2015-16 Monitoring and Maintenance Program
Upper Trinity South (New Harbour)
Waste Disposal Site
New Harbour Barrens, NL
(FINAL REPORT)

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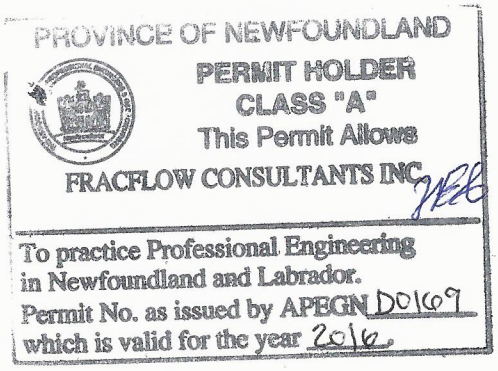

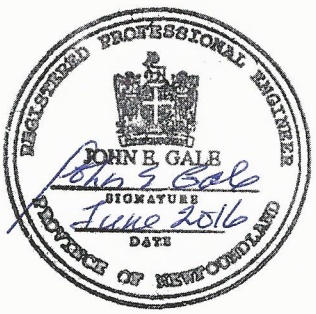

Executive Summary

The Newfoundland and Labrador Department of Environment and Conservation (ENVC) contracted Fracflow Consultants Inc. to conduct the 2015-16 Monitoring and Maintenance Program at the Upper Trinity South (New Harbour) Waste Disposal Site located on the New Harbour Barrens, Newfoundland and Labrador (NL). The Site is located on Route 73 on the Avalon Peninsula, approximately 5 km from the junction of Route 80 and Route 73, near the community of New Harbour. The Site operated as a domestic waste disposal facility from the early 1970s until 2009. In the mid-1990s, Provincial Government undertook a polychlorinated biphenyl (PCB) remediation program at a nearby scrap yard located in the community of Makinsons, NL. During this program, low-level PCB-impacted scrap metal and transformer casings were transported to the New Harbour facility and buried on-site.

The waste disposal site was a first-generation, unlined facility with no leachate containment or collection system. Potential leachate impacts were not effectively managed until interception ditches and a leachate collection system was installed in 2006/2007. In addition, seven monitoring wells were installed around the footprint of the waste disposal site to monitor potential leachate impacts and one monitor well was installed up-gradient of the site to monitor background groundwater conditions. Monitoring of groundwater and surface water quality has been ongoing since 2007.

ENVC has been completing environmental assessment and remediation work in relation to the PCB area since 2002. The Department has also been managing closure activities at the New Harbour site since 2009. The final phase of the closure plan was completed in 2013. A final soil cover was placed over the majority of the site, filling in any depressions or holes created through the settling process with additional imported cover materials. Final capping and liner installation was completed over the PCB-impacted area. All infrastructure and site access was removed and a soil berm was installed to obstruct the view from the adjacent highway.

The scope of work for the 2015-16 Monitoring and Maintenance Program conducted by Fracflow in December 2015 included surface water and groundwater sampling, as well as the inspection of monitoring wells and the leachate control system. The findings of the work conducted by Fracflow are summarized below.

<u>Surface Water</u>

Surface water samples were submitted for analysis of general chemistry, total metals including mercury, and PCBs.

Results from the December 7, 2015 sampling event show that the background surface water (SW-Upstream) and the two samples of surface water collected downstream of the waste disposal site (SW-Pond and SW-Stream) exceeded the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the protection of

freshwater aquatic life (FAL) for aluminum. The samples from SW-Pond and SW-Stream also exceeded the respective FAL guideline values for copper and iron. The sample from SW-Pond exceeded the FAL guideline for cadmium. PCBs were not detected in any of the surface water samples that were collected.

The general chemistry data for surface water samples show obvious leachate impacts at SW-Pond with diminishing, but detectable impacts at SW-Stream when compared with background surface water quality at SW-Upstream. The concentrations of chloride have been declining at SW-Pond since monitoring began. Chloride, for example, peaked at 195 mg/L in May 2008. Since then, chloride has declined to 29 mg/L in December 2015.

Groundwater

Groundwater samples were submitted for analysis of dissolved metals, total mercury, and PCBs.

Results from the December 7 and 8, 2015 sampling event show that none of the dissolved metals parameters in groundwater samples exceeded the reference guidelines for groundwater quality. The guidelines that have been used by other consultants and accepted for use by ENVC are the Ontario Ministry of Environment (MOE) “Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition. There were also no PCBs detected in any of the samples that were analyzed.

Groundwater elevation data indicate that the average direction of groundwater flow is from the northeast toward the southwest. Low pH and electrical conductivity values at MW-01 and MW-07, on the northeast side of the waste disposal site, were similar to those recorded at background well MW-08 and indicative of background groundwater quality. Groundwater quality at monitoring wells MW-02, MW-03, MW-04, MW-05A and MW-06 to the west and south of the waste disposal site are characterized by higher pH and conductivity and appear to be influenced by mixing with leachate.

The solubility of most trace metals decrease as pH increases. Leachate-impacted groundwater will often exhibit increased alkalinity and pH and, therefore, decreased concentrations of trace metals. That pattern is consistent with the sum totals of all trace metals (excluding the major metals of calcium, magnesium, phosphorus and sodium) that were detected in groundwater samples from monitoring wells MW-03, MW-04, MW-05A and MW-06, which appear to be located within the leachate plume.

Inspection of Leachate Control System and Monitoring Wells

The leachate ditch system and collection pond were visually inspected by Fracflow on December 3, 2015 and no degradation or defects in the system were noted. The rip rap around

the collection pond was found to be in good condition and there were no signs of blockages that would interfere with the proper flow of leachate to the collection pond.

There were some signs of erosion on the slopes of the landfill cover materials. Erosion has formed a number of small gullies that are approximately 0.10 m to 0.15 m deep and filled by rock fragments, and should be stable. There was some evidence of mass wasting of the west slope of the PCB remediation area, but is estimated to cover less than 1%. Some areas of the site could not be observed due to snow cover.

A site inspection of the monitoring wells was conducted in conjunction with the groundwater sampling event on December 7 and 8, 2015. All monitoring wells were found to be in generally good condition and accessible, with the following issues being documented.

1. There was no sampling equipment present in monitoring well MW-05A. New Waterra tubing and a foot valve were installed in that well for purging and sampling.

2. Well development water contained varying degrees of suspended sediment, which reflects the generally ineffective nature of the silica sand filter packs and typical well development procedures that are used in environmental monitoring.

3. As observed during the previous monitoring event, the top of the PVC riser pipe at MW-06 is cracked off below the steel protective casing, and there is no J-plug present.

4. It was noted at monitoring well MW-07 that the well screen may be broken or bent.

5. The cover of the steel protective casing at MW-07 was broken at the hinges and no longer attached to the casing. The cover opens, but it is vulnerable to vandalism.

6. There was no lock present on the well casing at MW-08, due to the protective well cap not fitting over the PVC casing stick up. This well is also vulnerable to vandalism.

7. The steel protective casings at MW-06 and MW-01 were found to be not cemented in or loose.

Recommendations

A number of recommendations have been developed by Fracflow based on the findings of the 2015-16 Monitoring and Maintenance Program at the New Harbour Waste Disposal Site. Those recommendations are presented at the end of this report for consideration by ENVC.

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Glossary of Terms

APHA	American Public Health Association
CCME	Canadian Council of Ministers of the Environment
CRA	Conestoga-Rovers & Associates
CWQGs	Canadian Water Quality Guidelines
ENVC	Newfoundland and Labrador Department of Environment and Conservation
FAL	CCME CWQGs for the protection of freshwater aquatic life
MOE	Ministry of Environment
PCBs	Polychlorinated biphenyls
TCUs	True colour units
TDS	Total dissolved solids

1.0 INTRODUCTION

The Newfoundland and Labrador Department of Environment and Conservation (ENVC) contracted Fracflow Consultants Inc. to conduct the 2015-16 Monitoring and Maintenance Program at the Upper Trinity South (New Harbour) Waste Disposal Site on the New Harbour Barrens, Newfoundland and Labrador (NL). The leachate control system inspection was conducted on December 3, 2015 and surface water and groundwater sampling, along with monitoring well inspections was completed on December 7 and 8, 2015. This report reviews the scope of work, outlines the field methods and data collected, and summarizes the conclusions and recommendations arising from this work.

Figures and photographs referenced in this report can be found in **Appendix A**. Data tables are provided in **Appendix B**. The results of the laboratory chemical analyses reported by Maxxam Analytics are presented in **Appendix C**. Analytical data from previous sampling events are presented in **Appendix D**.

1.1 Site Location and Description

The Upper Trinity South (New Harbour) waste disposal site is located on Route 73 in the community of New Harbour, Newfoundland and Labrador, approximately 5 km from the junction of Route 80 and Route 73 (**Figure 1**). Background information about the site and its operation history was obtained from the Request for Proposals issued by ENVC as well as from two previous monitoring reports by Conestoga-Rovers & Associates (CRA, 2014; 2015).

The New Harbour site operated as a domestic waste disposal facility from the early 1970s until November 2009, and accepted waste from the communities of Blaketown, Dildo, Green's Harbour, Hopeall, Markland, New Harbour, Old Shop, and South Dildo. The site also accepted waste from the Towns of Bay Roberts and Cupids during its early operational history. Materials disposed of at the site included domestic refuse and sawdust, as well as fat, seal pelt trim, and sludge from a local seal processing plant. One portion of the facility was dedicated to metals disposal, including cars and bulk items. The area to the northwest of the site was dedicated to disposal of scrap metal and transformer casings contaminated with low-level polychlorinated biphenyls (PCBs). The PCB-containing waste was buried between 1992 and 1995.

The waste disposal site was a first-generation, unlined facility with no leachate containment or collection system. Potential leachate impacts were not effectively managed until interception ditches and a leachate collection system was installed in 2006/2007. Eight monitoring wells were installed at the site at the locations shown in **Figure 2**. Seven of those wells (MW-01 to MW-07) were installed around the footprint of the waste disposal site, while well MW-08 was installed up-gradient of the site to monitor background groundwater conditions. A damaged monitoring well, MW-05, was replaced in 2013 by MW-05A.

The first phase of a three-year closure plan was completed at the site in 2011. Construction activities included: litter collection and control, consolidation, grading and compaction of

existing waste, placement of an interim soil cover to facilitate settling, tire collection and recycling, metal consolidation and recycling, and installation of site signage and placement of barriers to block site access. Phase 2 site closure activities were carried out in 2012 and included the transport, placement, grading and compaction of several thousand cubic metres of imported cover material. The final phase of the closure plan was completed in 2013. A final soil cover was placed over the majority of the site, filling in any depressions or holes created through the settling process with additional imported cover materials. Final capping and liner installation was completed over the PCB-impacted area. All infrastructure and site access was removed and a soil berm was installed to obstruct the view from the adjacent highway.

1.2 Historical Data

Water quality data for surface water and groundwater sampling stations date back to February 2007 (CRA, 2014; 2015). These data characterize water quality during the late operational and post-closure stages of waste disposal. There were no baseline data available for review. Historically, periods between successive monitoring events have varied between four and fourteen months and individual monitoring events have been conducted at different times of the year.

1.3 Scope of 2015-16 Monitoring Program

The scope of work for the 2015-16 Monitoring Program at the New Harbour Waste Disposal Site consisted of the following activities.

- Sampling of ambient surface water and groundwater. Background surface water quality was established by sampling at station SW-Upstream, which is located approximately 325 m northeast of the disposal site. Background groundwater quality was established by sampling at monitoring well MW-08, which is located approximately 1,500 m northeast of the disposal site.

- Sampling of two surface water stations on the down-gradient side of the waste disposal site. One sampling station is located at the sedimentation/leachate control pond (SW-Pond) and one sampling station is located approximately 450 m south-west of the footprint of the disposal site (SW-Stream).

- Water level survey, well development and groundwater sampling from a network of seven monitoring wells located around the footprint of the disposal site. Those wells are designated MW-01, MW-02, MW-03, MW-04, MW-05A, MW-06, and MW-07.

- Inspection of leachate control system and monitoring wells.

- Preparation of this report detailing the results of the work.

2.0 METHODOLOGY

2.1 Surface Water Monitoring

Surface water samples were collected on December 7, 2015 from the three (3) monitoring stations, the locations of which are shown in **Figure 2** and **Figure 3**. GPS coordinates for each surface water station are presented in **Table 1**.

The pH, electrical conductivity, and temperature of surface waters were measured using calibrated, hand-held HACH water quality meters. Dissolved oxygen concentrations were also measured using a hand-held HACH water quality meter (**Table 2**). Site conditions were noted and recorded at that time, including weather and physical water quality (e.g., water clarity, colour, presence of sheens, odours, etc.) also shown on **Table 2**.

2.2 Groundwater Monitoring

Groundwater samples were collected from eight (8) monitoring wells (MW01 to MW08) between December 7 and 8, 2015. The sampling locations are shown in **Figure 2** and **Figure 3**. GPS coordinates for each groundwater station are presented in **Table 1**. One field duplicate sample was collected from MW-06. Specific activities associated with groundwater sampling are discussed in separate sections below.

2.2.1 Water Level Measurements

The water level was measured in all monitoring wells at the time of the monitoring event. The height of the measuring point above ground surface (i.e., casing and riser stick up) was measured at each well prior to recording the water level. An electronic water level tape, with a stainless steel probe/sensor, was lowered into the well to measure the static water level, prior to well development. General site conditions, including weather, were recorded at that time (**Table 7**). Groundwater elevations were calculated using elevation data supplied in previous reports.

2.2.2 Well Development and Field Measurements

Each well was purged and sampled using dedicated bailers, with the exception of wells MW-02 and MW-05A, where Waterra tubing had to be installed and used. The goal was to remove a minimum of three well volumes, which was calculated using the static height of the water column in each well. The ability to remove three well volumes assumed that standing water was present in all wells at the time of sampling and that sufficient permeability existed to provide a steady recharge to each well during purging.

The pH, electrical conductivity, and temperature of the development waters were measured in an open bucket that was periodically replenished. Field parameters were recorded using hand-held HACH meters as noted during the preceding section for surface water sampling (**Table 7**). The physical condition of the development waters were noted, including colour, presence of suspended material, any odours that may be detected, and length of time required to remove the necessary volumes of water (**Table 6**).

