total			97.7		%		80-120	02-MAY-19
WG3039822-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	02-MAY-19
WG3039822-4 MS		**L2266155-2**						
Mercury (Hg)-Total			91.9		%		70-130	02-MAY-19
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-4 DUP		**WG3039578-3**						
Aluminum (Al)-Total		0.0057	0.0055		mg/L	4.4	20	02-MAY-19
Antimony (Sb)-Total		0.00066	0.00069		mg/L	4.4	20	02-MAY-19
Arsenic (As)-Total		0.00044	0.00046		mg/L	4.2	20	02-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-4 DUP		**WG3039578-3**						
Barium (Ba)-Total		0.0714	0.0700		mg/L	1.9	20	02-MAY-19
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	02-MAY-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-MAY-19
Boron (B)-Total		0.090	0.092		mg/L	2.7	20	02-MAY-19
Cadmium (Cd)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	02-MAY-19
Calcium (Ca)-Total		44.1	43.7		mg/L	1.0	20	02-MAY-19
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	02-MAY-19
Cesium (Cs)-Total		0.000095	0.000097		mg/L	2.9	20	02-MAY-19
Cobalt (Co)-Total		0.00042	0.00040		mg/L	3.4	20	02-MAY-19
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	02-MAY-19
Iron (Fe)-Total		0.130	0.127		mg/L	1.7	20	02-MAY-19
Lead (Pb)-Total		0.000097	0.000096		mg/L	1.7	20	02-MAY-19
Magnesium (Mg)-Total		14.3	14.4		mg/L	0.6	20	02-MAY-19
Manganese (Mn)-Total		0.0235	0.0235		mg/L	0.2	20	02-MAY-19
Molybdenum (Mo)-Total		0.00582	0.00600		mg/L	3.0	20	02-MAY-19
Nickel (Ni)-Total		0.00219	0.00219		mg/L	0.3	20	02-MAY-19
Potassium (K)-Total		5.56	5.68		mg/L	2.1	20	02-MAY-19
Rubidium (Rb)-Total		0.0134	0.0134		mg/L	0.4	20	02-MAY-19
Selenium (Se)-Total		0.000113	0.000103		mg/L	9.1	20	02-MAY-19
Silicon (Si)-Total		0.33	0.33		mg/L	0.5	20	02-MAY-19
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-MAY-19
Sodium (Na)-Total		63.7	62.1		mg/L	2.6	20	02-MAY-19
Strontium (Sr)-Total		0.372	0.391		mg/L	5.2	20	02-MAY-19
Sulfur (S)-Total		21.1	21.1		mg/L	0.1	25	02-MAY-19
Thallium (Tl)-Total		0.000025	0.000025		mg/L	1.6	20	02-MAY-19
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	02-MAY-19
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	02-MAY-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	02-MAY-19
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	02-MAY-19
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	02-MAY-19
Uranium (U)-Total		0.000012	0.000011		mg/L	1.7	20	02-MAY-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	02-MAY-19
Zinc (Zn)-Total		0.0033	0.0036		mg/L			02-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-4 DUP		**WG3039578-3**						
Zinc (Zn)-Total		0.0033	0.0036		mg/L	7.5	20	02-MAY-19
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	02-MAY-19
WG3039578-2 LCS								
Aluminum (Al)-Total			98.9		%		80-120	02-MAY-19
Antimony (Sb)-Total			102.5		%		80-120	02-MAY-19
Arsenic (As)-Total			99.4		%		80-120	02-MAY-19
Barium (Ba)-Total			93.7		%		80-120	02-MAY-19
Beryllium (Be)-Total			94.7		%		80-120	02-MAY-19
Bismuth (Bi)-Total			96.9		%		80-120	02-MAY-19
Boron (B)-Total			94.6		%		80-120	02-MAY-19
Cadmium (Cd)-Total			98.1		%		80-120	02-MAY-19
Calcium (Ca)-Total			97.1		%		80-120	02-MAY-19
Chromium (Cr)-Total			100.1		%		80-120	02-MAY-19
Cesium (Cs)-Total			101.3		%		80-120	02-MAY-19
Cobalt (Co)-Total			95.9		%		80-120	02-MAY-19
Copper (Cu)-Total			97.7		%		80-120	02-MAY-19
Iron (Fe)-Total			100.8		%		80-120	02-MAY-19
Lead (Pb)-Total			96.8		%		80-120	02-MAY-19
Magnesium (Mg)-Total			102.1		%		80-120	02-MAY-19
Manganese (Mn)-Total			99.3		%		80-120	02-MAY-19
Molybdenum (Mo)-Total			101.3		%		80-120	02-MAY-19
Nickel (Ni)-Total			98.8		%		80-120	02-MAY-19
Potassium (K)-Total			103.7		%		80-120	02-MAY-19
Rubidium (Rb)-Total			101.6		%		80-120	02-MAY-19
Selenium (Se)-Total			99.6		%		80-120	02-MAY-19
Silicon (Si)-Total			101.3		%		60-140	02-MAY-19
Silver (Ag)-Total			96.3		%		80-120	02-MAY-19
Sodium (Na)-Total			98.1		%		80-120	02-MAY-19
Strontium (Sr)-Total			100.1		%		80-120	02-MAY-19
Sulfur (S)-Total			93.9		%		80-120	02-MAY-19
Thallium (Tl)-Total			97.6		%		80-120	02-MAY-19
Tellurium (Te)-Total			96.3		%		80-120	02-MAY-19
Thorium (Th)-Total			97.2		%		70-130	02-MAY-19
Tin (Sn)-Total			99.1		%		80-120	02-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-2 LCS								
Titanium (Ti)-Total			98.7		%		80-120	02-MAY-19
Tungsten (W)-Total			97.6		%		80-120	02-MAY-19
Uranium (U)-Total			101.7		%		80-120	02-MAY-19
Vanadium (V)-Total			100.2		%		80-120	02-MAY-19
Zinc (Zn)-Total			101.2		%		80-120	02-MAY-19
Zirconium (Zr)-Total			98.0		%		80-120	02-MAY-19
WG3039578-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	02-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	02-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	02-MAY-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	02-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	02-MAY-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	02-MAY-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	02-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	02-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	02-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	02-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	02-MAY-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	02-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	02-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	02-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	02-MAY-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	02-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	02-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	02-MAY-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	02-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	02-MAY-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	02-MAY-19
Sulfur (S)-Total			<0.50		mg/L		0.5	02-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	02-MAY-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	02-MAY-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	02-MAY-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	02-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	02-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	02-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	03-MAY-19
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	02-MAY-19
WG3039578-5 MS		**WG3039578-6**						
Aluminum (Al)-Total			96.8		%		70-130	02-MAY-19
Antimony (Sb)-Total			99.6		%		70-130	02-MAY-19
Arsenic (As)-Total			98.2		%		70-130	02-MAY-19
Barium (Ba)-Total			N/A	MS-B	%		-	02-MAY-19
Beryllium (Be)-Total			97.5		%		70-130	02-MAY-19
Bismuth (Bi)-Total			90.8		%		70-130	02-MAY-19
Boron (B)-Total			N/A	MS-B	%		-	02-MAY-19
Cadmium (Cd)-Total			93.6		%		70-130	02-MAY-19
Calcium (Ca)-Total			N/A	MS-B	%		-	02-MAY-19
Chromium (Cr)-Total			96.0		%		70-130	02-MAY-19
Cesium (Cs)-Total			96.7		%		70-130	02-MAY-19
Cobalt (Co)-Total			91.7		%		70-130	02-MAY-19
Copper (Cu)-Total			91.4		%		70-130	02-MAY-19
Iron (Fe)-Total			N/A	MS-B	%		-	02-MAY-19
Lead (Pb)-Total			91.4		%		70-130	02-MAY-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	02-MAY-19
Manganese (Mn)-Total			N/A	MS-B	%		-	02-MAY-19
Molybdenum (Mo)-Total			97.6		%		70-130	02-MAY-19
Nickel (Ni)-Total			92.4		%		70-130	02-MAY-19
Potassium (K)-Total			N/A	MS-B	%		-	02-MAY-19
Rubidium (Rb)-Total			N/A	MS-B	%		-	02-MAY-19
Selenium (Se)-Total			98.4		%		70-130	02-MAY-19
Silicon (Si)-Total			100.7		%		70-130	02-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4620610								
WG3039578-5 MS		**WG3039578-6**						
Silver (Ag)-Total			89.5		%		70-130	02-MAY-19
Sodium (Na)-Total			N/A	MS-B	%		-	02-MAY-19
Strontium (Sr)-Total			N/A	MS-B	%		-	02-MAY-19
Sulfur (S)-Total			N/A	MS-B	%		-	02-MAY-19
Thallium (Tl)-Total			90.2		%		70-130	02-MAY-19
Tellurium (Te)-Total			93.4		%		70-130	02-MAY-19
Thorium (Th)-Total			97.3		%		70-130	02-MAY-19
Tin (Sn)-Total			95.8		%		70-130	02-MAY-19
Titanium (Ti)-Total			97.0		%		70-130	02-MAY-19
Tungsten (W)-Total			96.8		%		70-130	02-MAY-19
Uranium (U)-Total			99.6		%		70-130	02-MAY-19
Vanadium (V)-Total			99.5		%		70-130	02-MAY-19
Zinc (Zn)-Total			90.1		%		70-130	02-MAY-19
Zirconium (Zr)-Total			98.6		%		70-130	02-MAY-19
NO2-IC-WT	**Water**							
Batch R4625685								
WG3042630-4 DUP		**WG3042630-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	06-MAY-19
WG3042630-2 LCS								
Nitrite (as N)			100.1		%		90-110	06-MAY-19
WG3042630-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	06-MAY-19
WG3042630-5 MS		**WG3042630-3**						
Nitrite (as N)			101.0		%		75-125	06-MAY-19
NO3-IC-WT	**Water**							
Batch R4625685								
WG3042630-4 DUP		**WG3042630-3**						
Nitrate (as N)		0.660	0.663		mg/L	0.4	20	06-MAY-19
WG3042630-2 LCS								
Nitrate (as N)			102.0		%		90-110	06-MAY-19
WG3042630-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	06-MAY-19
WG3042630-5 MS		**WG3042630-3**						
Nitrate (as N)			105.3		%		75-125	06-MAY-19
P-T-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-WT	**Water**							
Batch R4622066								
WG3040444-3 DUP		**L2265646-1**						
Phosphorus, Total		0.0250	0.0246		mg/L	1.7	20	03-MAY-19
WG3040444-2 LCS								
Phosphorus, Total			99.4		%		80-120	03-MAY-19
WG3040444-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	03-MAY-19
WG3040444-4 MS		**L2265646-1**						
Phosphorus, Total			95.3		%		70-130	03-MAY-19
P-TD-COL-WT	**Water**							
Batch R4622060								
WG3040404-3 DUP		**L2265646-1**						
Phosphorus (P)-Total	Dissolved	0.0108	0.0113		mg/L	4.5	20	03-MAY-19
WG3040404-2 LCS								
Phosphorus (P)-Total	Dissolved		97.9		%		80-120	03-MAY-19
WG3040404-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	03-MAY-19
WG3040404-4 MS		**L2265646-1**						
Phosphorus (P)-Total	Dissolved		96.9		%		70-130	03-MAY-19
PAH-PWQO-WT	**Water**							
Batch R4628351								
WG3039709-2 LCS								
1-Methylnaphthalene			101.0		%		50-150	08-MAY-19
2-Methylnaphthalene			101.4		%		50-150	08-MAY-19
Acenaphthene			113.4		%		50-150	08-MAY-19
Acenaphthylene			106.3		%		50-150	08-MAY-19
Anthracene			117.2		%		60-130	08-MAY-19
Benzo(a)anthracene			168.6	LCS-ND	%		60-130	08-MAY-19
Benzo(a)pyrene			115.2		%		50-150	08-MAY-19
Benzo(b)fluoranthene			106.6		%		50-150	08-MAY-19
Benzo(g,h,i)perylene			123.6		%		60-130	08-MAY-19
Benzo(k)fluoranthene			111.9		%		60-130	08-MAY-19
Chrysene			161.4	LCS-ND	%		60-130	08-MAY-19
Dibenzo(ah)anthracene			117.2		%		60-130	08-MAY-19
Fluoranthene			120.2		%		60-130	08-MAY-19
Fluorene			110.4		%		50-150	08-MAY-19
Indeno(1,2,3-cd)pyrene			135.6		%		50-150	08-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4628351								
WG3039709-2 LCS								
Naphthalene			106.4		%		50-150	08-MAY-19
Phenanthrene			119.6		%		50-150	08-MAY-19
Pyrene			120.2		%		50-150	08-MAY-19
COMMENTS: RRQC: Surrogate recovery slightly above ALS DQO. Non-detect samples were deemed to be unaffected.								
WG3039709-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	08-MAY-19
2-Methylnaphthalene			<0.020		ug/L		0.02	08-MAY-19
Acenaphthene			<0.020		ug/L		0.02	08-MAY-19
Acenaphthylene			<0.020		ug/L		0.02	08-MAY-19
Anthracene			<0.010		ug/L		0.01	08-MAY-19
Benzo(a)anthracene			<0.020		ug/L		0.02	08-MAY-19
Benzo(a)pyrene			<0.010		ug/L		0.01	08-MAY-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	08-MAY-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	08-MAY-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	08-MAY-19
Chrysene			<0.010		ug/L		0.01	08-MAY-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	08-MAY-19
Fluoranthene			<0.010		ug/L		0.01	08-MAY-19
Fluorene			<0.020		ug/L		0.02	08-MAY-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	08-MAY-19
Naphthalene			<0.050		ug/L		0.05	08-MAY-19
Phenanthrene			<0.020		ug/L		0.02	08-MAY-19
Pyrene			<0.020		ug/L		0.02	08-MAY-19
Surrogate: d8-Naphthalene			88.6		%		40-130	08-MAY-19
Surrogate: d10-Phenanthrene			116.7		%		40-130	08-MAY-19
Surrogate: d12-Chrysene			145.8	RRQC	%		40-130	08-MAY-19
Surrogate: d10-Acenaphthene			103.6		%		40-130	08-MAY-19
COMMENTS: RRQC: Surrogate recovery slightly above ALS DQO. Non-detect samples were deemed to be unaffected.								
Batch R4629313								
WG3044503-2 LCS								
1-Methylnaphthalene			100.2		%		50-150	09-MAY-19
2-Methylnaphthalene			97.4		%		50-150	09-MAY-19
Acenaphthene			110.2		%		50-150	09-MAY-19
Acenaphthylene			105.6		%		50-150	09-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4629313								
WG3044503-2 LCS								
Anthracene			102.6		%		60-130	09-MAY-19
Benzo(a)anthracene			132.3	LCS-H	%		60-130	09-MAY-19
Benzo(a)pyrene			113.4		%		50-150	09-MAY-19
Benzo(b)fluoranthene			102.9		%		50-150	09-MAY-19
Benzo(g,h,i)perylene			126.3		%		60-130	09-MAY-19
Benzo(k)fluoranthene			114.6		%		60-130	09-MAY-19
Chrysene			130.0		%		60-130	09-MAY-19
Dibenzo(ah)anthracene			117.5		%		60-130	09-MAY-19
Fluoranthene			120.6		%		60-130	09-MAY-19
Fluorene			109.7		%		50-150	09-MAY-19
Indeno(1,2,3-cd)pyrene			134.3		%		50-150	09-MAY-19
Naphthalene			103.8		%		50-150	09-MAY-19
Phenanthrene			111.3		%		50-150	09-MAY-19
Pyrene			122.2		%		50-150	09-MAY-19
WG3044503-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	09-MAY-19
2-Methylnaphthalene			<0.020		ug/L		0.02	09-MAY-19
Acenaphthene			<0.020		ug/L		0.02	09-MAY-19
Acenaphthylene			<0.020		ug/L		0.02	09-MAY-19
Anthracene			<0.010		ug/L		0.01	09-MAY-19
Benzo(a)anthracene			<0.020		ug/L		0.02	09-MAY-19
Benzo(a)pyrene			<0.010		ug/L		0.01	09-MAY-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	09-MAY-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	09-MAY-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	09-MAY-19
Chrysene			<0.010		ug/L		0.01	09-MAY-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	09-MAY-19
Fluoranthene			<0.010		ug/L		0.01	09-MAY-19
Fluorene			<0.020		ug/L		0.02	09-MAY-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	09-MAY-19
Naphthalene			<0.050		ug/L		0.05	09-MAY-19
Phenanthrene			<0.020		ug/L		0.02	09-MAY-19
Pyrene			<0.020		ug/L		0.02	09-MAY-19
Surrogate: d8-Naphthalene			113.8		%		40-130	09-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4629313								
WG3044503-1 MB								
Surrogate: d10-Phenanthrene			129.3		%		40-130	09-MAY-19
Surrogate: d12-Chrysene			115.2		%		40-130	09-MAY-19
Surrogate: d10-Acenaphthene			103.0		%		40-130	09-MAY-19
PH-WT	**Water**							
Batch R4620891								
WG3039680-16 DUP		**WG3039680-15**						
pH		8.62	8.58	J	pH units	0.04	0.2	02-MAY-19
WG3039680-14 LCS								
pH			7.00		pH units		6.9-7.1	02-MAY-19
SOLIDS-TSS-WT	**Water**							
Batch R4623187								
WG3041834-3 DUP		**L2266703-2**						
Total Suspended Solids		1710	1820		mg/L	6.5	20	06-MAY-19
WG3041834-2 LCS								
Total Suspended Solids			99.9		%		85-115	06-MAY-19
WG3041834-1 MB								
Total Suspended Solids			<2.0		mg/L		2	06-MAY-19
TC-MF-WT	**Water**							
Batch R4622186								
WG3040192-3 DUP		**L2266343-7**						
Total Coliforms		0	<10	RPD-NA	CFU/100mL	N/A	65	03-MAY-19
WG3040192-1 MB								
Total Coliforms			0		CFU/100mL		1	03-MAY-19
TKN-WT	**Water**							
Batch R4625029								
WG3040717-3 DUP		**L2266155-1**						
Total Kjeldahl Nitrogen		0.90	0.86		mg/L	4.7	20	06-MAY-19
WG3040717-2 LCS								
Total Kjeldahl Nitrogen			115.7		%		75-125	06-MAY-19
WG3040717-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	06-MAY-19
WG3040717-4 MS		**L2266155-1**						
Total Kjeldahl Nitrogen			115.1		%		70-130	06-MAY-19
VOC-511-HS-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4627291								
WG3042965-4 DUP		**WG3042965-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	08-MAY-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	08-MAY-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	08-MAY-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	08-MAY-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	08-MAY-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	08-MAY-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	08-MAY-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	08-MAY-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	08-MAY-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	08-MAY-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	08-MAY-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	08-MAY-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	08-MAY-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	08-MAY-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	08-MAY-19
Styrene		<0.50	<0.50		ug/L			08-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4627291								
WG3042965-4 DUP		**WG3042965-3**						
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	08-MAY-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	08-MAY-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	08-MAY-19
WG3042965-1 LCS								
1,1,1,2-Tetrachloroethane			107.4		%		70-130	07-MAY-19
1,1,2,2-Tetrachloroethane			116.2		%		70-130	07-MAY-19
1,1,1-Trichloroethane			107.8		%		70-130	07-MAY-19
1,1,2-Trichloroethane			116.9		%		70-130	07-MAY-19
1,1-Dichloroethane			115.9		%		70-130	07-MAY-19
1,1-Dichloroethylene			107.9		%		70-130	07-MAY-19
1,2-Dibromoethane			118.5		%		70-130	07-MAY-19
1,2-Dichlorobenzene			108.2		%		70-130	07-MAY-19
1,2-Dichloroethane			118.1		%		70-130	07-MAY-19
1,2-Dichloropropane			112.2		%		70-130	07-MAY-19
1,3-Dichlorobenzene			107.7		%		70-130	07-MAY-19
1,4-Dichlorobenzene			107.9		%		70-130	07-MAY-19
Acetone			133.2		%		60-140	07-MAY-19
Benzene			111.5		%		70-130	07-MAY-19
Bromodichloromethane			110.0		%		70-130	07-MAY-19
Bromoform			116.6		%		70-130	07-MAY-19
Bromomethane			122.0		%		60-140	07-MAY-19
Carbon tetrachloride			106.5		%		70-130	07-MAY-19
Chlorobenzene			108.2		%		70-130	07-MAY-19
Chloroform			112.4		%		70-130	07-MAY-19
cis-1,2-Dichloroethylene			111.3		%		70-130	07-MAY-19
cis-1,3-Dichloropropene			109.3		%		70-130	07-MAY-19
Dibromochloromethane			110.3		%		70-130	07-MAY-19
Dichlorodifluoromethane			97.0		%		50-140	07-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4627291								
WG3042965-1 LCS								
Ethylbenzene			97.8		%		70-130	07-MAY-19
n-Hexane			108.8		%		70-130	07-MAY-19
m+p-Xylenes			98.9		%		70-130	07-MAY-19
Methyl Ethyl Ketone			135.3		%		60-140	07-MAY-19
Methyl Isobutyl Ketone			125.1		%		60-140	07-MAY-19
Methylene Chloride			120.0		%		70-130	07-MAY-19
MTBE			108.7		%		70-130	07-MAY-19
o-Xylene			99.2		%		70-130	07-MAY-19
Styrene			106.9		%		70-130	07-MAY-19
Tetrachloroethylene			100.0		%		70-130	07-MAY-19
Toluene			103.0		%		70-130	07-MAY-19
trans-1,2-Dichloroethylene			113.4		%		70-130	07-MAY-19
trans-1,3-Dichloropropene			112.4		%		70-130	07-MAY-19
Trichloroethylene			111.6		%		70-130	07-MAY-19
Trichlorofluoromethane			113.1		%		60-140	07-MAY-19
Vinyl chloride			95.7		%		60-140	07-MAY-19
WG3042965-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	07-MAY-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	07-MAY-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	07-MAY-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	07-MAY-19
1,1-Dichloroethane			<0.50		ug/L		0.5	07-MAY-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	07-MAY-19
1,2-Dibromoethane			<0.20		ug/L		0.2	07-MAY-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	07-MAY-19
1,2-Dichloroethane			<0.50		ug/L		0.5	07-MAY-19
1,2-Dichloropropane			<0.50		ug/L		0.5	07-MAY-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	07-MAY-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	07-MAY-19
Acetone			<30		ug/L		30	07-MAY-19
Benzene			<0.50		ug/L		0.5	07-MAY-19
Bromodichloromethane			<2.0		ug/L		2	07-MAY-19
Bromoform			<5.0		ug/L		5	07-MAY-19
Bromomethane			<0.50		ug/L		0.5	07-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4627291								
WG3042965-2 MB								
Carbon tetrachloride			<0.20		ug/L		0.2	07-MAY-19
Chlorobenzene			<0.50		ug/L		0.5	07-MAY-19
Chloroform			<1.0		ug/L		1	07-MAY-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	07-MAY-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	07-MAY-19
Dibromochloromethane			<2.0		ug/L		2	07-MAY-19
Dichlorodifluoromethane			<2.0		ug/L		2	07-MAY-19
Ethylbenzene			<0.50		ug/L		0.5	07-MAY-19
n-Hexane			<0.50		ug/L		0.5	07-MAY-19
m+p-Xylenes			<0.40		ug/L		0.4	07-MAY-19
Methyl Ethyl Ketone			<20		ug/L		20	07-MAY-19
Methyl Isobutyl Ketone			<20		ug/L		20	07-MAY-19
Methylene Chloride			<5.0		ug/L		5	07-MAY-19
MTBE			<2.0		ug/L		2	07-MAY-19
o-Xylene			<0.30		ug/L		0.3	07-MAY-19
Styrene			<0.50		ug/L		0.5	07-MAY-19
Tetrachloroethylene			<0.50		ug/L		0.5	07-MAY-19
Toluene			<0.50		ug/L		0.5	07-MAY-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	07-MAY-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	07-MAY-19
Trichloroethylene			<0.50		ug/L		0.5	07-MAY-19
Trichlorofluoromethane			<5.0		ug/L		5	07-MAY-19
Vinyl chloride			<0.50		ug/L		0.5	07-MAY-19
Surrogate: 1,4-Difluorobenzene			101.9		%		70-130	07-MAY-19
Surrogate: 4-Bromofluorobenzene			101.2		%		70-130	07-MAY-19
WG3042965-5 MS		**WG3042965-3**						
1,1,1,2-Tetrachloroethane			107.0		%		50-140	08-MAY-19
1,1,2,2-Tetrachloroethane			109.2		%		50-140	08-MAY-19
1,1,1-Trichloroethane			113.0		%		50-140	08-MAY-19
1,1,2-Trichloroethane			106.5		%		50-140	08-MAY-19
1,1-Dichloroethane			118.0		%		50-140	08-MAY-19
1,1-Dichloroethylene			111.7		%		50-140	08-MAY-19
1,2-Dibromoethane			105.5		%		50-140	08-MAY-19
1,2-Dichlorobenzene			108.5		%		50-140	08-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4627291								
WG3042965-5 MS		**WG3042965-3**						
1,2-Dichloroethane			109.4		%		50-140	08-MAY-19
1,2-Dichloropropane			109.5		%		50-140	08-MAY-19
1,3-Dichlorobenzene			111.8		%		50-140	08-MAY-19
1,4-Dichlorobenzene			111.3		%		50-140	08-MAY-19
Acetone			110.7		%		50-140	08-MAY-19
Benzene			111.8		%		50-140	08-MAY-19
Bromodichloromethane			107.1		%		50-140	08-MAY-19
Bromoform			105.2		%		50-140	08-MAY-19
Bromomethane			119.2		%		50-140	08-MAY-19
Carbon tetrachloride			112.9		%		50-140	08-MAY-19
Chlorobenzene			108.3		%		50-140	08-MAY-19
Chloroform			113.0		%		50-140	08-MAY-19
cis-1,2-Dichloroethylene			110.4		%		50-140	08-MAY-19
cis-1,3-Dichloropropene			104.5		%		50-140	08-MAY-19
Dibromochloromethane			102.9		%		50-140	08-MAY-19
Dichlorodifluoromethane			103.0		%		50-140	08-MAY-19
Ethylbenzene			100.1		%		50-140	08-MAY-19
n-Hexane			113.3		%		50-140	08-MAY-19
m+p-Xylenes			102.1		%		50-140	08-MAY-19
Methyl Ethyl Ketone			105.1		%		50-140	08-MAY-19
Methyl Isobutyl Ketone			103.3		%		50-140	08-MAY-19
Methylene Chloride			116.0		%		50-140	08-MAY-19
MTBE			108.9		%		50-140	08-MAY-19
o-Xylene			99.98		%		50-140	08-MAY-19
Styrene			104.4		%		50-140	08-MAY-19
Tetrachloroethylene			105.9		%		50-140	08-MAY-19
Toluene			103.5		%		50-140	08-MAY-19
trans-1,2-Dichloroethylene			116.7		%		50-140	08-MAY-19
trans-1,3-Dichloropropene			103.0		%		50-140	08-MAY-19
Trichloroethylene			114.1		%		50-140	08-MAY-19
Trichlorofluoromethane			118.8		%		50-140	08-MAY-19
Vinyl chloride			97.4		%		50-140	08-MAY-19

Quality Control Report

Workorder: L2266155 Report Date: 10-MAY-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
LCS-ND	Lab Control Sample recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.
RRQC	Refer to report remarks for information regarding this QC result.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

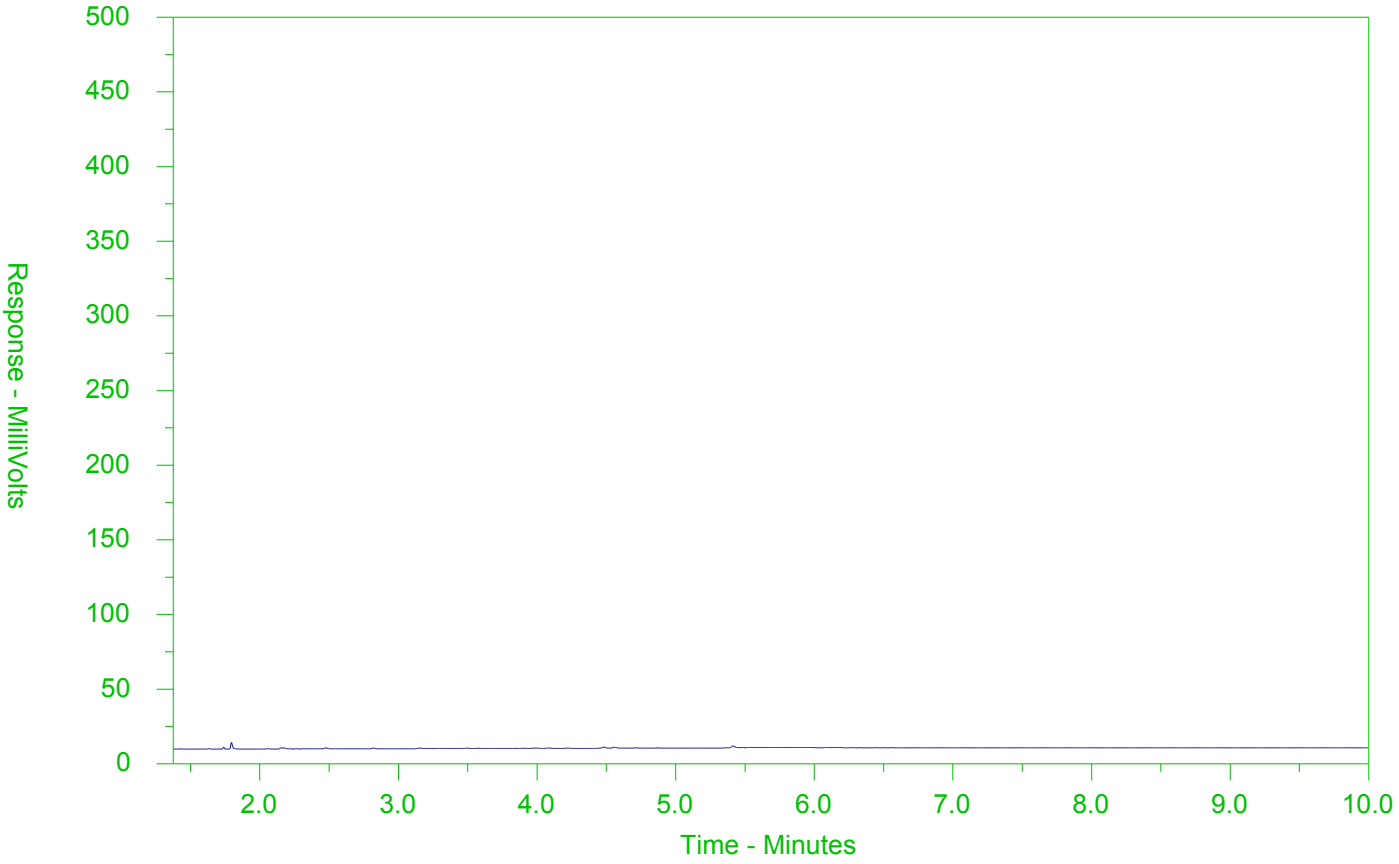
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2266155-1
Client Sample ID: WQ1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

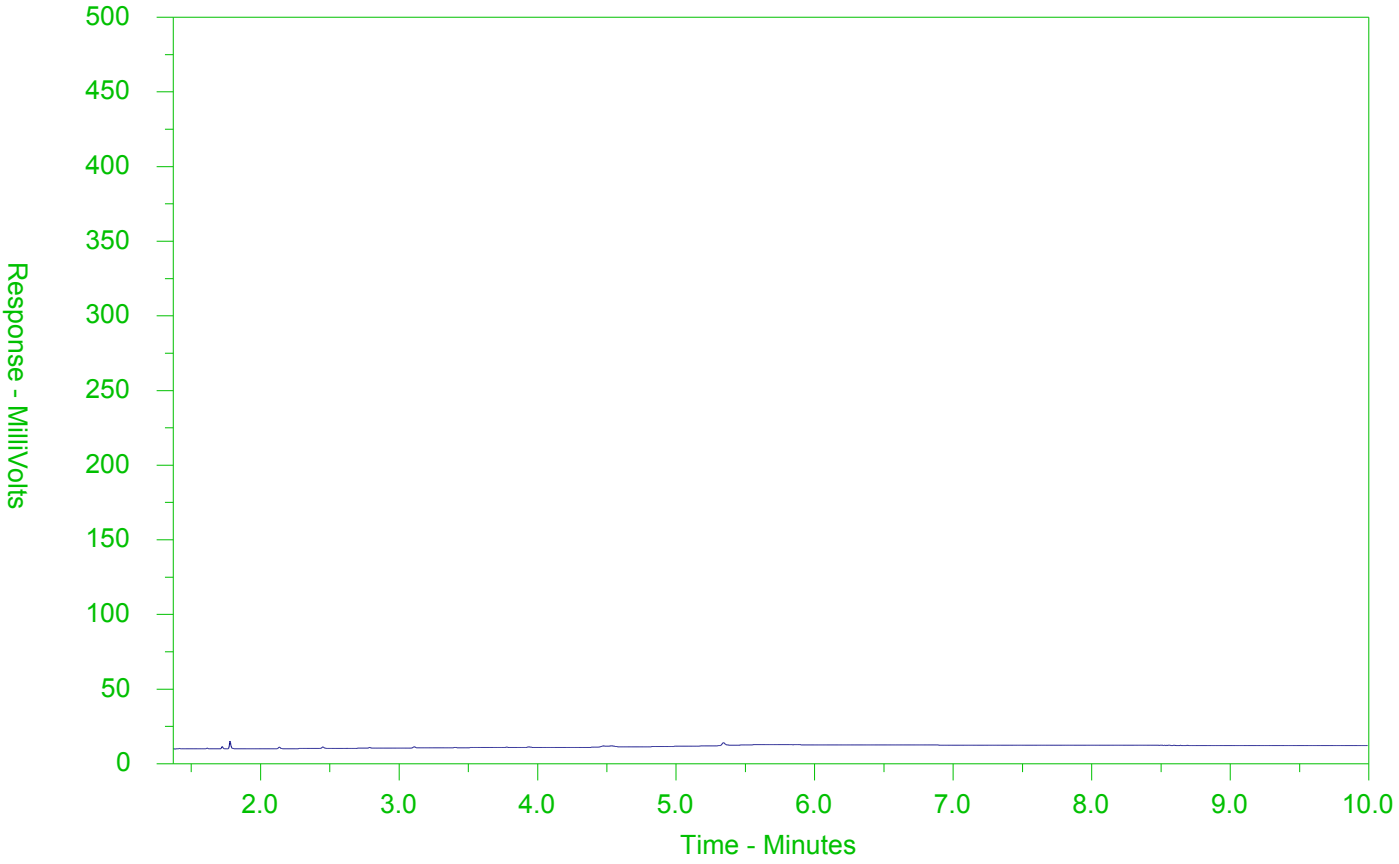
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2266155-2
Client Sample ID: WQ2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