2.3 Sample Collection and Handling

Surface water and groundwater samples were collected using pre-labeled sample bottles supplied by Maxxam Analytics. The sampling technicians wore disposable nitrile gloves during sample collection. Surface water samples were preserved, as required by the laboratory, without filtration, in order that chemical concentrations were reported as total concentration. Groundwater samples for dissolved metals analysis were field-filtered through 0.45 µ Nalgene disposable filters. All samples were preserved in the field. After sample collection, samples were placed in chilled coolers for transport to the laboratory. Chain-of-Custody forms were completed and submitted to the laboratory, specifying the chemical analyses required.

2.4 Laboratory Analysis

Surface water samples were submitted for analysis of general chemistry, total metals including mercury, and PCBs. Groundwater samples were submitted for analysis of dissolved metals, total mercury, and PCBs.

2.5 Inspection of Leachate Control System and Monitoring Wells

A visual inspection of the leachate control system (drainage ditches and collection pond) was conducted on December 3, 2015 and a site inspection of the monitoring wells was conducted in conjunction with the groundwater sampling event on December 7 and 8, 2015. Parameters assessed during the inspections include: damage to monitoring wells and protective casings, condition of the leachate ditch system and collection pond, and condition of the slopes and rip-rap around the waste disposal site **(Photos 1 to 10)**. It should be noted, however, that some areas were obscured from view under a cover of snow.

2.6 Data Compilation and Reporting

To be consistent with previous consultant's reports, all analytical data in this report were compared with guideline values adopted by previous consultants and ENVC. Tabulated analytical data is presented in **Appendix B**.

General chemistry, total metals and PCBs in surface water were assessed in relation to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the protection of Freshwater Aquatic Life (FAL).

Dissolved metals and PCBs in groundwater were assessed in relation to the Ontario Ministry of the Environment (MOE) "Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

3.0 MONITORING DATA

Field data and laboratory analytical results for the samples taken December 7 and 8, 2015 are presented in this section of the report. Those data are compared with the applicable guideline values and results from the previous sampling events dating back to 2007. Note that all chemical data tables referenced below are presented in **Appendix B**. Copies of the laboratory analytical reports are presented in **Appendix C**. **Appendix D** contains historical data from previous monitoring events.

3.1 Ambient Water Quality Conditions

3.1.1 Ambient Surface Water

Surface water sampling station SW-Upstream is located northeast and hydraulically up-gradient from the waste disposal site **(Photo 11)**. SW-Pond and SW-Stream **(Photo 12 and 13)** are located to the southwest and hydraulically down-gradient from the waste disposal site. Field-measured values of pH, electrical conductivity, dissolved oxygen and temperature are summarized in **Table 2.**

Analytical data for general chemistry, total metals and PCBs are shown, respectively in **Table 3**, **Table 4** and **Table 5**. Any concentrations in excess of the stated guideline values are highlighted by shading in the data tables.

3.1.2 Ambient Groundwater

Monitoring well MW-08 is located northeast and hydraulically up-gradient from the waste disposal site. **Table 6** and **Table 7**, respectively, present the volumes purged and the field-measured values for pH, electrical conductivity and temperature.

Table 8 presents the dissolved metals data and **Table 9** presents PCB data for groundwater from background well MW-08. Any concentrations in excess of the stated guideline values are highlighted by shading in the data tables.

3.2 On-Site Water Quality Conditions

3.2.1 On-Site Surface Water

Surface water sampling stations SW-Pond and SW-Stream are located southwest and hydraulically down-gradient from the waste disposal site. **Table 2** presents the field measurements for each surface water station.

Table 3 presents the general chemistry data, **Table 4** presents the total metals data, and **Table 5** presents the PCB data for surface water samples. Any concentrations in excess of the stated guideline values are highlighted by shading in the data tables.

3.2.2 On-Site Groundwater

Monitoring wells MW-01 through to MW-07 are located within the boundaries of the waste disposal site. **Table 6** and **Table 7**, respectively, present the volumes purged from each well during well development and the field measurements for each well respectively.

Table 8 contains the results for dissolved metals analyses. **Table 9** presents the results of the PCBs analyses for groundwater samples collected from each monitoring well. Any concentrations in excess of the stated guideline values are highlighted by shading in the data tables.

4.0 DISCUSSION

Surface water and groundwater results for samples collected December 7 and 8, 2015 were compared to applicable guidelines and historical data since 2007. Historical data are presented in **Appendix D**.

4.1 Surface Water

4.1.1 General Chemistry

The general chemistry data for surface water samples show distinct differences between the quality of SW-Pond and SW-Stream when compared with background surface water quality at SW-Upstream. For example, note the concentrations of chloride, total alkalinity and total dissolved solids (TDS):

- SW-Upstream: total alkalinity < 5 mg/L, chloride 7.9 mg/L and TDS 18 mg/L;
- SW-Pond: total alkalinity 160 mg/L, chloride 29 mg/L and TDS 330 mg/L; and
- SW-Stream: total alkalinity 27 mg/L, chloride 17 mg/L and TDS 70 mg/L.

Significant concentrations of nitrate plus nitrite (3.3 mg/L) and ammonia-nitrogen (3.6 mg/L) were also detected at SW-Pond. Based on the observed chemistry, especially the relatively high surface water alkalinity, CO_2-degassing may be responsible for the increased pH recorded at the laboratory.

The concentrations of chloride and other chemical parameters have been declining at SW-Pond since monitoring began. Chloride, for example, peaked at 195 mg/L in May 2008 . Since then, chloride has declined to 110 mg/L in September 2009, 46 mg/L in December 2011, 24 mg/L in August 2013, and 29 mg/L in December 2015.

4.1.2 Total Metals

Results from the December 2015 monitoring event indicate that surface water samples downstream of the site (SW-Pond and SW-Stream) exceeded guideline values for aluminum, cadmium (SW-Pond only), copper and iron. The sample collected upstream of the site (SW-Upstream) also exceeded the guideline value for aluminum. The samples from the settling pond (SW-Pond) and downstream of the site (SW-Stream) generally had higher total metals concentrations than the background sample (SW-Upstream), with the settling pond sample having the highest concentrations.

SW-Stream and SW-Pond commonly exceeded the guidelines for aluminum, copper, and iron during previous monitoring events. SW-Pond exceeded copper guidelines for all but two sampling events since November 2007, and exceeded iron guidelines for all but four sampling

events since November 2007. SW-Stream has had fewer exceedances since November 2007, exceeding copper and iron guidelines on only three sampling occasions. In general, metals concentrations at SW-Pond and SW-Stream are decreasing with time, which is consistent with the observed decreases in the concentrations of the leachate-indicator parameters (total alkalinity, chloride and TDS) at those stations, as noted in the previous section.

4.1.3 Polychlorinated biphenyls (PCBs)

PCBs were not-detected in any of the surface water samples collected in December 2015. PCBs have not been detected at any surface-water station since monitoring began in 2007.

4.1.4 Quality Control

A comparison between field-measured and laboratory-measured values of pH and electrical conductivity is a meaningful quality control tool. In particular, field-measured pH is an essential parameter for comparison of surface water quality to guideline values. The American Public Health Association (APHA) Standard Method requires that pH be analyzed within 15 minutes of sampling and therefore, field determination is required for sampling. All laboratory-reported pH values will exceed the APHA Standard Method holding time.

The background sample from SW-Upstream had a field-measured pH of 6.33, which agreed reasonably well with the laboratory-measured pH of 6.25. Both values are below the acceptable range of 6.5 to 8.5 for FAL. The field-measured electrical conductivity was 34 µS/cm and compared well with the laboratory-measured value of 32 µS/cm.

Field-measured electrical conductivities at SW-Pond and SW-Stream were also reasonably close to the laboratory-measured values, but field-measured and laboratory-measured pH values at SW-Pond were significantly different. The field-measured pH value at SW-Pond was 6.47. The laboratory-measured pH value at SW-Pond was substantially higher at 7.68. The reason for that difference could be pH-probe interference from organic compounds in the water, or degassing of carbon dioxide from the samples during sample storage and transport to the laboratory.

4.2 Groundwater

4.2.1 Dissolved Metals

None of the groundwater samples collected in the December 2015 event exceeded the guideline values for dissolved metals. There have been very few exceedances of dissolved metals in groundwater since monitoring began in 2007, with the majority of the exceedances occurring during the first event in February 2007.

4.2.2 Polychlorinated biphenyls (PCBs)

PCBs were non-detectable in all groundwater samples collected during the December 2015 sampling event. PCBs have been non-detect for all groundwater samples collected since 2007, with the exception of MW-01 in October 2009 (0.07 µg/L).

4.2.3 Quality Control

A comparison between field-measured and laboratory-measured values of pH and electrical conductivity is a meaningful quality control tool as noted in the preceding section for surface water sampling (Section 4.1.4). Such a comparison is not possible for groundwater samples because general chemistry analyses are not part of the analytical program for this site.

4.2.4 Interpretation

Depths to groundwater and calculated groundwater elevations are presented in **Table 6**. The inferred direction of average groundwater flow is toward the southwest. Note that the elevation of MW-05A, which replaced damaged well MW-05, was not surveyed during well construction.

The quality of background groundwater was characterized by readings taken at MW-08 where the field-measured groundwater pH was 7.32 and its conductivity was 32.9 µS/cm. Low pH and electrical conductivity values at MW-01 (6.02 and 43.6 µS/cM) and MW-07 (5.91and 53 µS/cm), on the northeast side of the waste disposal site, are also indicative of background groundwater quality. Groundwater quality at the other monitoring well locations are distinctly different from background and may be influenced by mixing with leachate based on the magnitude and distribution of the field-measured pH and electrical conductivity values. Groundwater quality at MW-03, MW-04, MW-05A and MW-06 appear to show the strongest influence of potential mixing with leachate. The highest conductivity value was 202 µS/cm, which was recorded at MW-04. The approximate boundaries of the inferred leachate plume are shown in **Figure 4**.

4.3 Inspection of Leachate Control System and Monitoring Wells

The leachate ditch system and collection pond were visually inspected by Fracflow on December 3, 2015 and no degradation or defects in the system were noted. The rip rap around the collection pond was found to be in good condition and there were no signs of blockages that would interfere with the proper flow of leachate to the collection pond (**Photo 1**).

There were some signs of erosion on the slopes of the landfill cover materials (**Photo 2**). Erosion has formed a number of small gullies that are approximately 0.10 m to 0.15 m deep and filled by rock fragments, and should be stable. There was some evidence of mass wasting of the west

slope of the PCB remediation area, but is estimated to cover less than 1% **(Photo 3**). Standing water was observed on the access road between MW-06 and the leachate collection pond. Some areas of the site could not be observed due to snow cover.

A site inspection of the monitoring wells was conducted in conjunction with the groundwater sampling event on December 7 and 8, 2015. All monitoring wells were found to be in generally good condition and accessible (**Photos 4 to 10**), with the following issues being documented.

- There was no sampling equipment present in monitoring well MW-05A. New Waterra tubing and a foot valve were installed in that well for purging and sampling.

- Well development water contained varying degrees of suspended sediment, which reflects the generally ineffective nature of the silica sand filter packs and typical well development procedures that are used in environmental monitoring.

- As observed during the previous monitoring event, the top of the PVC riser pipe at MW-06 is cracked off below the steel protective casing, and there is no J-plug present.

- It was noted at monitoring well MW-07 that the well screen may be broken or bent.

- The cover of the steel protective casing at MW-07 was broken at the hinges and no longer attached to the casing. The cover opens, but it is vulnerable to vandalism.

- There was no lock present on the well casing at MW-08, due to the protective well cap not fitting over the PVC casing stick up. This well is also vulnerable to vandalism.

- The steel protective casings at MW-01 and MW-06 were found to be not cemented in or loose.

5.0 SUMMARY AND RECOMMENDATIONS

The conclusions and recommendations arising from the work conducted by Fracflow for the 2015-16 Monitoring and Maintenance Program at the New Harbour Waste Disposal Site are summarized below.

5.1 Summary

5.1.1 Surface Water

The general chemistry data for surface water samples show obvious leachate impacts at SW-Pond with diminishing, but detectable impacts at SW-Stream when compared with background surface water quality at SW-Upstream. Significant concentrations of nitrate plus nitrite (3.3 mg/L) and ammonia-nitrogen (3.6 mg/L) were also detected at SW-Pond and indicative of leachate impacts. The observed chemical impacts at that location, especially the relatively high surface water alkalinity, suggest that CO_2-degassing is responsible for the increased pH recorded at the laboratory. The concentrations of chloride and other chemical parameters have been declining at SW-Pond since monitoring began. Chloride, for example, peaked at 195 mg/L in May 2008. Since then, chloride has declined to 29 mg/L in December 2015.

Background surface water (SW-Upstream) and the two samples of surface water collected downstream of the waste disposal site (SW-Pond and SW-Stream) exceeded the CCME FAL guideline value for aluminum. The samples from SW-Pond and SW-Stream also exceeded the respective FAL guideline values for copper and iron. The sample from SW-Pond also exceeded the FAL guideline for cadmium. The sample collected from SW-Upstream exceeded the FAL guideline for pH.

PCBs were not detected in any of the surface water samples that were collected.

5.1.2 Groundwater

Water levels and field-measured values of pH and electrical conductivity have provided some of the most meaningful insights into groundwater flow and quality at this site. Groundwater elevation data indicate that the average direction of groundwater flow is from the northeast toward the southwest. Low pH and electrical conductivity values at MW-01 and MW-07, on the northeast side of the waste disposal site, were similar to those recorded at background well MW-08 and indicative of background groundwater quality. Groundwater quality at the other monitoring well locations to the west and south of the waste disposal site are characterized by higher pH and conductivity and appear to be influenced by mixing with leachate. Samples from MW-02, MW-03, MW-04, MW-05A and MW-06 appear to show the strongest influence of mixing with leachate.

None of the dissolved metals parameters in groundwater samples exceeded the reference guidelines for groundwater quality. The guidelines that have been used by other consultants and accepted for use by ENVC are the Ontario MOE “Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition. There were also no PCBs detected in any of the samples that were analyzed.

The solubility of most trace metals decrease as pH increases. Leachate-impacted groundwater will often exhibit increased alkalinity and pH and, therefore, decreased concentrations of trace metals. That pattern is consistent with the sum totals of all trace metals (excluding the major metals of calcium, magnesium, phosphorus and sodium) that were detected in groundwater samples from four monitoring wells within the leachate plume.

5.1.3 Inspection of Leachate Control System and Monitoring Wells

A visual inspection of the leachate control system (drainage ditches and collection pond) and monitoring wells was conducted during the 2015-16 Monitoring and Maintenance Program. Parameters assessed during the inspections include: damage to monitoring wells and protective casings, condition of the leachate ditch system and collection pond, and condition of the slopes and rip-rap around the waste disposal site. It should be noted, however, that some areas were obscured from view under a cover of snow.

There were no degradation or defects in the leachate control system noted. The rip rap around the collection pond was found to be in good condition and there were no signs of blockages that would interfere with the proper flow of leachate to the collection pond.

There were some signs of erosion on the slopes of the landfill cover materials. Erosion has formed a number of small gullies that are approximately 0.10 m to 0.15 m deep and filled by rock fragments, and should be stable. There was some evidence of mass wasting of the west slope of the PCB remediation area, but is estimated to cover less than 1%. Standing water was observed on the access road between MW-06 and the leachate collection pond.

All monitoring wells were found to be in generally good condition and accessible, with the following issues being documented.

- There was no sampling equipment present in monitoring well MW-05A. New Waterra tubing and a foot valve were installed in that well for purging and sampling.

- Well development water contained varying degrees of suspended sediment, which reflects the generally ineffective nature of the silica sand filter packs and typical well development procedures that are used in environmental monitoring.

- As observed during the previous monitoring event, the top of the PVC riser pipe at MW-06 is cracked off below the steel protective casing, and there is no J-plug present.

- It was noted at monitoring well MW-07 that the well screen may be broken or bent.

- The cover of the steel protective casing at MW-07 was broken at the hinges and no longer attached to the casing. The cover opens, but it is vulnerable to vandalism.

- There was no lock present on the well casing at MW-08, due to the protective well cap not fitting over the PVC casing stick up. This well is also vulnerable to vandalism.

- The steel protective casings at MW-01 and MW-06 were found to be not cemented in or loose.

5.2 Recommendations

The following recommendations are presented for consideration by ENVC.

- Annual surface water and groundwater monitoring should be continued at this site. Historically, periods between successive monitoring events have varied between four and fourteen months and individual monitoring events have been conducted at different times of the year. That finding limits the ability to separate seasonal variability in water quality from trends that would otherwise reflect mixing with leachate and general evolution of the leachate plume. Therefore, monitoring should be conducted during the same month of each year in order to minimize seasonal variability and track developing water quality trends. Given the absence of any obvious leachate impacts at MW-01 and MW-07, it would be reasonable to consider limiting groundwater sampling at those sites to once every two years.

- A meaningful interpretation of metals concentrations in groundwater samples is limited by the absence of general chemistry data. In Fracflow's opinion, future monitoring events should include general chemistry analysis of all groundwater samples.

- Field-measured pH is an essential parameter for comparison of surface water and groundwater quality to guideline values. The APHA Standard Method requires that pH be analyzed within 15 minutes of sampling and, therefore, field determination is required for compliance. All laboratory-reported pH values will exceed the APHA Standard Method holding time. For that reason, laboratory-measured pH values should not be compared to guideline values.

- The elevation of MW-05A, which replaced damaged well MW-05, is unknown. That well should be surveyed to confirm groundwater flow patterns to the south of the waste disposal site.

- Several maintenance issues were identified during inspection of the monitoring wells:

- The cracked PVC casing at MW-06 should be repaired and a new j-plug installed. This will allow for improved measurements in relation to the top of casing and also for the well cover to be locked and secured.

- In order to determine if the well screen is broken or bent at MW-07, the above ground protective casing should be removed, the well screen inspected and repaired and/or replaced if possible.

- The broken protective-casing cover at MW-07 should be replaced to protect the top of the PVC casing and to allow the well cover to be locked and secured.

- The PVC casing at MW-08 should be cut lower than the protective-casing cover to allow the well cap to fit securely over the casing and be locked.

- The loose protective casings at MW-01 and MW-06 should be cemented and stabilized.

- The area between the edge of the waste disposal site and SW-Stream is heavily wooded. A walking trail should be cleared and marked for reasons of personnel safety and equipment/sample integrity while traversing to and from that location.

- Consultants should be responsible for updating the Excel spreadsheet databases during future sampling events. ENVC should provide the electronic data tables and request that consultants update the tables and develop plots to trend key parameters.

- In Fracflow's opinion, all future monitoring reports should include an illustration that shows the water table and inferred directions of groundwater flow, as well as the approximate boundaries of the leachate plume.

6.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME, 1999). Canadian Environmental Quality Guidelines, Updated 2001, 2002, 2003, 2004, 2005, 2006, and 2007, Chapter 4 Canadian Water Quality Guidelines for the Protection of Aquatic Life.

Conestoga-Rovers & Associates (CRA, 2015). 2014/2015 Monitoring and Maintenance Program, Upper Trinity South (New Harbour) Waste Disposal Site, New Harbour Barrens, Newfoundland and Labrador, Ref. No. 084308 (7).

Conestoga-Rovers & Associates (CRA, 2014). 2013/2014 Monitoring and Maintenance Program, Upper Trinity South (New Harbour) Waste Disposal Site, New Harbour Barrens, Newfoundland and Labrador, Ref. No. 084308 (4).

Ontario Ministry of the Environment (MOE, 2011). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

APPENDIX A

Figures and Photos

Figures

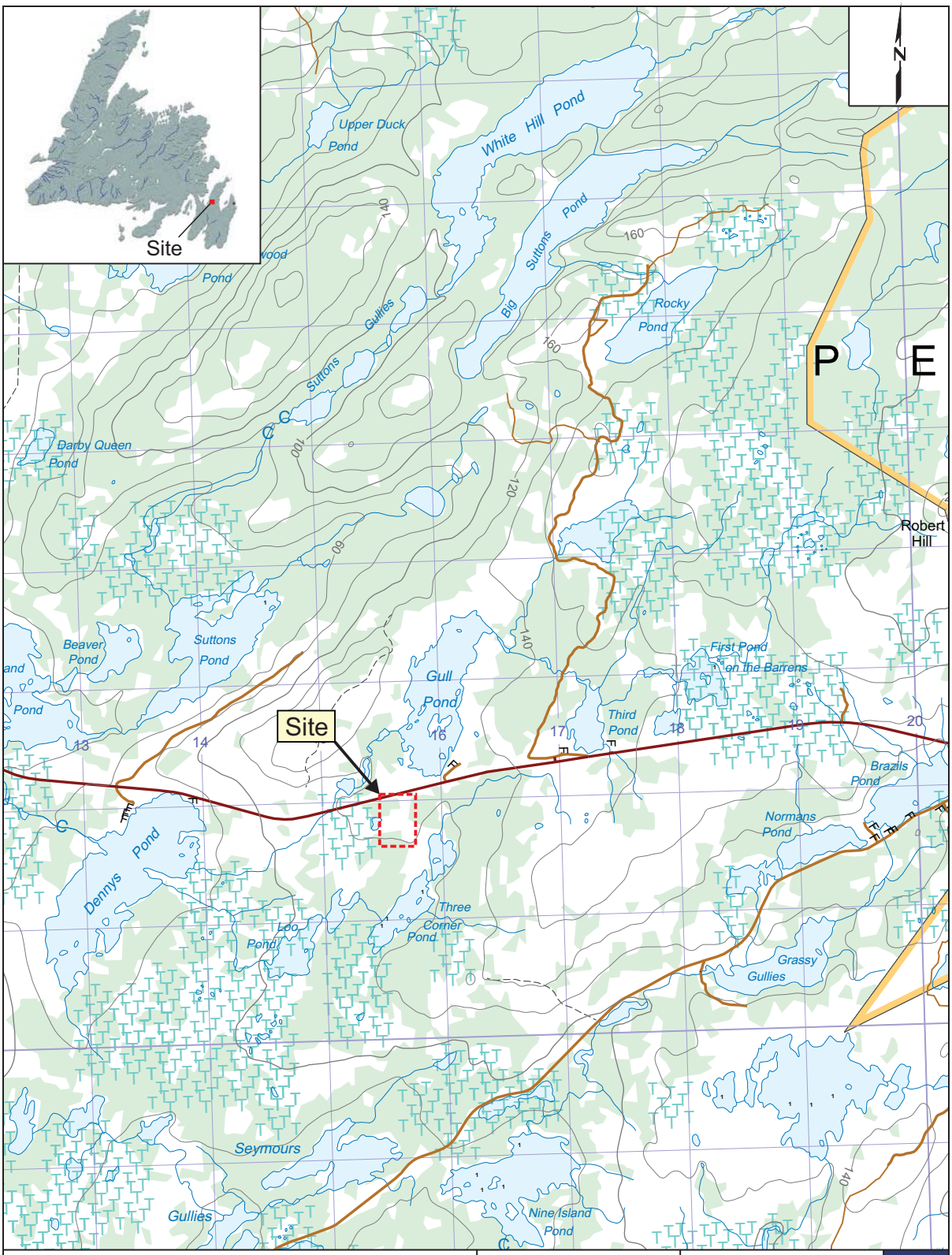

Figure 1 Location of Upper Trinity South (New Harbour) Waste Disposal Site.

Project No.	Document Reference
3073N	FFC-NL-3073N-1-RP
Location	**Date**
New Harbour Barrens, NL	June 2016

FFC

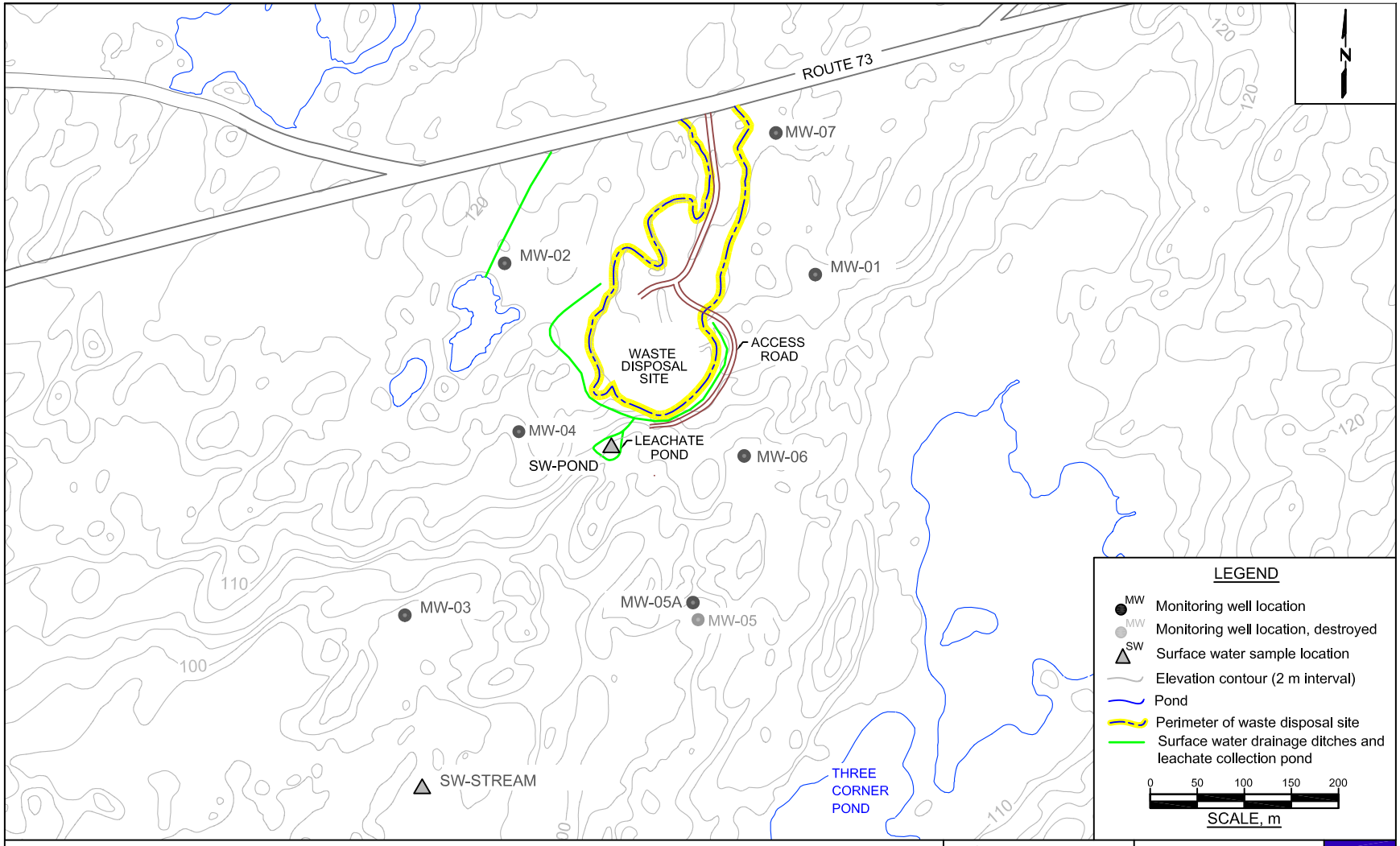

Figure 2 Upper Trinity South (New Harbour) Waste Disposal Site plan with on-site sampling locations.