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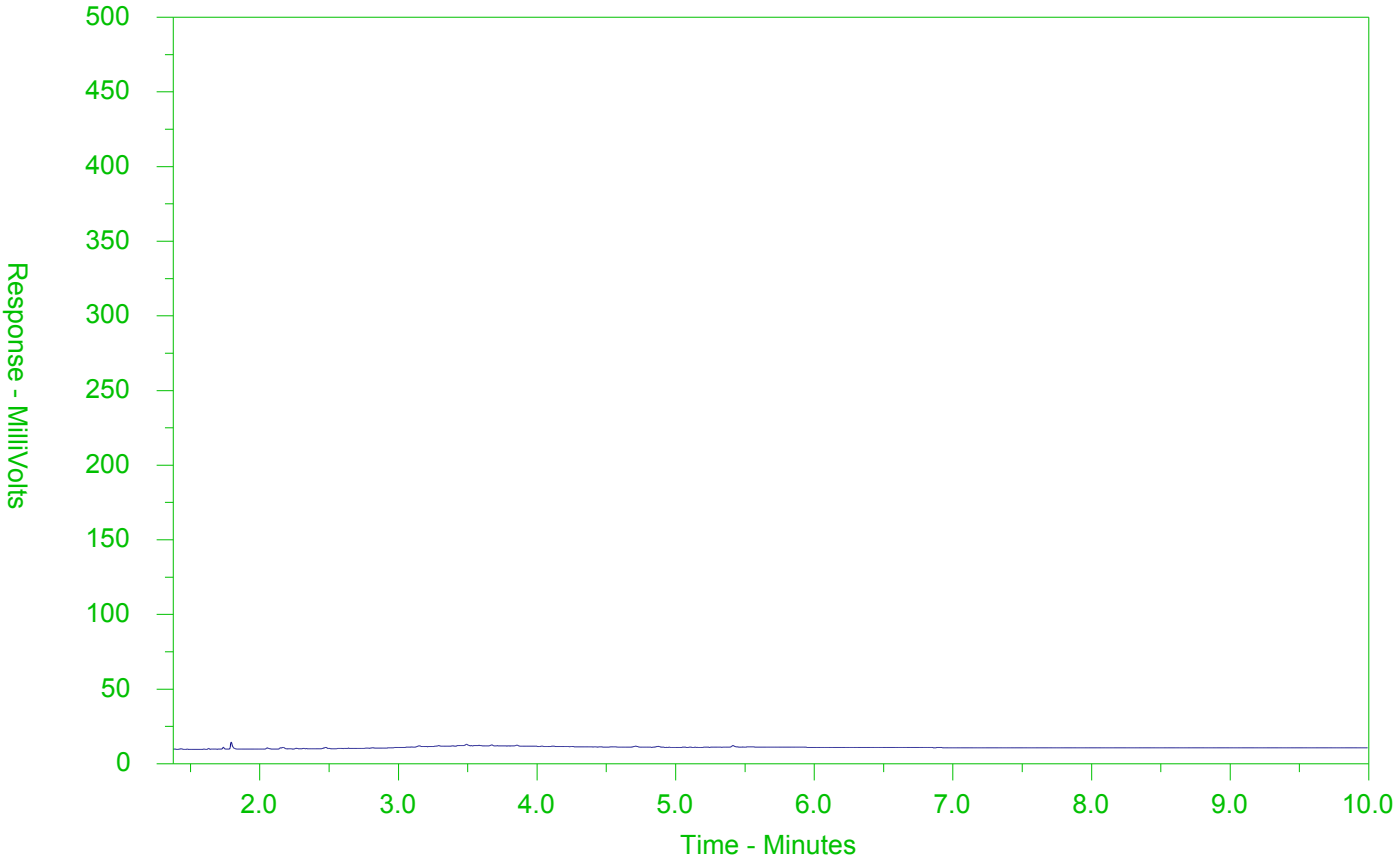
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2266155-3
Client Sample ID: WQ3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

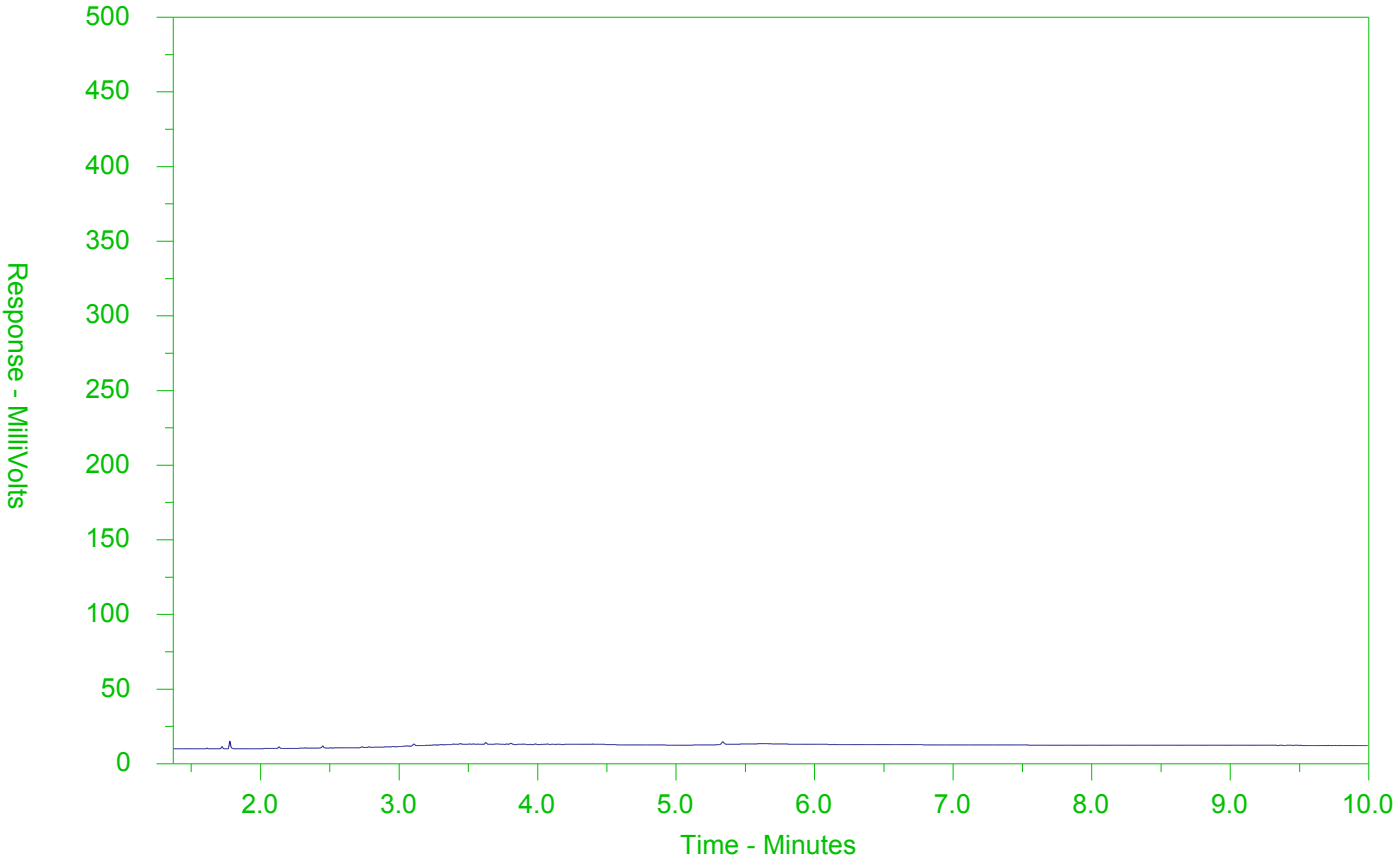
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2266155-4
Client Sample ID: WQ4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2266155-COFC

COC Number: 17 - 684121

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LTD
Contact:	WILL COWLIN
Phone:	519-803-7834
	Company address below will appear on the final report
Street:	55 REGAL RD, UNIT 3
City/Province:	GUELPH, ON
Postal Code:	N1K 1B6
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [X] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	[X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	COWLIN.W@AQUAFORBEECH.COM
Email 2	BORDI.M@AQUAFORBEECH.COM
Email 3	

Invoice Distribution	
Select Invoice Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2266155

ALS Contact: Gayle Braun

Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs / BTEX	TKN / TP	Total Coliforms/E.coli	Metals	PAHs	Hydrocarbons F1-F4	Chromium VI	SAR	TSS, pH, Conductivity, Hardness	Anions & Nutrients	Cyanides	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	WQ1	01-05-19		Water	X	X	X	X	X	X	X	X	X	X	X			
	WQ2	↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓			
	WQ3																	
	WQ4																	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [ ] NO

Are samples for human consumption/ use? [ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] | SIF Observations Yes [ ] No [ ]

Ice Packs [ ] | Ice Cubes [X] | Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				9.4°C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: 05/01/19	Time: 3:45	Received by:	Date:	Time:	Received by:	Date: 01/May/2019	Time: 15:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AQUAFOR BEECH LIMITED
ATTN: WILL COWLIN
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 22-MAY-19
Report Date: 30-MAY-19 08:53 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2277547

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-727409
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2277547-1	WQ1	Anions and Nutrients	Phosphorus, Total	0.0325	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.208	0.015	mg/L
			Copper (Cu)-Total	0.0016	0.001	mg/L
			Iron (Fe)-Total	0.453	0.3	mg/L
			Lead (Pb)-Total	0.00284	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.043	0.008	ug/L
L2277547-2	WQ2	Anions and Nutrients	Phosphorus, Total	0.0251	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.103	0.015	mg/L
			Copper (Cu)-Total	0.0017	0.001	mg/L
			Iron (Fe)-Total	0.325	0.3	mg/L
			Lead (Pb)-Total	0.00266	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.011	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.055	0.008	ug/L
L2277547-3	WQ3	Anions and Nutrients	Phosphorus, Total	0.0449	0.01	mg/L
		Bacteriological Tests	E. Coli	1600	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.145	0.015	mg/L
			Copper (Cu)-Total	0.0025	0.001	mg/L
			Iron (Fe)-Total	0.734	0.3	mg/L
			Lead (Pb)-Total	0.00229	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.011	0.0002	ug/L
			Chrysene	0.026	0.0001	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2277547-3	WQ3	Polycyclic Aromatic Hydrocarbons	Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.113	0.008	ug/L
			Phenanthrene	0.051	0.03	ug/L
L2277547-4	WQ4	Anions and Nutrients	Phosphorus, Total	0.0527	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	1.90	0.015	mg/L
			Cadmium (Cd)-Total	0.000272	0.0001	mg/L
			Cobalt (Co)-Total	0.00124	0.0009	mg/L
			Copper (Cu)-Total	0.0356	0.001	mg/L
			Iron (Fe)-Total	5.27	0.3	mg/L
			Lead (Pb)-Total	0.0382	0.001	mg/L
			Zinc (Zn)-Total	0.181	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.013	0.0002	ug/L
			Chrysene	0.035	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.138	0.008	ug/L
			Phenanthrene	0.050	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2277547-1 22-MAY-19 WQ1	L2277547-2 22-MAY-19 WQ2	L2277547-3 22-MAY-19 WQ3	L2277547-4 22-MAY-19 WQ4
Conductivity	umhos/cm	-	-	1490	1580	1910	1630
Hardness (as CaCO3)	mg/L	-	-	302 HTC	323 HTC	425 HTC	526 HTC
pH	pH units	6.5-8.5	-	8.18	8.22	8.01	8.00
Total Suspended Solids	mg/L	-	-	38.8	15.7	13.3	349 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
				Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Chloride (Cl)	mg/L	-	-		336 DLDS	360 DLDS	416 DLDS	340 DLDS
Nitrate (as N)	mg/L	-	-		1.21 DLDS	1.63 DLDS	3.34 DLDS	3.28 DLDS
Nitrite (as N)	mg/L	-	-		<0.050 DLDS	<0.050 DLDS	<0.050 DLDS	<0.050 DLDS
Total Kjeldahl Nitrogen	mg/L	-	-		0.78	0.75	0.72	0.68
Total Nitrogen	mg/L	-	-		1.99	2.38	4.06	3.96
Phosphorus, Total	mg/L	0.01	-		0.0325	0.0251	0.0449	0.0527

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
		Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
		Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits				
Analyte	Unit	#1	#2			
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.0020	0.0042

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2277547-1	22-MAY-19	WQ1
				L2277547-2	22-MAY-19	WQ2
				L2277547-3	22-MAY-19	WQ3
				L2277547-4	22-MAY-19	WQ4
E. Coli	CFU/100mL	100	-	52	38	1600 DLM	70 DLM
Total Coliforms	CFU/100mL	-	-	600 DLM	3000 DLM	21000 DLM	6000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2277547-1 / 22-MAY-19 / WQ1	L2277547-2 / 22-MAY-19 / WQ2	L2277547-3 / 22-MAY-19 / WQ3	L2277547-4 / 22-MAY-19 / WQ4
Sodium Adsorption Ratio	SAR	-	-	4.68	4.65	4.67	3.32

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
				Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Aluminum (Al)-Total	mg/L	0.015	-		0.208	0.103	0.145	1.90
Antimony (Sb)-Total	mg/L	0.02	-		0.00051	0.00053	0.00041	0.00093
Arsenic (As)-Total	mg/L	0.005	-		0.00060	0.00053	0.00051	0.00166
Barium (Ba)-Total	mg/L	-	-		0.0813	0.0837	0.111	0.128
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	0.000103
Boron (B)-Total	mg/L	0.2	-		0.054	0.057	0.075	0.052
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000014	0.000011	0.000014	0.000272
Calcium (Ca)-Total	mg/L	-	-		85.4	91.4	122	150
Cesium (Cs)-Total	mg/L	-	-		0.000020	0.000010	0.000014	0.000154
Chromium (Cr)-Total	mg/L	-	-		0.00052	<0.00050	0.00070	0.0115
Cobalt (Co)-Total	mg/L	0.0009	-		0.00016	0.00011	0.00018	0.00124
Copper (Cu)-Total	mg/L	0.001	-		0.0016	0.0017	0.0025	0.0356
Iron (Fe)-Total	mg/L	0.3	-		0.453	0.325	0.734	5.27
Lead (Pb)-Total	mg/L	0.001	-		0.00284	0.00266	0.00229	0.0382
Magnesium (Mg)-Total	mg/L	-	-		21.5	23.0	29.4	36.7
Manganese (Mn)-Total	mg/L	-	-		0.0722	0.0592	0.0956	0.174
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000839	0.000867	0.000809	0.000943
Nickel (Ni)-Total	mg/L	0.025	-		0.00080	0.00076	0.00087	0.00457
Potassium (K)-Total	mg/L	-	-		2.89	3.13	3.94	3.66
Rubidium (Rb)-Total	mg/L	-	-		0.00099	0.00085	0.00104	0.00305
Selenium (Se)-Total	mg/L	0.1	-		0.000696	0.000704	0.00101	0.00106
Silicon (Si)-Total	mg/L	-	-		3.69	3.75	5.25	6.75
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	0.000061
Sodium (Na)-Total	mg/L	-	-		187 DLHC	192 DLHC	221 DLHC	175 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.327	0.348	0.400	0.428
Sulfur (S)-Total	mg/L	-	-		17.3	18.1	21.7	21.5
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	0.000039

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

				Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
				Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Analyte	Unit	Guide Limits #1	#2					
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	0.00017
Tin (Sn)-Total	mg/L	-	-	<0.00010	<0.00010	0.00012	0.00207
Titanium (Ti)-Total	mg/L	-	-	0.00631	0.00299	0.00497	0.0595
Tungsten (W)-Total	mg/L	0.03	-	0.00019	0.00019	0.00013	0.00033
Uranium (U)-Total	mg/L	0.005	-	0.00120	0.00131	0.00154	0.00140
Vanadium (V)-Total	mg/L	0.006	-	0.00140	0.00117	0.00116	0.00535
Zinc (Zn)-Total	mg/L	0.02	-	0.0048	0.0047	0.0087	0.181
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	0.00053

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
		Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
		Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits				
Analyte	Unit	#1	#2			
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
				Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits						
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30	<30	<30	<30	
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0	
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0	
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20	
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50	
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0	
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0	
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50	
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	0.62	0.89	2.59	3.55	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0	
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50	
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20	
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20	
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
			Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	89.2	89.5	87.7	87.8
Surrogate: 1,4-Difluorobenzene	%	-	-	94.1	94.7	95.1	94.4

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

				Lab ID	L2277547-1	L2277547-2	L2277547-3	L2277547-4
				Sample Date	22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Analyte	Unit	Guide Limits #1	#2					
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F3-PAH	ug/L	-	-	<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	91.9	85.3	83.9	87.6
Surrogate: 3,4-Dichlorotoluene	%	-	-	99.3	104.6	102.0	74.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2277547-1	L2277547-2	L2277547-3	L2277547-4
Sample Date				22-MAY-19	22-MAY-19	22-MAY-19	22-MAY-19
Sample ID				WQ1	WQ2	WQ3	WQ4
Analyte	Unit	#1	#2				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	<0.010
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	<0.020
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010	0.013	0.015
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020	0.029	0.035
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	0.011	0.013
Chrysene	ug/L	0.0001	-	<0.010	0.011	0.026	0.035
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.043	0.055	0.113	0.138
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	<0.020
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	0.051	0.050
Pyrene	ug/L	-	-	0.029	0.034	0.081	0.092
Surrogate: d10-Acenaphthene	%	-	-	105.1	104.9	106.2	104.5
Surrogate: d12-Chrysene	%	-	-	107.1	107.2	107.6	106.7
Surrogate: d8-Naphthalene	%	-	-	111.7	110.1	111.2	110.4
Surrogate: d10-Phenanthrene	%	-	-	107.1	110.8	109.7	108.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-727409

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4642151								
WG3056626-19 DUP		**L2277526-1**						
Chloride (Cl)		36.9	37.0		mg/L	0.3	20	23-MAY-19
WG3056626-17 LCS								
Chloride (Cl)			100.9		%		90-110	23-MAY-19
WG3056626-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-MAY-19
WG3056626-20 MS		**L2277526-1**						
Chloride (Cl)			102.1		%		75-125	23-MAY-19
CN-FREE-CFA-WT	**Water**							
Batch R4641879								
WG3056610-14 LCS								
Cyanide, Free			100.7		%		80-120	23-MAY-19
WG3056610-13 MB								
Cyanide, Free			<0.0020		mg/L		0.002	23-MAY-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4641775								
WG3056533-4 DUP		**WG3056533-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	23-MAY-19
WG3056533-2 LCS								
Chromium, Hexavalent			97.4		%		80-120	23-MAY-19
WG3056533-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	23-MAY-19
WG3056533-5 MS		**WG3056533-3**						
Chromium, Hexavalent			96.0		%		70-130	23-MAY-19
Batch R4642032								
WG3057388-4 DUP		**WG3057388-3**						
Chromium, Hexavalent		37.1	36.1		ug/L	2.8	20	24-MAY-19
WG3057388-2 LCS								
Chromium, Hexavalent			98.2		%		80-120	24-MAY-19
WG3057388-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	24-MAY-19
WG3057388-5 MS		**WG3057388-3**						
Chromium, Hexavalent			95.6		%		70-130	24-MAY-19
EC-MF-WT	**Water**							

Quality Control Report

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55 Regal Road Unit 3
Guelph ON N1K 1B6
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-MF-WT	**Water**							
Batch R4642696								
WG3056697-3 DUP		**L2277627-2**						
E. Coli		4	3		CFU/100mL	29	65	24-MAY-19
WG3056697-1 MB								
E. Coli			0		CFU/100mL		1	24-MAY-19
EC-WT	**Water**							
Batch R4641794								
WG3056194-16 DUP		**WG3056194-15**						
Conductivity		1070	1080		umhos/cm	0.3	10	23-MAY-19
WG3056194-14 LCS								
Conductivity			99.8		%		90-110	23-MAY-19
WG3056194-13 MB								
Conductivity			<3.0		umhos/cm		3	23-MAY-19
F1-HS-511-WT	**Water**							
Batch R4644604								
WG3058959-4 DUP		**WG3058959-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	27-MAY-19
WG3058959-1 LCS								
F1 (C6-C10)			114.2		%		80-120	27-MAY-19
WG3058959-2 MB								
F1 (C6-C10)			<25		ug/L		25	27-MAY-19
Surrogate: 3,4-Dichlorotoluene			119.1		%		60-140	27-MAY-19
WG3058959-5 MS		**WG3058959-3**						
F1 (C6-C10)			101.1		%		60-140	27-MAY-19
F2-F4-511-WT	**Water**							
Batch R4644599								
WG3057398-2 LCS								
F2 (C10-C16)			108.0		%		70-130	24-MAY-19
F3 (C16-C34)			118.0		%		70-130	24-MAY-19
F4 (C34-C50)			101.9		%		70-130	24-MAY-19
WG3057398-1 MB								
F2 (C10-C16)			<100		ug/L		100	24-MAY-19
F3 (C16-C34)			<250		ug/L		250	24-MAY-19
F4 (C34-C50)			<250		ug/L		250	24-MAY-19
Surrogate: 2-Bromobenzotrifluoride			83.4		%		60-140	24-MAY-19
HG-T-CVAA-WT	**Water**							

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4641303								
WG3056597-3 DUP		**L2277492-1**						
Mercury (Hg)-Total		0.000117	0.000119		mg/L	1.7	20	23-MAY-19
WG3056597-2 LCS								
Mercury (Hg)-Total			96.1		%		80-120	23-MAY-19
WG3056597-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	23-MAY-19
WG3056597-4 MS		**L2277492-2**						
Mercury (Hg)-Total			90.7		%		70-130	23-MAY-19
MET-T-CCMS-WT	**Water**							
Batch R4641140								
WG3056054-4 DUP		**WG3056054-3**						
Aluminum (Al)-Total		0.0097	0.0089		mg/L	8.2	20	23-MAY-19
Antimony (Sb)-Total		0.00012	0.00013		mg/L	4.6	20	23-MAY-19
Arsenic (As)-Total		0.00051	0.00050		mg/L	0.9	20	23-MAY-19
Barium (Ba)-Total		0.0288	0.0291		mg/L	1.0	20	23-MAY-19
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-MAY-19
Boron (B)-Total		0.021	0.021		mg/L	4.1	20	23-MAY-19
Cadmium (Cd)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	23-MAY-19
Calcium (Ca)-Total		54.0	54.1		mg/L	0.2	20	23-MAY-19
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-19
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-MAY-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-19
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-MAY-19
Iron (Fe)-Total		0.018	0.017		mg/L	6.2	20	23-MAY-19
Lead (Pb)-Total		0.000625	0.000619		mg/L	0.9	20	23-MAY-19
Magnesium (Mg)-Total		7.73	7.35		mg/L	5.1	20	23-MAY-19
Manganese (Mn)-Total		0.0371	0.0360		mg/L	2.8	20	23-MAY-19
Molybdenum (Mo)-Total		0.000260	0.000264		mg/L	1.4	20	23-MAY-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-19
Potassium (K)-Total		2.79	2.69		mg/L	3.4	20	23-MAY-19
Rubidium (Rb)-Total		0.00125	0.00131		mg/L	4.9	20	23-MAY-19
Selenium (Se)-Total		0.000059	<0.000050	RPD-NA	mg/L	N/A	20	23-MAY-19
Silicon (Si)-Total		0.14	0.14		mg/L	1.5	20	23-MAY-19
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4641140								
WG3056054-4 DUP		**WG3056054-3**						
Sodium (Na)-Total		102	107		mg/L	5.1	20	23-MAY-19
Strontium (Sr)-Total		0.192	0.188		mg/L	2.3	20	23-MAY-19
Sulfur (S)-Total		6.60	6.51		mg/L	1.3	25	23-MAY-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	23-MAY-19
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	23-MAY-19
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	23-MAY-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-19
Titanium (Ti)-Total		<0.00030	0.00034	RPD-NA	mg/L	N/A	20	23-MAY-19
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-19
Uranium (U)-Total		0.000272	0.000268		mg/L	1.5	20	23-MAY-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	23-MAY-19
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	23-MAY-19
WG3056054-2 LCS								
Aluminum (Al)-Total			107.1		%		80-120	23-MAY-19
Antimony (Sb)-Total			106.5		%		80-120	23-MAY-19
Arsenic (As)-Total			102.7		%		80-120	23-MAY-19
Barium (Ba)-Total			104.2		%		80-120	23-MAY-19
Beryllium (Be)-Total			104.0		%		80-120	23-MAY-19
Bismuth (Bi)-Total			104.3		%		80-120	23-MAY-19
Boron (B)-Total			103.9		%		80-120	23-MAY-19
Cadmium (Cd)-Total			101.1		%		80-120	23-MAY-19
Calcium (Ca)-Total			99.6		%		80-120	23-MAY-19
Chromium (Cr)-Total			103.0		%		80-120	23-MAY-19
Cesium (Cs)-Total			97.1		%		80-120	23-MAY-19
Cobalt (Co)-Total			97.1		%		80-120	23-MAY-19
Copper (Cu)-Total			100.1		%		80-120	23-MAY-19
Iron (Fe)-Total			95.8		%		80-120	23-MAY-19
Lead (Pb)-Total			104.7		%		80-120	23-MAY-19
Magnesium (Mg)-Total			105.4		%		80-120	23-MAY-19
Manganese (Mn)-Total			105.0		%		80-120	23-MAY-19
Molybdenum (Mo)-Total			97.3		%		80-120	23-MAY-19
Nickel (Ni)-Total			100.2		%		80-120	23-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4641140								
WG3056054-2 LCS								
Potassium (K)-Total			101.9		%		80-120	23-MAY-19
Rubidium (Rb)-Total			103.0		%		80-120	23-MAY-19
Selenium (Se)-Total			96.6		%		80-120	23-MAY-19
Silicon (Si)-Total			106.4		%		60-140	23-MAY-19
Silver (Ag)-Total			100.2		%		80-120	23-MAY-19
Sodium (Na)-Total			103.7		%		80-120	23-MAY-19
Strontium (Sr)-Total			102.6		%		80-120	23-MAY-19
Sulfur (S)-Total			99.7		%		80-120	23-MAY-19
Thallium (Tl)-Total			101.6		%		80-120	23-MAY-19
Tellurium (Te)-Total			93.8		%		80-120	23-MAY-19
Thorium (Th)-Total			99.8		%		70-130	23-MAY-19
Tin (Sn)-Total			102.2		%		80-120	23-MAY-19
Titanium (Ti)-Total			101.7		%		80-120	23-MAY-19
Tungsten (W)-Total			100.1		%		80-120	23-MAY-19
Uranium (U)-Total			101.5		%		80-120	23-MAY-19
Vanadium (V)-Total			103.9		%		80-120	23-MAY-19
Zinc (Zn)-Total			101.4		%		80-120	23-MAY-19
Zirconium (Zr)-Total			98.3		%		80-120	23-MAY-19
WG3056054-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	23-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	23-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	23-MAY-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	23-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	23-MAY-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	23-MAY-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	23-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	23-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	23-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	23-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4641140								
WG3056054-1 MB								
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	23-MAY-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	23-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	23-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	23-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	23-MAY-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	23-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	23-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	23-MAY-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	23-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	23-MAY-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	23-MAY-19
Sulfur (S)-Total			<0.50		mg/L		0.5	23-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	23-MAY-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	23-MAY-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	23-MAY-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	23-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	23-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	23-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	23-MAY-19
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	23-MAY-19
WG3056054-5 MS		**WG3056054-6**						
Aluminum (Al)-Total			103.5		%		70-130	23-MAY-19
Antimony (Sb)-Total			103.6		%		70-130	23-MAY-19
Arsenic (As)-Total			99.7		%		70-130	23-MAY-19
Barium (Ba)-Total			N/A	MS-B	%		-	23-MAY-19
Beryllium (Be)-Total			98.9		%		70-130	23-MAY-19
Bismuth (Bi)-Total			90.0		%		70-130	23-MAY-19
Boron (B)-Total			99.1		%		70-130	23-MAY-19
Cadmium (Cd)-Total			89.4		%		70-130	23-MAY-19
Calcium (Ca)-Total			N/A	MS-B	%		-	23-MAY-19
Chromium (Cr)-Total			99.5		%		70-130	23-MAY-19
Cesium (Cs)-Total			97.6		%		70-130	23-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4641140								
WG3056054-5 MS		**WG3056054-6**						
Cobalt (Co)-Total			93.4		%		70-130	23-MAY-19
Copper (Cu)-Total			93.3		%		70-130	23-MAY-19
Iron (Fe)-Total			102.2		%		70-130	23-MAY-19
Lead (Pb)-Total			90.7		%		70-130	23-MAY-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	23-MAY-19
Manganese (Mn)-Total			N/A	MS-B	%		-	23-MAY-19
Molybdenum (Mo)-Total			101.1		%		70-130	23-MAY-19
Nickel (Ni)-Total			93.4		%		70-130	23-MAY-19
Potassium (K)-Total			N/A	MS-B	%		-	23-MAY-19
Rubidium (Rb)-Total			99.4		%		70-130	23-MAY-19
Selenium (Se)-Total			92.2		%		70-130	23-MAY-19
Silicon (Si)-Total			N/A	MS-B	%		-	23-MAY-19
Silver (Ag)-Total			94.4		%		70-130	23-MAY-19
Sodium (Na)-Total			N/A	MS-B	%		-	23-MAY-19
Strontium (Sr)-Total			N/A	MS-B	%		-	23-MAY-19
Sulfur (S)-Total			N/A	MS-B	%		-	23-MAY-19
Thallium (Tl)-Total			91.3		%		70-130	23-MAY-19
Tellurium (Te)-Total			87.8		%		70-130	23-MAY-19
Thorium (Th)-Total			80.4		%		70-130	23-MAY-19
Tin (Sn)-Total			94.9		%		70-130	23-MAY-19
Titanium (Ti)-Total			101.4		%		70-130	23-MAY-19
Tungsten (W)-Total			94.7		%		70-130	23-MAY-19
Uranium (U)-Total			86.1		%		70-130	23-MAY-19
Vanadium (V)-Total			104.6		%		70-130	23-MAY-19
Zinc (Zn)-Total			88.6		%		70-130	23-MAY-19
Zirconium (Zr)-Total			84.9		%		70-130	23-MAY-19
NO2-IC-WT	**Water**							
Batch R4642151								
WG3056626-19 DUP		**L2277526-1**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	23-MAY-19
WG3056626-17 LCS								
Nitrite (as N)			101.5		%		90-110	23-MAY-19
WG3056626-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	23-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4642151								
WG3056626-20 MS		**L2277526-1**						
Nitrite (as N)			102.2		%		75-125	23-MAY-19
NO3-IC-WT	**Water**							
Batch R4642151								
WG3056626-19 DUP		**L2277526-1**						
Nitrate (as N)		0.345	0.345		mg/L	0.1	20	23-MAY-19
WG3056626-17 LCS								
Nitrate (as N)			100.3		%		90-110	23-MAY-19
WG3056626-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	23-MAY-19
WG3056626-20 MS		**L2277526-1**						
Nitrate (as N)			100.8		%		75-125	23-MAY-19
P-T-COL-WT	**Water**							
Batch R4645498								
WG3059412-3 DUP		**L2277105-10**						
Phosphorus, Total		7.45	7.56		mg/L	1.4	20	28-MAY-19
WG3059412-2 LCS								
Phosphorus, Total			101.8		%		80-120	28-MAY-19
WG3059412-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	28-MAY-19
WG3059412-4 MS		**L2277105-10**						
Phosphorus, Total			N/A	MS-B	%		-	28-MAY-19
PAH-PWQO-WT	**Water**							
Batch R4645378								
WG3057398-2 LCS								
1-Methylnaphthalene			90.4		%		50-150	27-MAY-19
2-Methylnaphthalene			91.0		%		50-150	27-MAY-19
Acenaphthene			98.4		%		50-150	27-MAY-19
Acenaphthylene			93.8		%		50-150	27-MAY-19
Anthracene			94.2		%		60-130	27-MAY-19
Benzo(a)anthracene			99.3		%		60-130	27-MAY-19
Benzo(a)pyrene			90.9		%		50-150	27-MAY-19
Benzo(b)fluoranthene			91.9		%		50-150	27-MAY-19
Benzo(g,h,i)perylene			98.8		%		60-130	27-MAY-19
Benzo(k)fluoranthene			97.8		%		60-130	27-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4645378								
WG3057398-2 LCS								
Chrysene			94.2		%		60-130	27-MAY-19
Dibenzo(ah)anthracene			91.8		%		60-130	27-MAY-19
Fluoranthene			96.2		%		60-130	27-MAY-19
Fluorene			94.9		%		50-150	27-MAY-19
Indeno(1,2,3-cd)pyrene			103.0		%		50-150	27-MAY-19
Naphthalene			96.9		%		50-150	27-MAY-19
Phenanthrene			96.3		%		50-150	27-MAY-19
Pyrene			98.1		%		50-150	27-MAY-19
WG3057398-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	27-MAY-19
2-Methylnaphthalene			<0.020		ug/L		0.02	27-MAY-19
Acenaphthene			<0.020		ug/L		0.02	27-MAY-19
Acenaphthylene			<0.020		ug/L		0.02	27-MAY-19
Anthracene			<0.010		ug/L		0.01	27-MAY-19
Benzo(a)anthracene			<0.020		ug/L		0.02	27-MAY-19
Benzo(a)pyrene			<0.010		ug/L		0.01	27-MAY-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	27-MAY-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	27-MAY-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	27-MAY-19
Chrysene			<0.010		ug/L		0.01	27-MAY-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	27-MAY-19
Fluoranthene			<0.010		ug/L		0.01	27-MAY-19
Fluorene			<0.020		ug/L		0.02	27-MAY-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	27-MAY-19
Naphthalene			<0.050		ug/L		0.05	27-MAY-19
Phenanthrene			<0.020		ug/L		0.02	27-MAY-19
Pyrene			<0.020		ug/L		0.02	27-MAY-19
Surrogate: d8-Naphthalene			117.3		%		40-130	27-MAY-19
Surrogate: d10-Phenanthrene			115.2		%		40-130	27-MAY-19
Surrogate: d12-Chrysene			117.2		%		40-130	27-MAY-19
Surrogate: d10-Acenaphthene			112.2		%		40-130	27-MAY-19
PH-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R4641794								
WG3056194-16 DUP		**WG3056194-15**						
pH		7.07	7.05	J	pH units	0.02	0.2	23-MAY-19
WG3056194-14 LCS								
pH			7.03		pH units		6.9-7.1	23-MAY-19
SOLIDS-TSS-WT	**Water**							
Batch R4644123								
WG3058011-3 DUP		**L2277239-3**						
Total Suspended Solids		3790	3690		mg/L	2.5	20	25-MAY-19
WG3058011-2 LCS								
Total Suspended Solids			101.4		%		85-115	25-MAY-19
WG3058011-1 MB								
Total Suspended Solids			<2.0		mg/L		2	25-MAY-19
Batch R4644145								
WG3057968-3 DUP		**L2277252-2**						
Total Suspended Solids		363	305		mg/L	18	20	25-MAY-19
WG3057968-2 LCS								
Total Suspended Solids			104.2		%		85-115	25-MAY-19
WG3057968-1 MB								
Total Suspended Solids			<2.0		mg/L		2	25-MAY-19
Batch R4644476								
WG3058370-3 DUP		**L2278215-2**						
Total Suspended Solids		3460	3340		mg/L	3.3	20	27-MAY-19
WG3058370-2 LCS								
Total Suspended Solids			100.1		%		85-115	27-MAY-19
WG3058370-1 MB								
Total Suspended Solids			<2.0		mg/L		2	27-MAY-19
TC-MF-WT	**Water**							
Batch R4642690								
WG3056704-3 DUP		**L2277618-6**						
Total Coliforms		0	<10	RPD-NA	CFU/100mL	N/A	65	24-MAY-19
WG3056704-1 MB								
Total Coliforms			0		CFU/100mL		1	24-MAY-19
TKN-WT	**Water**							
Batch R4645798								
WG3060108-3 DUP		**L2277547-4**						
Total Kjeldahl Nitrogen		0.68	0.85	J	mg/L	0.17	0.3	28-MAY-19
WG3060108-2 LCS								