Project No.	Document Reference
3073N	FFC-NL-3073N-1-RP
Location	Date
New Harbour Barrens, NL	June 2016

FFC

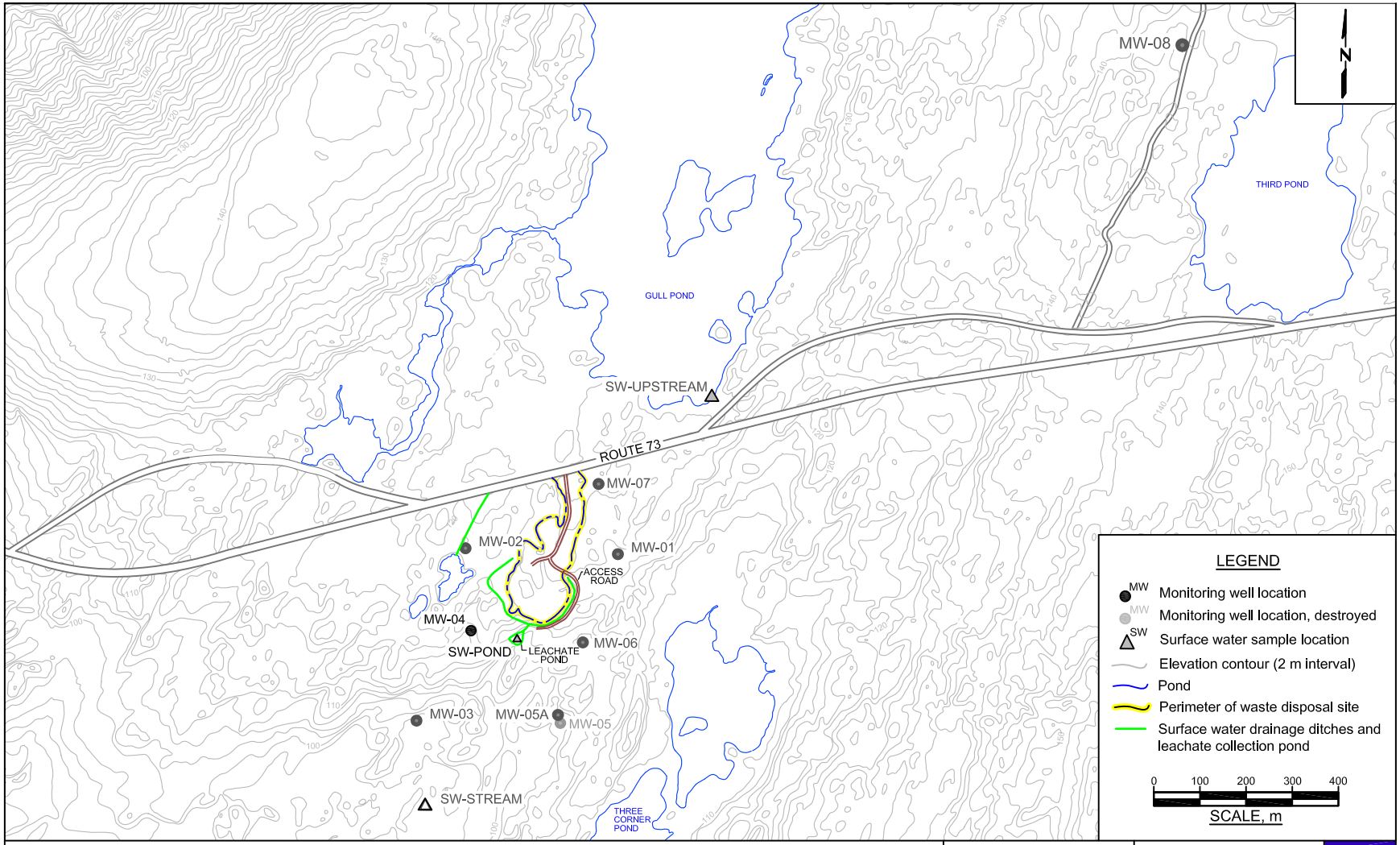

Figure 3 Upper Trinity South (New Harbour) Waste Disposal Site plan with on-site and background sampling locations.

Project No.	Document Reference
3073N	FFC-NL-3073N-1-RP
Location	Date
New Harbour Barrens, NL	June 2016

FFC

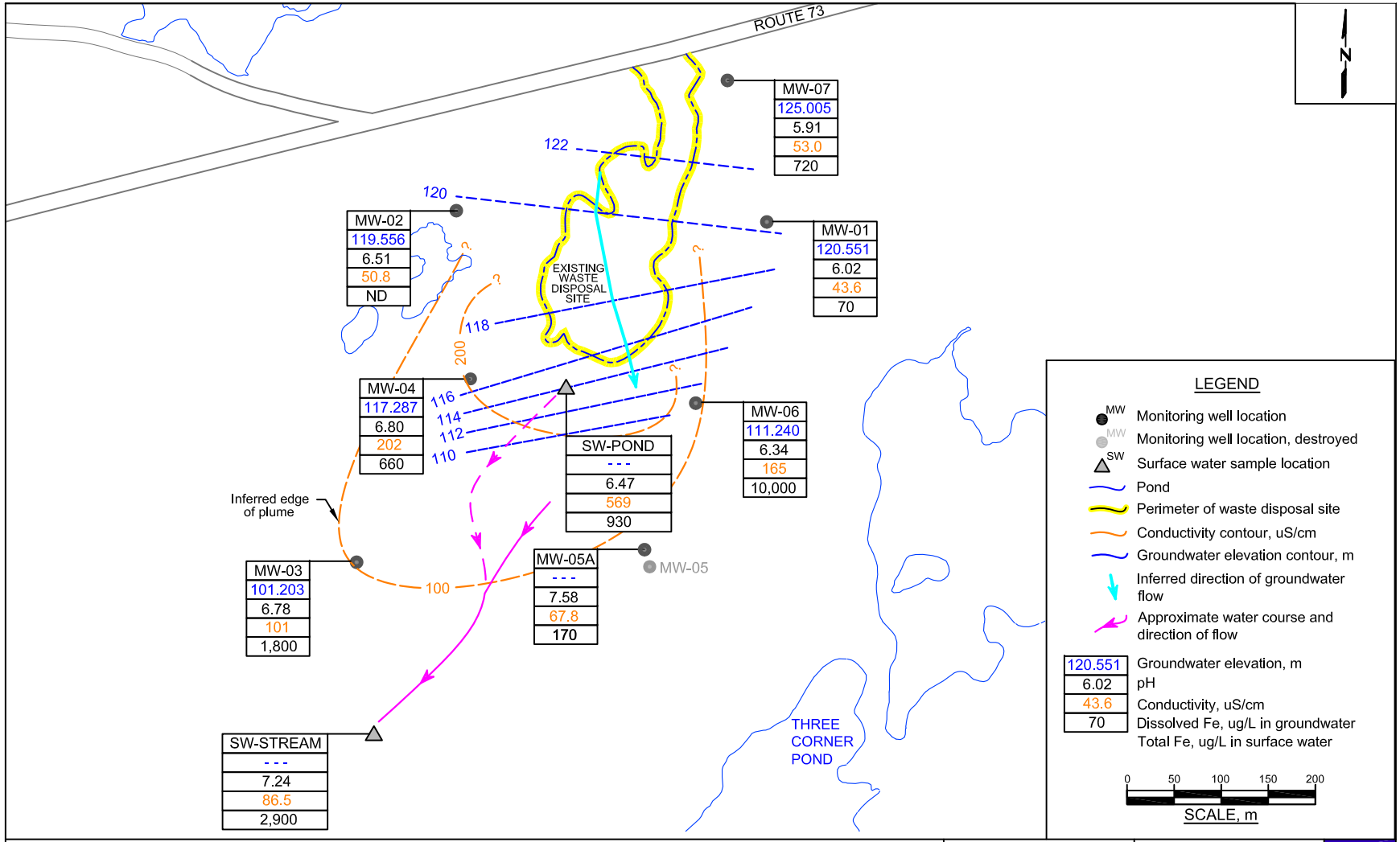

Figure 4 Inferred direction of groundwater flow and approximate plume boundaries.

Project No.	Document Reference
3073N	FFC-NL-3073N-1-RP
Location	Date
New Harbour Barrens, NL	June 2016

FFC

Photos

Photo 1 View of the leachate collection pond and discharge stream.

Photo 2 View of the waste disposal site slope, showing erosion of the landfill cover.

Photo 3 View of the west slope of the PCB disposal area, showing some mass wasting of the slope.

Photo 4 View of MW-02 during the December 2015 sampling event.

Photo 5 View of MW-03 during the December 2015 sampling event.

Photo 6 View of MW-04 during the December 2015 sampling event.

Photo 7 View of MW-05A during the December 2015 sampling event.

Photo 8 View of MW-06 during the December 2015 sampling event.

Photo 9 View of MW-07 during the December 2015 sampling event, showing the broken protective casing cover.

Photo 10 View of background well MW-08 during the December 2015 sampling event.

Photo 11 View of the pond up-gradient of the site, where sample SW-UPSTREAM was collected.

Photo 12 View of the leachate collection pond, where sample SW-POND was collected.

Photo 13 View of the stream down-gradient of the site, where sample SW-STREAM was collected.

APPENDIX B

Data Tables

Table 1 GPS coordinates of key site features.

ID	Northing m	Easting m
MW-01	5271867	315787
MW-02	5271887	315459
MW-03	5271518	315342
MW-04	5271711	315468
MW-05A	5271451	315670
MW-06	5271679	315707
MW-07	5272020	315750
MW-08	5272965	316998
SW-UPSTREAM	5272267	316026
SW-POND	5271648	315544
SW-STREAM	5271423	315381

GPS coordinates collected using a Topcon GRS-1 in December 2015.

All points recorded using UTM Zone 22 coordinate system.

Table 2 Field measurements for surface water samples.

ID	Location	Date	Weather	Sample Condition	pH	Conductivity	Dissolved Oxygen	Temperature
					pH units	µS/cm	mg/L	°C
SW-UPSTREAM	Approximately 400 m north-east of the site entrance, on the south side of Gull Pond.	07-Dec-15	Cloudy, 5° C, 5 cm ice cover on stream	Clear, no odours or sheens	6.33	34.1	13.17	0.6
SW-POND	Leachate collection pond immediately south of the waste disposal site.	07-Dec-15	Cloudy, 5° C, 5 cm ice cover on pond	Clear, no odours or sheens	6.47	569	10.33	0.9
SW-STREAM	Stream approximately 400 m south-west of the leachate collection pond.	07-Dec-15	Cloudy, 5° C, 5 cm ice cover on stream	Clear, no odours or sheens	7.24	86.5	9.69	2.1

Table 3 Surface water analytical results - general chemistry.

Maxxam ID	Units	Guideline *	RDL	BMR013	RDL	BMR014	RDL	BMR015
Sampling Date				07-Dec-15		07-Dec-15		07-Dec-15
COC Number				540677-01-01		540677-01-01		540677-01-01
Fracflow Sample ID				3073-NH-SW-POND		3073-NH-SW-STREAM		3073-NH-SW-UPSTREAM
Calculated Parameters								
Anion Sum	me/L	-	N/A	5.75	N/A	1.08	N/A	0.230
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	1.0	160	1.0	27	1.0	ND
Calculated TDS	mg/L	-	1.0	330	1.0	70	1.0	18
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	1.0	ND	1.0	ND	1.0	ND
Cation Sum	me/L	-	N/A	5.30	N/A	1.25	N/A	0.330
Hardness (CaCO3)	mg/L	-	1.0	180	1.0	14	1.0	4.8
Ion Balance (% Difference)	%	-	N/A	4.07	N/A	7.30	N/A	17.9
Langelier Index (@ 20C)	N/A	-		0.271		-2.48		NC
Langelier Index (@ 4C)	N/A	-		0.0220		-2.73		NC
Nitrate (N)	mg/L	-	0.050	3.3	0.050	0.16	0.050	0.071
Saturation pH (@ 20C)	N/A	-		7.41		9.30		NC
Saturation pH (@ 4C)	N/A	-		7.66		9.55		NC
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	-	25	160	5.0	27	5.0	ND
Dissolved Chloride (Cl)	mg/L	120	1.0	29	1.0	17	1.0	7.9
Colour	TCU	-	5.0	14	25	76	25	56
Nitrate + Nitrite (N)	mg/L	-	0.050	3.3	0.050	0.16	0.050	0.071
Nitrite (N)	mg/L	0.06	0.010	0.019	0.010	ND	0.010	ND
Nitrogen (Ammonia Nitrogen)	mg/L	73 (1)	0.25	3.6	0.050	ND	0.050	ND
Total Organic Carbon (C)	mg/L	-	2.5	8.0 (2)	5.0	8.7 (2)	0.50	7.7
Orthophosphate (P)	mg/L	-	0.010	ND	0.010	ND	0.010	ND
pH-Laboratory	pH	6.5 - 9.0	N/A	7.68	N/A	6.82	N/A	**6.25**
pH-Field Measured	pH	6.5 - 9.0	---	**6.47**		7.24		**6.33**
Reactive Silica (SiO2)	mg/L	-	0.50	6.8	0.50	5.5	0.50	2.5
Dissolved Sulphate (SO4)	mg/L	-	10	68	2.0	2.5	2.0	ND
Turbidity	NTU	-	0.10	4.6	0.10	30	0.10	1.1
Conductivity	uS/cm	-	1.0	490	1.0	99	1.0	32

** Guideline refers to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (Updated 2007).*

RDL = Reportable Detection Limit; Yellow shading indicates an abnormally high charge balance error.

ND = Not detected

N/A = Not Applicable

(1) Guideline for ammonia is pH and temperature dependant; guideline listed is for 3073-NH-SW-POND.

(2) Reporting limit was increased due to turbidity.

Shaded / Bold - Indicates parameter is above applicable criteria

Table 4 Surface water analytics results - total metals.

Maxxam ID	Units	Guideline *	RDL	BMR013	BMR014	BMR015
Sampling Date				07-Dec-15	07-Dec-15	07-Dec-15
COC Number				540677-01-01	540677-01-01	540677-01-01
Fracflow Sample ID				3073-NH-SW-POND	3073-NH-SW-STREAM	3073-NH-SW-UPSTREAM
Metals						
Total Aluminum (Al)	ug/L	5 / 100 (1)	5.0	**210**	**610**	**230**
Total Antimony (Sb)	ug/L	-	1.0	ND	ND	ND
Total Arsenic (As)	ug/L	5	1.0	ND	ND	ND
Total Barium (Ba)	ug/L	-	1.0	21	4.8	1.6
Total Beryllium (Be)	ug/L	-	1.0	ND	ND	ND
Total Bismuth (Bi)	ug/L	-	2.0	ND	ND	ND
Total Boron (B)	ug/L	1500	50	170	ND	ND
Total Cadmium (Cd)	ug/L	0.04	0.010	**0.054**	0.032	ND
Total Calcium (Ca)	ug/L	-	100	64000	3900	980
Total Chromium (Cr)	ug/L	-	1.0	12	ND	7.2
Total Cobalt (Co)	ug/L	-	0.40	2.7	1.3	ND
Total Copper (Cu)	ug/L	3.91 / 2 (2)	2.0	**4.4**	**2.6**	ND
Total Iron (Fe)	ug/L	300	50	**930**	**2900**	180
Total Lead (Pb)	ug/L	6.72 / 1 (3)	0.50	0.85	0.89	ND
Total Magnesium (Mg)	ug/L	-	100	5700	1100	570
Total Manganese (Mn)	ug/L	-	2.0	2400	230	6.8
Total Molybdenum (Mo)	ug/L	73	2.0	ND	ND	ND
Total Nickel (Ni)	ug/L	149.4 / 25 (4)	2.0	2.2	ND	ND
Total Phosphorus (P)	ug/L	-	100	ND	180	ND
Total Potassium (K)	ug/L	-	100	6200	480	170
Total Selenium (Se)	ug/L	1	1.0	ND	ND	ND
Total Silver (Ag)	ug/L	0.1	0.10	ND	ND	ND
Total Sodium (Na)	ug/L	-	100	27000	19000	5200
Total Strontium (Sr)	ug/L	-	2.0	160	15	4.9
Total Thallium (Tl)	ug/L	0.8	0.10	ND	ND	ND
Total Tin (Sn)	ug/L	-	2.0	ND	ND	ND
Total Titanium (Ti)	ug/L	-	2.0	20	19	2.6
Total Uranium (U)	ug/L	15	0.10	ND	ND	ND
Total Vanadium (V)	ug/L	-	2.0	ND	ND	ND
Total Zinc (Zn)	ug/L	30	5.0	27	9.7	ND
Total Mercury (Hg)	ug/L	1	0.013	ND	ND	ND

** Guideline refers to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (Updated 2007).*

RDL = Reportable Detection Limit

ND = Not detected

(1) Aluminum guideline: 5 µg/L if pH <6.5; 100 µg/L if pH ≥ 6.5.

(2) Guideline calculated as a function of water hardness. 3.91 µg/L applies to 3073-NH-SW-POND, 2 µg/L applies to 3073-NH-SW-STREAM and 3073-NH-SW-UPSTREAM.

(3) Guideline calculated as a function of water hardness. 6.72 µg/L applies to 3073-NH-SW-POND, 1 µg/L applies to 3073-NH-SW-STREAM and 3073-NH-SW-UPSTREAM.

(4) Guideline calculated as a function of water hardness. 149.4 µg/L applies to 3073-NH-SW-POND, 25 µg/L applies to 3073-NH-SW-STREAM and 3073-NH-SW-UPSTREAM.

Shaded / Bold - Indicates parameter is above applicable criteria

Table 5 Surface water analytical results - polychlorinated biphenyls (PCBs).

Maxxam ID	Units	RDL	Guideline *	BMR013	BMR014	BMR015
Sampling Date				07-Dec-15	07-Dec-15	07-Dec-15
COC Number				540677-01-01	540677-01-01	540677-01-01
Fracflow Sample ID				3073-NH-SW-POND	3073-NH-SW-STREAM	3073-NH-SW-UPSTREAM
PCBs						
Aroclor 1016	ug/L	0.050	-	ND	ND	ND
Aroclor 1221	ug/L	0.050	-	ND	ND	ND
Aroclor 1232	ug/L	0.050	-	ND	ND	ND
Aroclor 1248	ug/L	0.050	-	ND	ND	ND
Aroclor 1242	ug/L	0.050	-	ND	ND	ND
Aroclor 1254	ug/L	0.050	-	ND	ND	ND
Aroclor 1260	ug/L	0.050	-	ND	ND	ND
Calculated Total PCB	ug/L	0.050	-	ND	ND	ND
Surrogate Recovery (%)						
Decachlorobiphenyl	%			69	61 (1)	76

** Guideline refers to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (Updated 2007).*

RDL = Reportable Detection Limit

ND = Not detected

(1) PCB: Unidentified (possibly halogenated) compounds detected.

Shaded / Bold - Indicates parameter is above applicable criteria

Table 6 Volumes of fluid removed during well development.

ID	Date	Ground Surface Elevation	Depth to End of Well	Static Water Level	Groundwater Elevation	Height of Water Column	One Well Volume	Volume Purged	Development Water Condition
		(m amsl)	m BGS	m BGS	(m amsl)	m	L	L	
MW-01	07-Dec-15	120.666	0.71	0.115	120.551	0.60	1.2	3.6	Brown, moderate TSS, no odour/sheens.
MW-02	08-Dec-15	122.201	2.86	2.65	119.556	0.21	0.4	1.5	Light yellow, clear, no odour/sheens.
MW-03	07-Dec-15	101.323	2.66	0.12	101.203	2.54	5.1	15.0	Dark brown, moderate TSS, no odour/sheens.
MW-04	07-Dec-15	117.108	2.49	-0.179	117.287	2.67	5.4	18.0	Brownish-yellow, clear, no odour/sheens.
MW-05A	Replaced in 2013								
MW-05A	07-Dec-15	Not Surveyed	5.04	0.345	---	4.70	9.5	27.0	Dark brown, low-mod TSS, no odour/sheens.
MW-06	07-Dec-15	111.300	1.16	0.06	111.240	1.10	2.2	6.0	Light yellow, clear, no odour/sheens.
MW-07	07-Dec-15	125.215	2.46	0.21	125.005	2.25	4.6	13.5	Brown, moderate TSS, strong bog odour after 1st well volume.
MW-08	07-Dec-15	Not Surveyed	4.81	0.61	---	4.20	8.5	25.5	Light yellow, clear, no odour/sheens.

BGS: Below ground surface.

(-) Negative static water levels indicate water level is above ground surface.

Table 7 Field measurements for groundwater samples.

ID	Date	Weather	pH	Conductivity	Temperature
			pH units	µS/cm	°C
MW-01	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	6.02	43.6	4.5
MW-02	08-Dec-15	Cloudy, 0° C, 10 cm snow cover	6.51	50.8	4.6
MW-03	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	6.78	100.9	6.2
MW-04	07-Dec-15	Cloudy, 5° C, 15 cm snow cover, marsh/bog around well	6.80	202.0	6.8
MW-05A	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	7.58	67.8	6.3
MW-06	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	6.34	165.2	3.3
MW-07	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	5.91	53.0	6.1
MW-08	07-Dec-15	Cloudy, 5° C, 15 cm snow cover	7.32	32.9	2.7

Table 8 Groundwater analytical results - dissolved metals *(Page 1 of 2)* .

Maxxam ID	Units	Guideline *	RDL	BMR016	BMW093	BMR017	BMR018	BMR019
Sampling Date				07-Dec-15	08-Dec-15	07-Dec-15	07-Dec-15	07-Dec-15
COC Number				540677-01-01	540677-01-01	540677-01-01	540677-01-01	540677-01-01
Fracflow Sample ID				3073-NH-MW01	3073-NH-MW02	3073-NH-MW03	3073-NH-MW04	3073-NH-MW05A
Metals								
Dissolved Aluminum (Al)	ug/L	-	5.0	54	51	130	85	360
Dissolved Antimony (Sb)	ug/L	20000	1.0	ND	ND	ND	ND	ND
Dissolved Arsenic (As)	ug/L	1900	1.0	ND	ND	2.8	ND	ND
Dissolved Barium (Ba)	ug/L	29000	1.0	2.8	2.4	5.7	7.3	4.9
Dissolved Beryllium (Be)	ug/L	67	1.0	ND	ND	ND	ND	ND
Dissolved Bismuth (Bi)	ug/L	-	2.0	ND	ND	ND	ND	ND
Dissolved Boron (B)	ug/L	45000	50	ND	ND	ND	ND	ND
Dissolved Cadmium (Cd)	ug/L	2.7	0.010	ND	ND	ND	0.029	0.013
Dissolved Calcium (Ca)	ug/L	-	100	3000	2500	5800	6800	3900
Dissolved Chromium (Cr)	ug/L	810	1.0	ND	ND	ND	ND	ND
Dissolved Cobalt (Co)	ug/L	66	0.40	ND	ND	1.7	3.4	ND
Dissolved Copper (Cu)	ug/L	87	2.0	ND	ND	2.3	3.4	4.9
Dissolved Iron (Fe)	ug/L	-	50	70	ND	1800	660	170
Dissolved Lead (Pb)	ug/L	25	0.50	ND	ND	ND	0.84	0.5
Dissolved Magnesium (Mg)	ug/L	-	100	940	830	1600	1600	1300
Dissolved Manganese (Mn)	ug/L	-	2.0	21	4.6	720	130	7
Dissolved Molybdenum (Mo)	ug/L	9200	2.0	ND	ND	ND	ND	ND
Dissolved Nickel (Ni)	ug/L	490	2.0	ND	ND	ND	ND	ND
Dissolved Phosphorus (P)	ug/L	-	100	ND	ND	ND	ND	ND
Dissolved Potassium (K)	ug/L	-	100	250	260	820	670	360
Dissolved Selenium (Se)	ug/L	63	1.0	ND	ND	ND	ND	ND
Dissolved Silver (Ag)	ug/L	1.5	0.10	ND	ND	ND	ND	ND
Dissolved Sodium (Na)	ug/L	2300000	100	6200	8800	19000	29000	15000
Dissolved Strontium (Sr)	ug/L	-	2.0	11	9	19	23	13
Dissolved Thallium (Tl)	ug/L	510	0.10	ND	ND	ND	ND	ND
Dissolved Tin (Sn)	ug/L	-	2.0	ND	ND	ND	ND	ND
Dissolved Titanium (Ti)	ug/L	-	2.0	ND	2.1	4.4	3.6	5
Dissolved Uranium (U)	ug/L	420	0.10	ND	ND	ND	ND	0.14
Dissolved Vanadium (V)	ug/L	250	2.0	ND	ND	ND	ND	ND
Dissolved Zinc (Zn)	ug/L	1100	5.0	ND	ND	ND	16	5.4
Total Mercury (Hg)	ug/L	0.29	0.013	0.04	ND	0.092	ND	0.022

** Guideline refers to the Ontario Ministry of the Environment (MOE) "Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.*

RDL = Reportable Detection Limit

ND = Not detected

Shaded / Bold - Indicates parameter is above applicable criteria

Table 8 Groundwater analytical results - dissolved metals *(Page 2 of 2)*.

Maxxam ID	Units	Guideline *	RDL	BMR020	BMR024	BMR021	BMR023
Sampling Date				07-Dec-15	07-Dec-15	07-Dec-15	07-Dec-15
COC Number				540677-01-01	540677-02-01	540677-01-01	540677-02-01
Fracflow Sample ID				3073-NH-MW06	3073-NH-MW-DUP1	3073-NH-MW07	3073-NH-MW08
Metals							
Dissolved Aluminum (Al)	ug/L	-	5.0	120	120	2100	1400
Dissolved Antimony (Sb)	ug/L	20000	1.0	ND	ND	ND	ND
Dissolved Arsenic (As)	ug/L	1900	1.0	2.1	1.7	1.4	ND
Dissolved Barium (Ba)	ug/L	29000	1.0	7	7.2	6.7	2.7
Dissolved Beryllium (Be)	ug/L	67	1.0	ND	ND	ND	ND
Dissolved Bismuth (Bi)	ug/L	-	2.0	ND	ND	ND	ND
Dissolved Boron (B)	ug/L	45000	50	ND	ND	ND	ND
Dissolved Cadmium (Cd)	ug/L	2.7	0.010	ND	ND	0.017	ND
Dissolved Calcium (Ca)	ug/L	-	100	13000	13000	4700	1700
Dissolved Chromium (Cr)	ug/L	810	1.0	ND	ND	2.1	ND
Dissolved Cobalt (Co)	ug/L	66	0.40	0.86	1	ND	ND
Dissolved Copper (Cu)	ug/L	87	2.0	ND	2.1	5.3	6.7
Dissolved Iron (Fe)	ug/L	-	50	10000	11000	720	270
Dissolved Lead (Pb)	ug/L	25	0.50	0.52	0.61	1.3	ND
Dissolved Magnesium (Mg)	ug/L	-	100	2500	2500	1300	610
Dissolved Manganese (Mn)	ug/L	-	2.0	350	350	8.8	6
Dissolved Molybdenum (Mo)	ug/L	9200	2.0	ND	ND	ND	ND
Dissolved Nickel (Ni)	ug/L	490	2.0	ND	ND	ND	ND
Dissolved Phosphorus (P)	ug/L	-	100	120	ND	110	ND
Dissolved Potassium (K)	ug/L	-	100	2100	2100	300	230
Dissolved Selenium (Se)	ug/L	63	1.0	ND	ND	ND	ND
Dissolved Silver (Ag)	ug/L	1.5	0.10	ND	ND	ND	0.11
Dissolved Sodium (Na)	ug/L	2300000	100	9500	9200	12000	5600
Dissolved Strontium (Sr)	ug/L	-	2.0	38	38	16	6.7
Dissolved Thallium (Tl)	ug/L	510	0.10	ND	ND	ND	ND
Dissolved Tin (Sn)	ug/L	-	2.0	ND	ND	ND	ND
Dissolved Titanium (Ti)	ug/L	-	2.0	5.2	5.3	52	22
Dissolved Uranium (U)	ug/L	420	0.10	ND	ND	0.23	ND
Dissolved Vanadium (V)	ug/L	250	2.0	ND	ND	2.6	ND
Dissolved Zinc (Zn)	ug/L	1100	5.0	ND	ND	7.1	5.1
Total Mercury (Hg)	ug/L	0.29	0.013	0.053	0.018	0.17	0.025

** Guideline refers to the Ontario Ministry of the Environment (MOE) "Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.*

RDL = Reportable Detection Limit

ND = Not detected

Shaded / Bold - Indicates parameter is above applicable criteria

Table 9 Groundwater analytical results - polychlorinated biphenyls (PCBs) *(Page 1 of 2)*.

Maxxam ID	Units	RDL	Guideline *	BMR016	BMW093	BMR017	BMR018	BMR019
Sampling Date				07-Dec-15	08-Dec-15	07-Dec-15	07-Dec-15	07-Dec-15
COC Number				540677-01-01	540677-01-01	540677-01-01	540677-01-01	540677-01-01
Fracflow Sample ID				3073-NH-MW01	3073-NH-MW02	3073-NH-MW03	3073-NH-MW04	3073-NH-MW05A
PCBs								
Aroclor 1016	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1221	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1232	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1248	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1242	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1254	ug/L	0.050	-	ND	ND	ND	ND	ND
Aroclor 1260	ug/L	0.050	-	ND	ND	ND	ND	ND
Calculated Total PCB	ug/L	0.050	7.8	ND	ND	ND	ND	ND
Surrogate Recovery (%)								
Decachlorobiphenyl	%		-	56 (2)	53	52 (3)	77 (1)	46 (2)

** Guideline refers to the Ontario Ministry of the Environment (MOE) "Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.*

RDL = Reportable Detection Limit

ND = Not detected

(1) PCB:Unidentified (possibly halogenated) compounds detected.