Quality Control Report

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55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4645798								
WG3060108-2 LCS								
Total Kjeldahl Nitrogen			115.8		%		75-125	28-MAY-19
WG3060108-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	28-MAY-19
WG3060108-4 MS		**L2277547-4**						
Total Kjeldahl Nitrogen			105.7		%		70-130	28-MAY-19
VOC-511-HS-WT	**Water**							
Batch R4644604								
WG3058959-4 DUP		**WG3058959-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	27-MAY-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	27-MAY-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	27-MAY-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	27-MAY-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	27-MAY-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	27-MAY-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	27-MAY-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	27-MAY-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	27-MAY-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19

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Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
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Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4644604								
WG3058959-4 DUP		**WG3058959-3**						
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	27-MAY-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	27-MAY-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	27-MAY-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	27-MAY-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	27-MAY-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	27-MAY-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	27-MAY-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	27-MAY-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	27-MAY-19
WG3058959-1 LCS								
1,1,1,2-Tetrachloroethane			100.0		%		70-130	27-MAY-19
1,1,2,2-Tetrachloroethane			93.5		%		70-130	27-MAY-19
1,1,1-Trichloroethane			108.5		%		70-130	27-MAY-19
1,1,2-Trichloroethane			93.9		%		70-130	27-MAY-19
1,1-Dichloroethane			106.1		%		70-130	27-MAY-19
1,1-Dichloroethylene			105.4		%		70-130	27-MAY-19
1,2-Dibromoethane			90.0		%		70-130	27-MAY-19
1,2-Dichlorobenzene			102.1		%		70-130	27-MAY-19
1,2-Dichloroethane			94.9		%		70-130	27-MAY-19
1,2-Dichloropropane			101.2		%		70-130	27-MAY-19
1,3-Dichlorobenzene			105.8		%		70-130	27-MAY-19
1,4-Dichlorobenzene			106.6		%		70-130	27-MAY-19
Acetone			102.0		%		60-140	27-MAY-19
Benzene			106.9		%		70-130	27-MAY-19
Bromodichloromethane			98.9		%		70-130	27-MAY-19
Bromoform			89.9		%		70-130	27-MAY-19
Bromomethane			111.4		%		60-140	27-MAY-19
Carbon tetrachloride			108.8		%		70-130	27-MAY-19
Chlorobenzene			100.0		%		70-130	27-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4644604								
WG3058959-1 LCS								
Chloroform			104.9		%		70-130	27-MAY-19
cis-1,3-Dichloropropene			99.4		%		70-130	27-MAY-19
Dibromochloromethane			94.2		%		70-130	27-MAY-19
Dichlorodifluoromethane			91.6		%		50-140	27-MAY-19
Ethylbenzene			92.6		%		70-130	27-MAY-19
n-Hexane			101.1		%		70-130	27-MAY-19
m+p-Xylenes			97.9		%		70-130	27-MAY-19
Methyl Ethyl Ketone			95.6		%		60-140	27-MAY-19
Methyl Isobutyl Ketone			83.9		%		60-140	27-MAY-19
Methylene Chloride			98.7		%		70-130	27-MAY-19
MTBE			100.5		%		70-130	27-MAY-19
o-Xylene			90.3		%		70-130	27-MAY-19
Styrene			90.4		%		70-130	27-MAY-19
Toluene			90.3		%		70-130	27-MAY-19
trans-1,2-Dichloroethylene			109.6		%		70-130	27-MAY-19
trans-1,3-Dichloropropene			92.2		%		70-130	27-MAY-19
Trichloroethylene			106.7		%		70-130	27-MAY-19
Trichlorofluoromethane			112.7		%		60-140	27-MAY-19
Vinyl chloride			83.6		%		60-140	27-MAY-19
WG3058959-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	27-MAY-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	27-MAY-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	27-MAY-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	27-MAY-19
1,1-Dichloroethane			<0.50		ug/L		0.5	27-MAY-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	27-MAY-19
1,2-Dibromoethane			<0.20		ug/L		0.2	27-MAY-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	27-MAY-19
1,2-Dichloroethane			<0.50		ug/L		0.5	27-MAY-19
1,2-Dichloropropane			<0.50		ug/L		0.5	27-MAY-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	27-MAY-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	27-MAY-19
Acetone			<30		ug/L		30	27-MAY-19
Benzene			<0.50		ug/L		0.5	27-MAY-19

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55 Regal Road Unit 3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4644604								
WG3058959-2 MB								
Bromodichloromethane			<2.0		ug/L		2	27-MAY-19
Bromoform			<5.0		ug/L		5	27-MAY-19
Bromomethane			<0.50		ug/L		0.5	27-MAY-19
Carbon tetrachloride			<0.20		ug/L		0.2	27-MAY-19
Chlorobenzene			<0.50		ug/L		0.5	27-MAY-19
Chloroform			<1.0		ug/L		1	27-MAY-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	27-MAY-19
Dibromochloromethane			<2.0		ug/L		2	27-MAY-19
Dichlorodifluoromethane			<2.0		ug/L		2	27-MAY-19
Ethylbenzene			<0.50		ug/L		0.5	27-MAY-19
n-Hexane			<0.50		ug/L		0.5	27-MAY-19
m+p-Xylenes			<0.40		ug/L		0.4	27-MAY-19
Methyl Ethyl Ketone			<20		ug/L		20	27-MAY-19
Methyl Isobutyl Ketone			<20		ug/L		20	27-MAY-19
Methylene Chloride			<5.0		ug/L		5	27-MAY-19
MTBE			<2.0		ug/L		2	27-MAY-19
o-Xylene			<0.30		ug/L		0.3	27-MAY-19
Styrene			<0.50		ug/L		0.5	27-MAY-19
Toluene			<0.50		ug/L		0.5	27-MAY-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	27-MAY-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	27-MAY-19
Trichloroethylene			<0.50		ug/L		0.5	27-MAY-19
Trichlorofluoromethane			<5.0		ug/L		5	27-MAY-19
Vinyl chloride			<0.50		ug/L		0.5	27-MAY-19
Surrogate: 1,4-Difluorobenzene			96.0		%		70-130	27-MAY-19
Surrogate: 4-Bromofluorobenzene			90.1		%		70-130	27-MAY-19
WG3058959-5 MS		**WG3058959-3**						
1,1,1,2-Tetrachloroethane			99.95		%		50-140	27-MAY-19
1,1,2,2-Tetrachloroethane			96.7		%		50-140	27-MAY-19
1,1,1-Trichloroethane			104.9		%		50-140	27-MAY-19
1,1,2-Trichloroethane			96.8		%		50-140	27-MAY-19
1,1-Dichloroethane			103.8		%		50-140	27-MAY-19
1,1-Dichloroethylene			100.4		%		50-140	27-MAY-19
1,2-Dibromoethane			93.6		%		50-140	27-MAY-19

Quality Control Report

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Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4644604								
WG3058959-5 MS		**WG3058959-3**						
1,2-Dichlorobenzene			102.2		%		50-140	27-MAY-19
1,2-Dichloroethane			97.5		%		50-140	27-MAY-19
1,2-Dichloropropane			101.5		%		50-140	27-MAY-19
1,3-Dichlorobenzene			104.5		%		50-140	27-MAY-19
1,4-Dichlorobenzene			105.6		%		50-140	27-MAY-19
Acetone			107.1		%		50-140	27-MAY-19
Benzene			105.7		%		50-140	27-MAY-19
Bromodichloromethane			101.1		%		50-140	27-MAY-19
Bromoform			92.9		%		50-140	27-MAY-19
Bromomethane			108.9		%		50-140	27-MAY-19
Carbon tetrachloride			104.8		%		50-140	27-MAY-19
Chlorobenzene			99.7		%		50-140	27-MAY-19
Chloroform			104.3		%		50-140	27-MAY-19
cis-1,3-Dichloropropene			103.3		%		50-140	27-MAY-19
Dibromochloromethane			96.5		%		50-140	27-MAY-19
Dichlorodifluoromethane			80.6		%		50-140	27-MAY-19
Ethylbenzene			90.5		%		50-140	27-MAY-19
n-Hexane			94.5		%		50-140	27-MAY-19
m+p-Xylenes			95.0		%		50-140	27-MAY-19
Methyl Ethyl Ketone			101.3		%		50-140	27-MAY-19
Methyl Isobutyl Ketone			87.6		%		50-140	27-MAY-19
Methylene Chloride			102.3		%		50-140	27-MAY-19
MTBE			100.2		%		50-140	27-MAY-19
o-Xylene			89.0		%		50-140	27-MAY-19
Styrene			90.3		%		50-140	27-MAY-19
Toluene			91.6		%		50-140	27-MAY-19
trans-1,2-Dichloroethylene			105.9		%		50-140	27-MAY-19
trans-1,3-Dichloropropene			96.5		%		50-140	27-MAY-19
Trichloroethylene			104.8		%		50-140	27-MAY-19
Trichlorofluoromethane			105.9		%		50-140	27-MAY-19
Vinyl chloride			78.2		%		50-140	27-MAY-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4645432								
WG3059194-4 DUP		**WG3059194-3**						
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-MAY-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	28-MAY-19
WG3059194-1 LCS								
cis-1,2-Dichloroethylene			95.4		%		70-130	28-MAY-19
Tetrachloroethylene			99.3		%		70-130	28-MAY-19
WG3059194-2 MB								
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	28-MAY-19
Tetrachloroethylene			<0.50		ug/L		0.5	28-MAY-19
WG3059194-5 MS		**WG3059194-3**						
cis-1,2-Dichloroethylene			94.6		%		50-140	28-MAY-19
Tetrachloroethylene			100.9		%		50-140	28-MAY-19

Quality Control Report

Workorder: L2277547 Report Date: 30-MAY-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: WILL COWLIN

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

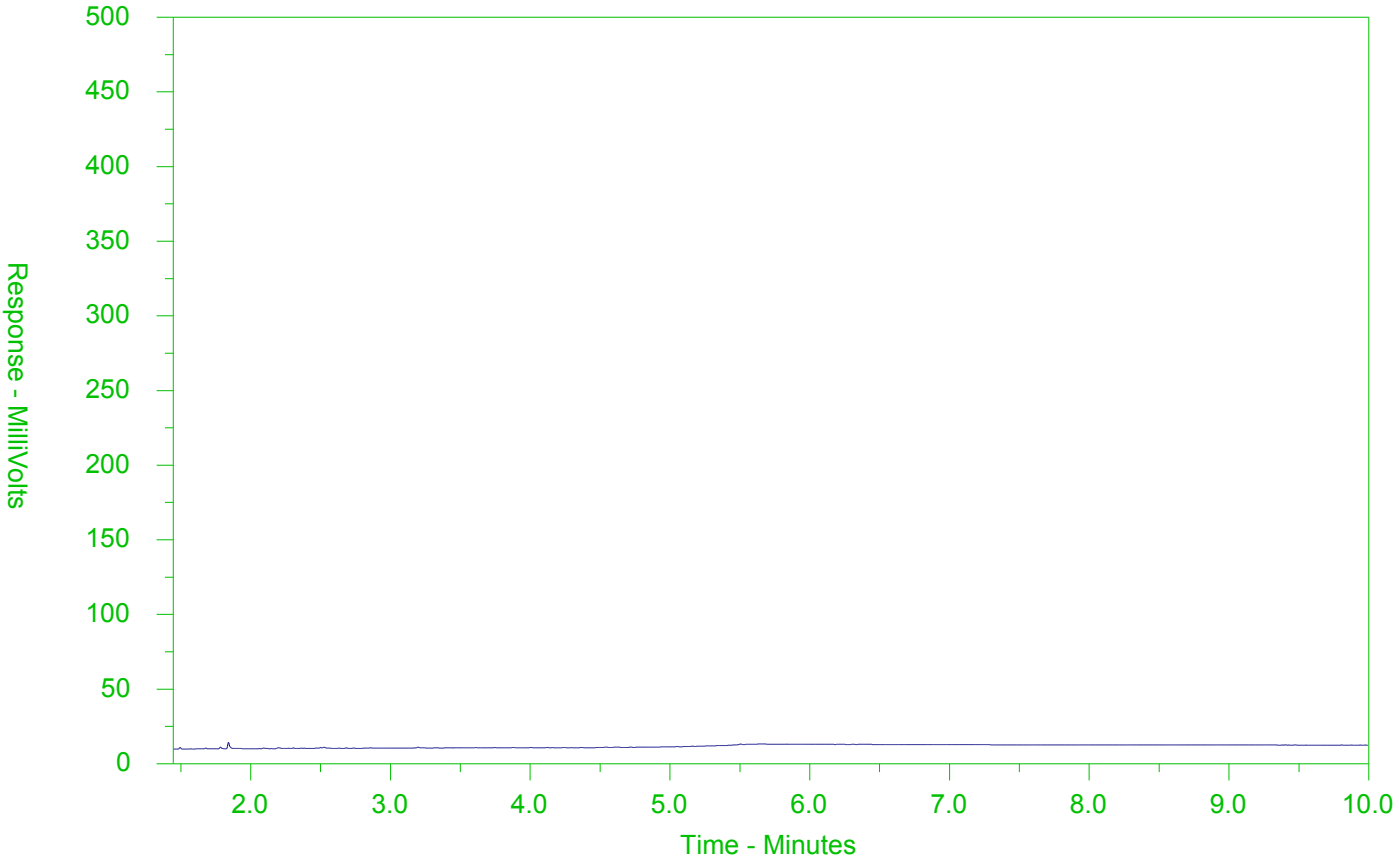
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2277547-1
Client Sample ID: WQ1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

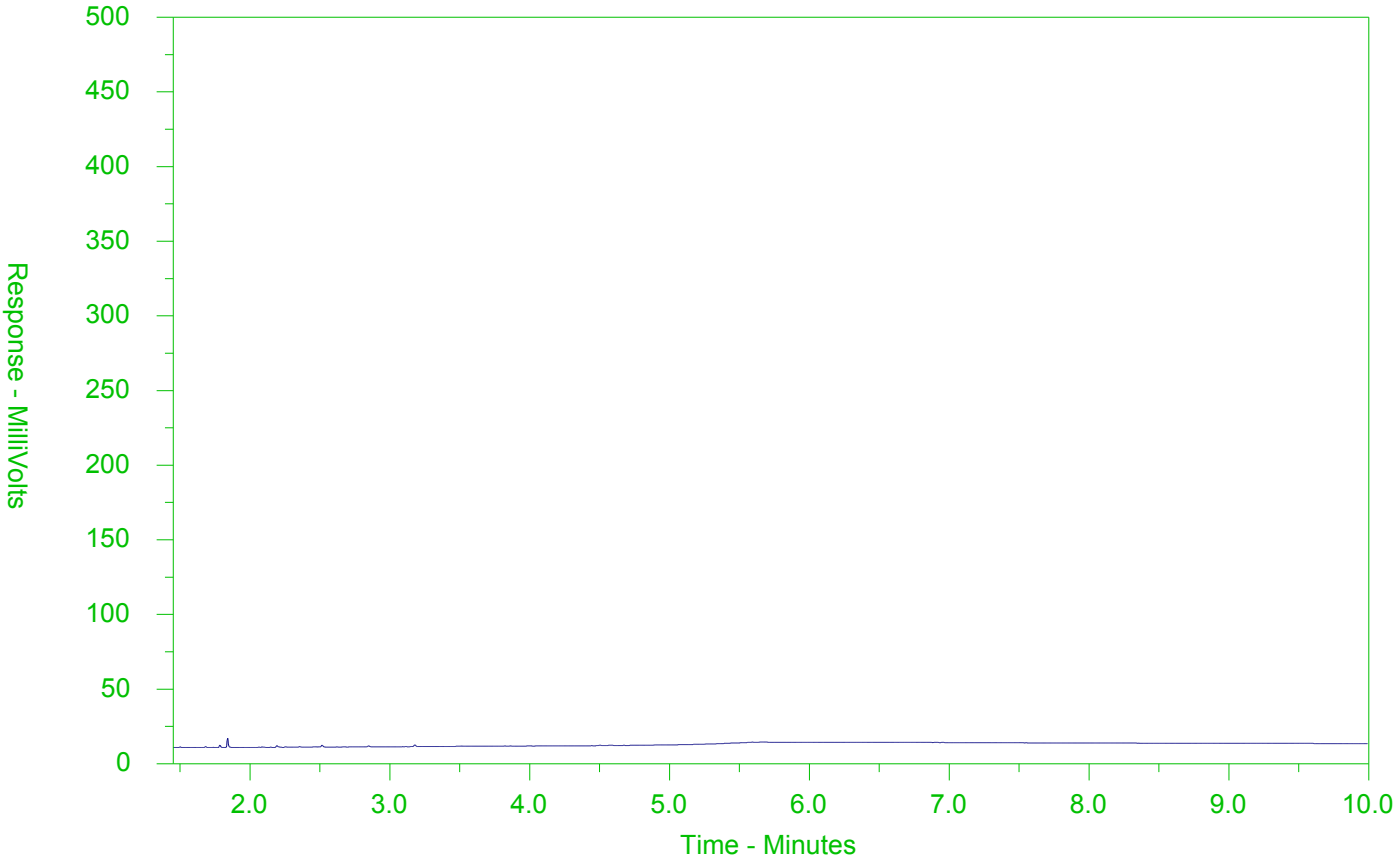
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2277547-2
Client Sample ID: WQ2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

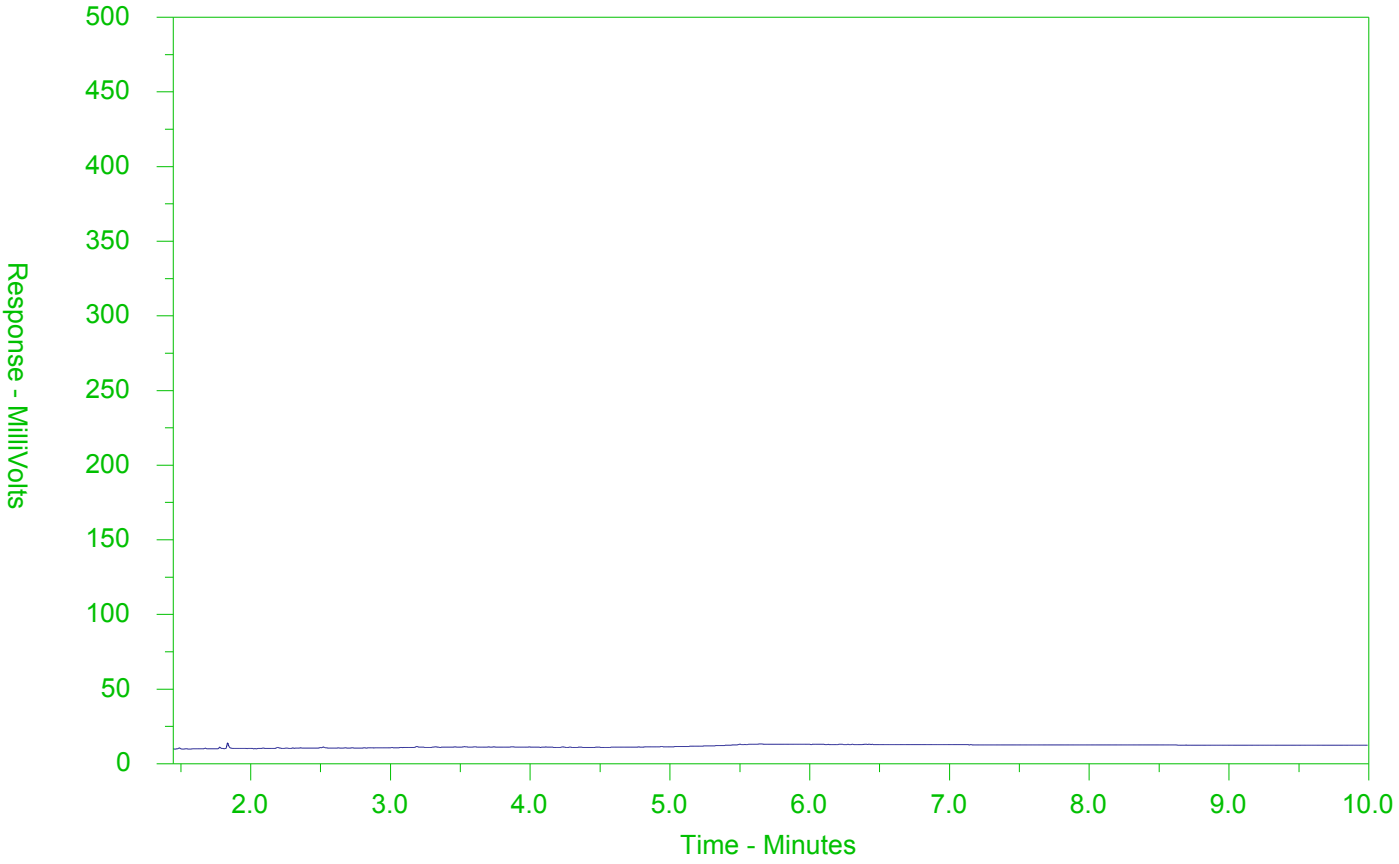
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2277547-3
Client Sample ID: WQ3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

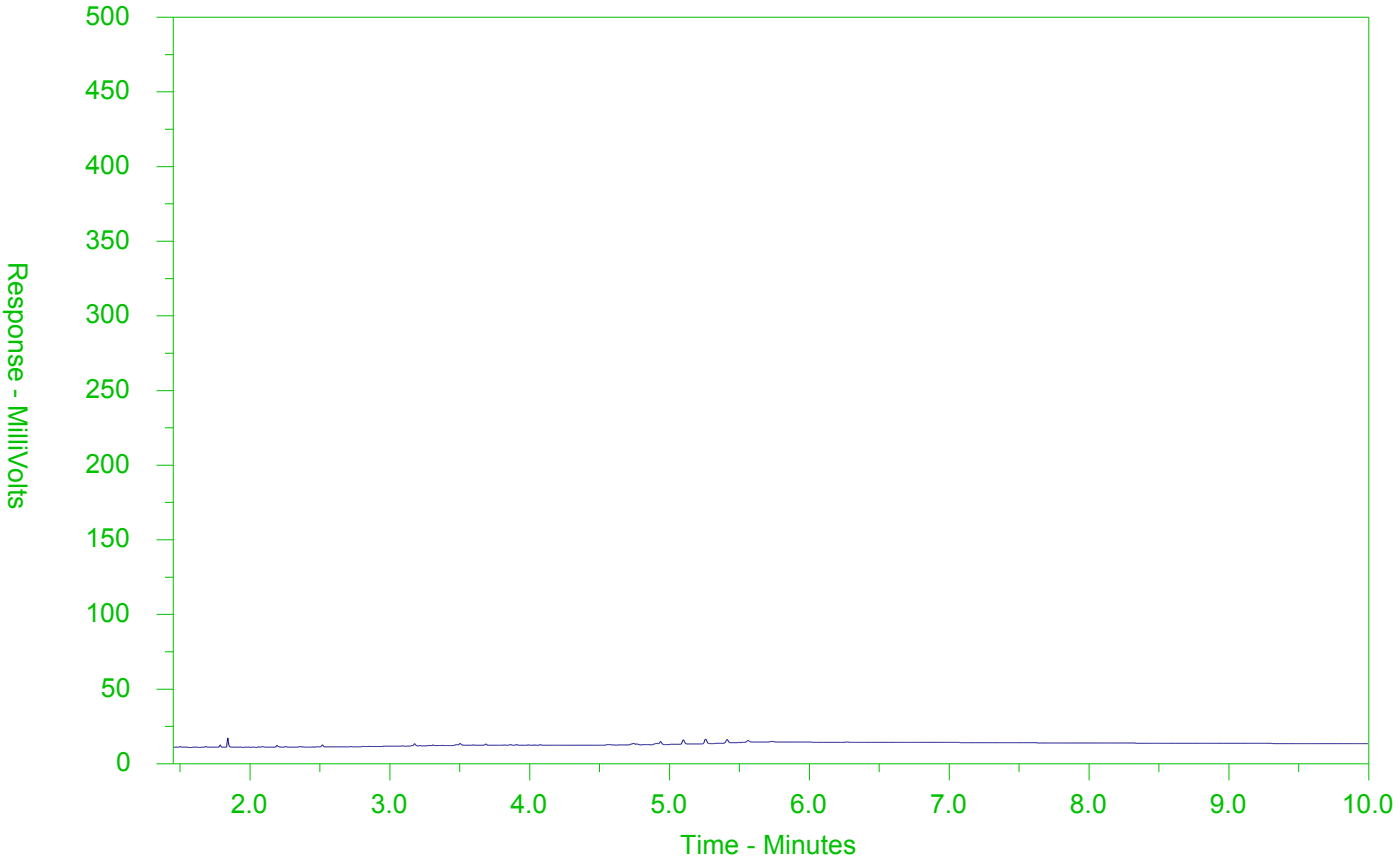
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2277547-4
Client Sample ID: WQ4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2277547-COFC

COC Number: 17 - 727409

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LTD
Contact:	WILL COWLIN
Phone:	519-803-7834
	Company address below will appear on the final report
Street:	55 Regal Road, unit 3
City/Province:	Guelph, ONT
Postal Code:	N1K 1B6
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [X] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report [X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: [X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax COWLIN.W@AQUAFORBEECH.COM
Email 2 BORDI.M@AQUAFORBEECH.COM
Email 3

Invoice Distribution

Select Invoice Distribution: [ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885
Job #: Mohawk Lake
PO / AFE:
LSD:

Additional Invoicing Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2277547

ALS Contact: Gayle Braun **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs/BTEX	TKN/TP	Total Coliforms/E.Coli	Metals	PAHs	Hydrocarbons F1-F4	Chromium 6+	SAR	TSS, hardness, pH conductivity	Anions & Nutrients	Cyanide	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	WQ1	22-05-19		Water														
	WQ2																	
	WQ3																	
	WQ4																	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [X] NO
Are samples for human consumption/ use? [ ] YES [X] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] | SIF Observations Yes [ ] No [ ]
Ice Packs [X] Ice Cubes [X] | Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				12.7			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: MBordi	Date: 22/05/19	Time:	Received by:	Date:	Time:	Received by:	Date: May 22/19	Time: 16:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AQUAFOR BEECH LIMITED
ATTN: Will Cowlin
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 05-JUN-19
Report Date: 14-JUN-19 08:40 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2286024

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-622585
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2286024-1	WQ-1	Anions and Nutrients	Phosphorus, Total	0.0903	0.01	mg/L
		Bacteriological Tests	E. Coli	9800	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.227	0.015	mg/L
			Copper (Cu)-Total	0.0037	0.001	mg/L
			Iron (Fe)-Total	0.417	0.3	mg/L
			Lead (Pb)-Total	0.00171	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.035	0.008	ug/L
L2286024-2	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0298	0.01	mg/L
		Bacteriological Tests	E. Coli	330	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.084	0.015	mg/L
			Copper (Cu)-Total	0.0015	0.001	mg/L
			Lead (Pb)-Total	0.00189	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.036	0.008	ug/L
L2286024-3	WQ-3	Anions and Nutrients	Phosphorus, Total	0.0641	0.01	mg/L
		Bacteriological Tests	E. Coli	11100	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.160	0.015	mg/L
			Copper (Cu)-Total	0.0036	0.001	mg/L
			Iron (Fe)-Total	0.632	0.3	mg/L
			Lead (Pb)-Total	0.00193	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2286024-3	WQ-3	Polycyclic Aromatic Hydrocarbons	Chrysene	0.026	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.119	0.008	ug/L
			Phenanthrene	0.060	0.03	ug/L
L2286024-4	WQ-4	Anions and Nutrients	Phosphorus, Total	0.168	0.01	mg/L
		Bacteriological Tests	E. Coli	17300	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.696	0.015	mg/L
			Copper (Cu)-Total	0.0128	0.001	mg/L
			Iron (Fe)-Total	1.51	0.3	mg/L
			Lead (Pb)-Total	0.00984	0.001	mg/L
			Zinc (Zn)-Total	0.0588	0.02	mg/L
		Speciated Metals	Chromium, Hexavalent	1.69	1	ug/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.019	0.0008	ug/L
			Benzo(a)anthracene	0.063	0.0004	ug/L
			Benzo(g,h,i)perylene	0.104	0.00002	ug/L
			Benzo(k)fluoranthene	0.059	0.0002	ug/L
			Chrysene	0.148	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.473	0.008	ug/L
			Phenanthrene	0.251	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2286024-1 05-JUN-19 WQ-1	L2286024-2 05-JUN-19 WQ-2	L2286024-3 05-JUN-19 WQ-3	L2286024-4 05-JUN-19 WQ-4
Conductivity	umhos/cm	-	-	1060	1260	1760	378
Hardness (as CaCO3)	mg/L	-	-	222 HTC	275 HTC	397 HTC	102 HTC
pH	pH units	6.5-8.5	-	8.09	8.12	7.91	7.47
Total Suspended Solids	mg/L	-	-	21.7	11.9	19.3	54.0

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2286024-1	L2286024-2	L2286024-3	L2286024-4
				Sample Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Chloride (Cl)	mg/L	-	-		213 DLDS	269 DLDS	370 DLDS	65.8 DLDS
Nitrate (as N)	mg/L	-	-		1.42 DLDS	1.06 DLDS	3.26 DLDS	0.81 DLDS
Nitrite (as N)	mg/L	-	-		<0.050 DLDS	<0.050 DLDS	<0.050 DLDS	<0.050 DLDS
Total Kjeldahl Nitrogen	mg/L	-	-		1.21	1.00	1.04	1.75
Total Nitrogen	mg/L	-	-		2.63	2.06	4.30	2.56
Phosphorus (P)-Total Dissolved	mg/L	-	-		0.0102	0.0088	0.0208	0.0501
Phosphorus, Total	mg/L	0.01	-		0.0903	0.0298	0.0641	0.168

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2286024-1	L2286024-2	L2286024-3	L2286024-4
				Sample Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

				Lab ID	L2286024-1	L2286024-2	L2286024-3	L2286024-4
				Sample Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits						
Analyte	Unit	#1	#2					
E. Coli	CFU/100mL	100	-	9800 DLM	330 DLM	11100 DLM	17300 DLM
Total Coliforms	CFU/100mL	-	-	73000 DLM	18000 DLM	102000 DLM	>200000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2286024-1	L2286024-2	L2286024-3	L2286024-4
				05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				WQ-1	WQ-2	WQ-3	WQ-4
Sodium Adsorption Ratio	SAR	-	-	2.43	3.97	4.57	1.61

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2286024-1 / Sample Date 05-JUN-19 / Sample ID WQ-1	Lab ID L2286024-2 / Sample Date 05-JUN-19 / Sample ID WQ-2	Lab ID L2286024-3 / Sample Date 05-JUN-19 / Sample ID WQ-3	Lab ID L2286024-4 / Sample Date 05-JUN-19 / Sample ID WQ-4
Aluminum (Al)-Total	mg/L	0.015	-	0.227	0.084	0.160	0.696
Antimony (Sb)-Total	mg/L	0.02	-	0.00036	0.00053	0.00039	0.00096
Arsenic (As)-Total	mg/L	0.005	-	0.00070	0.00058	0.00045	0.00078
Barium (Ba)-Total	mg/L	-	-	0.0583	0.0656	0.101	0.0301
Beryllium (Be)-Total	mg/L	0.011	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-	0.037	0.049	0.060	0.017
Cadmium (Cd)-Total	mg/L	0.0001	-	0.000026	0.000014	0.000022	0.000073
Calcium (Ca)-Total	mg/L	-	-	63.1	78.8	114	30.2
Cesium (Cs)-Total	mg/L	-	-	0.000024	<0.000010	0.000017	0.000062
Chromium (Cr)-Total	mg/L	-	-	0.00087	0.00098	0.00133	0.00572
Cobalt (Co)-Total	mg/L	0.0009	-	0.00017	<0.00010	0.00026	0.00050
Copper (Cu)-Total	mg/L	0.001	-	0.0037	0.0015	0.0036	0.0128
Iron (Fe)-Total	mg/L	0.3	-	0.417	0.214	0.632	1.51
Lead (Pb)-Total	mg/L	0.001	-	0.00171	0.00189	0.00193	0.00984
Magnesium (Mg)-Total	mg/L	-	-	15.6	18.9	27.3	6.53
Manganese (Mn)-Total	mg/L	-	-	0.0416	0.0448	0.0968	0.0933
Mercury (Hg)-Total	mg/L	0.0002	-	<0.000010	<0.000010	<0.000010	0.000016
Molybdenum (Mo)-Total	mg/L	0.04	-	0.000866	0.000862	0.000851	0.000670
Nickel (Ni)-Total	mg/L	0.025	-	0.00097	0.00092	0.00094	0.00192
Potassium (K)-Total	mg/L	-	-	2.34	2.84	3.69	2.45
Rubidium (Rb)-Total	mg/L	-	-	0.00142	0.00107	0.00116	0.00212
Selenium (Se)-Total	mg/L	0.1	-	0.000403	0.000618	0.000944	0.000381
Silicon (Si)-Total	mg/L	-	-	3.81	3.24	5.33	2.28
Silver (Ag)-Total	mg/L	0.0001	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-	83.2	151 DLHC	209 DLHC	37.3
Strontium (Sr)-Total	mg/L	-	-	0.256	0.283	0.382	0.118
Sulfur (S)-Total	mg/L	-	-	10.9	14.0	19.8	5.02
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-	<0.000010	<0.000010	<0.000010	0.000012

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2286024-1	L2286024-2	L2286024-3	L2286024-4
				05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				WQ-1	WQ-2	WQ-3	WQ-4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00012	<0.00010	0.00013	0.00060
Titanium (Ti)-Total	mg/L	-	-	0.00652	0.00285	0.00536	0.0312
Tungsten (W)-Total	mg/L	0.03	-	0.00013	0.00023	0.00020	0.00017
Uranium (U)-Total	mg/L	0.005	-	0.000653	0.00104	0.00151	0.000220
Vanadium (V)-Total	mg/L	0.006	-	0.00128	0.00094	0.00103	0.00284
Zinc (Zn)-Total	mg/L	0.02	-	0.0150	0.0038	0.0127	0.0588
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	0.00049

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits					
Lab ID				L2286024-1	L2286024-2	L2286024-3	L2286024-4
Sample Date				05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Chromium, Hexavalent	ug/L	1	-	<0.50	<0.50	<0.50	1.69

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2286024-1	L2286024-2	L2286024-3	L2286024-4
				Sample Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits						
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30	<30	<30	<30	
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0	
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0	
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20	
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50	
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0	
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0	
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50	
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	0.68	3.02	3.37	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0	
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50	
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20	
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20	
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2286024-1	L2286024-2	L2286024-3	L2286024-4
			Sample Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
			Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits					
Analyte	Unit	#1	#2				
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	0.57
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	102.6	103.3	103.3	101.4
Surrogate: 1,4-Difluorobenzene	%	-	-	104.6	104.5	104.4	103.7

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2286024-1	05-JUN-19	WQ-1
				L2286024-2	05-JUN-19	WQ-2
				L2286024-3	05-JUN-19	WQ-3
				L2286024-4	05-JUN-19	WQ-4
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	390
F3-PAH	ug/L	-	-	<250	<250	<250	390
				<250	<250	<250	390
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<250	390
				<250	<250	<370	390
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	93.1	96.1	94.8	95.0
Surrogate: 3,4-Dichlorotoluene	%	-	-	104.1	99.5	91.2	97.5

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2286024-1	L2286024-2	L2286024-3	L2286024-4
Sample Date				05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	0.076
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	0.010	0.019
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	0.063
Benzo(a)pyrene	ug/L	-	-	<0.010	<0.010	<0.010	0.069
Benzo(b)fluoranthene	ug/L	-	-	<0.020	<0.020	0.020	0.175
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	0.104
Benzo(k)fluoranthene	ug/L	0.0002	-	<0.010	<0.010	<0.010	0.059
Chrysene	ug/L	0.0001	-	<0.010	<0.010	0.026	0.148
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.035	0.036	0.119	0.473
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	0.053
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	0.113
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	0.029	0.033
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	0.041	0.034
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	<0.020	<0.020	0.060	0.251
Pyrene	ug/L	-	-	0.020	0.021	0.076	0.312
Surrogate: d10-Acenaphthene	%	-	-	115.3	96.8	116.0	99.1
Surrogate: d12-Chrysene	%	-	-	103.9	90.5	109.0	96.8
Surrogate: d8-Naphthalene	%	-	-	119.8	100.0	122.3	102.7
Surrogate: d10-Phenanthrene	%	-	-	113.7	99.2	120.8	99.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
ETL-TVH,TEH-CCME-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270

Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TC-MF-WT	Water	Total Coliforms	SM 9222B

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-622585

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2286024 Report Date: 14-JUN-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4661315								
WG3069823-14 DUP		**WG3069823-13**						
Chloride (Cl)		126	126		mg/L	0.1	20	06-JUN-19
WG3069823-12 LCS								
Chloride (Cl)			102.7		%		90-110	06-JUN-19
WG3069823-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-JUN-19
WG3069823-15 MS		**WG3069823-13**						
Chloride (Cl)			N/A	MS-B	%		-	06-JUN-19
CN-FREE-CFA-WT	**Water**							
Batch R4660913								
WG3069579-7 DUP		**L2286024-4**						
Cyanide, Free		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	06-JUN-19
WG3069579-6 LCS								
Cyanide, Free			96.3		%		80-120	06-JUN-19
WG3069579-5 MB								
Cyanide, Free			<0.0020		mg/L		0.002	06-JUN-19
WG3069579-8 MS		**L2286024-4**						
Cyanide, Free			94.6		%		75-125	06-JUN-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4660997								
WG3069569-4 DUP		**WG3069569-3**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	06-JUN-19
WG3069569-2 LCS								
Chromium, Hexavalent			98.3		%		80-120	06-JUN-19
WG3069569-1 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	06-JUN-19
WG3069569-5 MS		**WG3069569-3**						
Chromium, Hexavalent			97.0		%		70-130	06-JUN-19
EC-MF-WT	**Water**							
Batch R4661116								
WG3069216-3 DUP		**L2285790-1**						
E. Coli		2	1	J	CFU/100mL	1	2	07-JUN-19
WG3069216-1 MB								
E. Coli			0		CFU/100mL		1	07-JUN-19
EC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4661283								
WG3070615-16 DUP		**WG3070615-15**						
Conductivity		408	405		umhos/cm	0.7	10	09-JUN-19
WG3070615-14 LCS								
Conductivity			101.9		%		90-110	09-JUN-19
WG3070615-13 MB								
Conductivity			<3.0		umhos/cm		3	09-JUN-19
F1-HS-511-WT	**Water**							
Batch R4664390								
WG3065396-4 DUP		**WG3065396-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	12-JUN-19
WG3065396-1 LCS								
F1 (C6-C10)			99.2		%		80-120	11-JUN-19
WG3065396-2 MB								
F1 (C6-C10)			<25		ug/L		25	12-JUN-19
Surrogate: 3,4-Dichlorotoluene			102.9		%		60-140	12-JUN-19
WG3065396-5 MS		**WG3065396-3**						
F1 (C6-C10)			104.5		%		60-140	12-JUN-19
F2-F4-511-WT	**Water**							
Batch R4663124								
WG3069027-2 LCS								
F2 (C10-C16)			99.9		%		70-130	07-JUN-19
F3 (C16-C34)			97.7		%		70-130	07-JUN-19
F4 (C34-C50)			100.8		%		70-130	07-JUN-19
WG3069027-1 MB								
F2 (C10-C16)			<100		ug/L		100	07-JUN-19
F3 (C16-C34)			<250		ug/L		250	07-JUN-19
F4 (C34-C50)			<250		ug/L		250	07-JUN-19
Surrogate: 2-Bromobenzotrifluoride			73.4		%		60-140	07-JUN-19
Batch R4667507								
WG3074372-2 LCS								
F2 (C10-C16)			98.6		%		70-130	12-JUN-19
F3 (C16-C34)			103.8		%		70-130	12-JUN-19
F4 (C34-C50)			98.8		%		70-130	12-JUN-19
WG3074372-1 MB								
F2 (C10-C16)			<100		ug/L		100	12-JUN-19
F3 (C16-C34)			<250		ug/L		250	12-JUN-19
							250	

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT	**Water**							
Batch R4667507								
WG3074372-1 MB								
F4 (C34-C50)			<250		ug/L		250	12-JUN-19
Surrogate: 2-Bromobenzotrifluoride			95.3		%		60-140	12-JUN-19
HG-T-CVAA-WT	**Water**							
Batch R4660194								
WG3069147-3 DUP		**L2285885-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	06-JUN-19
WG3069147-2 LCS								
Mercury (Hg)-Total			97.4		%		80-120	06-JUN-19
WG3069147-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	06-JUN-19
WG3069147-4 MS		**L2285885-2**						
Mercury (Hg)-Total			81.0		%		70-130	06-JUN-19
MET-T-CCMS-WT	**Water**							
Batch R4659849								
WG3068900-4 DUP		**WG3068900-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	06-JUN-19
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Barium (Ba)-Total		0.0763	0.0746		mg/L	2.1	20	06-JUN-19
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	06-JUN-19
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	06-JUN-19
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	06-JUN-19
Calcium (Ca)-Total		121	123		mg/L	1.0	20	06-JUN-19
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	06-JUN-19
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	06-JUN-19
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	06-JUN-19
Iron (Fe)-Total		0.13	0.13		mg/L	2.2	20	06-JUN-19
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	06-JUN-19
Magnesium (Mg)-Total		24.5	24.4		mg/L	0.1	20	06-JUN-19
Manganese (Mn)-Total		0.0915	0.0921		mg/L	0.6	20	06-JUN-19
Molybdenum (Mo)-Total		0.00141	0.00133		mg/L	6.3	20	06-JUN-19
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	06-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4659849								
WG3068900-4 DUP		**WG3068900-3**						
Potassium (K)-Total		1.87	1.91		mg/L	2.0	20	06-JUN-19
Rubidium (Rb)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	06-JUN-19
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	06-JUN-19
Silicon (Si)-Total		4.1	4.1		mg/L	1.8	20	06-JUN-19
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	06-JUN-19
Sodium (Na)-Total		258	260		mg/L	0.9	20	06-JUN-19
Strontium (Sr)-Total		0.343	0.328		mg/L	4.7	20	06-JUN-19
Sulfur (S)-Total		6.1	6.1		mg/L	0.5	25	06-JUN-19
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	06-JUN-19
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	06-JUN-19
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	06-JUN-19
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	06-JUN-19
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	06-JUN-19
Uranium (U)-Total		0.00062	0.00061		mg/L	1.4	20	06-JUN-19
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	06-JUN-19
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	06-JUN-19
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	06-JUN-19
WG3068900-2 LCS								
Aluminum (Al)-Total			99.6		%		80-120	06-JUN-19
Antimony (Sb)-Total			104.3		%		80-120	06-JUN-19
Arsenic (As)-Total			96.0		%		80-120	06-JUN-19
Barium (Ba)-Total			99.0		%		80-120	06-JUN-19
Beryllium (Be)-Total			100.7		%		80-120	06-JUN-19
Bismuth (Bi)-Total			98.5		%		80-120	06-JUN-19
Boron (B)-Total			95.8		%		80-120	06-JUN-19
Cadmium (Cd)-Total			94.0		%		80-120	06-JUN-19
Calcium (Ca)-Total			98.1		%		80-120	06-JUN-19
Chromium (Cr)-Total			96.9		%		80-120	06-JUN-19
Cesium (Cs)-Total			100.4		%		80-120	06-JUN-19
Cobalt (Co)-Total			94.9		%		80-120	06-JUN-19
Copper (Cu)-Total			99.8		%		80-120	06-JUN-19
Iron (Fe)-Total			95.9		%		80-120	06-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4659849								
WG3068900-2 LCS								
Lead (Pb)-Total			99.1		%		80-120	06-JUN-19
Magnesium (Mg)-Total			99.3		%		80-120	06-JUN-19
Manganese (Mn)-Total			97.2		%		80-120	06-JUN-19
Molybdenum (Mo)-Total			96.8		%		80-120	06-JUN-19
Nickel (Ni)-Total			96.0		%		80-120	06-JUN-19
Potassium (K)-Total			98.8		%		80-120	06-JUN-19
Rubidium (Rb)-Total			99.2		%		80-120	06-JUN-19
Selenium (Se)-Total			96.0		%		80-120	06-JUN-19
Silicon (Si)-Total			99.3		%		60-140	06-JUN-19
Silver (Ag)-Total			95.9		%		80-120	06-JUN-19
Sodium (Na)-Total			106.1		%		80-120	06-JUN-19
Strontium (Sr)-Total			93.8		%		80-120	06-JUN-19
Sulfur (S)-Total			100.0		%		80-120	06-JUN-19
Thallium (Tl)-Total			94.1		%		80-120	06-JUN-19
Tellurium (Te)-Total			96.6		%		80-120	06-JUN-19
Thorium (Th)-Total			95.2		%		70-130	06-JUN-19
Tin (Sn)-Total			94.5		%		80-120	06-JUN-19
Titanium (Ti)-Total			98.8		%		80-120	06-JUN-19
Tungsten (W)-Total			95.2		%		80-120	06-JUN-19
Uranium (U)-Total			97.1		%		80-120	06-JUN-19
Vanadium (V)-Total			98.0		%		80-120	06-JUN-19
Zinc (Zn)-Total			93.1		%		80-120	06-JUN-19
Zirconium (Zr)-Total			95.3		%		80-120	06-JUN-19
WG3068900-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	06-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	06-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	06-JUN-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	06-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	06-JUN-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	06-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4659849								
WG3068900-1 MB								
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	06-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	06-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	06-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	06-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	06-JUN-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	06-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	06-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	06-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	06-JUN-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	06-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	06-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	06-JUN-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	06-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	06-JUN-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	06-JUN-19
Sulfur (S)-Total			<0.50		mg/L		0.5	06-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	06-JUN-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	06-JUN-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	06-JUN-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	06-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	06-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	06-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	06-JUN-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	06-JUN-19
WG3068900-5 MS		**WG3068900-6**						
Aluminum (Al)-Total			91.1		%		70-130	06-JUN-19
Antimony (Sb)-Total			97.4		%		70-130	06-JUN-19
Arsenic (As)-Total			96.4		%		70-130	06-JUN-19
Barium (Ba)-Total			N/A	MS-B	%		-	06-JUN-19
Beryllium (Be)-Total			95.8		%		70-130	06-JUN-19
Bismuth (Bi)-Total			96.5		%		70-130	06-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4659849								
WG3068900-5 MS		**WG3068900-6**						
Boron (B)-Total			91.6		%		70-130	06-JUN-19
Cadmium (Cd)-Total			94.9		%		70-130	06-JUN-19
Calcium (Ca)-Total			N/A	MS-B	%		-	06-JUN-19
Chromium (Cr)-Total			94.3		%		70-130	06-JUN-19
Cesium (Cs)-Total			100.1		%		70-130	06-JUN-19
Cobalt (Co)-Total			94.7		%		70-130	06-JUN-19
Copper (Cu)-Total			91.8		%		70-130	06-JUN-19
Iron (Fe)-Total			N/A	MS-B	%		-	06-JUN-19
Lead (Pb)-Total			96.2		%		70-130	06-JUN-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	06-JUN-19
Manganese (Mn)-Total			N/A	MS-B	%		-	06-JUN-19
Molybdenum (Mo)-Total			96.8		%		70-130	06-JUN-19
Nickel (Ni)-Total			96.4		%		70-130	06-JUN-19
Potassium (K)-Total			94.5		%		70-130	06-JUN-19
Rubidium (Rb)-Total			97.4		%		70-130	06-JUN-19
Selenium (Se)-Total			98.5		%		70-130	06-JUN-19
Silicon (Si)-Total			N/A	MS-B	%		-	06-JUN-19
Silver (Ag)-Total			93.5		%		70-130	06-JUN-19
Sodium (Na)-Total			N/A	MS-B	%		-	06-JUN-19
Strontium (Sr)-Total			N/A	MS-B	%		-	06-JUN-19
Sulfur (S)-Total			N/A	MS-B	%		-	06-JUN-19
Thallium (Tl)-Total			92.3		%		70-130	06-JUN-19
Tellurium (Te)-Total			87.6		%		70-130	06-JUN-19
Thorium (Th)-Total			90.9		%		70-130	06-JUN-19
Tin (Sn)-Total			92.9		%		70-130	06-JUN-19
Titanium (Ti)-Total			99.4		%		70-130	06-JUN-19
Tungsten (W)-Total			94.8		%		70-130	06-JUN-19
Uranium (U)-Total			N/A	MS-B	%		-	06-JUN-19
Vanadium (V)-Total			98.0		%		70-130	06-JUN-19
Zinc (Zn)-Total			96.0		%		70-130	06-JUN-19
Zirconium (Zr)-Total			83.1		%		70-130	06-JUN-19
NO2-IC-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4661315								
WG3069823-14 DUP		**WG3069823-13**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	06-JUN-19
WG3069823-12 LCS								
Nitrite (as N)			103.4		%		90-110	06-JUN-19
WG3069823-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	06-JUN-19
WG3069823-15 MS		**WG3069823-13**						
Nitrite (as N)			103.8		%		75-125	06-JUN-19
NO3-IC-WT	**Water**							
Batch R4661315								
WG3069823-14 DUP		**WG3069823-13**						
Nitrate (as N)		3.39	3.39		mg/L	0.0	20	06-JUN-19
WG3069823-12 LCS								
Nitrate (as N)			102.5		%		90-110	06-JUN-19
WG3069823-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	06-JUN-19
WG3069823-15 MS		**WG3069823-13**						
Nitrate (as N)			N/A	MS-B	%		-	06-JUN-19
P-T-COL-WT	**Water**							
Batch R4668512								
WG3075302-3 DUP		**L2286024-2**						
Phosphorus, Total		0.0298	0.0294		mg/L	1.3	20	13-JUN-19
WG3075302-2 LCS								
Phosphorus, Total			98.2		%		80-120	13-JUN-19
WG3075302-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	13-JUN-19
WG3075302-4 MS		**L2286024-2**						
Phosphorus, Total			95.8		%		70-130	13-JUN-19
P-TD-COL-WT	**Water**							
Batch R4668516								
WG3075306-3 DUP		**L2287106-4**						
Phosphorus (P)-Total	Dissolved	0.0068	0.0069		mg/L	2.3	20	13-JUN-19
WG3075306-2 LCS								
Phosphorus (P)-Total	Dissolved		99.2		%		80-120	13-JUN-19
WG3075306-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	13-JUN-19
WG3075306-4 MS		**L2287106-4**						

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4668516								
WG3075306-4 MS		**L2287106-4**						
Phosphorus (P)-Total Dissolved			114.1		%		70-130	13-JUN-19
PAH-PWQO-WT	**Water**							
Batch R4661387								
WG3069027-2 LCS								
1-Methylnaphthalene			96.4		%		50-150	07-JUN-19
2-Methylnaphthalene			95.8		%		50-150	07-JUN-19
Acenaphthene			105.3		%		50-150	07-JUN-19
Acenaphthylene			101.4		%		50-150	07-JUN-19
Anthracene			90.4		%		60-130	07-JUN-19
Benzo(a)anthracene			113.4		%		60-130	07-JUN-19
Benzo(a)pyrene			102.6		%		50-150	07-JUN-19
Benzo(b)fluoranthene			95.3		%		50-150	07-JUN-19
Benzo(g,h,i)perylene			109.8		%		60-130	07-JUN-19
Benzo(k)fluoranthene			105.3		%		60-130	07-JUN-19
Chrysene			115.5		%		60-130	07-JUN-19
Dibenzo(ah)anthracene			104.5		%		60-130	07-JUN-19
Fluoranthene			106.9		%		60-130	07-JUN-19
Fluorene			102.7		%		50-150	07-JUN-19
Indeno(1,2,3-cd)pyrene			115.5		%		50-150	07-JUN-19
Naphthalene			102.2		%		50-150	07-JUN-19
Phenanthrene			105.8		%		50-150	07-JUN-19
Pyrene			108.6		%		50-150	07-JUN-19
WG3069027-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	07-JUN-19
2-Methylnaphthalene			<0.020		ug/L		0.02	07-JUN-19
Acenaphthene			<0.020		ug/L		0.02	07-JUN-19
Acenaphthylene			<0.020		ug/L		0.02	07-JUN-19
Anthracene			<0.010		ug/L		0.01	07-JUN-19
Benzo(a)anthracene			<0.020		ug/L		0.02	07-JUN-19
Benzo(a)pyrene			<0.010		ug/L		0.01	07-JUN-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	07-JUN-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	07-JUN-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	07-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4661387								
WG3069027-1 MB								
Chrysene			<0.010		ug/L		0.01	07-JUN-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	07-JUN-19
Fluoranthene			<0.010		ug/L		0.01	07-JUN-19
Fluorene			<0.020		ug/L		0.02	07-JUN-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	07-JUN-19
Naphthalene			<0.050		ug/L		0.05	07-JUN-19
Phenanthrene			<0.020		ug/L		0.02	07-JUN-19
Pyrene			<0.020		ug/L		0.02	07-JUN-19
Surrogate: d8-Naphthalene			105.0		%		40-130	07-JUN-19
Surrogate: d10-Phenanthrene			101.5		%		40-130	07-JUN-19
Surrogate: d12-Chrysene			96.1		%		40-130	07-JUN-19
Surrogate: d10-Acenaphthene			104.6		%		40-130	07-JUN-19
PH-WT	**Water**							
Batch R4661283								
WG3070615-16 DUP		**WG3070615-15**						
pH		8.09	8.07	J	pH units	0.02	0.2	09-JUN-19
WG3070615-14 LCS								
pH			7.06		pH units		6.9-7.1	09-JUN-19
SOLIDS-TSS-WT	**Water**							
Batch R4664650								
WG3073338-3 DUP		**L2286868-1**						
Total Suspended Solids		2820	2920		mg/L	3.4	20	12-JUN-19
WG3073338-2 LCS								
Total Suspended Solids			99.7		%		85-115	12-JUN-19
WG3073338-1 MB								
Total Suspended Solids			<2.0		mg/L		2	12-JUN-19
TC-MF-WT	**Water**							
Batch R4661124								
WG3069224-1 MB								
Total Coliforms			0		CFU/100mL		1	07-JUN-19
TKN-WT	**Water**							

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55 Regal Road Unit 3
Guelph ON N1K 1B6
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R4669529								
WG3075342-3 DUP		**L2286024-2**						
Total Kjeldahl Nitrogen		1.00	0.89		mg/L	11	20	13-JUN-19
WG3075342-2 LCS								
Total Kjeldahl Nitrogen			100.4		%		75-125	13-JUN-19
WG3075342-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	13-JUN-19
WG3075342-4 MS		**L2286024-2**						
Total Kjeldahl Nitrogen			96.9		%		70-130	13-JUN-19
Batch R4669602								
WG3075811-3 DUP		**L2287968-1**						
Total Kjeldahl Nitrogen		<0.15	0.22	RPD-NA	mg/L	N/A	20	13-JUN-19
WG3075811-2 LCS								
Total Kjeldahl Nitrogen			105.5		%		75-125	13-JUN-19
WG3075811-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	13-JUN-19
WG3075811-4 MS		**L2287968-1**						
Total Kjeldahl Nitrogen			101.4		%		70-130	13-JUN-19
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-4 DUP		**WG3065396-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	12-JUN-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	12-JUN-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	12-JUN-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-4 DUP		**WG3065396-3**						
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	12-JUN-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	12-JUN-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	12-JUN-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	12-JUN-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	12-JUN-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	12-JUN-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	12-JUN-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	12-JUN-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	12-JUN-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	12-JUN-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	12-JUN-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	12-JUN-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	12-JUN-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	12-JUN-19
WG3065396-1 LCS								
1,1,1,2-Tetrachloroethane			100.8		%		70-130	11-JUN-19
1,1,2,2-Tetrachloroethane			104.3		%		70-130	11-JUN-19
1,1,1-Trichloroethane			106.0		%		70-130	11-JUN-19
1,1,2-Trichloroethane			101.6		%		70-130	11-JUN-19
1,1-Dichloroethane			107.0		%		70-130	11-JUN-19
1,1-Dichloroethylene			102.8		%		70-130	11-JUN-19
1,2-Dibromoethane			106.1		%		70-130	11-JUN-19
1,2-Dichlorobenzene			102.4		%		70-130	11-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-1 LCS								
1,2-Dichloroethane			101.0		%		70-130	11-JUN-19
1,2-Dichloropropane			101.9		%		70-130	11-JUN-19
1,3-Dichlorobenzene			104.5		%		70-130	11-JUN-19
1,4-Dichlorobenzene			103.9		%		70-130	11-JUN-19
Acetone			101.9		%		60-140	11-JUN-19
Benzene			104.7		%		70-130	11-JUN-19
Bromodichloromethane			100.8		%		70-130	11-JUN-19
Bromoform			103.3		%		70-130	11-JUN-19
Bromomethane			106.7		%		60-140	11-JUN-19
Carbon tetrachloride			105.2		%		70-130	11-JUN-19
Chlorobenzene			102.4		%		70-130	11-JUN-19
Chloroform			104.0		%		70-130	11-JUN-19
cis-1,2-Dichloroethylene			100.6		%		70-130	11-JUN-19
cis-1,3-Dichloropropene			98.6		%		70-130	11-JUN-19
Dibromochloromethane			106.8		%		70-130	11-JUN-19
Dichlorodifluoromethane			74.4		%		50-140	11-JUN-19
Ethylbenzene			102.7		%		70-130	11-JUN-19
n-Hexane			97.8		%		70-130	11-JUN-19
m+p-Xylenes			102.8		%		70-130	11-JUN-19
Methyl Ethyl Ketone			98.4		%		60-140	11-JUN-19
Methyl Isobutyl Ketone			91.6		%		60-140	11-JUN-19
Methylene Chloride			101.0		%		70-130	11-JUN-19
MTBE			100.2		%		70-130	11-JUN-19
o-Xylene			101.7		%		70-130	11-JUN-19
Styrene			102.8		%		70-130	11-JUN-19
Tetrachloroethylene			105.3		%		70-130	11-JUN-19
Toluene			100.4		%		70-130	11-JUN-19
trans-1,2-Dichloroethylene			102.4		%		70-130	11-JUN-19
trans-1,3-Dichloropropene			100.7		%		70-130	11-JUN-19
Trichloroethylene			103.9		%		70-130	11-JUN-19
Trichlorofluoromethane			107.4		%		60-140	11-JUN-19
Vinyl chloride			81.3		%		60-140	11-JUN-19
WG3065396-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-2 MB								
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	12-JUN-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	12-JUN-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	12-JUN-19
1,1-Dichloroethane			<0.50		ug/L		0.5	12-JUN-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	12-JUN-19
1,2-Dibromoethane			<0.20		ug/L		0.2	12-JUN-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	12-JUN-19
1,2-Dichloroethane			<0.50		ug/L		0.5	12-JUN-19
1,2-Dichloropropane			<0.50		ug/L		0.5	12-JUN-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	12-JUN-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	12-JUN-19
Acetone			<30		ug/L		30	12-JUN-19
Benzene			<0.50		ug/L		0.5	12-JUN-19
Bromodichloromethane			<2.0		ug/L		2	12-JUN-19
Bromoform			<5.0		ug/L		5	12-JUN-19
Bromomethane			<0.50		ug/L		0.5	12-JUN-19
Carbon tetrachloride			<0.20		ug/L		0.2	12-JUN-19
Chlorobenzene			<0.50		ug/L		0.5	12-JUN-19
Chloroform			<1.0		ug/L		1	12-JUN-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	12-JUN-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	12-JUN-19
Dibromochloromethane			<2.0		ug/L		2	12-JUN-19
Dichlorodifluoromethane			<2.0		ug/L		2	12-JUN-19
Ethylbenzene			<0.50		ug/L		0.5	12-JUN-19
n-Hexane			<0.50		ug/L		0.5	12-JUN-19
m+p-Xylenes			<0.40		ug/L		0.4	12-JUN-19
Methyl Ethyl Ketone			<20		ug/L		20	12-JUN-19
Methyl Isobutyl Ketone			<20		ug/L		20	12-JUN-19
Methylene Chloride			<5.0		ug/L		5	12-JUN-19
MTBE			<2.0		ug/L		2	12-JUN-19
o-Xylene			<0.30		ug/L		0.3	12-JUN-19
Styrene			<0.50		ug/L		0.5	12-JUN-19
Tetrachloroethylene			<0.50		ug/L		0.5	12-JUN-19

Quality Control Report

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Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-2 MB								
Toluene			<0.50		ug/L		0.5	12-JUN-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	12-JUN-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	12-JUN-19
Trichloroethylene			<0.50		ug/L		0.5	12-JUN-19
Trichlorofluoromethane			<5.0		ug/L		5	12-JUN-19
Vinyl chloride			<0.50		ug/L		0.5	12-JUN-19
Surrogate: 1,4-Difluorobenzene			103.8		%		70-130	12-JUN-19
Surrogate: 4-Bromofluorobenzene			100.2		%		70-130	12-JUN-19
WG3065396-5 MS		**WG3065396-3**						
1,1,1,2-Tetrachloroethane			97.8		%		50-140	12-JUN-19
1,1,2,2-Tetrachloroethane			103.3		%		50-140	12-JUN-19
1,1,1-Trichloroethane			102.0		%		50-140	12-JUN-19
1,1,2-Trichloroethane			100.6		%		50-140	12-JUN-19
1,1-Dichloroethane			104.6		%		50-140	12-JUN-19
1,1-Dichloroethylene			99.0		%		50-140	12-JUN-19
1,2-Dibromoethane			106.2		%		50-140	12-JUN-19
1,2-Dichlorobenzene			102.9		%		50-140	12-JUN-19
1,2-Dichloroethane			102.2		%		50-140	12-JUN-19
1,2-Dichloropropane			101.6		%		50-140	12-JUN-19
1,3-Dichlorobenzene			107.5		%		50-140	12-JUN-19
1,4-Dichlorobenzene			108.6		%		50-140	12-JUN-19
Acetone			101.2		%		50-140	12-JUN-19
Benzene			103.7		%		50-140	12-JUN-19
Bromodichloromethane			100.9		%		50-140	12-JUN-19
Bromoform			101.7		%		50-140	12-JUN-19
Bromomethane			106.7		%		50-140	12-JUN-19
Carbon tetrachloride			101.2		%		50-140	12-JUN-19
Chlorobenzene			102.1		%		50-140	12-JUN-19
Chloroform			102.9		%		50-140	12-JUN-19
cis-1,2-Dichloroethylene			100.9		%		50-140	12-JUN-19
cis-1,3-Dichloropropene			111.2		%		50-140	12-JUN-19
Dibromochloromethane			104.8		%		50-140	12-JUN-19
Dichlorodifluoromethane			64.0		%		50-140	12-JUN-19
Ethylbenzene			102.0		%		50-140	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4664390								
WG3065396-5 MS		**WG3065396-3**						
n-Hexane			92.4		%		50-140	12-JUN-19
m+p-Xylenes			103.0		%		50-140	12-JUN-19
Methyl Ethyl Ketone			98.9		%		50-140	12-JUN-19
Methyl Isobutyl Ketone			96.1		%		50-140	12-JUN-19
Methylene Chloride			100.2		%		50-140	12-JUN-19
MTBE			100.4		%		50-140	12-JUN-19
o-Xylene			101.0		%		50-140	12-JUN-19
Styrene			104.9		%		50-140	12-JUN-19
Tetrachloroethylene			105.4		%		50-140	12-JUN-19
Toluene			98.6		%		50-140	12-JUN-19
trans-1,2-Dichloroethylene			105.5		%		50-140	12-JUN-19
trans-1,3-Dichloropropene			115.0		%		50-140	12-JUN-19
Trichloroethylene			105.6		%		50-140	12-JUN-19
Trichlorofluoromethane			100.6		%		50-140	12-JUN-19
Vinyl chloride			76.5		%		50-140	12-JUN-19

Quality Control Report

Workorder: L2286024 Report Date: 14-JUN-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

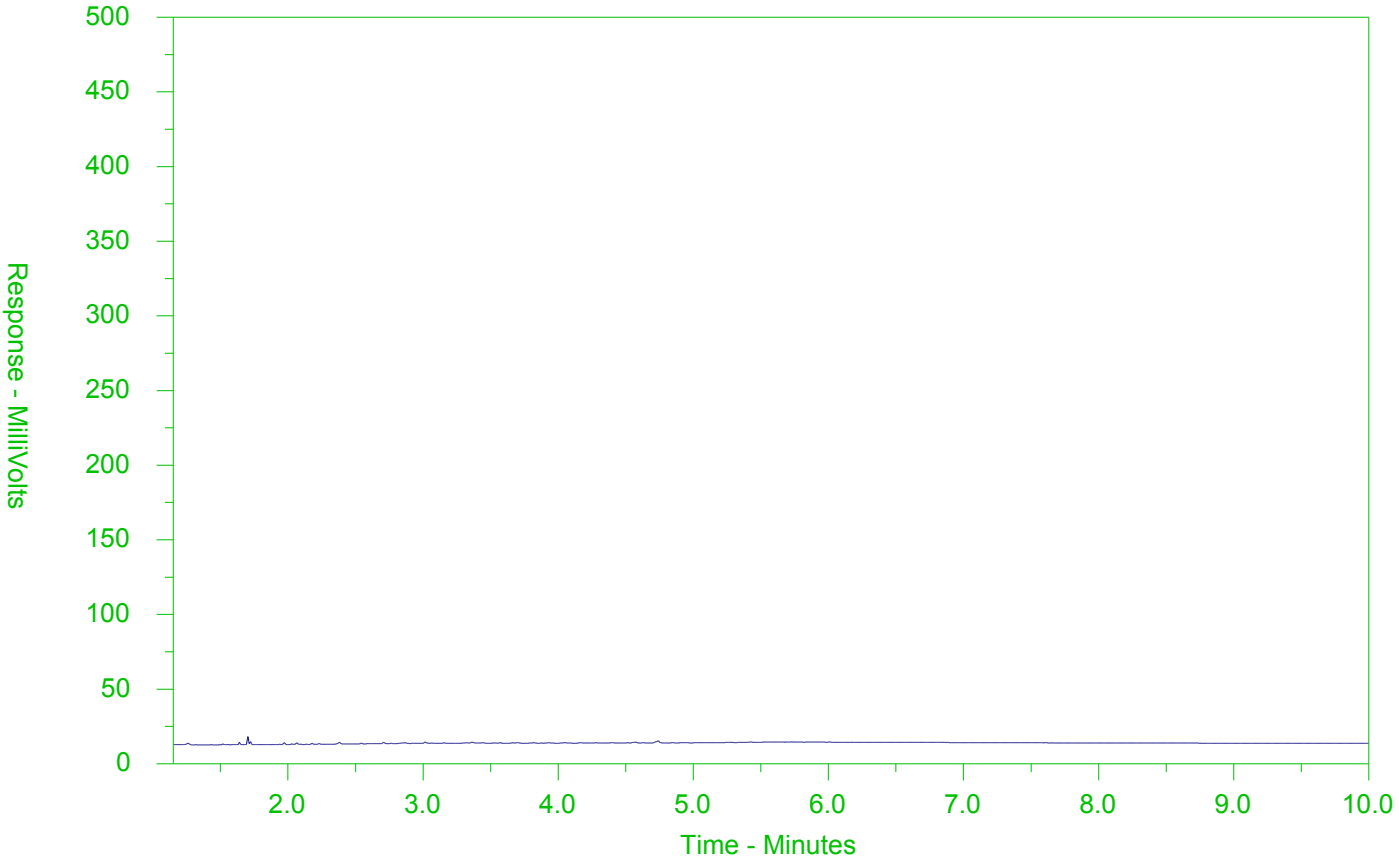
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286024-1
Client Sample ID: WQ-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