(2) PCB sample contained sediment.

(3) PCB sample contained sediment. PCB:Unidentified (possibly halogenated) compounds detected.

Shaded / Bold - Indicates parameter is above applicable criteria

Table 9 Groundwater analytical results - polychlorinated biphenyls (PCBs) *(Page 2 of 2)*.

Maxxam ID	**Units**	**RDL**	**Guideline ***	BMR020	BMR024	BMR021	BMR023	
Sampling Date				07-Dec-15	07-Dec-15	07-Dec-15	07-Dec-15	
COC Number				540677-01-01	540677-02-01	540677-01-01	540677-02-01	
Fracflow Sample ID				3073-NH-MW06	3073-NH-MW-DUP1	3073-NH-MW07	3073-NH-MW08	
PCBs								
Aroclor 1016	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1221	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1232	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1248	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1242	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1254	ug/L	0.050	-	ND	ND	ND	ND	
Aroclor 1260	ug/L	0.050	-	ND	ND	ND	ND	
Calculated Total PCB	ug/L	0.050	7.8	ND	ND	ND	ND	
Surrogate Recovery (%)								
Decachlorobiphenyl	%		-	43 (3)	53 (3)	35 (3)	40	

** Guideline refers to the Ontario Ministry of the Environment (MOE) "Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.*

RDL = Reportable Detection Limit

ND = Not detected

(1) PCB:Unidentified (possibly halogenated) compounds detected.

(2) PCB sample contained sediment.

(3) PCB sample contained sediment. PCB:Unidentified (possibly halogenated) compounds detected.

Shaded / Bold - Indicates parameter is above applicable criteria

APPENDIX C

Laboratory Analytical Reports

Site Location: NEW HARBOUR
Your C.O.C. #: 540677-01-01, 540677-02-01

Attention:Ingrid Lawlor

Fracflow Consultants Inc
154 Major's Path
St. John's, NL
A1A 5A1

Report Date: 2015/12/16
Report #: R3809012
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5P4044
Received: 2015/12/09, 11:01

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	3	N/A	2015/12/14	N/A	SM 22 4500-CO2 D
Alkalinity (1)	3	N/A	2015/12/15	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	3	N/A	2015/12/15	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	3	N/A	2015/12/14	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	3	N/A	2015/12/11	ATL SOP 00004	SM 22 2510B m
Hardness (calculated as CaCO3) (1)	2	N/A	2015/12/15	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3) (1)	1	N/A	2015/12/16	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	11	2015/12/14	2015/12/14	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Diss. MS (as rec'd) (1)	7	N/A	2015/12/11	ATL SOP 00058	EPA 6020A R1 m
Metals Water Diss. MS (as rec'd) (1)	1	N/A	2015/12/14	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	2	2015/12/14	2015/12/14	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	1	2015/12/14	2015/12/15	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	3	N/A	2015/12/16		Auto Calc.
Anion and Cation Sum (1)	3	N/A	2015/12/16		Auto Calc.
Nitrogen Ammonia - water (1)	3	N/A	2015/12/15	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	3	N/A	2015/12/15	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	3	N/A	2015/12/14	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	3	N/A	2015/12/16	ATL SOP 00018	ASTM D3867
PCBs in water by GC/ECD (1)	11	2015/12/14	2015/12/15	ATL SOP 00107	EPA 8082A m
PCB Aroclor sum (water) (1)	11	N/A	2015/12/15		Auto Calc.
pH (1, 2)	3	N/A	2015/12/11	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	3	N/A	2015/12/16	ATL SOP 00021	EPA 365.2 m
Sat. pH and Langelier Index (@ 20C) (1)	1	N/A	2015/12/15	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C) (1)	2	N/A	2015/12/16	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	1	N/A	2015/12/15	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	2	N/A	2015/12/16	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	2	N/A	2015/12/14	ATL SOP 00022	EPA 366.0 m
Reactive Silica (1)	1	N/A	2015/12/15	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	3	N/A	2015/12/14	ATL SOP 00023	EPA 375.4 R1978 m
Total Dissolved Solids (TDS calc) (1)	3	N/A	2015/12/16		Auto Calc.

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Site Location: NEW HARBOUR
Your C.O.C. #: 540677-01-01, 540677-02-01

Attention:Ingrid Lawlor

Fracflow Consultants Inc
154 Major's Path
St. John's, NL
A1A 5A1

Report Date: 2015/12/16
Report #: R3809012
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5P4044
Received: 2015/12/09, 11:01

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Organic carbon - Total (TOC) (1, 3)	3	N/A	2015/12/16	ATL SOP 00037	SM 22 5310C m
Turbidity (1)	3	N/A	2015/12/14	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Bedford
(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		BMR013			BMR014		
Sampling Date		2015/12/07			2015/12/07		
COC Number		540677-01-01			540677-01-01		
	UNITS	**3073-NH-SW-POND**	**RDL**	**QC Batch**	**3073-NH-SW-STREAM**	**RDL**	**QC Batch**
Calculated Parameters							
Anion Sum	me/L	5.75	N/A	4306837	1.08	N/A	4306837
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	160	1.0	4306833	27	1.0	4306833
Calculated TDS	mg/L	330	1.0	4306842	70	1.0	4306842
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4306833	ND	1.0	4306833
Cation Sum	me/L	5.30	N/A	4306837	1.25	N/A	4306837
Hardness (CaCO3)	mg/L	180	1.0	4306835	14	1.0	4306835
Ion Balance (% Difference)	%	4.07	N/A	4306836	7.30	N/A	4306836
Langelier Index (@ 20C)	N/A	0.271		4306840	-2.48		4306840
Langelier Index (@ 4C)	N/A	0.0220		4306841	-2.73		4306841
Nitrate (N)	mg/L	3.3	0.050	4306838	0.16	0.050	4306838
Saturation pH (@ 20C)	N/A	7.41		4306840	9.30		4306840
Saturation pH (@ 4C)	N/A	7.66		4306841	9.55		4306841
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	160	25	4309446	27	5.0	4309446
Dissolved Chloride (Cl)	mg/L	29	1.0	4309480	17	1.0	4309480
Colour	TCU	14	5.0	4309491	76	25	4309491
Nitrate + Nitrite (N)	mg/L	3.3	0.050	4309506	0.16	0.050	4309506
Nitrite (N)	mg/L	0.019	0.010	4309512	ND	0.010	4309512
Nitrogen (Ammonia Nitrogen)	mg/L	3.6	0.25	4312184	ND	0.050	4312184
Total Organic Carbon (C)	mg/L	8.0 (1)	2.5	4314078	8.7 (1)	5.0	4314078
Orthophosphate (P)	mg/L	ND	0.010	4309498	ND	0.010	4309498
pH	pH	7.68	N/A	4309265	6.82	N/A	4309265
Reactive Silica (SiO2)	mg/L	6.8	0.50	4309489	5.5	0.50	4309489
Dissolved Sulphate (SO4)	mg/L	68	10	4309483	2.5	2.0	4309483
Turbidity	NTU	4.6	0.10	4312208	30	0.10	4312223
Conductivity	uS/cm	490	1.0	4309271	99	1.0	4309271
Metals							
Total Aluminum (Al)	ug/L	210	5.0	4311572	610	5.0	4311572
Total Antimony (Sb)	ug/L	ND	1.0	4311572	ND	1.0	4311572
Total Arsenic (As)	ug/L	ND	1.0	4311572	ND	1.0	4311572
Total Barium (Ba)	ug/L	21	1.0	4311572	4.8	1.0	4311572
Total Beryllium (Be)	ug/L	ND	1.0	4311572	ND	1.0	4311572
Total Bismuth (Bi)	ug/L	ND	2.0	4311572	ND	2.0	4311572

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Reporting limit was increased due to turbidity.

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		BMR013			BMR014		
Sampling Date		2015/12/07			2015/12/07		
COC Number		540677-01-01			540677-01-01		
	UNITS	**3073-NH-SW-POND**	**RDL**	**QC Batch**	**3073-NH-SW-STREAM**	**RDL**	**QC Batch**
Total Boron (B)	ug/L	170	50	4311572	ND	50	4311572
Total Cadmium (Cd)	ug/L	0.054	0.010	4311572	0.032	0.010	4311572
Total Calcium (Ca)	ug/L	64000	100	4311572	3900	100	4311572
Total Chromium (Cr)	ug/L	12	1.0	4311572	ND	1.0	4311572
Total Cobalt (Co)	ug/L	2.7	0.40	4311572	1.3	0.40	4311572
Total Copper (Cu)	ug/L	4.4	2.0	4311572	2.6	2.0	4311572
Total Iron (Fe)	ug/L	930	50	4311572	2900	50	4311572
Total Lead (Pb)	ug/L	0.85	0.50	4311572	0.89	0.50	4311572
Total Magnesium (Mg)	ug/L	5700	100	4311572	1100	100	4311572
Total Manganese (Mn)	ug/L	2400	2.0	4311572	230	2.0	4311572
Total Molybdenum (Mo)	ug/L	ND	2.0	4311572	ND	2.0	4311572
Total Nickel (Ni)	ug/L	2.2	2.0	4311572	ND	2.0	4311572
Total Phosphorus (P)	ug/L	ND	100	4311572	180	100	4311572
Total Potassium (K)	ug/L	6200	100	4311572	480	100	4311572
Total Selenium (Se)	ug/L	ND	1.0	4311572	ND	1.0	4311572
Total Silver (Ag)	ug/L	ND	0.10	4311572	ND	0.10	4311572
Total Sodium (Na)	ug/L	27000	100	4311572	19000	100	4311572
Total Strontium (Sr)	ug/L	160	2.0	4311572	15	2.0	4311572
Total Thallium (Tl)	ug/L	ND	0.10	4311572	ND	0.10	4311572
Total Tin (Sn)	ug/L	ND	2.0	4311572	ND	2.0	4311572
Total Titanium (Ti)	ug/L	20	2.0	4311572	19	2.0	4311572
Total Uranium (U)	ug/L	ND	0.10	4311572	ND	0.10	4311572
Total Vanadium (V)	ug/L	ND	2.0	4311572	ND	2.0	4311572
Total Zinc (Zn)	ug/L	27	5.0	4311572	9.7	5.0	4311572

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		BMR015		
Sampling Date		2015/12/07		
COC Number		540677-01-01		
	UNITS	**3073-NH-SW-UPSTREAM**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	0.230	N/A	4306837
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4306833
Calculated TDS	mg/L	18	1.0	4306842
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4306833
Cation Sum	me/L	0.330	N/A	4306837
Hardness (CaCO3)	mg/L	4.8	1.0	4306835
Ion Balance (% Difference)	%	17.9	N/A	4306836
Langelier Index (@ 20C)	N/A	NC		4306840
Langelier Index (@ 4C)	N/A	NC		4306841
Nitrate (N)	mg/L	0.071	0.050	4306838
Saturation pH (@ 20C)	N/A	NC		4306840
Saturation pH (@ 4C)	N/A	NC		4306841
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	ND	5.0	4309446
Dissolved Chloride (Cl)	mg/L	7.9	1.0	4309480
Colour	TCU	56	25	4309491
Nitrate + Nitrite (N)	mg/L	0.071	0.050	4309506
Nitrite (N)	mg/L	ND	0.010	4309512
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	4312184
Total Organic Carbon (C)	mg/L	7.7	0.50	4314078
Orthophosphate (P)	mg/L	ND	0.010	4309498
pH	pH	6.25	N/A	4309265
Reactive Silica (SiO2)	mg/L	2.5	0.50	4309489
Dissolved Sulphate (SO4)	mg/L	ND	2.0	4309483
Turbidity	NTU	1.1	0.10	4312208
Conductivity	uS/cm	32	1.0	4309271
Metals				
Total Aluminum (Al)	ug/L	230	5.0	4311578
Total Antimony (Sb)	ug/L	ND	1.0	4311578
Total Arsenic (As)	ug/L	ND	1.0	4311578
Total Barium (Ba)	ug/L	1.6	1.0	4311578
Total Beryllium (Be)	ug/L	ND	1.0	4311578
Total Bismuth (Bi)	ug/L	ND	2.0	4311578

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		BMR015		
Sampling Date		2015/12/07		
COC Number		540677-01-01		
	UNITS	**3073-NH-SW-UPSTREAM**	**RDL**	**QC Batch**
Total Boron (B)	ug/L	ND	50	4311578
Total Cadmium (Cd)	ug/L	ND	0.010	4311578
Total Calcium (Ca)	ug/L	980	100	4311578
Total Chromium (Cr)	ug/L	7.2	1.0	4311578
Total Cobalt (Co)	ug/L	ND	0.40	4311578
Total Copper (Cu)	ug/L	ND	2.0	4311578
Total Iron (Fe)	ug/L	180	50	4311578
Total Lead (Pb)	ug/L	ND	0.50	4311578
Total Magnesium (Mg)	ug/L	570	100	4311578
Total Manganese (Mn)	ug/L	6.8	2.0	4311578
Total Molybdenum (Mo)	ug/L	ND	2.0	4311578
Total Nickel (Ni)	ug/L	ND	2.0	4311578
Total Phosphorus (P)	ug/L	ND	100	4311578
Total Potassium (K)	ug/L	170	100	4311578
Total Selenium (Se)	ug/L	ND	1.0	4311578
Total Silver (Ag)	ug/L	ND	0.10	4311578
Total Sodium (Na)	ug/L	5200	100	4311578
Total Strontium (Sr)	ug/L	4.9	2.0	4311578
Total Thallium (Tl)	ug/L	ND	0.10	4311578
Total Tin (Sn)	ug/L	ND	2.0	4311578
Total Titanium (Ti)	ug/L	2.6	2.0	4311578
Total Uranium (U)	ug/L	ND	0.10	4311578
Total Vanadium (V)	ug/L	ND	2.0	4311578
Total Zinc (Zn)	ug/L	ND	5.0	4311578