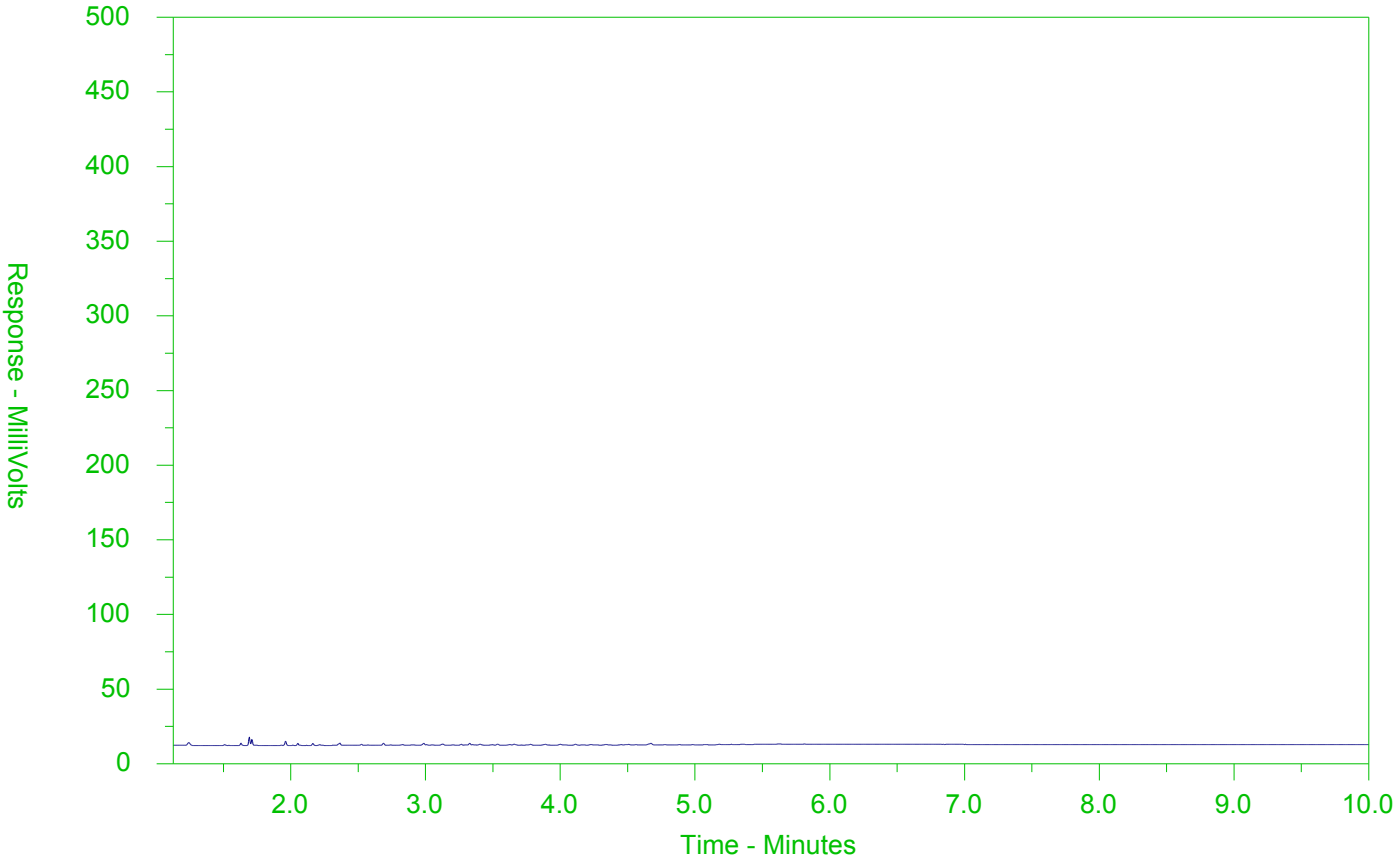
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286024-2
Client Sample ID: WQ-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

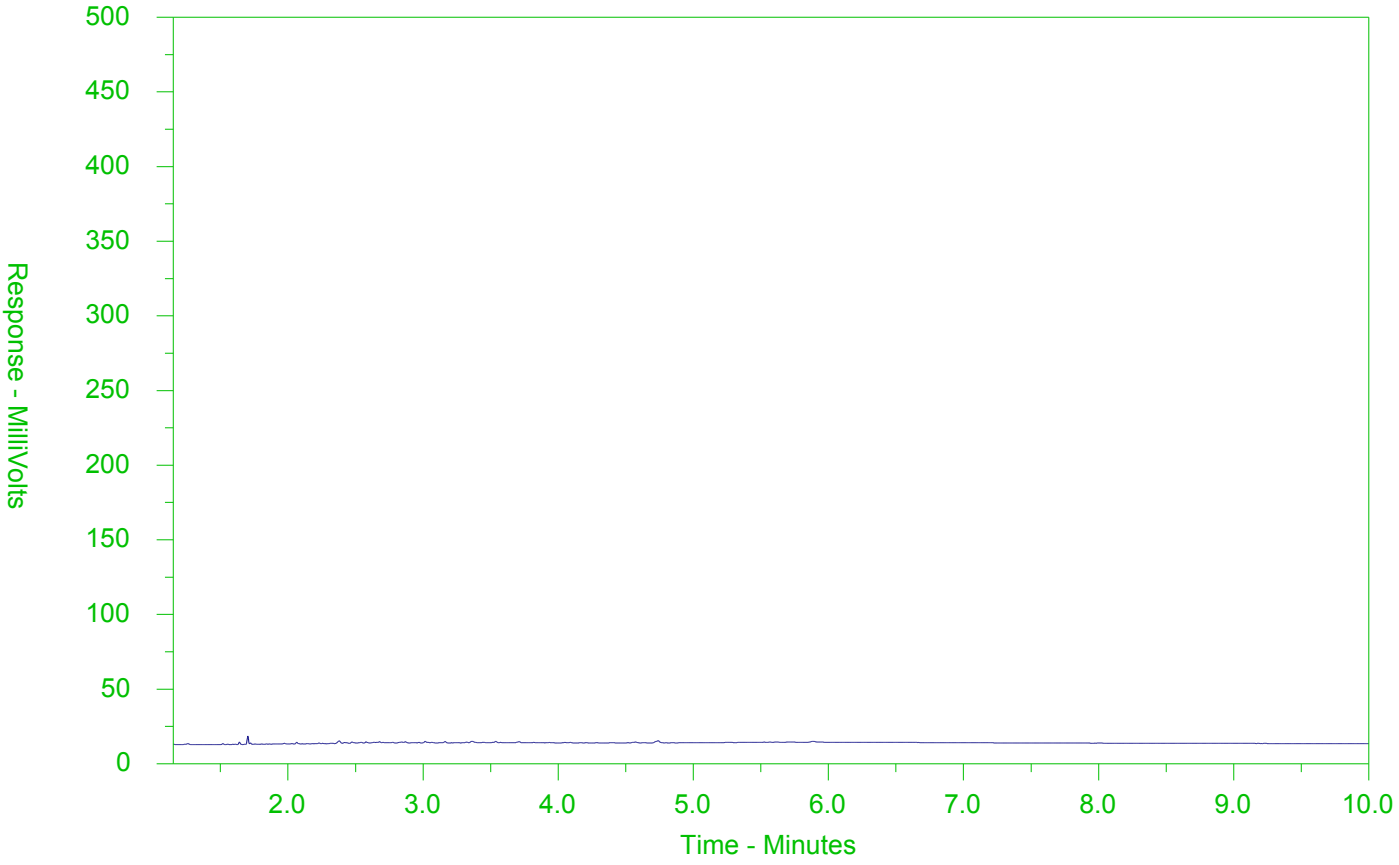
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286024-3
Client Sample ID: WQ-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

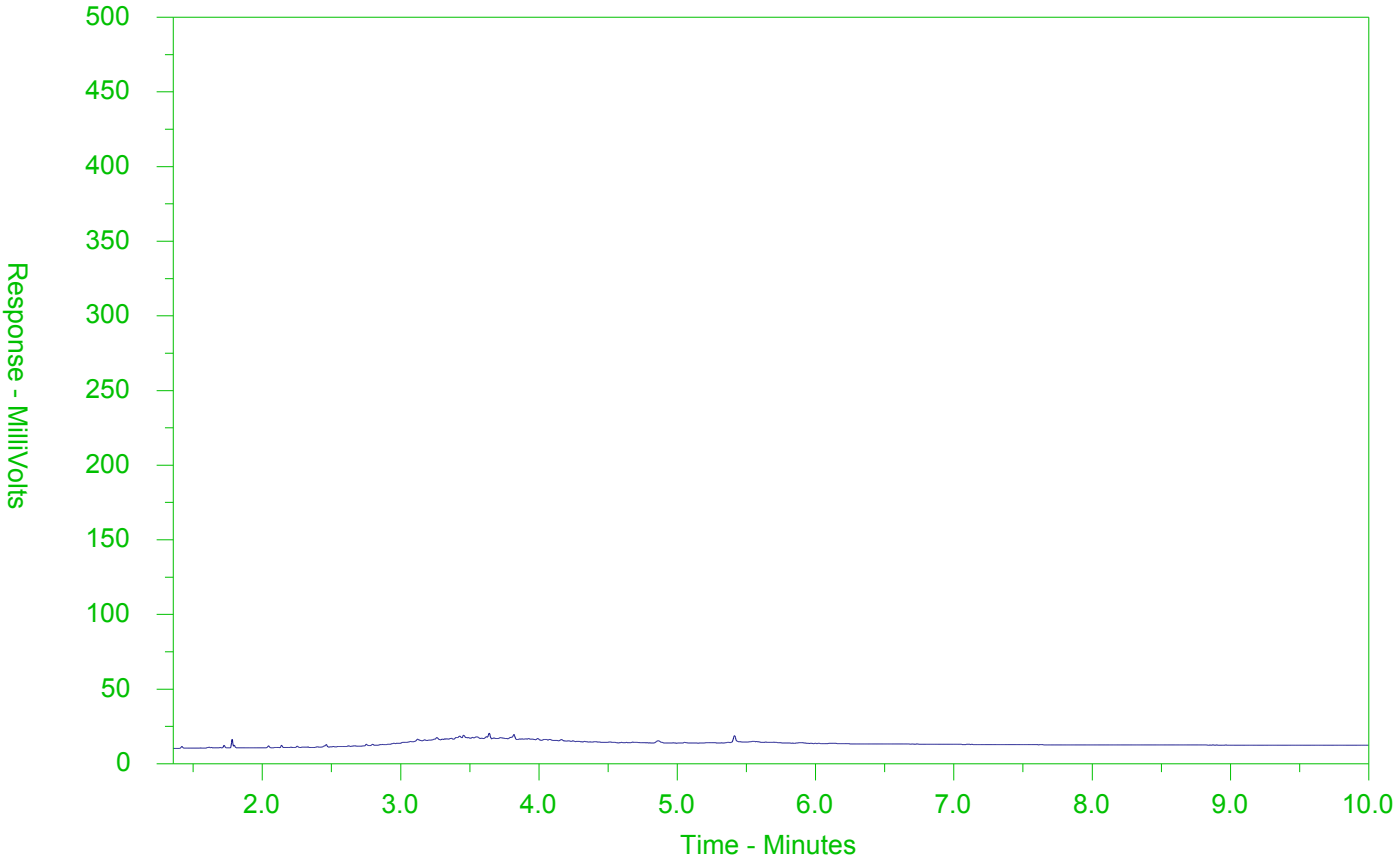
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286024-4
Client Sample ID: WQ-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2286024-COFC

COC Number: 17 - 622585

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LTD
Contact:	WILL COWLIN
Phone:	519-803-7834
	Company address below will appear on the final report
Street:	55 REGAL RD, UNIT 3
City/Province:	GUELPH, ONT
Postal Code:	N1K 1B6
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [X] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report [X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: [X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax COWLIN.W@AQUAFORBEECH.COM
Email 2 BORDI.M@AQUAFORBEECH.COM
Email 3

Invoice Distribution

Select Invoice Distribution: [X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885
Job #: Mohawk Lake
PO / AFE:
LSD:

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2286024
ALS Contact: Gayle Braun
Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs/BTEX	TKN/TP	Total Coliforms/E. Coli	Metals	PAHs	Hydrocarbons F1-F4	Chromium VI	SAR	TSS, pH, Hardness, Conductivity	Anions & Nutrients	Cyanides	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
1	WQ-1	05-06-19		water	X	X	X	X	X	X	X	X	X	X	X			
2	WQ-2	05-06-19		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓			
3	WQ-3	05-06-19																
4	WQ-4	05-06-19																

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
[ ] YES [ ] NO
Are samples for human consumption/ use?
[ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] | SIF Observations Yes [ ] No [ ]
Ice Packs [ ] Ice Cubes [ ] | Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				17.3			

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
MBordi	05-06-19	

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
MG	June 5, 2019	16:37

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

SIF.

AQUAFOR BEECH LIMITED
ATTN: Will Cowlin
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 11-JUN-19
Report Date: 18-JUN-19 14:20 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2289115

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-684114
Legal Site Desc:

Gayle Braun
Senior Account Manager

Summary of Guideline Exceedances

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2289115-1	WQ-1	Anions and Nutrients	Phosphorus, Total	0.223	0.01	mg/L
		Bacteriological Tests	E. Coli	4600	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.429	0.015	mg/L
			Copper (Cu)-Total	0.0047	0.001	mg/L
			Iron (Fe)-Total	0.683	0.3	mg/L
			Lead (Pb)-Total	0.00260	0.001	mg/L
			Zinc (Zn)-Total	0.0225	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.013	0.0002	ug/L
			Chrysene	0.029	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.075	0.008	ug/L
L2289115-2	WQ-2	Anions and Nutrients	Phosphorus, Total	0.0713	0.01	mg/L
		Bacteriological Tests	E. Coli	140	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.079	0.015	mg/L
			Copper (Cu)-Total	0.0015	0.001	mg/L
			Lead (Pb)-Total	0.00125	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.042	0.008	ug/L
L2289115-3	WQ-3	Anions and Nutrients	Phosphorus, Total	0.0589	0.01	mg/L
		Bacteriological Tests	E. Coli	6900	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.219	0.015	mg/L
			Copper (Cu)-Total	0.0044	0.001	mg/L
			Iron (Fe)-Total	0.754	0.3	mg/L
			Lead (Pb)-Total	0.00282	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2289115-3	WQ-3	Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	0.010	0.0002	ug/L
			Chrysene	0.030	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.115	0.008	ug/L
			Phenanthrene	0.059	0.03	ug/L
L2289115-4	WQ-4	Anions and Nutrients	Phosphorus, Total	0.171	0.01	mg/L
		Bacteriological Tests	E. Coli	44000	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.732	0.015	mg/L
			Copper (Cu)-Total	0.0123	0.001	mg/L
			Iron (Fe)-Total	1.70	0.3	mg/L
			Lead (Pb)-Total	0.0101	0.001	mg/L
			Zinc (Zn)-Total	0.0574	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.029	0.0008	ug/L
			Benzo(a)anthracene	0.063	0.0004	ug/L
			Benzo(g,h,i)perylene	0.070	0.00002	ug/L
			Benzo(k)fluoranthene	0.050	0.0002	ug/L
			Chrysene	0.150	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.503	0.008	ug/L
			Phenanthrene	0.221	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2289115-1 10-JUN-19 WQ-1	L2289115-2 10-JUN-19 WQ-2	L2289115-3 10-JUN-19 WQ-3	L2289115-4 10-JUN-19 WQ-4
Conductivity	umhos/cm	-	-	525	1220	1790	1040
Hardness (as CaCO3)	mg/L	-	-	149 HTC	269 HTC	426 HTC	257 HTC
pH	pH units	6.5-8.5	-	7.87	8.27	8.09	7.87
Total Suspended Solids	mg/L	-	-	24.5	8.2	18.1	56.4

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2289115-1	10-JUN-19	WQ-1
				L2289115-2	10-JUN-19	WQ-2
				L2289115-3	10-JUN-19	WQ-3
				L2289115-4	10-JUN-19	WQ-4
Chloride (Cl)	mg/L	-	-	96.5 DLDS	252 DLDS	382 DLDS	204
Nitrate (as N)	mg/L	-	-	0.43 DLDS	0.92 DLDS	3.01 DLDS	2.24
Nitrite (as N)	mg/L	-	-	<0.050 DLDS	<0.050 DLDS	0.062 DLDS	0.024
Total Kjeldahl Nitrogen	mg/L	-	-	0.91	0.76	0.85	1.20
Total Nitrogen	mg/L	-	-	1.34	1.68	3.92	3.46
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0269	0.0097	0.0125	<0.0030
Phosphorus, Total	mg/L	0.01	-	0.223	0.0713	0.0589	0.171

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

		Guide Limits					
				Lab ID	L2289115-1	L2289115-2	L2289115-3	L2289115-4
				Sample Date	10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Analyte	Unit	#1	#2					
Cyanide, Free	mg/L	0.005	-		<0.0020	<0.0020	<0.0020	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2289115-1	10-JUN-19	WQ-1
				L2289115-2	10-JUN-19	WQ-2
				L2289115-3	10-JUN-19	WQ-3
				L2289115-4	10-JUN-19	WQ-4
E. Coli	CFU/100mL	100	-	4600 DLM	140 DLM	6900 DLM	44000 DLM
Total Coliforms	CFU/100mL	-	-	410000 DLM	12000 DLM	90000 DLM	3900000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID		
				L2289115-1	L2289115-2	L2289115-3	L2289115-4	
				10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19	
				WQ-1	WQ-2	WQ-3	WQ-4	
Sodium Adsorption Ratio	SAR	-	-	2.49	3.76	4.26	3.01	

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2289115-1	L2289115-2	L2289115-3	L2289115-4
				Sample Date	10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
Aluminum (Al)-Total	mg/L	0.015	-		0.429	0.079	0.219	0.732
Antimony (Sb)-Total	mg/L	0.02	-		0.00051	0.00048	0.00041	0.00086
Arsenic (As)-Total	mg/L	0.005	-		0.00063	0.00059	0.00054	0.00084
Barium (Ba)-Total	mg/L	-	-		0.0404	0.0676	0.118	0.0738
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.029	0.052	0.069	0.035
Cadmium (Cd)-Total	mg/L	0.0001	-		0.000028	0.000010	0.000023	0.000070
Calcium (Ca)-Total	mg/L	-	-		42.9	76.4	123	74.6
Cesium (Cs)-Total	mg/L	-	-		0.000041	<0.000010	0.000019	0.000063
Chromium (Cr)-Total	mg/L	-	-		0.00195	<0.00050	0.00107	0.00371
Cobalt (Co)-Total	mg/L	0.0009	-		0.00028	<0.00010	0.00024	0.00056
Copper (Cu)-Total	mg/L	0.001	-		0.0047	0.0015	0.0044	0.0123
Iron (Fe)-Total	mg/L	0.3	-		0.683	0.192	0.754	1.70
Lead (Pb)-Total	mg/L	0.001	-		0.00260	0.00125	0.00282	0.0101
Magnesium (Mg)-Total	mg/L	-	-		10.2	19.1	28.7	17.2
Manganese (Mn)-Total	mg/L	-	-		0.0556	0.0329	0.116	0.132
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	0.000016
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000538	0.000924	0.000734	0.000963
Nickel (Ni)-Total	mg/L	0.025	-		0.00102	0.00073	0.00099	0.00195
Potassium (K)-Total	mg/L	-	-		2.14	2.95	3.82	3.43
Rubidium (Rb)-Total	mg/L	-	-		0.00143	0.00100	0.00118	0.00229
Selenium (Se)-Total	mg/L	0.1	-		0.000349	0.000584	0.000949	0.000722
Silicon (Si)-Total	mg/L	-	-		2.44	3.21	5.69	4.50
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		69.7	142 DLHC	202 DLHC	111 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.166	0.296	0.411	0.259
Sulfur (S)-Total	mg/L	-	-		7.24	14.3	20.6	13.0
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	0.000011

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2289115-1 / Sample Date 10-JUN-19 / Sample ID WQ-1	Lab ID L2289115-2 / Sample Date 10-JUN-19 / Sample ID WQ-2	Lab ID L2289115-3 / Sample Date 10-JUN-19 / Sample ID WQ-3	Lab ID L2289115-4 / Sample Date 10-JUN-19 / Sample ID WQ-4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	0.00017	<0.00010	0.00016	0.00062
Titanium (Ti)-Total	mg/L	-	-	0.0123	0.00198	<0.0070 DLUI	0.0231
Tungsten (W)-Total	mg/L	0.03	-	0.00015	0.00023	0.00013	0.00018
Uranium (U)-Total	mg/L	0.005	-	0.000532	0.00103	0.00154	0.000835
Vanadium (V)-Total	mg/L	0.006	-	0.00189	0.00105	0.00120	0.00282
Zinc (Zn)-Total	mg/L	0.02	-	0.0225	<0.0030	0.0119	0.0574
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	0.00045

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits					
Lab ID				L2289115-1	L2289115-2	L2289115-3	L2289115-4
Sample Date				10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Chromium, Hexavalent	ug/L	1	-	0.79	<0.50	<0.50	0.94

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

				Lab ID	L2289115-1	L2289115-2	L2289115-3	L2289115-4
				Sample Date	10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19
				Sample ID	WQ-1	WQ-2	WQ-3	WQ-4
		Guide Limits						
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30	<30	<30	<30	
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0	
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0	
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20	
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50	
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0	
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0	
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20	
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50	
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50	
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50	
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50	
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	0.58	2.80	5.52	
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0	
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50	
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30	
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30	
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50	
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50	
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20	
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20	
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0	
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50	

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID L2289115-1 / Sample Date 10-JUN-19 / Sample ID WQ-1	Lab ID L2289115-2 / Sample Date 10-JUN-19 / Sample ID WQ-2	Lab ID L2289115-3 / Sample Date 10-JUN-19 / Sample ID WQ-3	Lab ID L2289115-4 / Sample Date 10-JUN-19 / Sample ID WQ-4
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	0.83
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	87.2	87.3	103.7	87.0
Surrogate: 1,4-Difluorobenzene	%	-	-	98.9	98.8	105.1	98.3

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2289115-1	10-JUN-19	WQ-1
				L2289115-2	10-JUN-19	WQ-2
				L2289115-3	10-JUN-19	WQ-3
				L2289115-4	10-JUN-19	WQ-4
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	<250	<250
F3-PAH	ug/L	-	-	<250	<250	<250	<250
				<250	<250	<250	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<250	<370	<250	<370
				<370	<250	<370	<250
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	89.8	86.4	87.6	94.5
Surrogate: 3,4-Dichlorotoluene	%	-	-	88.3	84.9	71.3	75.9

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

		Guide Limits					
Lab ID				L2289115-1	L2289115-2	L2289115-3	L2289115-4
Sample Date				10-JUN-19	10-JUN-19	10-JUN-19	10-JUN-19
Sample ID				WQ-1	WQ-2	WQ-3	WQ-4
Analyte	**Unit**	**#1**	**#2**				
Acenaphthene	ug/L	-	-	<0.020	<0.020	<0.020	0.095
Acenaphthylene	ug/L	-	-	<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-	<0.010	<0.010	<0.010	0.029
Benzo(a)anthracene	ug/L	0.0004	-	<0.020	<0.020	<0.020	0.063
Benzo(a)pyrene	ug/L	-	-	0.011	<0.010	0.011	0.060
Benzo(b)fluoranthene	ug/L	-	-	0.038	<0.020	0.029	0.177
Benzo(g,h,i)perylene	ug/L	0.00002	-	<0.020	<0.020	<0.020	0.070
Benzo(k)fluoranthene	ug/L	0.0002	-	0.013	<0.010	0.010	0.050
Chrysene	ug/L	0.0001	-	0.029	0.010	0.030	0.150
Dibenzo(ah)anthracene	ug/L	0.002	-	<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-	0.075	0.042	0.115	0.503
Fluorene	ug/L	0.2	-	<0.020	<0.020	<0.020	0.057
Indeno(1,2,3-cd)pyrene	ug/L	-	-	<0.020	<0.020	<0.020	0.082
1-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	0.024
2-Methylnaphthalene	ug/L	2	-	<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-	<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-	0.027	<0.020	0.059	0.221
Pyrene	ug/L	-	-	0.046	<0.020	0.069	0.341
Surrogate: d10-Acenaphthene	%	-	-	106.5	99.6	105.9	108.2
Surrogate: d12-Chrysene	%	-	-	99.7	94.7	98.1	100.3
Surrogate: d8-Naphthalene	%	-	-	108.2	105.2	107.0	109.1
Surrogate: d10-Phenanthrene	%	-	-	101.9	100.7	103.0	104.1

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation
ETL-TVH,TEH-CCME-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270

Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TC-MF-WT	Water	Total Coliforms	SM 9222B

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.

VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-684114

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4668066								
WG3075046-14 DUP		**WG3075046-15**						
Chloride (Cl)		5.14	5.14		mg/L	0.2	20	12-JUN-19
WG3075046-12 LCS								
Chloride (Cl)			101.2		%		90-110	12-JUN-19
WG3075046-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	12-JUN-19
WG3075046-13 MS		**WG3075046-15**						
Chloride (Cl)			102.2		%		75-125	12-JUN-19
CN-FREE-CFA-WT	**Water**							
Batch R4665587								
WG3074895-14 LCS								
Cyanide, Free			99.95		%		80-120	12-JUN-19
WG3074895-13 MB								
Cyanide, Free			<0.0020		mg/L		0.002	12-JUN-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4665171								
WG3075161-15 DUP		**WG3075161-13**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	12-JUN-19
WG3075161-12 LCS								
Chromium, Hexavalent			97.4		%		80-120	12-JUN-19
WG3075161-11 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	12-JUN-19
WG3075161-14 MS		**WG3075161-13**						
Chromium, Hexavalent			98.6		%		70-130	12-JUN-19
EC-MF-WT	**Water**							
Batch R4669066								
WG3074816-1 MB								
E. Coli			0		CFU/100mL		1	13-JUN-19
EC-WT	**Water**							
Batch R4668310								
WG3075298-8 DUP		**WG3075298-7**						
Conductivity		1850	1840		umhos/cm	0.8	10	12-JUN-19
WG3075298-6 LCS								
Conductivity			100.6		%		90-110	12-JUN-19
WG3075298-5 MB								
Conductivity			<3.0		umhos/cm		3	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT	**Water**							
Batch R4671308								
WG3078057-4 DUP		**WG3078057-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	17-JUN-19
WG3078057-1 LCS								
F1 (C6-C10)			119.5		%		80-120	17-JUN-19
WG3078057-2 MB								
F1 (C6-C10)			<25		ug/L		25	17-JUN-19
Surrogate: 3,4-Dichlorotoluene			106.9		%		60-140	17-JUN-19
WG3078057-5 MS		**WG3078057-3**						
F1 (C6-C10)			95.2		%		60-140	17-JUN-19
F2-F4-511-WT	**Water**							
Batch R4667532								
WG3074632-2 LCS								
F2 (C10-C16)			101.2		%		70-130	12-JUN-19
F3 (C16-C34)			105.3		%		70-130	12-JUN-19
F4 (C34-C50)			100.8		%		70-130	12-JUN-19
WG3074632-1 MB								
F2 (C10-C16)			<100		ug/L		100	12-JUN-19
F3 (C16-C34)			<250		ug/L		250	12-JUN-19
F4 (C34-C50)			<250		ug/L		250	12-JUN-19
Surrogate: 2-Bromobenzotrifluoride			81.7		%		60-140	12-JUN-19
HG-T-CVAA-WT	**Water**							
Batch R4667987								
WG3075846-3 DUP		**L2290203-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-JUN-19
WG3075846-2 LCS								
Mercury (Hg)-Total			102.0		%		80-120	13-JUN-19
WG3075846-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	13-JUN-19
WG3075846-4 MS		**L2290203-2**						
Mercury (Hg)-Total			97.0		%		70-130	13-JUN-19
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-4 DUP		**WG3074459-3**						
Aluminum (Al)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	12-JUN-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-JUN-19
Arsenic (As)-Total		0.00026	0.00025		mg/L	3.9	20	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-4 DUP		**WG3074459-3**						
Barium (Ba)-Total		0.112	0.110		mg/L	2.1	20	12-JUN-19
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-JUN-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-JUN-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	12-JUN-19
Cadmium (Cd)-Total		0.0000078	0.0000064		mg/L	20	20	12-JUN-19
Calcium (Ca)-Total		74.4	74.1		mg/L	0.4	20	12-JUN-19
Chromium (Cr)-Total		0.00092	0.00093		mg/L	0.8	20	12-JUN-19
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-JUN-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-JUN-19
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	12-JUN-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	12-JUN-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-JUN-19
Magnesium (Mg)-Total		29.4	28.7		mg/L	2.6	20	12-JUN-19
Manganese (Mn)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-JUN-19
Molybdenum (Mo)-Total		0.000230	0.000247		mg/L	7.0	20	12-JUN-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-JUN-19
Potassium (K)-Total		1.08	1.06		mg/L	2.0	20	12-JUN-19
Rubidium (Rb)-Total		0.00076	0.00072		mg/L	4.8	20	12-JUN-19
Selenium (Se)-Total		0.000190	0.000193		mg/L	1.9	20	12-JUN-19
Silicon (Si)-Total		5.44	5.44		mg/L	0.0	20	12-JUN-19
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-JUN-19
Sodium (Na)-Total		14.3	14.0		mg/L	2.0	20	12-JUN-19
Strontium (Sr)-Total		0.0875	0.0872		mg/L	0.3	20	12-JUN-19
Sulfur (S)-Total		8.12	8.11		mg/L	0.2	25	12-JUN-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-JUN-19
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	12-JUN-19
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	12-JUN-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-JUN-19
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	12-JUN-19
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-JUN-19
Uranium (U)-Total		0.000357	0.000362		mg/L	1.4	20	12-JUN-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-JUN-19
Zinc (Zn)-Total		0.0031	0.0031		mg/L			12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-4 DUP		**WG3074459-3**						
Zinc (Zn)-Total		0.0031	0.0031		mg/L	0.2	20	12-JUN-19
Zirconium (Zr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	12-JUN-19
WG3074459-2 LCS								
Aluminum (Al)-Total			102.3		%		80-120	12-JUN-19
Antimony (Sb)-Total			105.2		%		80-120	12-JUN-19
Arsenic (As)-Total			100.2		%		80-120	12-JUN-19
Barium (Ba)-Total			102.7		%		80-120	12-JUN-19
Beryllium (Be)-Total			99.6		%		80-120	12-JUN-19
Bismuth (Bi)-Total			99.6		%		80-120	12-JUN-19
Boron (B)-Total			99.3		%		80-120	12-JUN-19
Cadmium (Cd)-Total			99.97		%		80-120	12-JUN-19
Calcium (Ca)-Total			99.2		%		80-120	12-JUN-19
Chromium (Cr)-Total			100.0		%		80-120	12-JUN-19
Cesium (Cs)-Total			100.6		%		80-120	12-JUN-19
Cobalt (Co)-Total			98.6		%		80-120	12-JUN-19
Copper (Cu)-Total			98.0		%		80-120	12-JUN-19
Iron (Fe)-Total			101.7		%		80-120	12-JUN-19
Lead (Pb)-Total			100.3		%		80-120	12-JUN-19
Magnesium (Mg)-Total			101.3		%		80-120	12-JUN-19
Manganese (Mn)-Total			100.2		%		80-120	12-JUN-19
Molybdenum (Mo)-Total			100.2		%		80-120	12-JUN-19
Nickel (Ni)-Total			98.3		%		80-120	12-JUN-19
Potassium (K)-Total			100.9		%		80-120	12-JUN-19
Rubidium (Rb)-Total			99.8		%		80-120	12-JUN-19
Selenium (Se)-Total			96.9		%		80-120	12-JUN-19
Silicon (Si)-Total			108.6		%		60-140	12-JUN-19
Silver (Ag)-Total			98.4		%		80-120	12-JUN-19
Sodium (Na)-Total			98.9		%		80-120	12-JUN-19
Strontium (Sr)-Total			99.0		%		80-120	12-JUN-19
Sulfur (S)-Total			101.3		%		80-120	12-JUN-19
Thallium (Tl)-Total			99.5		%		80-120	12-JUN-19
Tellurium (Te)-Total			96.3		%		80-120	12-JUN-19
Thorium (Th)-Total			100.3		%		70-130	12-JUN-19
Tin (Sn)-Total			100.0		%		80-120	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-2 LCS								
Titanium (Ti)-Total			99.0		%		80-120	12-JUN-19
Tungsten (W)-Total			99.5		%		80-120	12-JUN-19
Uranium (U)-Total			100.4		%		80-120	12-JUN-19
Vanadium (V)-Total			100.9		%		80-120	12-JUN-19
Zinc (Zn)-Total			98.7		%		80-120	12-JUN-19
Zirconium (Zr)-Total			97.8		%		80-120	12-JUN-19
WG3074459-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	12-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	12-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	12-JUN-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	12-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	12-JUN-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	12-JUN-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	12-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	12-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	12-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	12-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	12-JUN-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	12-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	12-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	12-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	12-JUN-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	12-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	12-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	12-JUN-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	12-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	12-JUN-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	12-JUN-19
Sulfur (S)-Total			<0.50		mg/L		0.5	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	12-JUN-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	12-JUN-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	12-JUN-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	12-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	12-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	12-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	12-JUN-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	12-JUN-19
WG3074459-5 MS		**WG3074459-6**						
Aluminum (Al)-Total			100.3		%		70-130	12-JUN-19
Antimony (Sb)-Total			101.3		%		70-130	12-JUN-19
Arsenic (As)-Total			96.7		%		70-130	12-JUN-19
Barium (Ba)-Total			N/A	MS-B	%		-	12-JUN-19
Beryllium (Be)-Total			100.7		%		70-130	12-JUN-19
Bismuth (Bi)-Total			91.0		%		70-130	12-JUN-19
Boron (B)-Total			99.6		%		70-130	12-JUN-19
Cadmium (Cd)-Total			95.5		%		70-130	12-JUN-19
Calcium (Ca)-Total			N/A	MS-B	%		-	12-JUN-19
Chromium (Cr)-Total			96.3		%		70-130	12-JUN-19
Cesium (Cs)-Total			98.8		%		70-130	12-JUN-19
Cobalt (Co)-Total			92.9		%		70-130	12-JUN-19
Copper (Cu)-Total			87.8		%		70-130	12-JUN-19
Iron (Fe)-Total			97.1		%		70-130	12-JUN-19
Lead (Pb)-Total			93.0		%		70-130	12-JUN-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	12-JUN-19
Manganese (Mn)-Total			95.5		%		70-130	12-JUN-19
Molybdenum (Mo)-Total			98.8		%		70-130	12-JUN-19
Nickel (Ni)-Total			90.6		%		70-130	12-JUN-19
Potassium (K)-Total			96.1		%		70-130	12-JUN-19
Rubidium (Rb)-Total			98.9		%		70-130	12-JUN-19
Selenium (Se)-Total			89.8		%		70-130	12-JUN-19
Silicon (Si)-Total			N/A	MS-B	%		-	12-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4666488								
WG3074459-5 MS		**WG3074459-6**						
Silver (Ag)-Total			92.9		%		70-130	12-JUN-19
Sodium (Na)-Total			N/A	MS-B	%		-	12-JUN-19
Strontium (Sr)-Total			N/A	MS-B	%		-	12-JUN-19
Sulfur (S)-Total			N/A	MS-B	%		-	12-JUN-19
Thallium (Tl)-Total			92.9		%		70-130	12-JUN-19
Tellurium (Te)-Total			84.1		%		70-130	12-JUN-19
Thorium (Th)-Total			97.6		%		70-130	12-JUN-19
Tin (Sn)-Total			98.7		%		70-130	12-JUN-19
Titanium (Ti)-Total			94.9		%		70-130	12-JUN-19
Tungsten (W)-Total			97.0		%		70-130	12-JUN-19
Uranium (U)-Total			N/A	MS-B	%		-	12-JUN-19
Vanadium (V)-Total			98.9		%		70-130	12-JUN-19
Zinc (Zn)-Total			89.1		%		70-130	12-JUN-19
Zirconium (Zr)-Total			96.1		%		70-130	12-JUN-19
NO2-IC-WT	**Water**							
Batch R4668066								
WG3075046-14 DUP		**WG3075046-15**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	12-JUN-19
WG3075046-12 LCS								
Nitrite (as N)			101.6		%		90-110	12-JUN-19
WG3075046-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	12-JUN-19
WG3075046-13 MS		**WG3075046-15**						
Nitrite (as N)			102.0		%		75-125	12-JUN-19
NO3-IC-WT	**Water**							
Batch R4668066								
WG3075046-14 DUP		**WG3075046-15**						
Nitrate (as N)		0.432	0.436		mg/L	0.9	20	12-JUN-19
WG3075046-12 LCS								
Nitrate (as N)			100.6		%		90-110	12-JUN-19
WG3075046-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	12-JUN-19
WG3075046-13 MS		**WG3075046-15**						
Nitrate (as N)			99.4		%		75-125	12-JUN-19
P-T-COL-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-WT	**Water**							
Batch R4672402								
WG3079468-3 DUP		**L2289115-4**						
Phosphorus, Total		0.171	0.174		mg/L	2.0	20	18-JUN-19
WG3079468-2 LCS								
Phosphorus, Total			89.0		%		80-120	18-JUN-19
WG3079468-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	18-JUN-19
WG3079468-4 MS		**L2289115-4**						
Phosphorus, Total			N/A	MS-B	%		-	18-JUN-19
P-TD-COL-WT	**Water**							
Batch R4672411								
WG3079464-3 DUP		**L2288189-3**						
Phosphorus (P)-Total	Dissolved	0.0055	0.0060		mg/L	9.6	20	18-JUN-19
WG3079464-2 LCS								
Phosphorus (P)-Total	Dissolved		90.2		%		80-120	18-JUN-19
WG3079464-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	18-JUN-19
WG3079464-4 MS		**L2288189-3**						
Phosphorus (P)-Total	Dissolved		98.1		%		70-130	18-JUN-19
PAH-PWQO-WT	**Water**							
Batch R4668272								
WG3074632-2 LCS								
1-Methylnaphthalene			98.6		%		50-150	13-JUN-19
2-Methylnaphthalene			100.9		%		50-150	13-JUN-19
Acenaphthene			111.3		%		50-150	13-JUN-19
Acenaphthylene			105.1		%		50-150	13-JUN-19
Anthracene			104.2		%		60-130	13-JUN-19
Benzo(a)anthracene			125.4		%		60-130	13-JUN-19
Benzo(a)pyrene			112.1		%		50-150	13-JUN-19
Benzo(b)fluoranthene			111.0		%		50-150	13-JUN-19
Benzo(g,h,i)perylene			111.8		%		60-130	13-JUN-19
Benzo(k)fluoranthene			112.2		%		60-130	13-JUN-19
Chrysene			127.4		%		60-130	13-JUN-19
Dibenzo(ah)anthracene			108.6		%		60-130	13-JUN-19
Fluoranthene			118.3		%		60-130	13-JUN-19
Fluorene			107.3		%		50-150	13-JUN-19
Indeno(1,2,3-cd)pyrene			120.2		%		50-150	13-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4668272								
WG3074632-2 LCS								
Naphthalene			106.6		%		50-150	13-JUN-19
Phenanthrene			111.4		%		50-150	13-JUN-19
Pyrene			114.0		%		50-150	13-JUN-19
WG3074632-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	13-JUN-19
2-Methylnaphthalene			<0.020		ug/L		0.02	13-JUN-19
Acenaphthene			<0.020		ug/L		0.02	13-JUN-19
Acenaphthylene			<0.020		ug/L		0.02	13-JUN-19
Anthracene			<0.010		ug/L		0.01	13-JUN-19
Benzo(a)anthracene			<0.020		ug/L		0.02	13-JUN-19
Benzo(a)pyrene			<0.010		ug/L		0.01	13-JUN-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	13-JUN-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	13-JUN-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	13-JUN-19
Chrysene			<0.010		ug/L		0.01	13-JUN-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	13-JUN-19
Fluoranthene			<0.010		ug/L		0.01	13-JUN-19
Fluorene			<0.020		ug/L		0.02	13-JUN-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	13-JUN-19
Naphthalene			<0.050		ug/L		0.05	13-JUN-19
Phenanthrene			<0.020		ug/L		0.02	13-JUN-19
Pyrene			<0.020		ug/L		0.02	13-JUN-19
Surrogate: d8-Naphthalene			112.8		%		40-130	13-JUN-19
Surrogate: d10-Phenanthrene			108.5		%		40-130	13-JUN-19
Surrogate: d12-Chrysene			104.7		%		40-130	13-JUN-19
Surrogate: d10-Acenaphthene			111.2		%		40-130	13-JUN-19
PH-WT	**Water**							
Batch R4668310								
WG3075298-8 DUP		**WG3075298-7**						
pH		7.84	7.85	J	pH units	0.01	0.2	12-JUN-19
WG3075298-6 LCS								
pH			7.03		pH units		6.9-7.1	12-JUN-19
SOLIDS-TSS-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4671800								
WG3077382-3 DUP		**L2289384-2**						
Total Suspended Solids		2980	2920		mg/L	2.3	20	17-JUN-19
WG3077382-2 LCS								
Total Suspended Solids			100.3		%		85-115	17-JUN-19
WG3077382-1 MB								
Total Suspended Solids			<2.0		mg/L		2	17-JUN-19
TC-MF-WT	**Water**							
Batch R4669075								
WG3074813-3 DUP		**L2289115-4**						
Total Coliforms		3900000	3700000		CFU/100mL	5.3	65	13-JUN-19
WG3074813-1 MB								
Total Coliforms			0		CFU/100mL		1	13-JUN-19
TKN-WT	**Water**							
Batch R4672016								
WG3078961-3 DUP		**L2288940-5**						
Total Kjeldahl Nitrogen		0.61	0.55		mg/L	10	20	17-JUN-19
WG3078961-2 LCS								
Total Kjeldahl Nitrogen			111.9		%		75-125	17-JUN-19
WG3078961-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	17-JUN-19
WG3078961-4 MS		**L2288940-5**						
Total Kjeldahl Nitrogen			104.7		%		70-130	17-JUN-19
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-4 DUP		**WG3078057-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-JUN-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-4 DUP		**WG3078057-3**						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	17-JUN-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-JUN-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-JUN-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	17-JUN-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-JUN-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-JUN-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-JUN-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-JUN-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	17-JUN-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-JUN-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	17-JUN-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-JUN-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-JUN-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-JUN-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	17-JUN-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	17-JUN-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	17-JUN-19
WG3078057-1 LCS								
1,1,1,2-Tetrachloroethane			94.2		%		70-130	17-JUN-19
1,1,2,2-Tetrachloroethane			89.9		%		70-130	17-JUN-19
1,1,1-Trichloroethane			106.5		%		70-130	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-1 LCS								
1,1,2-Trichloroethane			90.9		%		70-130	17-JUN-19
1,1-Dichloroethane			111.0		%		70-130	17-JUN-19
1,1-Dichloroethylene			103.2		%		70-130	17-JUN-19
1,2-Dibromoethane			87.8		%		70-130	17-JUN-19
1,2-Dichlorobenzene			98.5		%		70-130	17-JUN-19
1,2-Dichloroethane			95.8		%		70-130	17-JUN-19
1,2-Dichloropropane			96.3		%		70-130	17-JUN-19
1,3-Dichlorobenzene			97.3		%		70-130	17-JUN-19
1,4-Dichlorobenzene			98.8		%		70-130	17-JUN-19
Acetone			97.0		%		60-140	17-JUN-19
Benzene			98.9		%		70-130	17-JUN-19
Bromodichloromethane			96.1		%		70-130	17-JUN-19
Bromoform			89.7		%		70-130	17-JUN-19
Bromomethane			106.3		%		60-140	17-JUN-19
Carbon tetrachloride			105.4		%		70-130	17-JUN-19
Chlorobenzene			92.1		%		70-130	17-JUN-19
Chloroform			99.1		%		70-130	17-JUN-19
cis-1,2-Dichloroethylene			95.3		%		70-130	17-JUN-19
cis-1,3-Dichloropropene			91.9		%		70-130	17-JUN-19
Dibromochloromethane			95.4		%		70-130	17-JUN-19
Dichlorodifluoromethane			58.8		%		50-140	17-JUN-19
Ethylbenzene			86.2		%		70-130	17-JUN-19
n-Hexane			98.9		%		70-130	17-JUN-19
m+p-Xylenes			92.6		%		70-130	17-JUN-19
Methyl Ethyl Ketone			88.4		%		60-140	17-JUN-19
Methyl Isobutyl Ketone			79.8		%		60-140	17-JUN-19
Methylene Chloride			101.2		%		70-130	17-JUN-19
MTBE			99.4		%		70-130	17-JUN-19
o-Xylene			84.5		%		70-130	17-JUN-19
Styrene			87.9		%		70-130	17-JUN-19
Tetrachloroethylene			94.8		%		70-130	17-JUN-19
Toluene			90.9		%		70-130	17-JUN-19
trans-1,2-Dichloroethylene			108.8		%		70-130	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-1 LCS								
trans-1,3-Dichloropropene			89.2		%		70-130	17-JUN-19
Trichloroethylene			103.7		%		70-130	17-JUN-19
Trichlorofluoromethane			101.1		%		60-140	17-JUN-19
Vinyl chloride			77.6		%		60-140	17-JUN-19
WG3078057-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	17-JUN-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	17-JUN-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	17-JUN-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	17-JUN-19
1,1-Dichloroethane			<0.50		ug/L		0.5	17-JUN-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	17-JUN-19
1,2-Dibromoethane			<0.20		ug/L		0.2	17-JUN-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	17-JUN-19
1,2-Dichloroethane			<0.50		ug/L		0.5	17-JUN-19
1,2-Dichloropropane			<0.50		ug/L		0.5	17-JUN-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	17-JUN-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	17-JUN-19
Acetone			<30		ug/L		30	17-JUN-19
Benzene			<0.50		ug/L		0.5	17-JUN-19
Bromodichloromethane			<2.0		ug/L		2	17-JUN-19
Bromoform			<5.0		ug/L		5	17-JUN-19
Bromomethane			<0.50		ug/L		0.5	17-JUN-19
Carbon tetrachloride			<0.20		ug/L		0.2	17-JUN-19
Chlorobenzene			<0.50		ug/L		0.5	17-JUN-19
Chloroform			<1.0		ug/L		1	17-JUN-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-JUN-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	17-JUN-19
Dibromochloromethane			<2.0		ug/L		2	17-JUN-19
Dichlorodifluoromethane			<2.0		ug/L		2	17-JUN-19
Ethylbenzene			<0.50		ug/L		0.5	17-JUN-19
n-Hexane			<0.50		ug/L		0.5	17-JUN-19
m+p-Xylenes			<0.40		ug/L		0.4	17-JUN-19
Methyl Ethyl Ketone			<20		ug/L		20	17-JUN-19
Methyl Isobutyl Ketone			<20		ug/L		20	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-2 MB								
Methylene Chloride			<5.0		ug/L		5	17-JUN-19
MTBE			<2.0		ug/L		2	17-JUN-19
o-Xylene			<0.30		ug/L		0.3	17-JUN-19
Styrene			<0.50		ug/L		0.5	17-JUN-19
Tetrachloroethylene			<0.50		ug/L		0.5	17-JUN-19
Toluene			<0.50		ug/L		0.5	17-JUN-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-JUN-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	17-JUN-19
Trichloroethylene			<0.50		ug/L		0.5	17-JUN-19
Trichlorofluoromethane			<5.0		ug/L		5	17-JUN-19
Vinyl chloride			<0.50		ug/L		0.5	17-JUN-19
Surrogate: 1,4-Difluorobenzene			98.8		%		70-130	17-JUN-19
Surrogate: 4-Bromofluorobenzene			88.7		%		70-130	17-JUN-19
WG3078057-5 MS		**WG3078057-3**						
1,1,1,2-Tetrachloroethane			95.3		%		50-140	17-JUN-19
1,1,2,2-Tetrachloroethane			96.0		%		50-140	17-JUN-19
1,1,1-Trichloroethane			105.0		%		50-140	17-JUN-19
1,1,2-Trichloroethane			94.2		%		50-140	17-JUN-19
1,1-Dichloroethane			111.4		%		50-140	17-JUN-19
1,1-Dichloroethylene			98.3		%		50-140	17-JUN-19
1,2-Dibromoethane			90.5		%		50-140	17-JUN-19
1,2-Dichlorobenzene			97.6		%		50-140	17-JUN-19
1,2-Dichloroethane			100.4		%		50-140	17-JUN-19
1,2-Dichloropropane			98.8		%		50-140	17-JUN-19
1,3-Dichlorobenzene			94.8		%		50-140	17-JUN-19
1,4-Dichlorobenzene			96.5		%		50-140	17-JUN-19
Acetone			107.1		%		50-140	17-JUN-19
Benzene			98.8		%		50-140	17-JUN-19
Bromodichloromethane			99.9		%		50-140	17-JUN-19
Bromoform			93.5		%		50-140	17-JUN-19
Bromomethane			96.1		%		50-140	17-JUN-19
Carbon tetrachloride			103.1		%		50-140	17-JUN-19
Chlorobenzene			92.1		%		50-140	17-JUN-19
Chloroform			100.7		%		50-140	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4671308								
WG3078057-5 MS		**WG3078057-3**						
cis-1,2-Dichloroethylene			95.2		%		50-140	17-JUN-19
cis-1,3-Dichloropropene			88.9		%		50-140	17-JUN-19
Dibromochloromethane			98.1		%		50-140	17-JUN-19
Dichlorodifluoromethane			48.7	MES	%		50-140	17-JUN-19
Ethylbenzene			82.4		%		50-140	17-JUN-19
n-Hexane			90.7		%		50-140	17-JUN-19
m+p-Xylenes			89.6		%		50-140	17-JUN-19
Methyl Ethyl Ketone			91.6		%		50-140	17-JUN-19
Methyl Isobutyl Ketone			86.5		%		50-140	17-JUN-19
Methylene Chloride			100.7		%		50-140	17-JUN-19
MTBE			100.1		%		50-140	17-JUN-19
o-Xylene			82.0		%		50-140	17-JUN-19
Styrene			86.1		%		50-140	17-JUN-19
Tetrachloroethylene			91.1		%		50-140	17-JUN-19
Toluene			87.6		%		50-140	17-JUN-19
trans-1,2-Dichloroethylene			105.9		%		50-140	17-JUN-19
trans-1,3-Dichloropropene			84.4		%		50-140	17-JUN-19
Trichloroethylene			102.6		%		50-140	17-JUN-19
Trichlorofluoromethane			94.0		%		50-140	17-JUN-19
Vinyl chloride			69.4		%		50-140	17-JUN-19
Batch R4672158								
WG3078905-4 DUP		**WG3078905-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-JUN-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4672158								
WG3078905-4 DUP		**WG3078905-3**						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	18-JUN-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-JUN-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-JUN-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	18-JUN-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	18-JUN-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-JUN-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-JUN-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-JUN-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-JUN-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-JUN-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-JUN-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-JUN-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-JUN-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-JUN-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-JUN-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	18-JUN-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-JUN-19
WG3078905-1 LCS								
1,1,1,2-Tetrachloroethane			100.1		%		70-130	17-JUN-19
1,1,2,2-Tetrachloroethane			97.5		%		70-130	17-JUN-19
1,1,1-Trichloroethane			97.3		%		70-130	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4672158								
WG3078905-1 LCS								
1,1,2-Trichloroethane			110.6		%		70-130	17-JUN-19
1,1-Dichloroethane			103.4		%		70-130	17-JUN-19
1,1-Dichloroethylene			95.8		%		70-130	17-JUN-19
1,2-Dibromoethane			113.4		%		70-130	17-JUN-19
1,2-Dichlorobenzene			101.2		%		70-130	17-JUN-19
1,2-Dichloroethane			108.3		%		70-130	17-JUN-19
1,2-Dichloropropane			106.2		%		70-130	17-JUN-19
1,3-Dichlorobenzene			97.4		%		70-130	17-JUN-19
1,4-Dichlorobenzene			98.9		%		70-130	17-JUN-19
Acetone			116.2		%		60-140	17-JUN-19
Benzene			104.9		%		70-130	17-JUN-19
Bromodichloromethane			106.4		%		70-130	17-JUN-19
Bromoform			111.1		%		70-130	17-JUN-19
Bromomethane			117.9		%		60-140	17-JUN-19
Carbon tetrachloride			96.5		%		70-130	17-JUN-19
Chlorobenzene			101.4		%		70-130	17-JUN-19
Chloroform			104.0		%		70-130	17-JUN-19
cis-1,2-Dichloroethylene			103.3		%		70-130	17-JUN-19
cis-1,3-Dichloropropene			113.1		%		70-130	17-JUN-19
Dibromochloromethane			106.5		%		70-130	17-JUN-19
Dichlorodifluoromethane			86.5		%		50-140	17-JUN-19
Ethylbenzene			98.9		%		70-130	17-JUN-19
n-Hexane			90.8		%		70-130	17-JUN-19
m+p-Xylenes			99.9		%		70-130	17-JUN-19
Methyl Ethyl Ketone			110.7		%		60-140	17-JUN-19
Methyl Isobutyl Ketone			105.8		%		60-140	17-JUN-19
Methylene Chloride			108.0		%		70-130	17-JUN-19
MTBE			102.2		%		70-130	17-JUN-19
o-Xylene			98.9		%		70-130	17-JUN-19
Styrene			103.9		%		70-130	17-JUN-19
Tetrachloroethylene			103.1		%		70-130	17-JUN-19
Toluene			96.1		%		70-130	17-JUN-19
trans-1,2-Dichloroethylene			101.2		%		70-130	17-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4672158								
WG3078905-1 LCS								
trans-1,3-Dichloropropene			114.3		%		70-130	17-JUN-19
Trichloroethylene			102.0		%		70-130	17-JUN-19
Trichlorofluoromethane			100.4		%		60-140	17-JUN-19
Vinyl chloride			85.0		%		60-140	17-JUN-19
WG3078905-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	18-JUN-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	18-JUN-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	18-JUN-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	18-JUN-19
1,1-Dichloroethane			<0.50		ug/L		0.5	18-JUN-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	18-JUN-19
1,2-Dibromoethane			<0.20		ug/L		0.2	18-JUN-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	18-JUN-19
1,2-Dichloroethane			<0.50		ug/L		0.5	18-JUN-19
1,2-Dichloropropane			<0.50		ug/L		0.5	18-JUN-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	18-JUN-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	18-JUN-19
Acetone			<30		ug/L		30	18-JUN-19
Benzene			<0.50		ug/L		0.5	18-JUN-19
Bromodichloromethane			<2.0		ug/L		2	18-JUN-19
Bromoform			<5.0		ug/L		5	18-JUN-19
Bromomethane			<0.50		ug/L		0.5	18-JUN-19
Carbon tetrachloride			<0.20		ug/L		0.2	18-JUN-19
Chlorobenzene			<0.50		ug/L		0.5	18-JUN-19
Chloroform			<1.0		ug/L		1	18-JUN-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-JUN-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	18-JUN-19
Dibromochloromethane			<2.0		ug/L		2	18-JUN-19
Dichlorodifluoromethane			<2.0		ug/L		2	18-JUN-19
Ethylbenzene			<0.50		ug/L		0.5	18-JUN-19
n-Hexane			<0.50		ug/L		0.5	18-JUN-19
m+p-Xylenes			<0.40		ug/L		0.4	18-JUN-19
Methyl Ethyl Ketone			<20		ug/L		20	18-JUN-19
Methyl Isobutyl Ketone			<20		ug/L		20	18-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4672158								
WG3078905-2 MB								
Methylene Chloride			<5.0		ug/L		5	18-JUN-19
MTBE			<2.0		ug/L		2	18-JUN-19
o-Xylene			<0.30		ug/L		0.3	18-JUN-19
Styrene			<0.50		ug/L		0.5	18-JUN-19
Tetrachloroethylene			<0.50		ug/L		0.5	18-JUN-19
Toluene			<0.50		ug/L		0.5	18-JUN-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	18-JUN-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	18-JUN-19
Trichloroethylene			<0.50		ug/L		0.5	18-JUN-19
Trichlorofluoromethane			<5.0		ug/L		5	18-JUN-19
Vinyl chloride			<0.50		ug/L		0.5	18-JUN-19
Surrogate: 1,4-Difluorobenzene			104.5		%		70-130	18-JUN-19
Surrogate: 4-Bromofluorobenzene			102.4		%		70-130	18-JUN-19
WG3078905-5 MS		**WG3078905-3**						
1,1,1,2-Tetrachloroethane			100.8		%		50-140	18-JUN-19
1,1,2,2-Tetrachloroethane			95.1		%		50-140	18-JUN-19
1,1,1-Trichloroethane			97.5		%		50-140	18-JUN-19
1,1,2-Trichloroethane			110.8		%		50-140	18-JUN-19
1,1-Dichloroethane			103.1		%		50-140	18-JUN-19
1,1-Dichloroethylene			94.1		%		50-140	18-JUN-19
1,2-Dibromoethane			112.9		%		50-140	18-JUN-19
1,2-Dichlorobenzene			101.0		%		50-140	18-JUN-19
1,2-Dichloroethane			107.4		%		50-140	18-JUN-19
1,2-Dichloropropane			106.5		%		50-140	18-JUN-19
1,3-Dichlorobenzene			97.4		%		50-140	18-JUN-19
1,4-Dichlorobenzene			97.9		%		50-140	18-JUN-19
Acetone			115.7		%		50-140	18-JUN-19
Benzene			104.4		%		50-140	18-JUN-19
Bromodichloromethane			107.7		%		50-140	18-JUN-19
Bromoform			110.2		%		50-140	18-JUN-19
Bromomethane			109.5		%		50-140	18-JUN-19
Carbon tetrachloride			96.9		%		50-140	18-JUN-19
Chlorobenzene			100.5		%		50-140	18-JUN-19
Chloroform			104.4		%		50-140	18-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4672158								
WG3078905-5 MS		**WG3078905-3**						
cis-1,2-Dichloroethylene			102.7		%		50-140	18-JUN-19
cis-1,3-Dichloropropene			104.6		%		50-140	18-JUN-19
Dibromochloromethane			106.4		%		50-140	18-JUN-19
Dichlorodifluoromethane			77.5		%		50-140	18-JUN-19
Ethylbenzene			98.0		%		50-140	18-JUN-19
n-Hexane			88.4		%		50-140	18-JUN-19
m+p-Xylenes			98.3		%		50-140	18-JUN-19
Methyl Ethyl Ketone			105.9		%		50-140	18-JUN-19
Methyl Isobutyl Ketone			103.5		%		50-140	18-JUN-19
Methylene Chloride			107.8		%		50-140	18-JUN-19
MTBE			102.3		%		50-140	18-JUN-19
o-Xylene			98.2		%		50-140	18-JUN-19
Styrene			102.2		%		50-140	18-JUN-19
Tetrachloroethylene			100.1		%		50-140	18-JUN-19
Toluene			95.7		%		50-140	18-JUN-19
trans-1,2-Dichloroethylene			97.6		%		50-140	18-JUN-19
trans-1,3-Dichloropropene			102.5		%		50-140	18-JUN-19
Trichloroethylene			100.8		%		50-140	18-JUN-19
Trichlorofluoromethane			98.5		%		50-140	18-JUN-19
Vinyl chloride			79.8		%		50-140	18-JUN-19

Quality Control Report

Workorder: L2289115 Report Date: 18-JUN-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

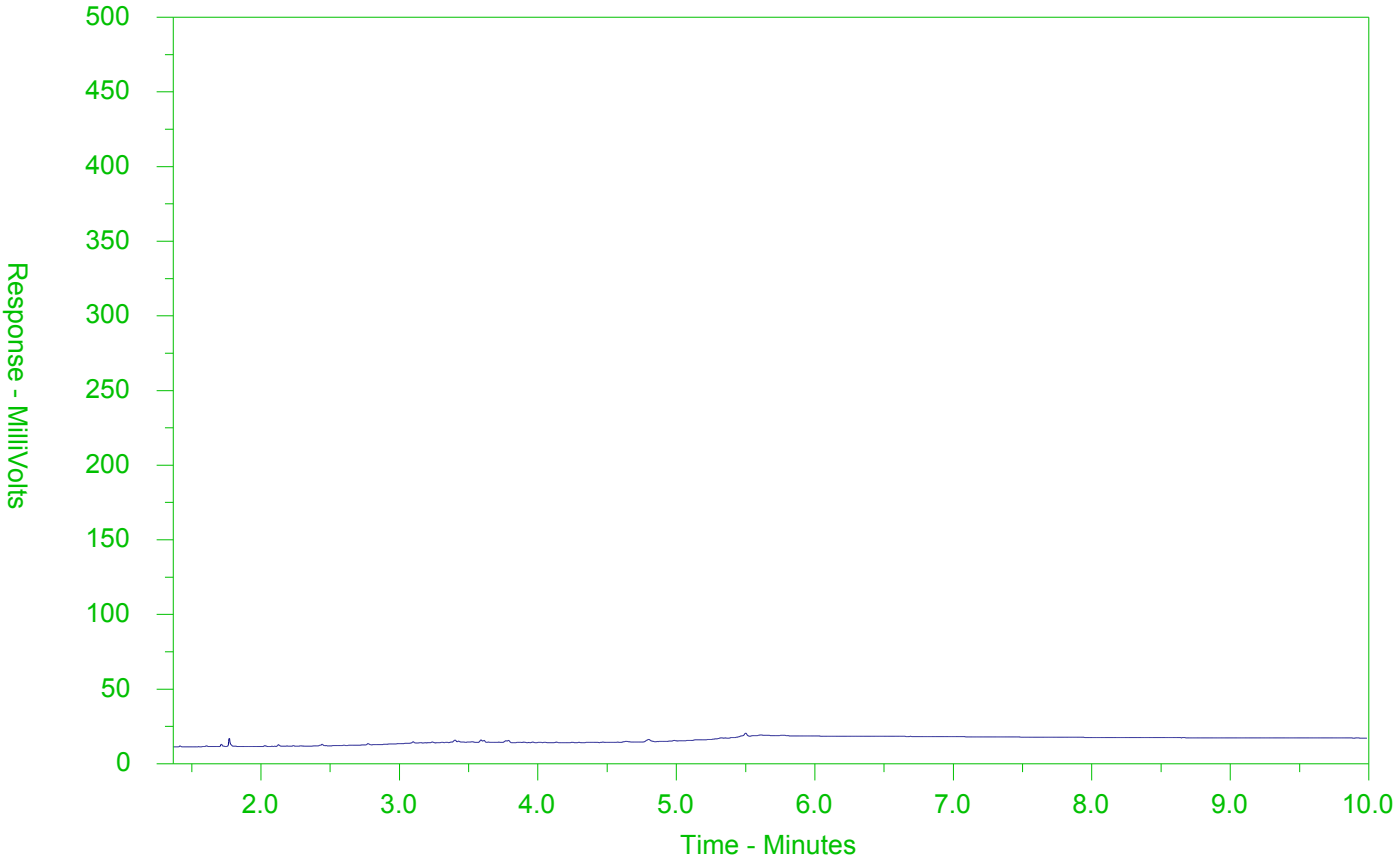
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2289115-1
Client Sample ID: WQ-1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

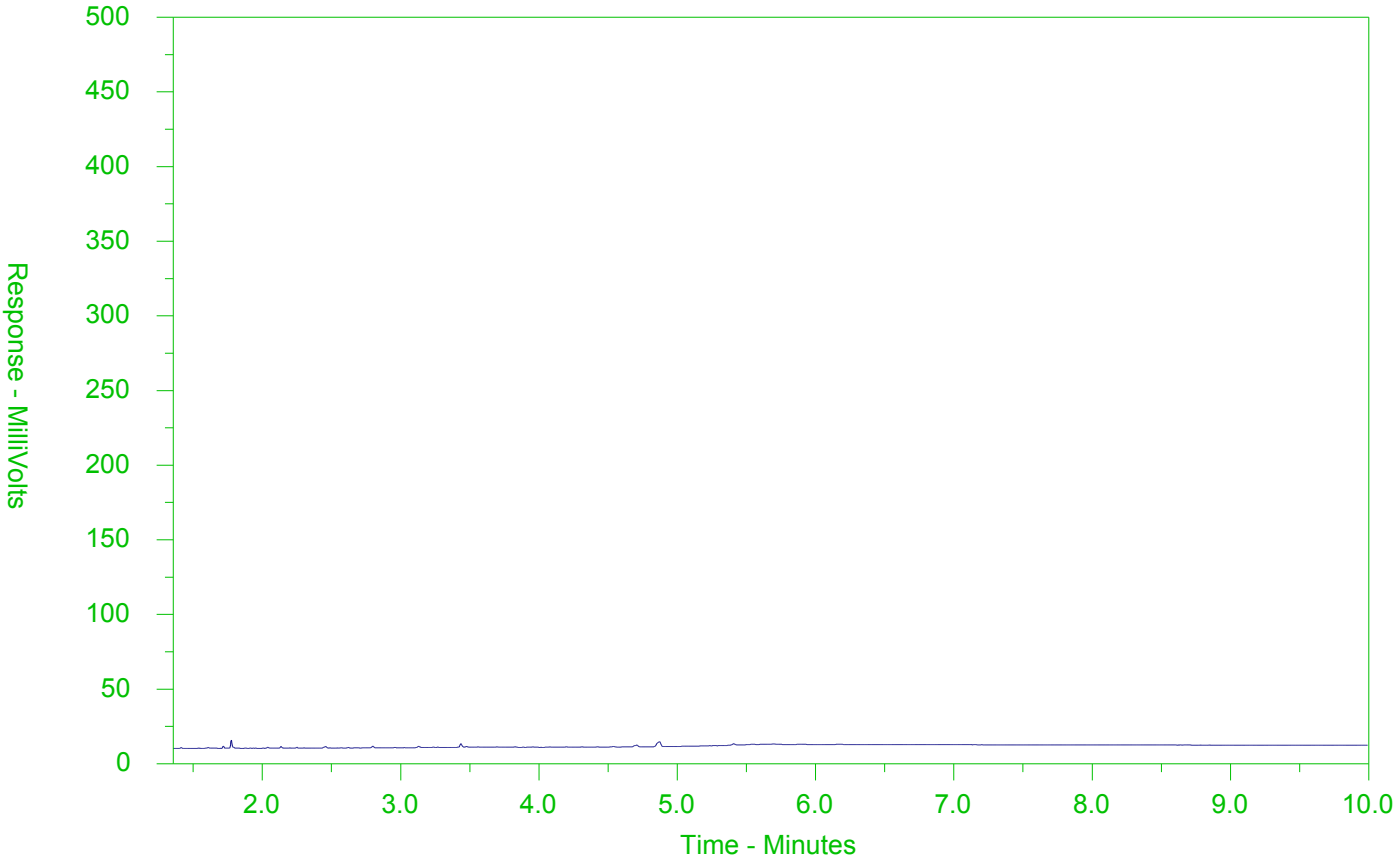
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2289115-2
Client Sample ID: WQ-2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

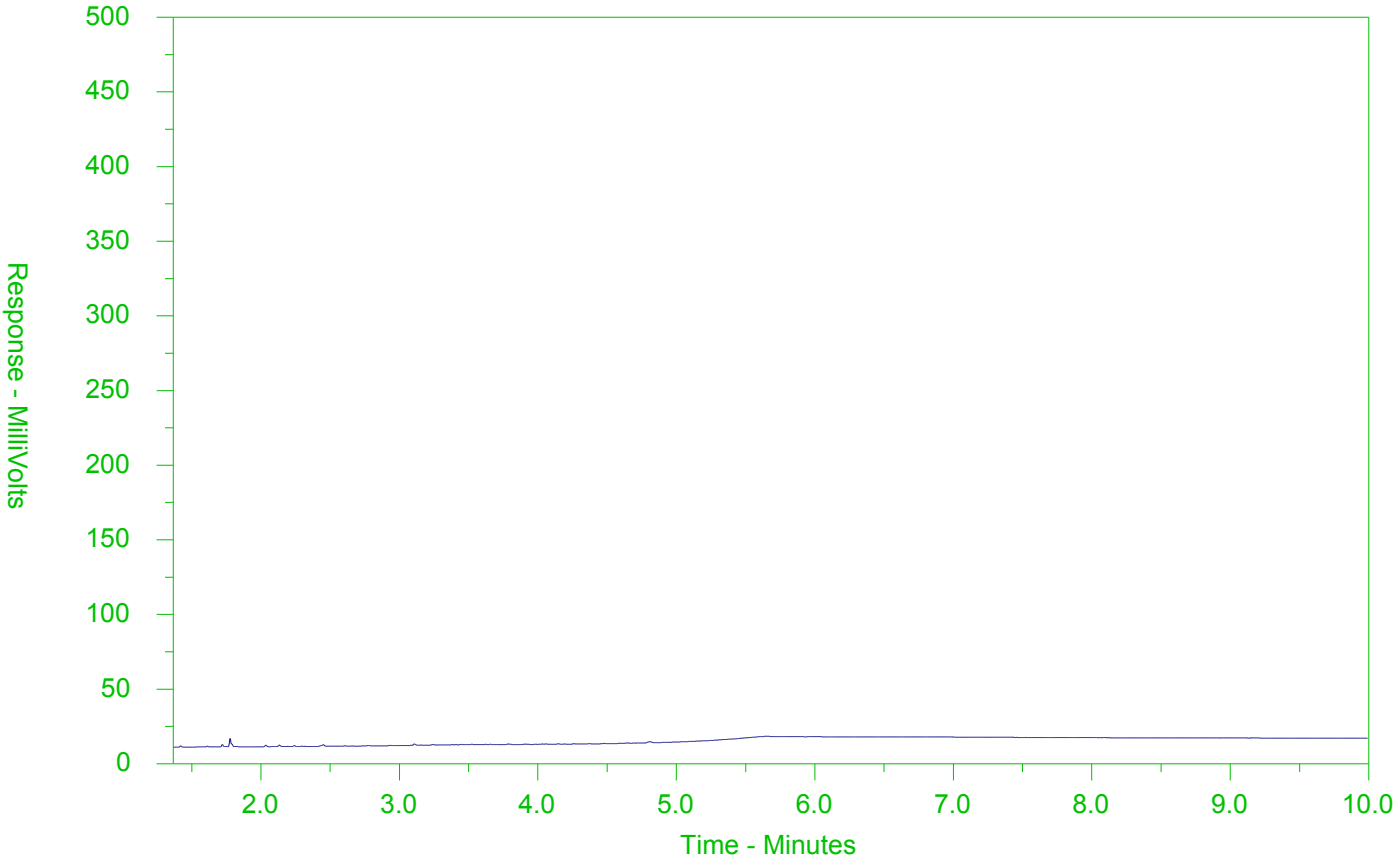
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2289115-3
Client Sample ID: WQ-3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