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		BMR013	BMR014	BMR015	BMR016		
Sampling Date		2015/12/07	2015/12/07	2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01	540677-01-01	540677-01-01		
	UNITS	**3073-NH-SW-POND**	**3073-NH-SW-STREAM**	**3073-NH-SW-UPSTREAM**	**3073-NH-MW01**	**RDL**	**QC Batch**
Metals							
Total Mercury (Hg)	ug/L	ND	ND	ND	0.040	0.013	4311574

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		BMR017	BMR018	BMR019	BMR020	BMR021		
Sampling Date		2015/12/07	2015/12/07	2015/12/07	2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01	540677-01-01	540677-01-01	540677-01-01		
	UNITS	**3073-NH-MW03**	**3073-NH-MW04**	**3073-NH-MW05A**	**3073-NH-MW06**	**3073-NH-MW07**	**RDL**	**QC Batch**
Metals								
Total Mercury (Hg)	ug/L	0.092	ND	0.022	0.053	0.17	0.013	4311574

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		BMR023	BMR024		
Sampling Date		2015/12/07	2015/12/07		
COC Number		540677-02-01	540677-02-01		
	UNITS	**3073-NH-MW08**	**3073-NH-MW-DUP1**	**RDL**	**QC Batch**
Metals					
Total Mercury (Hg)	ug/L	0.025	0.018	0.013	4311574

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		BMR016	BMR017		BMR018	BMR019		
Sampling Date		2015/12/07	2015/12/07		2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01		540677-01-01	540677-01-01		
	UNITS	**3073-NH-MW01**	**3073-NH-MW03**	**QC Batch**	**3073-NH-MW04**	**3073-NH-MW05A**	**RDL**	**QC Batch**
Metals								
Dissolved Aluminum (Al)	ug/L	54	130	4308821	85	360	5.0	4308824
Dissolved Antimony (Sb)	ug/L	ND	ND	4308821	ND	ND	1.0	4308824
Dissolved Arsenic (As)	ug/L	ND	2.8	4308821	ND	ND	1.0	4308824
Dissolved Barium (Ba)	ug/L	2.8	5.7	4308821	7.3	4.9	1.0	4308824
Dissolved Beryllium (Be)	ug/L	ND	ND	4308821	ND	ND	1.0	4308824
Dissolved Bismuth (Bi)	ug/L	ND	ND	4308821	ND	ND	2.0	4308824
Dissolved Boron (B)	ug/L	ND	ND	4308821	ND	ND	50	4308824
Dissolved Cadmium (Cd)	ug/L	ND	ND	4308821	0.029	0.013	0.010	4308824
Dissolved Calcium (Ca)	ug/L	3000	5800	4308821	6800	3900	100	4308824
Dissolved Chromium (Cr)	ug/L	ND	ND	4308821	ND	ND	1.0	4308824
Dissolved Cobalt (Co)	ug/L	ND	1.7	4308821	3.4	ND	0.40	4308824
Dissolved Copper (Cu)	ug/L	ND	2.3	4308821	3.4	4.9	2.0	4308824
Dissolved Iron (Fe)	ug/L	70	1800	4308821	660	170	50	4308824
Dissolved Lead (Pb)	ug/L	ND	ND	4308821	0.84	0.50	0.50	4308824
Dissolved Magnesium (Mg)	ug/L	940	1600	4308821	1600	1300	100	4308824
Dissolved Manganese (Mn)	ug/L	21	720	4308821	130	7.0	2.0	4308824
Dissolved Molybdenum (Mo)	ug/L	ND	ND	4308821	ND	ND	2.0	4308824
Dissolved Nickel (Ni)	ug/L	ND	ND	4308821	ND	ND	2.0	4308824
Dissolved Phosphorus (P)	ug/L	ND	ND	4308821	ND	ND	100	4308824
Dissolved Potassium (K)	ug/L	250	820	4308821	670	360	100	4308824
Dissolved Selenium (Se)	ug/L	ND	ND	4308821	ND	ND	1.0	4308824
Dissolved Silver (Ag)	ug/L	ND	ND	4308821	ND	ND	0.10	4308824
Dissolved Sodium (Na)	ug/L	6200	19000	4308821	29000	15000	100	4308824
Dissolved Strontium (Sr)	ug/L	11	19	4308821	23	13	2.0	4308824
Dissolved Thallium (Tl)	ug/L	ND	ND	4308821	ND	ND	0.10	4308824
Dissolved Tin (Sn)	ug/L	ND	ND	4308821	ND	ND	2.0	4308824
Dissolved Titanium (Ti)	ug/L	ND	4.4	4308821	3.6	5.0	2.0	4308824
Dissolved Uranium (U)	ug/L	ND	ND	4308821	ND	0.14	0.10	4308824
Dissolved Vanadium (V)	ug/L	ND	ND	4308821	ND	ND	2.0	4308824
Dissolved Zinc (Zn)	ug/L	ND	ND	4308821	16	5.4	5.0	4308824

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		BMR020	BMR021	BMR023	BMR024		
Sampling Date		2015/12/07	2015/12/07	2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01	540677-02-01	540677-02-01		
	UNITS	**3073-NH-MW06**	**3073-NH-MW07**	**3073-NH-MW08**	**3073-NH-MW-DUP1**	**RDL**	**QC Batch**
Metals							
Dissolved Aluminum (Al)	ug/L	120	2100	1400	120	5.0	4308824
Dissolved Antimony (Sb)	ug/L	ND	ND	ND	ND	1.0	4308824
Dissolved Arsenic (As)	ug/L	2.1	1.4	ND	1.7	1.0	4308824
Dissolved Barium (Ba)	ug/L	7.0	6.7	2.7	7.2	1.0	4308824
Dissolved Beryllium (Be)	ug/L	ND	ND	ND	ND	1.0	4308824
Dissolved Bismuth (Bi)	ug/L	ND	ND	ND	ND	2.0	4308824
Dissolved Boron (B)	ug/L	ND	ND	ND	ND	50	4308824
Dissolved Cadmium (Cd)	ug/L	ND	0.017	ND	ND	0.010	4308824
Dissolved Calcium (Ca)	ug/L	13000	4700	1700	13000	100	4308824
Dissolved Chromium (Cr)	ug/L	ND	2.1	ND	ND	1.0	4308824
Dissolved Cobalt (Co)	ug/L	0.86	ND	ND	1.0	0.40	4308824
Dissolved Copper (Cu)	ug/L	ND	5.3	6.7	2.1	2.0	4308824
Dissolved Iron (Fe)	ug/L	10000	720	270	11000	50	4308824
Dissolved Lead (Pb)	ug/L	0.52	1.3	ND	0.61	0.50	4308824
Dissolved Magnesium (Mg)	ug/L	2500	1300	610	2500	100	4308824
Dissolved Manganese (Mn)	ug/L	350	8.8	6.0	350	2.0	4308824
Dissolved Molybdenum (Mo)	ug/L	ND	ND	ND	ND	2.0	4308824
Dissolved Nickel (Ni)	ug/L	ND	ND	ND	ND	2.0	4308824
Dissolved Phosphorus (P)	ug/L	120	110	ND	ND	100	4308824
Dissolved Potassium (K)	ug/L	2100	300	230	2100	100	4308824
Dissolved Selenium (Se)	ug/L	ND	ND	ND	ND	1.0	4308824
Dissolved Silver (Ag)	ug/L	ND	ND	0.11	ND	0.10	4308824
Dissolved Sodium (Na)	ug/L	9500	12000	5600	9200	100	4308824
Dissolved Strontium (Sr)	ug/L	38	16	6.7	38	2.0	4308824
Dissolved Thallium (Tl)	ug/L	ND	ND	ND	ND	0.10	4308824
Dissolved Tin (Sn)	ug/L	ND	ND	ND	ND	2.0	4308824
Dissolved Titanium (Ti)	ug/L	5.2	52	22	5.3	2.0	4308824
Dissolved Uranium (U)	ug/L	ND	0.23	ND	ND	0.10	4308824
Dissolved Vanadium (V)	ug/L	ND	2.6	ND	ND	2.0	4308824
Dissolved Zinc (Zn)	ug/L	ND	7.1	5.1	ND	5.0	4308824

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5P4044
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Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		BMR013	BMR014	BMR015	BMR016		
Sampling Date		2015/12/07	2015/12/07	2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01	540677-01-01	540677-01-01		
	UNITS	**3073-NH-SW-POND**	**3073-NH-SW-STREAM**	**3073-NH-SW-UPSTREAM**	**3073-NH-MW01**	**RDL**	**QC Batch**
PCBs							
Aroclor 1016	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1221	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1232	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1248	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1242	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1254	ug/L	ND	ND	ND	ND	0.050	4311587
Aroclor 1260	ug/L	ND	ND	ND	ND	0.050	4311587
Calculated Total PCB	ug/L	ND	ND	ND	ND	0.050	4307183
Surrogate Recovery (%)							
Decachlorobiphenyl	%	69	61 (1)	76	56 (2)		4311587

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) PCB:Unidentified (possibly halogenated) compounds detected.
(2) PCB sample contained sediment.

Maxxam ID		BMR017	BMR018	BMR019	BMR020	BMR021		
Sampling Date		2015/12/07	2015/12/07	2015/12/07	2015/12/07	2015/12/07		
COC Number		540677-01-01	540677-01-01	540677-01-01	540677-01-01	540677-01-01		
	UNITS	**3073-NH-MW03**	**3073-NH-MW04**	**3073-NH-MW05A**	**3073-NH-MW06**	**3073-NH-MW07**	**RDL**	**QC Batch**
PCBs								
Aroclor 1016	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1221	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1232	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1248	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1242	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1254	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Aroclor 1260	ug/L	ND	ND	ND	ND	ND	0.050	4311587
Calculated Total PCB	ug/L	ND	ND	ND	ND	ND	0.050	4307183
Surrogate Recovery (%)								
Decachlorobiphenyl	%	52 (1)	77 (2)	46 (3)	43 (1)	35 (1)		4311587

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) PCB sample contained sediment. PCB:Unidentified (possibly halogenated) compounds detected.

(2) PCB:Unidentified (possibly halogenated) compounds detected.
(3) PCB sample contained sediment.

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		BMR023	BMR024		
Sampling Date		2015/12/07	2015/12/07		
COC Number		540677-02-01	540677-02-01		
	UNITS	**3073-NH-MW08**	**3073-NH-MW-DUP1**	**RDL**	**QC Batch**
PCBs					
Aroclor 1016	ug/L	ND	ND	0.050	4311587
Aroclor 1221	ug/L	ND	ND	0.050	4311587
Aroclor 1232	ug/L	ND	ND	0.050	4311587
Aroclor 1248	ug/L	ND	ND	0.050	4311587
Aroclor 1242	ug/L	ND	ND	0.050	4311587
Aroclor 1254	ug/L	ND	ND	0.050	4311587
Aroclor 1260	ug/L	ND	ND	0.050	4311587
Calculated Total PCB	ug/L	ND	ND	0.050	4307183
Surrogate Recovery (%)					
Decachlorobiphenyl	%	40	53 (1)		4311587

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) PCB sample contained sediment. PCB:Unidentified (possibly halogenated) compounds detected.

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Sample BMR014-01 : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample BMR015-01 : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