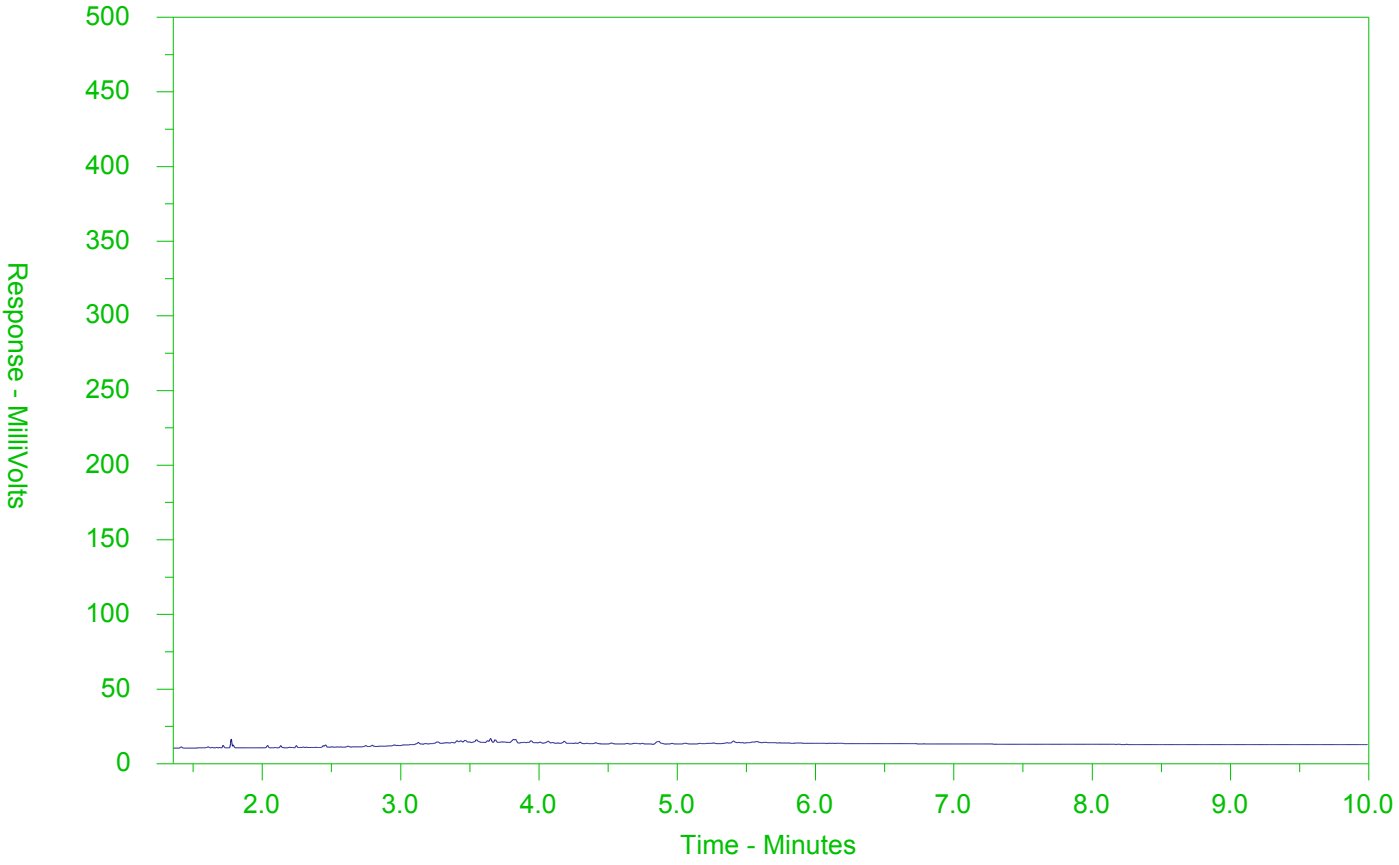
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2289115-4
Client Sample ID: WQ-4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2289115-COFC

COC Number: 17 - 684114

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LTD
Contact:	WILL COWLIN
Phone:	519-803-7834
	Company address below will appear on the final report
Street:	55 REGINAL RD, UNIT 3
City/Province:	GUELPH, ONT
Postal Code:	N1K 1B6

Report Format / Distribution	
Select Report Format:	[X] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	COWLIN.W@AQUAFORBEECH.COM
Email 2	BORDI.M@AQUAFORBEECH.COM
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ] | Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To		
	Same as Report To	[X] YES [ ] NO
	Copy of Invoice with Report	[X] YES [ ] NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q67885
Job #:	MOHAWK LAKE
PO / AFE:	
LSD:	

Purchase Order (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2289115

ALS Contact: Gayle Braun

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	VOCs/BTEX	TKN/TP	Total Coliforms/E.coli	Metals	PAHs	Hydrocarbons F1-F4	Chromium 6+	SAR	TSS, pH, conductivity, hardness	Anions & Nutrients	Cyanides	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	WQ-1	10-06-19		WATER	X	X	X	X	X	X	X	X	X	X	X			
	WQ-2	10-06-19																
	WQ-3	10-06-19																
	WQ-4	10-06-19																

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [ ] NO

Are samples for human consumption/ use? [ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] | SIF Observations Yes [ ] No [ ]

Ice Packs [X] | Ice Cubes [X] | Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	7.1

SHIPMENT RELEASE (client use)		
Released by: M Bordi	Date: June 11, 2019	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: June 11 2019	Time: 10:10

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

SIF

AQUAFOR BEECH LIMITED
ATTN: Will Cowlin
55 Regal Road
Unit 3
Guelph ON N1K 1B6

Date Received: 18-JUN-19
Report Date: 26-JUN-19 12:13 (MT)
Version: FINAL

Client Phone: 519-224-3740

Certificate of Analysis

Lab Work Order #: L2293530

Project P.O. #: NOT SUBMITTED
Job Reference: MOHAWK LAKE
C of C Numbers: 17-822572
Legal Site Desc:

Gayle Braun
Senior Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2293530-1	WQ1	Anions and Nutrients	Phosphorus, Total	0.0591	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.105	0.015	mg/L
			Copper (Cu)-Total	0.0013	0.001	mg/L
			Lead (Pb)-Total	0.00188	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.027	0.008	ug/L
L2293530-2	WQ2	Anions and Nutrients	Phosphorus, Total	0.0320	0.01	mg/L
		Total Metals	Aluminum (Al)-Total	0.073	0.015	mg/L
			Copper (Cu)-Total	0.0014	0.001	mg/L
			Lead (Pb)-Total	0.00213	0.001	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	<0.020	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	<0.010	0.0002	ug/L
			Chrysene	<0.010	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.032	0.008	ug/L
L2293530-3	WQ3	Anions and Nutrients	Phosphorus, Total	0.164	0.01	mg/L
		Cyanides	Cyanide, Free	<0.020	0.005	mg/L
		Bacteriological Tests	E. Coli	700	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.310	0.015	mg/L
			Copper (Cu)-Total	0.0051	0.001	mg/L
			Iron (Fe)-Total	1.38	0.3	mg/L
			Lead (Pb)-Total	0.00611	0.001	mg/L
			Zinc (Zn)-Total	0.0237	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	<0.010	0.0008	ug/L
			Benzo(a)anthracene	0.024	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.016	0.0002	ug/L
			Chrysene	0.068	0.0001	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Provincial Water Quality Objectives (JULY, 1994) - Surface Water PWQO						
L2293530-3	WQ3	Polycyclic Aromatic Hydrocarbons	Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.213	0.008	ug/L
			Phenanthrene	0.096	0.03	ug/L
L2293530-4	WQ4	Anions and Nutrients	Phosphorus, Total	0.376	0.01	mg/L
		Bacteriological Tests	E. Coli	130	100	CFU/100mL
		Total Metals	Aluminum (Al)-Total	0.517	0.015	mg/L
			Copper (Cu)-Total	0.0109	0.001	mg/L
			Iron (Fe)-Total	1.90	0.3	mg/L
			Lead (Pb)-Total	0.0116	0.001	mg/L
			Zinc (Zn)-Total	0.0551	0.02	mg/L
		Polycyclic Aromatic Hydrocarbons	Anthracene	0.013	0.0008	ug/L
			Benzo(a)anthracene	0.029	0.0004	ug/L
			Benzo(g,h,i)perylene	<0.020	0.00002	ug/L
			Benzo(k)fluoranthene	0.017	0.0002	ug/L
			Chrysene	0.071	0.0001	ug/L
			Dibenzo(ah)anthracene	<0.020	0.002	ug/L
			Fluoranthene	0.352	0.008	ug/L
			Phenanthrene	0.188	0.03	ug/L

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2293530-1	18-JUN-19	WQ1
				L2293530-2	18-JUN-19	WQ2
				L2293530-3	18-JUN-19	WQ3
				L2293530-4	18-JUN-19	WQ4
Conductivity	umhos/cm	-	-	1210	1270	1770	1780
Hardness (as CaCO3)		-	-	275			
Hardness (as CaCO3)	mg/L	-	-		277 HTC	440 HTC	466 HTC
pH	pH units	6.5-8.5	-	7.91	8.12	7.85	7.98
Total Suspended Solids	mg/L	-	-	14.7	5.7	85.0 DLHC	420 DLHC

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID / Sample Date / Sample ID: L2293530-1 18-JUN-19 WQ1	L2293530-2 18-JUN-19 WQ2	L2293530-3 18-JUN-19 WQ3	L2293530-4 18-JUN-19 WQ4
Chloride (Cl)	mg/L	-	-	258	263	367	374
Nitrate (as N)	mg/L	-	-	0.810	0.943	3.19	2.60
Nitrite (as N)	mg/L	-	-	0.047	0.050	0.066	0.058
Total Kjeldahl Nitrogen	mg/L	-	-	1.02	0.78	1.78	1.19
Total Nitrogen	mg/L	-	-	1.88	1.77	5.04	3.85
Phosphorus (P)-Total Dissolved	mg/L	-	-	0.0124	0.0120	0.0141	0.0162
Phosphorus, Total	mg/L	0.01	-	0.0591	0.0320 RRR	0.164	0.376

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

			Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
			Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
Cyanide, Free	mg/L	0.005	-	<0.0020	<0.0020	<0.020 DLM	<0.0020

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID
				L2293530-1	18-JUN-19	WQ1
				L2293530-2	18-JUN-19	WQ2
				L2293530-3	18-JUN-19	WQ3
				L2293530-4	18-JUN-19	WQ4
E. Coli	CFU/100mL	100	-	100 DLM	40 DLM	700 DLM	130 DLM
Total Coliforms	CFU/100mL	-	-	90000 DLM	110000 DLM	40000 DLM	40000 DLM

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2293530-1	L2293530-2	L2293530-3	L2293530-4
				18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				WQ1	WQ2	WQ3	WQ4
Sodium Adsorption Ratio	SAR	-	-	3.99	3.95	4.43	4.28

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
				Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Aluminum (Al)-Total	mg/L	0.015	-		0.105	0.073	0.310	0.517
Antimony (Sb)-Total	mg/L	0.02	-		0.00046	0.00050	0.00045	0.00072
Arsenic (As)-Total	mg/L	0.005	-		0.00062	0.00061	0.00068	0.00093
Barium (Ba)-Total	mg/L	-	-		0.0641	0.0637	0.100	0.106
Beryllium (Be)-Total	mg/L	0.011	-		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.2	-		0.047	0.047	0.062	0.051
Cadmium (Cd)-Total	mg/L	0.0001	-		<0.000010	<0.000010	0.000047	0.000081
Calcium (Ca)-Total	mg/L	-	-		78.1	78.6	126	132
Cesium (Cs)-Total	mg/L	-	-		0.000010	<0.000010	0.000029	0.000039
Chromium (Cr)-Total	mg/L	-	-		<0.00050	<0.00050	0.00157	0.00321
Cobalt (Co)-Total	mg/L	0.0009	-		0.00011	<0.00010	0.00035	0.00049
Copper (Cu)-Total	mg/L	0.001	-		0.0013	0.0014	0.0051	0.0109
Iron (Fe)-Total	mg/L	0.3	-		0.280	0.232	1.38	1.90
Lead (Pb)-Total	mg/L	0.001	-		0.00188	0.00213	0.00611	0.0116
Magnesium (Mg)-Total	mg/L	-	-		19.3	19.5	30.7	33.1
Manganese (Mn)-Total	mg/L	-	-		0.0439	0.0457	0.181	0.122
Mercury (Hg)-Total	mg/L	0.0002	-		<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.04	-		0.000884	0.000891	0.000909	0.000833
Nickel (Ni)-Total	mg/L	0.025	-		0.00076	0.00076	0.00141	0.00203
Potassium (K)-Total	mg/L	-	-		2.96	3.03	4.10	3.84
Rubidium (Rb)-Total	mg/L	-	-		0.00110	0.00101	0.00128	0.00140
Selenium (Se)-Total	mg/L	0.1	-		0.000588	0.000644	0.00104	0.00108
Silicon (Si)-Total	mg/L	-	-		3.68	3.62	6.08	6.20
Silver (Ag)-Total	mg/L	0.0001	-		<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	-		152 DLHC	151 DLHC	213 DLHC	212 DLHC
Strontium (Sr)-Total	mg/L	-	-		0.307	0.307	0.418	0.417
Sulfur (S)-Total	mg/L	-	-		14.0	14.2	20.4	22.0
Tellurium (Te)-Total	mg/L	-	-		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.0003	-		<0.000010	<0.000010	<0.000010	0.000013

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	Sample Date	Sample ID	
				L2293530-1	L2293530-2	L2293530-3	L2293530-4
				18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				WQ1	WQ2	WQ3	WQ4
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00010	<0.00010	0.00024	0.00052
Titanium (Ti)-Total	mg/L	-	-	0.00373	0.00222	0.0111	0.0173
Tungsten (W)-Total	mg/L	0.03	-	0.00024	0.00024	0.00018	0.00026
Uranium (U)-Total	mg/L	0.005	-	0.00105	0.00110	0.00160	0.00160
Vanadium (V)-Total	mg/L	0.006	-	0.00114	0.00116	0.00182	0.00224
Zinc (Zn)-Total	mg/L	0.02	-	<0.0030	0.0035	0.0237	0.0551
Zirconium (Zr)-Total	mg/L	0.004	-	<0.00030	<0.00030	<0.00030	0.00032

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Speciated Metals - WATER

		Guide Limits					
				Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
				Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Analyte	Unit	#1	#2					
Chromium, Hexavalent	ug/L	1	-		<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

		Guide Limits					
				Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
				Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Analyte	Unit	#1	#2					
Acetone	ug/L	-	-	<30	<30	<30	<30
Benzene	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	ug/L	200	-	<2.0	<2.0	<2.0	<2.0
Bromoform	ug/L	60	-	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Carbon tetrachloride	ug/L	-	-	<0.20	<0.20	<0.20	<0.20
Chlorobenzene	ug/L	15	-	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	40	-	<2.0	<2.0	<2.0	<2.0
Chloroform	ug/L	-	-	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	ug/L	5	-	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,3-Dichlorobenzene	ug/L	2.5	-	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
1,1-Dichloroethane	ug/L	200	-	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	100	-	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/L	40	-	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	ug/L	-	-	<0.50	0.59	3.07	4.54
trans-1,2-Dichloroethylene	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	100	-	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	ug/L	0.7	-	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	-	-	<0.30	<0.30	<0.30	<0.30
trans-1,3-Dichloropropene	ug/L	7	-	<0.30	<0.30	<0.30	<0.30
1,3-Dichloropropene (cis & trans)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Ethylbenzene	ug/L	8	-	<0.50	<0.50	<0.50	<0.50
n-Hexane	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Methyl Ethyl Ketone	ug/L	400	-	<20	<20	<20	<20
Methyl Isobutyl Ketone	ug/L	-	-	<20	<20	<20	<20
MTBE	ug/L	-	-	<2.0	<2.0	<2.0	<2.0
Styrene	ug/L	4	-	<0.50	<0.50	<0.50	<0.50

Guide Limit #1: Surface Water PWQO

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
			Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
			Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits					
Analyte	Unit	#1	#2				
1,1,1,2-Tetrachloroethane	ug/L	20.0	-	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	70	-	<0.50	<0.50	<0.50	<0.50
Tetrachloroethylene	ug/L	50	-	<0.50	<0.50	<0.50	<0.50
Toluene	ug/L	0.8	-	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	10	-	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	800	-	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	20	-	<0.50	<0.50	<0.50	0.68
Trichlorofluoromethane	ug/L	-	-	<5.0	<5.0	<5.0	<5.0
Vinyl chloride	ug/L	600	-	<0.50	<0.50	<0.50	<0.50
o-Xylene	ug/L	40	-	<0.30	<0.30	<0.30	<0.30
m+p-Xylenes	ug/L	2	-	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	ug/L	-	-	<0.50	<0.50	<0.50	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	96.3	96.5	95.6	96.2
Surrogate: 1,4-Difluorobenzene	%	-	-	98.8	98.8	97.8	98.7

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Hydrocarbons - WATER

				Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
				Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
		Guide Limits						
Analyte	Unit	#1	#2					
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	<25
F1-BTEX	ug/L	-	-	<25	<25	<25	<25
F2 (C10-C16)	ug/L	-	-	<100	<100	<100	<100
F2-Naphth	ug/L	-	-	<100	<100	<100	<100
F3 (C16-C34)	ug/L	-	-	<250	<250	310	<250
F3-PAH	ug/L	-	-	<250	<250	310	<250
				<250	<250	300	<250
F4 (C34-C50)	ug/L	-	-	<250	<250	<250	<250
Total Hydrocarbons (C6-C50)	ug/L	-	-	<370	<370	<370	<370
				<250	<250	310	<250
Chrom. to baseline at nC50		-	-	YES	YES	YES	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	96.7	92.2	93.2	93.9
Surrogate: 3,4-Dichlorotoluene	%	-	-	86.9	84.2	81.0	82.4

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID	L2293530-1	L2293530-2	L2293530-3	L2293530-4
				Sample Date	18-JUN-19	18-JUN-19	18-JUN-19	18-JUN-19
				Sample ID	WQ1	WQ2	WQ3	WQ4
Acenaphthene	ug/L	-	-		<0.020	<0.020	<0.020	0.027
Acenaphthylene	ug/L	-	-		<0.020	<0.020	<0.020	<0.020
Anthracene	ug/L	0.0008	-		<0.010	<0.010	<0.010	0.013 R
Benzo(a)anthracene	ug/L	0.0004	-		<0.020	<0.020	0.024	0.029
Benzo(a)pyrene	ug/L	-	-		<0.010	<0.010	0.015	0.018
Benzo(b)fluoranthene	ug/L	-	-		<0.020	<0.020	0.090 R	0.051
Benzo(g,h,i)perylene	ug/L	0.00002	-		<0.020	<0.020	<0.020	<0.020
Benzo(k)fluoranthene	ug/L	0.0002	-		<0.010	<0.010	0.016	0.017
Chrysene	ug/L	0.0001	-		<0.010	<0.010	0.068	0.071
Dibenzo(ah)anthracene	ug/L	0.002	-		<0.020	<0.020	<0.020	<0.020
Fluoranthene	ug/L	0.008	-		0.027	0.032	0.213	0.352
Fluorene	ug/L	0.2	-		<0.020	<0.020	<0.020	0.029
Indeno(1,2,3-cd)pyrene	ug/L	-	-		<0.020	<0.020	0.023	0.022
1-Methylnaphthalene	ug/L	2	-		<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	ug/L	2	-		<0.020	<0.020	<0.020	<0.020
Naphthalene	ug/L	7	-		<0.050	<0.050	<0.050	<0.050
Phenanthrene	ug/L	0.03	-		<0.020	<0.020	0.096	0.188
Pyrene	ug/L	-	-		<0.020	<0.020	0.148	0.223
Surrogate: d10-Acenaphthene	%	-	-		108.2	96.3	109.6	97.4
Surrogate: d12-Chrysene	%	-	-		102.7	93.2	103.0	99.3
Surrogate: d8-Naphthalene	%	-	-		111.8	99.3	112.9	98.9
Surrogate: d10-Phenanthrene	%	-	-		111.5	100.7	113.6	103.8

Guide Limit #1: Surface Water PWQO

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2293530-2	Water	Note: DTC: Dissolved Concentration exceeds total. Results were confirmed by re-analysis- TP RRV: Reported Result Verified By Repeat Analysis- TP	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-FREE-CFA-WT	Water	Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CR-CR6-PWQO-IC-WT	Water	Chromium +6	EPA 7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-MF-WT	Water	E. coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-N-TOT-WT	Water	Calculate from NO2 + NO3+TKN	CALCULATION
ETL-SAR-CALC-WT	Water	Sodium Adsorption Ratio	Calculation

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-TVH,TEH-CCME-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the fiReference Method for the Canada-

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**

Wide Standard for Petroleum Hydrocarbons in Soil ŒTier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

P-TD-COL-WT	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PAH-PWQO-WT	Water	PWQO Polyaromatic Hydrocarbons (PAHs)	SW846 8270

Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD. Benzo(j)fluoranthene chromatographically co-elutes with benzo(b)fluoranthene and is reported with benzo(b)fluoranthene.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TC-MF-WT	Water	Total Coliforms	SM 9222B
		A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35–0.5°C for 24–2h. Method ID: WT-TM-1200	
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.	
VOC-1,3-DCP-CALC-WT	Water	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Water	VOC by GCMS HS O.Reg 153/04 (July 2011)	SW846 8260
		Liquid samples are analyzed by headspace GC/MSD.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).	
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
		Total xylenes represents the sum of o-xylene and m&p-xylene.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-822572

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2293530 Report Date: 26-JUN-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6

Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R4678509								
WG3081875-10 DUP		**WG3081875-8**						
Chloride (Cl)		0.56	0.56		mg/L	0.3	20	19-JUN-19
WG3081875-7 LCS								
Chloride (Cl)			101.3		%		90-110	19-JUN-19
WG3081875-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-JUN-19
WG3081875-9 MS		**WG3081875-8**						
Chloride (Cl)			100.3		%		75-125	19-JUN-19
CN-FREE-CFA-WT	**Water**							
Batch R4677172								
WG3081781-10 LCS								
Cyanide, Free			96.4		%		80-120	19-JUN-19
WG3081781-9 MB								
Cyanide, Free			<0.0020		mg/L		0.002	19-JUN-19
CR-CR6-PWQO-IC-WT	**Water**							
Batch R4677772								
WG3082819-14 DUP		**WG3082819-13**						
Chromium, Hexavalent		<0.50	<0.50	RPD-NA	ug/L	N/A	20	20-JUN-19
WG3082819-12 LCS								
Chromium, Hexavalent			96.4		%		80-120	20-JUN-19
WG3082819-11 MB								
Chromium, Hexavalent			<0.50		ug/L		0.5	20-JUN-19
WG3082819-15 MS		**WG3082819-13**						
Chromium, Hexavalent			93.4		%		70-130	20-JUN-19
EC-MF-WT	**Water**							
Batch R4678618								
WG3082087-3 DUP		**L2293651-11**						
E. Coli		0	<10	RPD-NA	CFU/100mL	N/A	65	20-JUN-19
WG3082087-1 MB								
E. Coli			0		CFU/100mL		1	20-JUN-19
EC-WT	**Water**							
Batch R4683442								
WG3084323-8 DUP		**WG3084323-7**						
Conductivity		652	642		umhos/cm	1.5	10	21-JUN-19
WG3084323-6 LCS								
Conductivity			99.3		%		90-110	21-JUN-19
WG3084323-5 MB								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R4683442								
WG3084323-5 MB								
Conductivity			<3.0		umhos/cm		3	21-JUN-19
F1-HS-511-WT	**Water**							
Batch R4682572								
WG3085047-4 DUP		**WG3085047-3**						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	24-JUN-19
WG3085047-1 LCS								
F1 (C6-C10)			101.9		%		80-120	24-JUN-19
WG3085047-2 MB								
F1 (C6-C10)			<25		ug/L		25	24-JUN-19
Surrogate: 3,4-Dichlorotoluene			90.2		%		60-140	24-JUN-19
WG3085047-5 MS		**WG3085047-3**						
F1 (C6-C10)			91.8		%		60-140	24-JUN-19
F2-F4-511-WT	**Water**							
Batch R4681263								
WG3081879-2 LCS								
F2 (C10-C16)			101.7		%		70-130	20-JUN-19
F3 (C16-C34)			99.9		%		70-130	20-JUN-19
F4 (C34-C50)			99.9		%		70-130	20-JUN-19
WG3081879-1 MB								
F2 (C10-C16)			<100		ug/L		100	20-JUN-19
F3 (C16-C34)			<250		ug/L		250	20-JUN-19
F4 (C34-C50)			<250		ug/L		250	20-JUN-19
Surrogate: 2-Bromobenzotrifluoride			82.9		%		60-140	20-JUN-19
Batch R4682924								
WG3084600-2 LCS								
F2 (C10-C16)			106.6		%		70-130	24-JUN-19
F3 (C16-C34)			109.9		%		70-130	24-JUN-19
F4 (C34-C50)			108.9		%		70-130	24-JUN-19
WG3084600-1 MB								
F2 (C10-C16)			<100		ug/L		100	24-JUN-19
F3 (C16-C34)			<250		ug/L		250	24-JUN-19
F4 (C34-C50)			<250		ug/L		250	24-JUN-19
Surrogate: 2-Bromobenzotrifluoride			82.2		%		60-140	24-JUN-19
HG-T-CVAA-WT	**Water**							

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R4677429								
WG3082626-4 DUP		**WG3082626-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-JUN-19
WG3082626-2 LCS								
Mercury (Hg)-Total			97.2		%		80-120	20-JUN-19
WG3082626-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	20-JUN-19
WG3082626-6 MS		**WG3082626-5**						
Mercury (Hg)-Total			91.0		%		70-130	20-JUN-19
MET-T-CCMS-WT	**Water**							
Batch R4673448								
WG3081158-4 DUP		**WG3081158-3**						
Aluminum (Al)-Total		0.0144	0.0123		mg/L	16	20	19-JUN-19
Antimony (Sb)-Total		0.00039	0.00039		mg/L	0.3	20	19-JUN-19
Arsenic (As)-Total		0.00015	0.00014		mg/L	7.4	20	19-JUN-19
Barium (Ba)-Total		0.0220	0.0215		mg/L	2.4	20	19-JUN-19
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-JUN-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-JUN-19
Boron (B)-Total		0.081	0.084		mg/L	3.5	20	19-JUN-19
Cadmium (Cd)-Total		0.0000928	0.0000924		mg/L	0.4	20	19-JUN-19
Calcium (Ca)-Total		78.7	78.3		mg/L	0.5	20	19-JUN-19
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	19-JUN-19
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	19-JUN-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-JUN-19
Copper (Cu)-Total		0.181	0.173		mg/L	4.1	20	19-JUN-19
Iron (Fe)-Total		0.086	0.085		mg/L	1.1	20	19-JUN-19
Lead (Pb)-Total		0.0152	0.0150		mg/L	1.4	20	19-JUN-19
Magnesium (Mg)-Total		53.8	52.1		mg/L	3.3	20	19-JUN-19
Manganese (Mn)-Total		0.00127	0.00130		mg/L	2.2	20	19-JUN-19
Molybdenum (Mo)-Total		0.00200	0.00194		mg/L	3.2	20	19-JUN-19
Nickel (Ni)-Total		0.00929	0.00897		mg/L	3.5	20	19-JUN-19
Potassium (K)-Total		3.81	3.71		mg/L	2.6	20	19-JUN-19
Rubidium (Rb)-Total		0.00163	0.00157		mg/L	4.1	20	19-JUN-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-JUN-19
Silicon (Si)-Total		1.39	1.38		mg/L	1.0	20	19-JUN-19
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4673448								
WG3081158-4 DUP		**WG3081158-3**						
Sodium (Na)-Total		26.7	26.0		mg/L	3.0	20	19-JUN-19
Strontium (Sr)-Total		1.19	1.18		mg/L	0.9	20	19-JUN-19
Sulfur (S)-Total		60.5	60.0		mg/L	0.8	25	19-JUN-19
Thallium (Tl)-Total		0.000051	0.000048		mg/L	5.7	20	19-JUN-19
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	19-JUN-19
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	19-JUN-19
Tin (Sn)-Total		0.00246	0.00243		mg/L	1.2	20	19-JUN-19
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	19-JUN-19
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	19-JUN-19
Uranium (U)-Total		0.000483	0.000466		mg/L	3.6	20	19-JUN-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	19-JUN-19
Zinc (Zn)-Total		0.225	0.217		mg/L	3.3	20	19-JUN-19
Zirconium (Zr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	19-JUN-19
WG3081158-2 LCS								
Aluminum (Al)-Total			101.0		%		80-120	19-JUN-19
Antimony (Sb)-Total			102.9		%		80-120	19-JUN-19
Arsenic (As)-Total			100.3		%		80-120	19-JUN-19
Barium (Ba)-Total			98.9		%		80-120	19-JUN-19
Beryllium (Be)-Total			95.2		%		80-120	19-JUN-19
Bismuth (Bi)-Total			101.4		%		80-120	19-JUN-19
Boron (B)-Total			90.0		%		80-120	19-JUN-19
Cadmium (Cd)-Total			93.7		%		80-120	19-JUN-19
Calcium (Ca)-Total			96.1		%		80-120	19-JUN-19
Chromium (Cr)-Total			99.8		%		80-120	19-JUN-19
Cesium (Cs)-Total			99.5		%		80-120	19-JUN-19
Cobalt (Co)-Total			99.1		%		80-120	19-JUN-19
Copper (Cu)-Total			98.1		%		80-120	19-JUN-19
Iron (Fe)-Total			102.1		%		80-120	19-JUN-19
Lead (Pb)-Total			102.3		%		80-120	19-JUN-19
Magnesium (Mg)-Total			101.5		%		80-120	19-JUN-19
Manganese (Mn)-Total			99.4		%		80-120	19-JUN-19
Molybdenum (Mo)-Total			98.5		%		80-120	19-JUN-19
Nickel (Ni)-Total			98.1		%		80-120	19-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4673448								
WG3081158-2 LCS								
Potassium (K)-Total			103.1		%		80-120	19-JUN-19
Rubidium (Rb)-Total			101.7		%		80-120	19-JUN-19
Selenium (Se)-Total			96.7		%		80-120	19-JUN-19
Silicon (Si)-Total			103.4		%		60-140	19-JUN-19
Silver (Ag)-Total			99.0		%		80-120	19-JUN-19
Sodium (Na)-Total			103.5		%		80-120	19-JUN-19
Strontium (Sr)-Total			100.9		%		80-120	19-JUN-19
Sulfur (S)-Total			98.3		%		80-120	19-JUN-19
Thallium (Tl)-Total			101.6		%		80-120	19-JUN-19
Tellurium (Te)-Total			93.6		%		80-120	19-JUN-19
Thorium (Th)-Total			100.0		%		70-130	19-JUN-19
Tin (Sn)-Total			96.4		%		80-120	19-JUN-19
Titanium (Ti)-Total			97.5		%		80-120	19-JUN-19
Tungsten (W)-Total			98.7		%		80-120	19-JUN-19
Uranium (U)-Total			101.8		%		80-120	19-JUN-19
Vanadium (V)-Total			100.3		%		80-120	19-JUN-19
Zinc (Zn)-Total			97.4		%		80-120	19-JUN-19
Zirconium (Zr)-Total			96.5		%		80-120	19-JUN-19
WG3081158-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	19-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	19-JUN-19
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	19-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-JUN-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	19-JUN-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	19-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Copper (Cu)-Total			<0.0010		mg/L		0.001	19-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4673448								
WG3081158-1 MB								
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-JUN-19
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	19-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	19-JUN-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	19-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-JUN-19
Silver (Ag)-Total			<0.000050		mg/L		0.00005	19-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	19-JUN-19
Strontium (Sr)-Total			<0.0010		mg/L		0.001	19-JUN-19
Sulfur (S)-Total			<0.50		mg/L		0.5	19-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-JUN-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	19-JUN-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-JUN-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	19-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-JUN-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	19-JUN-19
WG3081158-5 MS		**WG3081158-3**						
Aluminum (Al)-Total			97.4		%		70-130	19-JUN-19
Antimony (Sb)-Total			99.7		%		70-130	19-JUN-19
Arsenic (As)-Total			95.9		%		70-130	19-JUN-19
Barium (Ba)-Total			N/A	MS-B	%		-	19-JUN-19
Beryllium (Be)-Total			93.2		%		70-130	19-JUN-19
Bismuth (Bi)-Total			88.1		%		70-130	19-JUN-19
Boron (B)-Total			N/A	MS-B	%		-	19-JUN-19
Cadmium (Cd)-Total			88.5		%		70-130	19-JUN-19
Calcium (Ca)-Total			N/A	MS-B	%		-	19-JUN-19
Chromium (Cr)-Total			96.7		%		70-130	19-JUN-19
Cesium (Cs)-Total			96.3		%		70-130	19-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R4673448								
WG3081158-5 MS		**WG3081158-3**						
Cobalt (Co)-Total			93.6		%		70-130	19-JUN-19
Copper (Cu)-Total			N/A	MS-B	%		-	19-JUN-19
Iron (Fe)-Total			N/A	MS-B	%		-	19-JUN-19
Lead (Pb)-Total			88.4		%		70-130	19-JUN-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	19-JUN-19
Manganese (Mn)-Total			96.9		%		70-130	19-JUN-19
Molybdenum (Mo)-Total			96.9		%		70-130	19-JUN-19
Nickel (Ni)-Total			88.6		%		70-130	19-JUN-19
Potassium (K)-Total			N/A	MS-B	%		-	19-JUN-19
Rubidium (Rb)-Total			97.3		%		70-130	19-JUN-19
Selenium (Se)-Total			95.7		%		70-130	19-JUN-19
Silicon (Si)-Total			N/A	MS-B	%		-	19-JUN-19
Silver (Ag)-Total			90.4		%		70-130	19-JUN-19
Sodium (Na)-Total			N/A	MS-B	%		-	19-JUN-19
Strontium (Sr)-Total			N/A	MS-B	%		-	19-JUN-19
Sulfur (S)-Total			N/A	MS-B	%		-	19-JUN-19
Thallium (Tl)-Total			91.6		%		70-130	19-JUN-19
Tellurium (Te)-Total			82.3		%		70-130	19-JUN-19
Thorium (Th)-Total			94.0		%		70-130	19-JUN-19
Tin (Sn)-Total			93.4		%		70-130	19-JUN-19
Titanium (Ti)-Total			97.8		%		70-130	19-JUN-19
Tungsten (W)-Total			94.5		%		70-130	19-JUN-19
Uranium (U)-Total			N/A	MS-B	%		-	19-JUN-19
Vanadium (V)-Total			99.2		%		70-130	19-JUN-19
Zinc (Zn)-Total			N/A	MS-B	%		-	19-JUN-19
Zirconium (Zr)-Total			97.0		%		70-130	19-JUN-19
NO2-IC-WT	**Water**							
Batch R4678509								
WG3081875-10 DUP		**WG3081875-8**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	19-JUN-19
WG3081875-7 LCS								
Nitrite (as N)			102.2		%		90-110	19-JUN-19
WG3081875-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	19-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	**Water**							
Batch R4678509								
WG3081875-9 MS		**WG3081875-8**						
Nitrite (as N)			100.0		%		75-125	19-JUN-19
NO3-IC-WT	**Water**							
Batch R4678509								
WG3081875-10 DUP		**WG3081875-8**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	19-JUN-19
WG3081875-7 LCS								
Nitrate (as N)			100.7		%		90-110	19-JUN-19
WG3081875-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	19-JUN-19
WG3081875-9 MS		**WG3081875-8**						
Nitrate (as N)			99.7		%		75-125	19-JUN-19
P-T-COL-WT	**Water**							
Batch R4684277								
WG3086406-3 DUP		**L2294576-1**						
Phosphorus, Total		0.421	0.417		mg/L	0.8	20	25-JUN-19
WG3086406-2 LCS								
Phosphorus, Total			99.6		%		80-120	25-JUN-19
WG3086406-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	25-JUN-19
WG3086406-4 MS		**L2294576-1**						
Phosphorus, Total			N/A	MS-B	%		-	25-JUN-19
Batch R4687490								
WG3088099-3 DUP		**L2293530-2**						
Phosphorus, Total		0.0320	0.0354		mg/L	9.9	20	26-JUN-19
WG3088099-2 LCS								
Phosphorus, Total			98.2		%		80-120	26-JUN-19
WG3088099-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	26-JUN-19
WG3088099-4 MS		**L2293530-2**						
Phosphorus, Total			87.5		%		70-130	26-JUN-19
P-TD-COL-WT	**Water**							
Batch R4684280								
WG3086422-3 DUP		**L2293530-1**						
Phosphorus (P)-Total Dissolved		0.0124	0.0133		mg/L	6.9	20	25-JUN-19
WG3086422-2 LCS								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-COL-WT	**Water**							
Batch R4684280								
WG3086422-2 LCS								
Phosphorus (P)-Total	Dissolved		99.3		%		80-120	25-JUN-19
WG3086422-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	25-JUN-19
Batch R4687551								
WG3088104-3 DUP		**L2293809-1**						
Phosphorus (P)-Total	Dissolved	0.0057	0.0052		mg/L	10	20	26-JUN-19
WG3088104-2 LCS								
Phosphorus (P)-Total	Dissolved		99.3		%		80-120	26-JUN-19
WG3088104-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0030		mg/L		0.003	26-JUN-19
WG3088104-4 MS		**L2293809-1**						
Phosphorus (P)-Total	Dissolved		95.4		%		70-130	26-JUN-19
PAH-PWQO-WT	**Water**							
Batch R4687171								
WG3081879-2 LCS								
1-Methylnaphthalene			86.3		%		50-150	26-JUN-19
2-Methylnaphthalene			84.2		%		50-150	26-JUN-19
Acenaphthene			93.9		%		50-150	26-JUN-19
Acenaphthylene			90.5		%		50-150	26-JUN-19
Anthracene			85.0		%		60-130	26-JUN-19
Benzo(a)anthracene			95.4		%		60-130	26-JUN-19
Benzo(a)pyrene			91.4		%		50-150	26-JUN-19
Benzo(b)fluoranthene			87.0		%		50-150	26-JUN-19
Benzo(g,h,i)perylene			94.1		%		60-130	26-JUN-19
Benzo(k)fluoranthene			94.2		%		60-130	26-JUN-19
Chrysene			103.6		%		60-130	26-JUN-19
Dibenzo(ah)anthracene			89.5		%		60-130	26-JUN-19
Fluoranthene			91.7		%		60-130	26-JUN-19
Fluorene			92.0		%		50-150	26-JUN-19
Indeno(1,2,3-cd)pyrene			96.7		%		50-150	26-JUN-19
Naphthalene			89.8		%		50-150	26-JUN-19
Phenanthrene			94.0		%		50-150	26-JUN-19
Pyrene			94.8		%		50-150	26-JUN-19
WG3081879-1 MB								
1-Methylnaphthalene			<0.020		ug/L		0.02	26-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-PWQO-WT	**Water**							
Batch R4687171								
WG3081879-1 MB								
2-Methylnaphthalene			<0.020		ug/L		0.02	26-JUN-19
Acenaphthene			<0.020		ug/L		0.02	26-JUN-19
Acenaphthylene			<0.020		ug/L		0.02	26-JUN-19
Anthracene			<0.010		ug/L		0.01	26-JUN-19
Benzo(a)anthracene			<0.020		ug/L		0.02	26-JUN-19
Benzo(a)pyrene			<0.010		ug/L		0.01	26-JUN-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	26-JUN-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	26-JUN-19
Benzo(k)fluoranthene			<0.010		ug/L		0.01	26-JUN-19
Chrysene			<0.010		ug/L		0.01	26-JUN-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	26-JUN-19
Fluoranthene			<0.010		ug/L		0.01	26-JUN-19
Fluorene			<0.020		ug/L		0.02	26-JUN-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	26-JUN-19
Naphthalene			<0.050		ug/L		0.05	26-JUN-19
Phenanthrene			<0.020		ug/L		0.02	26-JUN-19
Pyrene			<0.020		ug/L		0.02	26-JUN-19
Surrogate: d8-Naphthalene			100.1		%		40-130	26-JUN-19
Surrogate: d10-Phenanthrene			104.9		%		40-130	26-JUN-19
Surrogate: d12-Chrysene			102.2		%		40-130	26-JUN-19
Surrogate: d10-Acenaphthene			99.3		%		40-130	26-JUN-19
PH-WT	**Water**							
Batch R4683442								
WG3084323-8 DUP		**WG3084323-7**						
pH		7.90	7.88	J	pH units	0.02	0.2	21-JUN-19
WG3084323-6 LCS								
pH			7.05		pH units		6.9-7.1	21-JUN-19
SOLIDS-TSS-WT	**Water**							
Batch R4681896								
WG3084069-3 DUP		**L2293887-4**						
Total Suspended Solids		2780	3000		mg/L	7.8	20	22-JUN-19
WG3084069-2 LCS								
Total Suspended Solids			97.9		%		85-115	22-JUN-19
WG3084069-1 MB								

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R4681896								
WG3084069-1 MB								
Total Suspended Solids			<2.0		mg/L		2	22-JUN-19
TC-MF-WT	**Water**							
Batch R4678649								
WG3082089-3 DUP		**L2293638-1**						
Total Coliforms		0	<10	RPD-NA	CFU/100mL	N/A	65	20-JUN-19
WG3082089-1 MB								
Total Coliforms			0		CFU/100mL		1	20-JUN-19
TKN-WT	**Water**							
Batch R4683132								
WG3085961-7 DUP		**L2293181-2**						
Total Kjeldahl Nitrogen		0.20	0.25		mg/L	19	20	24-JUN-19
WG3085961-6 LCS								
Total Kjeldahl Nitrogen			103.7		%		75-125	24-JUN-19
WG3085961-5 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	24-JUN-19
WG3085961-8 MS		**L2293181-2**						
Total Kjeldahl Nitrogen			99.7		%		70-130	24-JUN-19
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-4 DUP		**WG3085047-3**						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	24-JUN-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Acetone		63	65		ug/L	2.6	30	24-JUN-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-4 DUP		**WG3085047-3**						
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	24-JUN-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	24-JUN-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	24-JUN-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	24-JUN-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	24-JUN-19
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	24-JUN-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	24-JUN-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	24-JUN-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	24-JUN-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	24-JUN-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	24-JUN-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	24-JUN-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	24-JUN-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Toluene		0.55	0.52		ug/L	5.6	30	24-JUN-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	24-JUN-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	24-JUN-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	24-JUN-19
WG3085047-1 LCS								
1,1,1,2-Tetrachloroethane			96.0		%		70-130	24-JUN-19
1,1,2,2-Tetrachloroethane			101.1		%		70-130	24-JUN-19
1,1,1-Trichloroethane			100.7		%		70-130	24-JUN-19
1,1,2-Trichloroethane			91.4		%		70-130	24-JUN-19
1,1-Dichloroethane			100.6		%		70-130	24-JUN-19
1,1-Dichloroethylene			97.3		%		70-130	24-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-1 LCS								
1,2-Dibromoethane			88.8		%		70-130	24-JUN-19
1,2-Dichlorobenzene			95.4		%		70-130	24-JUN-19
1,2-Dichloroethane			97.0		%		70-130	24-JUN-19
1,2-Dichloropropane			95.3		%		70-130	24-JUN-19
1,3-Dichlorobenzene			99.4		%		70-130	24-JUN-19
1,4-Dichlorobenzene			97.9		%		70-130	24-JUN-19
Acetone			96.2		%		60-140	24-JUN-19
Benzene			98.7		%		70-130	24-JUN-19
Bromodichloromethane			93.5		%		70-130	24-JUN-19
Bromoform			90.9		%		70-130	24-JUN-19
Bromomethane			97.3		%		60-140	24-JUN-19
Carbon tetrachloride			100.6		%		70-130	24-JUN-19
Chlorobenzene			96.6		%		70-130	24-JUN-19
Chloroform			96.7		%		70-130	24-JUN-19
cis-1,2-Dichloroethylene			93.6		%		70-130	24-JUN-19
cis-1,3-Dichloropropene			95.8		%		70-130	24-JUN-19
Dibromochloromethane			92.1		%		70-130	24-JUN-19
Dichlorodifluoromethane			57.2		%		50-140	24-JUN-19
Ethylbenzene			98.9		%		70-130	24-JUN-19
n-Hexane			95.0		%		70-130	24-JUN-19
m+p-Xylenes			98.5		%		70-130	24-JUN-19
Methyl Ethyl Ketone			89.1		%		60-140	24-JUN-19
Methyl Isobutyl Ketone			92.6		%		60-140	24-JUN-19
Methylene Chloride			91.8		%		70-130	24-JUN-19
MTBE			97.4		%		70-130	24-JUN-19
o-Xylene			96.7		%		70-130	24-JUN-19
Styrene			97.1		%		70-130	24-JUN-19
Tetrachloroethylene			100.8		%		70-130	24-JUN-19
Toluene			99.0		%		70-130	24-JUN-19
trans-1,2-Dichloroethylene			98.7		%		70-130	24-JUN-19
trans-1,3-Dichloropropene			97.8		%		70-130	24-JUN-19
Trichloroethylene			99.2		%		70-130	24-JUN-19
Trichlorofluoromethane			99.6		%		60-140	24-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-1 LCS								
Vinyl chloride			79.2		%		60-140	24-JUN-19
WG3085047-2 MB								
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	24-JUN-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	24-JUN-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	24-JUN-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	24-JUN-19
1,1-Dichloroethane			<0.50		ug/L		0.5	24-JUN-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	24-JUN-19
1,2-Dibromoethane			<0.20		ug/L		0.2	24-JUN-19
1,2-Dichlorobenzene			<0.50		ug/L		0.5	24-JUN-19
1,2-Dichloroethane			<0.50		ug/L		0.5	24-JUN-19
1,2-Dichloropropane			<0.50		ug/L		0.5	24-JUN-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	24-JUN-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	24-JUN-19
Acetone			<30		ug/L		30	24-JUN-19
Benzene			<0.50		ug/L		0.5	24-JUN-19
Bromodichloromethane			<2.0		ug/L		2	24-JUN-19
Bromoform			<5.0		ug/L		5	24-JUN-19
Bromomethane			<0.50		ug/L		0.5	24-JUN-19
Carbon tetrachloride			<0.20		ug/L		0.2	24-JUN-19
Chlorobenzene			<0.50		ug/L		0.5	24-JUN-19
Chloroform			<1.0		ug/L		1	24-JUN-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	24-JUN-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	24-JUN-19
Dibromochloromethane			<2.0		ug/L		2	24-JUN-19
Dichlorodifluoromethane			<2.0		ug/L		2	24-JUN-19
Ethylbenzene			<0.50		ug/L		0.5	24-JUN-19
n-Hexane			<0.50		ug/L		0.5	24-JUN-19
m+p-Xylenes			<0.40		ug/L		0.4	24-JUN-19
Methyl Ethyl Ketone			<20		ug/L		20	24-JUN-19
Methyl Isobutyl Ketone			<20		ug/L		20	24-JUN-19
Methylene Chloride			<5.0		ug/L		5	24-JUN-19
MTBE			<2.0		ug/L		2	24-JUN-19
o-Xylene			<0.30		ug/L		0.3	24-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-2 MB								
Styrene			<0.50		ug/L		0.5	24-JUN-19
Tetrachloroethylene			<0.50		ug/L		0.5	24-JUN-19
Toluene			<0.50		ug/L		0.5	24-JUN-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	24-JUN-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	24-JUN-19
Trichloroethylene			<0.50		ug/L		0.5	24-JUN-19
Trichlorofluoromethane			<5.0		ug/L		5	24-JUN-19
Vinyl chloride			<0.50		ug/L		0.5	24-JUN-19
Surrogate: 1,4-Difluorobenzene			99.0		%		70-130	24-JUN-19
Surrogate: 4-Bromofluorobenzene			97.3		%		70-130	24-JUN-19
WG3085047-5 MS		**WG3085047-3**						
1,1,1,2-Tetrachloroethane			97.0		%		50-140	24-JUN-19
1,1,2,2-Tetrachloroethane			96.9		%		50-140	24-JUN-19
1,1,1-Trichloroethane			101.3		%		50-140	24-JUN-19
1,1,2-Trichloroethane			90.3		%		50-140	24-JUN-19
1,1-Dichloroethane			99.4		%		50-140	24-JUN-19
1,1-Dichloroethylene			95.7		%		50-140	24-JUN-19
1,2-Dibromoethane			87.1		%		50-140	24-JUN-19
1,2-Dichlorobenzene			95.7		%		50-140	24-JUN-19
1,2-Dichloroethane			94.6		%		50-140	24-JUN-19
1,2-Dichloropropane			94.3		%		50-140	24-JUN-19
1,3-Dichlorobenzene			99.8		%		50-140	24-JUN-19
1,4-Dichlorobenzene			98.0		%		50-140	24-JUN-19
Acetone			98.4		%		50-140	24-JUN-19
Benzene			98.0		%		50-140	24-JUN-19
Bromodichloromethane			92.9		%		50-140	24-JUN-19
Bromoform			89.0		%		50-140	24-JUN-19
Bromomethane			92.2		%		50-140	24-JUN-19
Carbon tetrachloride			101.8		%		50-140	24-JUN-19
Chlorobenzene			96.8		%		50-140	24-JUN-19
Chloroform			97.0		%		50-140	24-JUN-19
cis-1,2-Dichloroethylene			93.1		%		50-140	24-JUN-19
cis-1,3-Dichloropropene			90.2		%		50-140	24-JUN-19
Dibromochloromethane			91.4		%		50-140	24-JUN-19

Quality Control Report

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Water**							
Batch R4682572								
WG3085047-5 MS		**WG3085047-3**						
Dichlorodifluoromethane			52.3		%		50-140	24-JUN-19
Ethylbenzene			99.4		%		50-140	24-JUN-19
n-Hexane			92.6		%		50-140	24-JUN-19
m+p-Xylenes			98.5		%		50-140	24-JUN-19
Methyl Ethyl Ketone			83.3		%		50-140	24-JUN-19
Methyl Isobutyl Ketone			86.3		%		50-140	24-JUN-19
Methylene Chloride			90.1		%		50-140	24-JUN-19
MTBE			96.8		%		50-140	24-JUN-19
o-Xylene			97.2		%		50-140	24-JUN-19
Styrene			96.3		%		50-140	24-JUN-19
Tetrachloroethylene			100.9		%		50-140	24-JUN-19
Toluene			99.2		%		50-140	24-JUN-19
trans-1,2-Dichloroethylene			96.3		%		50-140	24-JUN-19
trans-1,3-Dichloropropene			91.7		%		50-140	24-JUN-19
Trichloroethylene			99.1		%		50-140	24-JUN-19
Trichlorofluoromethane			98.2		%		50-140	24-JUN-19
Vinyl chloride			75.0		%		50-140	24-JUN-19

Quality Control Report

Workorder: L2293530 Report Date: 26-JUN-19

Client: AQUAFOR BEECH LIMITED
55 Regal Road Unit 3
Guelph ON N1K 1B6
Contact: Will Cowlin

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

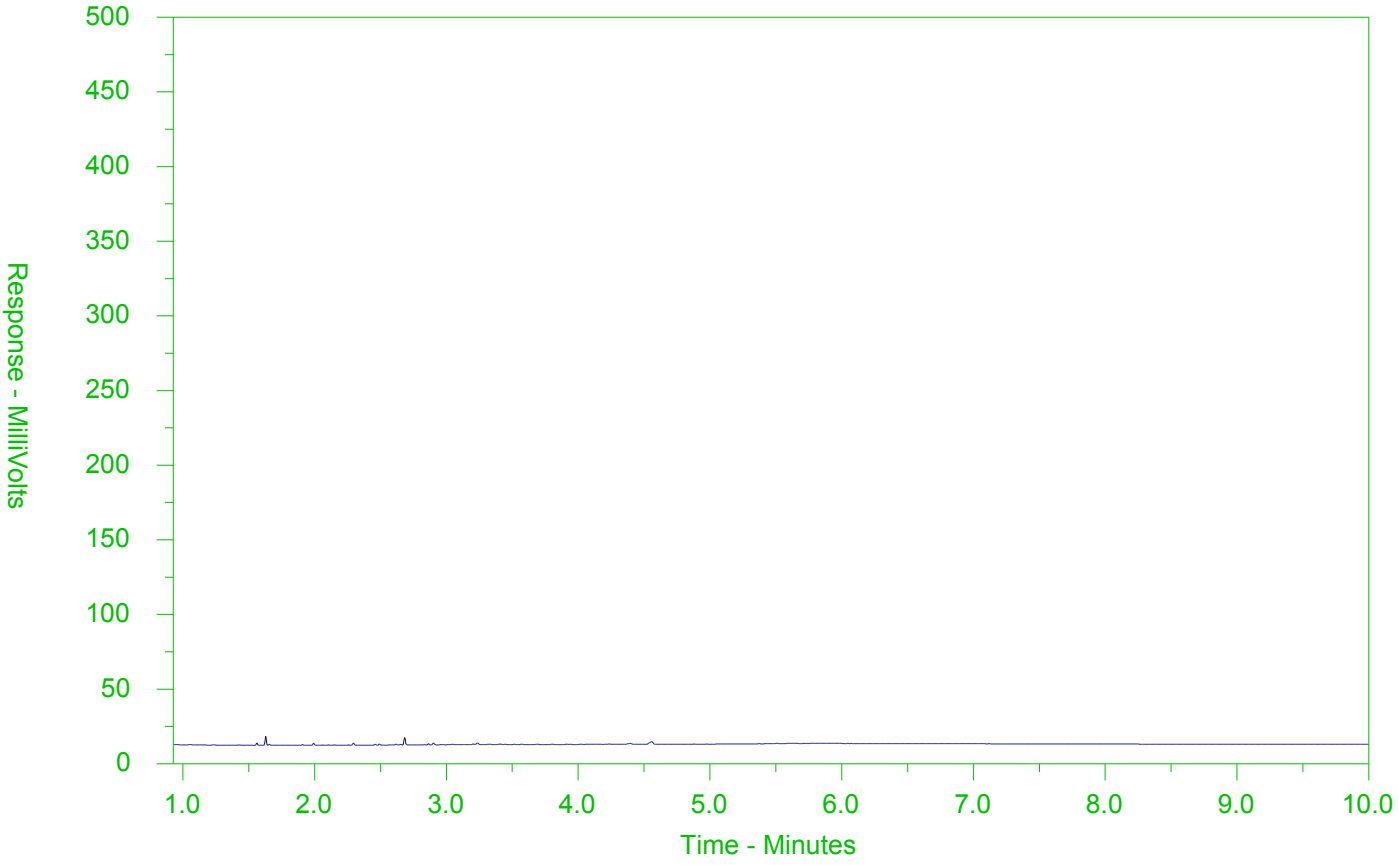
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2293530-1
Client Sample ID: WQ1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

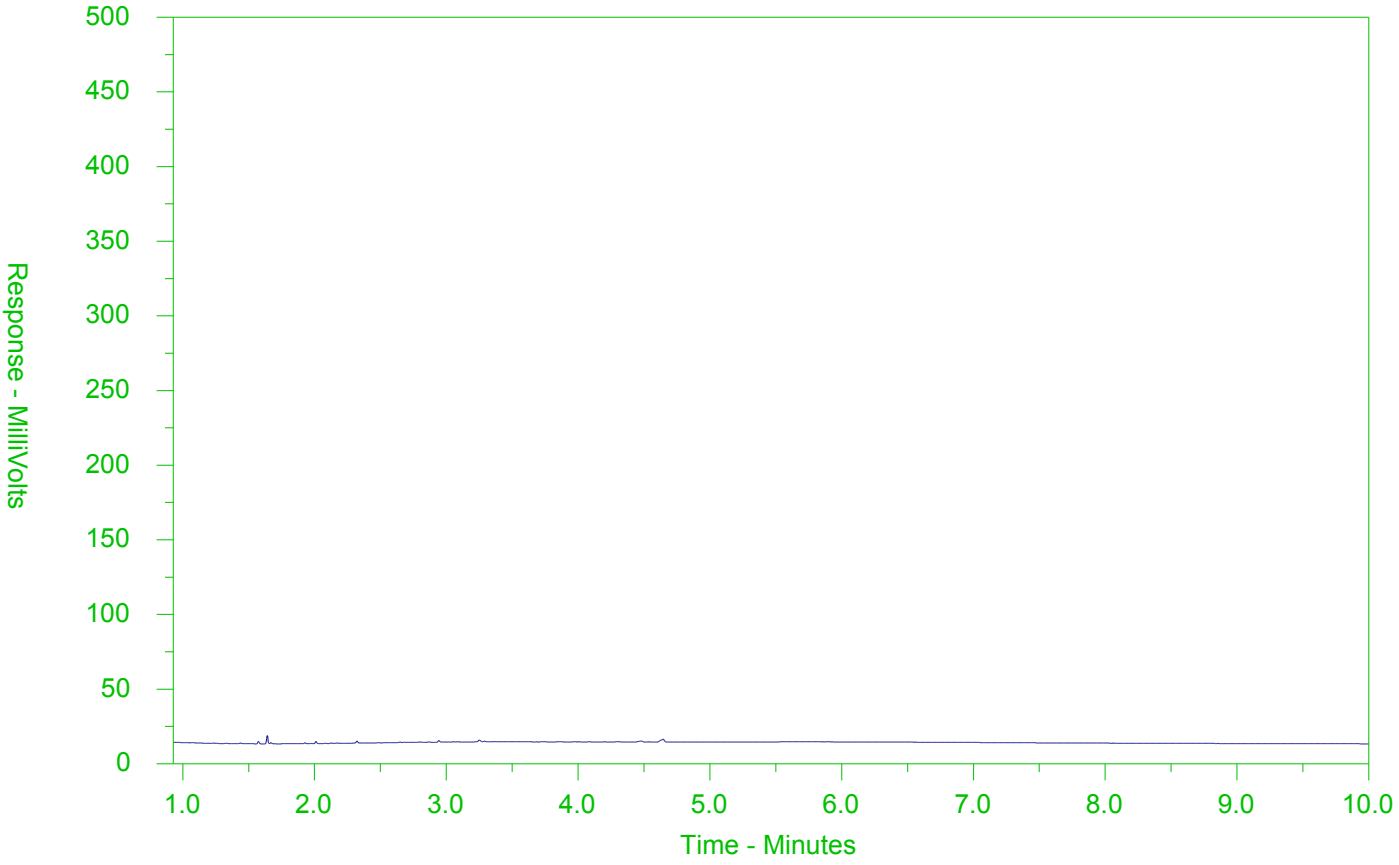
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2293530-2
Client Sample ID: WQ2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

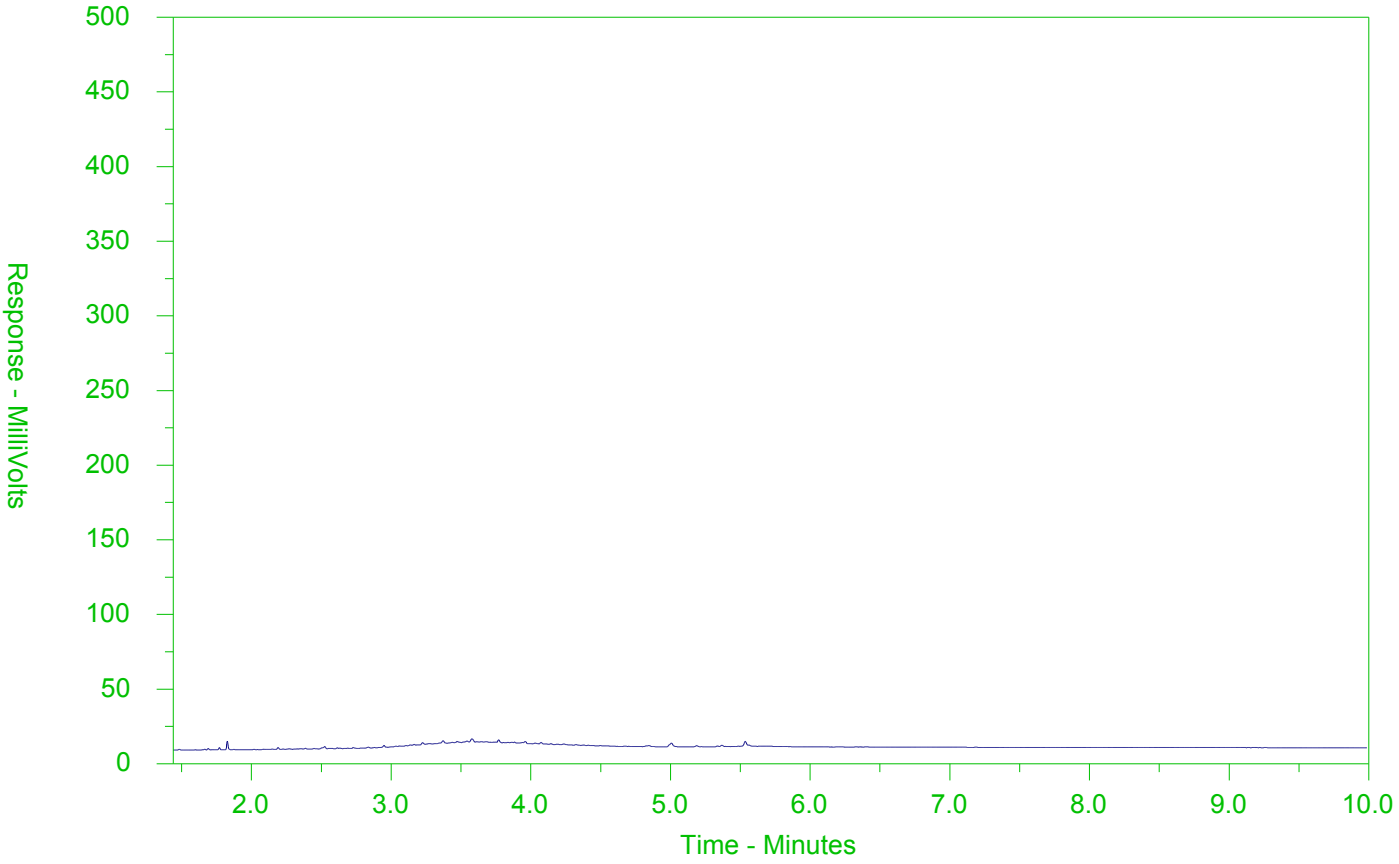
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2293530-3
Client Sample ID: WQ3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

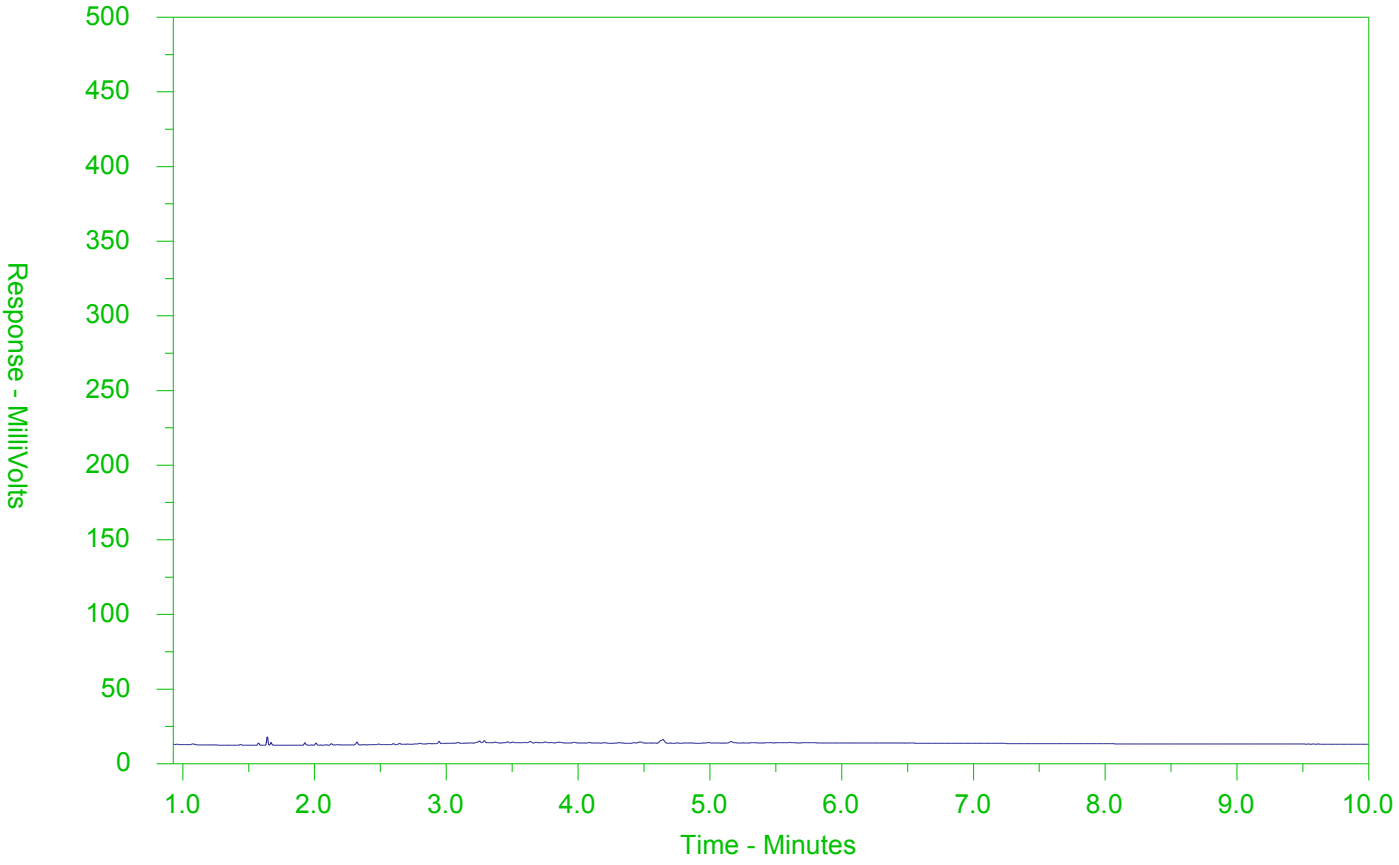
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2293530-4
Client Sample ID: WQ4



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytic Request Form

Canada Toll Free: 1 800 668 9878

L2293530-COFC

COC Number: 17 - 822572

MG

Page of

Report To	Contact and company name below will appear on the final report
Company:	AQUAFOR BEECH LTD
Contact:	WILL COWLIN
Phone:	519 803 7834
	Company address below will appear on the final report
Street:	55 REGAL RD UNIT 3
City/Province:	GUELPH ONT
Postal Code:	N1K 1B6
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [X] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [ ] PDF [ ] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report [ ] YES [ ] NO
[ ] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: [ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: [ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [✓] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E - 100%] [ ] | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q67885
Job #: MOHAWK LAKE
PO / AFE:
LSD: L2293530 MG
ALS Lab Work Order # (lab use only): ~~LC2587618~~ MG

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:
ALS Contact: | Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	VOCs / BTEX	TKN / TP	TOTAL COLIFORMS / ECOLI	METALS	PAHs	HYDROCARBONS F1-PH	CHROMIUM 6+	SAR	TDS, PH, HARDNESS, COND	ANIONS + NUTRIENTS	CYANIDES	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	WQ1	~~06~~ 18/06/19		WATER		X	X	X	X	X	X	X	X	X	X	X		
	WQ2	"		W "		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
	WQ3	"		"														
	WQ4	"		"														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [ ] NO
Are samples for human consumption/ use? [ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] | SIF Observations Yes [ ] No [ ]
Ice Packs [✓] Ice Cubes [✓] | Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				19.0			

SHIPMENT RELEASE (client use)

Released by: GRAHAM E | Date: 06/18/19 | Time: 14:00

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: June 18, 2019 | Time: 13:55

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

SIF.