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Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4308821	BAN	Matrix Spike	Dissolved Aluminum (Al)	2015/12/11		105	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/11		101	%	80 - 120
			Dissolved Arsenic (As)	2015/12/11		101	%	80 - 120
			Dissolved Barium (Ba)	2015/12/11		97	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/11		98	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/11		102	%	80 - 120
			Dissolved Boron (B)	2015/12/11		99	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/11		102	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/11		NC	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/11		101	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/11		102	%	80 - 120
			Dissolved Copper (Cu)	2015/12/11		100	%	80 - 120
			Dissolved Iron (Fe)	2015/12/11		107	%	80 - 120
			Dissolved Lead (Pb)	2015/12/11		99	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/11		NC	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/11		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/11		104	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/11		101	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/11		110	%	80 - 120
			Dissolved Potassium (K)	2015/12/11		NC	%	80 - 120
			Dissolved Selenium (Se)	2015/12/11		102	%	80 - 120
			Dissolved Silver (Ag)	2015/12/11		93	%	80 - 120
			Dissolved Sodium (Na)	2015/12/11		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/11		NC	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/11		102	%	80 - 120
			Dissolved Tin (Sn)	2015/12/11		108	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/11		109	%	80 - 120
			Dissolved Uranium (U)	2015/12/11		109	%	80 - 120
			Dissolved Vanadium (V)	2015/12/11		103	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/11		102	%	80 - 120
4308821	BAN	Spiked Blank	Dissolved Aluminum (Al)	2015/12/11		107	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/11		100	%	80 - 120
			Dissolved Arsenic (As)	2015/12/11		100	%	80 - 120
			Dissolved Barium (Ba)	2015/12/11		98	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/11		98	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/11		104	%	80 - 120
			Dissolved Boron (B)	2015/12/11		99	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/11		102	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/11		105	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/11		101	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/11		102	%	80 - 120
			Dissolved Copper (Cu)	2015/12/11		102	%	80 - 120
			Dissolved Iron (Fe)	2015/12/11		107	%	80 - 120
			Dissolved Lead (Pb)	2015/12/11		101	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/11		109	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/11		104	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/11		104	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/11		104	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/11		108	%	80 - 120
			Dissolved Potassium (K)	2015/12/11		105	%	80 - 120
			Dissolved Selenium (Se)	2015/12/11		101	%	80 - 120
			Dissolved Silver (Ag)	2015/12/11		101	%	80 - 120
			Dissolved Sodium (Na)	2015/12/11		108	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2015/12/11		102	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/11		103	%	80 - 120
			Dissolved Tin (Sn)	2015/12/11		106	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/11		108	%	80 - 120
			Dissolved Uranium (U)	2015/12/11		109	%	80 - 120
			Dissolved Vanadium (V)	2015/12/11		101	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/11		103	%	80 - 120
4308821	BAN	Method Blank	Dissolved Aluminum (Al)	2015/12/11	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Arsenic (As)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Bismuth (Bi)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Boron (B)	2015/12/11	ND, RDL=50		ug/L	
			Dissolved Cadmium (Cd)	2015/12/11	ND, RDL=0.010		ug/L	
			Dissolved Calcium (Ca)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Chromium (Cr)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Cobalt (Co)	2015/12/11	ND, RDL=0.40		ug/L	
			Dissolved Copper (Cu)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Iron (Fe)	2015/12/11	ND, RDL=50		ug/L	
			Dissolved Lead (Pb)	2015/12/11	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Manganese (Mn)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Nickel (Ni)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Phosphorus (P)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Selenium (Se)	2015/12/11	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silver (Ag)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Thallium (Tl)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Tin (Sn)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Titanium (Ti)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Uranium (U)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Zinc (Zn)	2015/12/11	ND, RDL=5.0		ug/L	
4308821	BAN	RPD	Dissolved Chromium (Cr)	2015/12/11	NC		%	20
			Dissolved Copper (Cu)	2015/12/11	NC		%	20
			Dissolved Iron (Fe)	2015/12/11	NC		%	20
			Dissolved Nickel (Ni)	2015/12/11	NC		%	20
			Dissolved Zinc (Zn)	2015/12/11	NC		%	20
4308824	MLB	Matrix Spike [BMR018-02]	Dissolved Aluminum (Al)	2015/12/11		108	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/11		102	%	80 - 120
			Dissolved Arsenic (As)	2015/12/11		100	%	80 - 120
			Dissolved Barium (Ba)	2015/12/11		97	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/11		99	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/11		101	%	80 - 120
			Dissolved Boron (B)	2015/12/11		99	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/11		104	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/11		104	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/11		101	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/11		101	%	80 - 120
			Dissolved Copper (Cu)	2015/12/11		101	%	80 - 120
			Dissolved Iron (Fe)	2015/12/11		NC	%	80 - 120
			Dissolved Lead (Pb)	2015/12/11		99	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/11		109	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/11		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/11		105	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/11		102	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/11		108	%	80 - 120
			Dissolved Potassium (K)	2015/12/11		106	%	80 - 120
			Dissolved Selenium (Se)	2015/12/11		102	%	80 - 120
			Dissolved Silver (Ag)	2015/12/11		95	%	80 - 120
			Dissolved Sodium (Na)	2015/12/11		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/11		100	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/11		102	%	80 - 120
			Dissolved Tin (Sn)	2015/12/11		105	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/11		105	%	80 - 120
			Dissolved Uranium (U)	2015/12/11		110	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Vanadium (V)	2015/12/11		102	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/11		104	%	80 - 120
4308824	MLB	Spiked Blank	Dissolved Aluminum (Al)	2015/12/11		106	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/11		100	%	80 - 120
			Dissolved Arsenic (As)	2015/12/11		97	%	80 - 120
			Dissolved Barium (Ba)	2015/12/11		97	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/11		98	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/11		103	%	80 - 120
			Dissolved Boron (B)	2015/12/11		97	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/11		103	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/11		105	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/11		100	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/11		102	%	80 - 120
			Dissolved Copper (Cu)	2015/12/11		102	%	80 - 120
			Dissolved Iron (Fe)	2015/12/11		107	%	80 - 120
			Dissolved Lead (Pb)	2015/12/11		100	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/11		111	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/11		102	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/11		102	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/11		103	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/11		108	%	80 - 120
			Dissolved Potassium (K)	2015/12/11		106	%	80 - 120
			Dissolved Selenium (Se)	2015/12/11		101	%	80 - 120
			Dissolved Silver (Ag)	2015/12/11		103	%	80 - 120
			Dissolved Sodium (Na)	2015/12/11		108	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/11		101	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/11		103	%	80 - 120
			Dissolved Tin (Sn)	2015/12/11		105	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/11		104	%	80 - 120
			Dissolved Uranium (U)	2015/12/11		111	%	80 - 120
			Dissolved Vanadium (V)	2015/12/11		101	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/11		103	%	80 - 120
4308824	MLB	Method Blank	Dissolved Aluminum (Al)	2015/12/11	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Arsenic (As)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Bismuth (Bi)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Boron (B)	2015/12/11	ND, RDL=50		ug/L	
			Dissolved Cadmium (Cd)	2015/12/11	ND, RDL=0.010		ug/L	
			Dissolved Calcium (Ca)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Chromium (Cr)	2015/12/11	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Cobalt (Co)	2015/12/11	ND, RDL=0.40		ug/L	
			Dissolved Copper (Cu)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Iron (Fe)	2015/12/11	ND, RDL=50		ug/L	
			Dissolved Lead (Pb)	2015/12/11	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Manganese (Mn)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Nickel (Ni)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Phosphorus (P)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Selenium (Se)	2015/12/11	ND, RDL=1.0		ug/L	
			Dissolved Silver (Ag)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2015/12/11	ND, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Thallium (Tl)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Tin (Sn)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Titanium (Ti)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Uranium (U)	2015/12/11	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2015/12/11	ND, RDL=2.0		ug/L	
			Dissolved Zinc (Zn)	2015/12/11	ND, RDL=5.0		ug/L	
4308824	MLB	RPD [BMR018-02]	Dissolved Aluminum (Al)	2015/12/11	8.5		%	20
			Dissolved Antimony (Sb)	2015/12/11	NC		%	20
			Dissolved Arsenic (As)	2015/12/11	NC		%	20
			Dissolved Barium (Ba)	2015/12/11	1.7		%	20
			Dissolved Beryllium (Be)	2015/12/11	NC		%	20
			Dissolved Bismuth (Bi)	2015/12/11	NC		%	20
			Dissolved Boron (B)	2015/12/11	NC		%	20
			Dissolved Cadmium (Cd)	2015/12/11	NC		%	20
			Dissolved Calcium (Ca)	2015/12/11	0.27		%	20
			Dissolved Chromium (Cr)	2015/12/11	NC		%	20
			Dissolved Cobalt (Co)	2015/12/11	2.4		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Copper (Cu)	2015/12/11	NC		%	20
			Dissolved Iron (Fe)	2015/12/11	0.61		%	20
			Dissolved Lead (Pb)	2015/12/11	NC		%	20
			Dissolved Magnesium (Mg)	2015/12/11	0.40		%	20
			Dissolved Manganese (Mn)	2015/12/11	1.7		%	20
			Dissolved Molybdenum (Mo)	2015/12/11	NC		%	20
			Dissolved Nickel (Ni)	2015/12/11	NC		%	20
			Dissolved Phosphorus (P)	2015/12/11	NC		%	20
			Dissolved Potassium (K)	2015/12/11	2.4		%	20
			Dissolved Selenium (Se)	2015/12/11	NC		%	20
			Dissolved Silver (Ag)	2015/12/11	NC		%	20
			Dissolved Sodium (Na)	2015/12/11	0.68		%	20
			Dissolved Strontium (Sr)	2015/12/11	1.5		%	20
			Dissolved Thallium (Tl)	2015/12/11	NC		%	20
			Dissolved Tin (Sn)	2015/12/11	NC		%	20
			Dissolved Titanium (Ti)	2015/12/11	NC		%	20
			Dissolved Uranium (U)	2015/12/11	NC		%	20
			Dissolved Vanadium (V)	2015/12/11	NC		%	20
			Dissolved Zinc (Zn)	2015/12/11	NC		%	20
4309265	TMO	QC Standard	pH	2015/12/11		100	%	97 - 103
4309265	TMO	RPD	pH	2015/12/11	1.1		%	N/A
4309271	TMO	Spiked Blank	Conductivity	2015/12/11		98	%	80 - 120
4309271	TMO	Method Blank	Conductivity	2015/12/11	1.2, RDL=1.0		uS/cm	
4309271	TMO	RPD	Conductivity	2015/12/11	1.6		%	25
4309446	ARS	Matrix Spike	Total Alkalinity (Total as CaCO3)	2015/12/15		84	%	80 - 120
4309446	ARS	Spiked Blank	Total Alkalinity (Total as CaCO3)	2015/12/15		114	%	80 - 120
4309446	ARS	Method Blank	Total Alkalinity (Total as CaCO3)	2015/12/15	ND, RDL=5.0		mg/L	
4309446	ARS	RPD	Total Alkalinity (Total as CaCO3)	2015/12/15	NC		%	25
4309480	ARS	Matrix Spike	Dissolved Chloride (Cl)	2015/12/15		100	%	80 - 120
4309480	ARS	QC Standard	Dissolved Chloride (Cl)	2015/12/15		109	%	80 - 120
4309480	ARS	Spiked Blank	Dissolved Chloride (Cl)	2015/12/15		100	%	80 - 120
4309480	ARS	Method Blank	Dissolved Chloride (Cl)	2015/12/15	ND, RDL=1.0		mg/L	
4309480	ARS	RPD	Dissolved Chloride (Cl)	2015/12/15	NC		%	25
4309483	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2015/12/14		NC	%	80 - 120
4309483	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2015/12/14		100	%	80 - 120
4309483	MCN	Method Blank	Dissolved Sulphate (SO4)	2015/12/14	ND, RDL=2.0		mg/L	
4309483	MCN	RPD	Dissolved Sulphate (SO4)	2015/12/14	0.087		%	25
4309489	ARS	Matrix Spike	Reactive Silica (SiO2)	2015/12/14		NC	%	80 - 120
4309489	ARS	Spiked Blank	Reactive Silica (SiO2)	2015/12/14		98	%	80 - 120
4309489	ARS	Method Blank	Reactive Silica (SiO2)	2015/12/14	ND, RDL=0.50		mg/L	
4309489	ARS	RPD	Reactive Silica (SiO2)	2015/12/14	5.1		%	25
4309491	MCN	Spiked Blank	Colour	2015/12/14		97	%	80 - 120
4309491	MCN	Method Blank	Colour	2015/12/14	ND, RDL=5.0		TCU	
4309491	MCN	RPD	Colour	2015/12/14	NC		%	20
4309498	ARS	Matrix Spike	Orthophosphate (P)	2015/12/16		NC	%	80 - 120
4309498	ARS	Spiked Blank	Orthophosphate (P)	2015/12/16		97	%	80 - 120

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4309498	ARS	Method Blank	Orthophosphate (P)	2015/12/16	ND, RDL=0.010		mg/L	
4309498	ARS	RPD	Orthophosphate (P)	2015/12/16	2.4		%	25
4309506	MCN	Matrix Spike	Nitrate + Nitrite (N)	2015/12/15		101	%	80 - 120
4309506	MCN	Spiked Blank	Nitrate + Nitrite (N)	2015/12/15		98	%	80 - 120
4309506	MCN	Method Blank	Nitrate + Nitrite (N)	2015/12/15	ND, RDL=0.050		mg/L	
4309506	MCN	RPD	Nitrate + Nitrite (N)	2015/12/15	NC		%	25
4309512	NRG	Matrix Spike	Nitrite (N)	2015/12/14		99	%	80 - 120
4309512	NRG	Spiked Blank	Nitrite (N)	2015/12/14		100	%	80 - 120
4309512	NRG	Method Blank	Nitrite (N)	2015/12/14	ND, RDL=0.010		mg/L	
4309512	NRG	RPD	Nitrite (N)	2015/12/14	NC		%	25
4311572	BAN	Matrix Spike	Total Aluminum (Al)	2015/12/14		NC	%	80 - 120
			Total Antimony (Sb)	2015/12/14		101	%	80 - 120
			Total Arsenic (As)	2015/12/14		99	%	80 - 120
			Total Barium (Ba)	2015/12/14		98	%	80 - 120
			Total Beryllium (Be)	2015/12/14		98	%	80 - 120
			Total Bismuth (Bi)	2015/12/14		104	%	80 - 120
			Total Boron (B)	2015/12/14		100	%	80 - 120
			Total Cadmium (Cd)	2015/12/14		102	%	80 - 120
			Total Calcium (Ca)	2015/12/14		105	%	80 - 120
			Total Chromium (Cr)	2015/12/14		101	%	80 - 120
			Total Cobalt (Co)	2015/12/14		102	%	80 - 120
			Total Copper (Cu)	2015/12/14		101	%	80 - 120
			Total Iron (Fe)	2015/12/14		109	%	80 - 120
			Total Lead (Pb)	2015/12/14		101	%	80 - 120
			Total Magnesium (Mg)	2015/12/14		111	%	80 - 120
			Total Manganese (Mn)	2015/12/14		NC	%	80 - 120
			Total Molybdenum (Mo)	2015/12/14		106	%	80 - 120
			Total Nickel (Ni)	2015/12/14		102	%	80 - 120
			Total Phosphorus (P)	2015/12/14		111	%	80 - 120
			Total Potassium (K)	2015/12/14		111	%	80 - 120
			Total Selenium (Se)	2015/12/14		102	%	80 - 120
			Total Silver (Ag)	2015/12/14		103	%	80 - 120
			Total Sodium (Na)	2015/12/14		108	%	80 - 120
			Total Strontium (Sr)	2015/12/14		101	%	80 - 120
			Total Thallium (Tl)	2015/12/14		104	%	80 - 120
			Total Tin (Sn)	2015/12/14		103	%	80 - 120
			Total Titanium (Ti)	2015/12/14		104	%	80 - 120
			Total Uranium (U)	2015/12/14		112	%	80 - 120
			Total Vanadium (V)	2015/12/14		101	%	80 - 120
			Total Zinc (Zn)	2015/12/14		103	%	80 - 120
4311572	BAN	Spiked Blank	Total Aluminum (Al)	2015/12/14		103	%	80 - 120
			Total Antimony (Sb)	2015/12/14		97	%	80 - 120
			Total Arsenic (As)	2015/12/14		94	%	80 - 120
			Total Barium (Ba)	2015/12/14		95	%	80 - 120
			Total Beryllium (Be)	2015/12/14		94	%	80 - 120
			Total Bismuth (Bi)	2015/12/14		101	%	80 - 120
			Total Boron (B)	2015/12/14		97	%	80 - 120
			Total Cadmium (Cd)	2015/12/14		100	%	80 - 120
			Total Calcium (Ca)	2015/12/14		101	%	80 - 120
			Total Chromium (Cr)	2015/12/14		96	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cobalt (Co)	2015/12/14		97	%	80 - 120
			Total Copper (Cu)	2015/12/14		98	%	80 - 120
			Total Iron (Fe)	2015/12/14		104	%	80 - 120
			Total Lead (Pb)	2015/12/14		97	%	80 - 120
			Total Magnesium (Mg)	2015/12/14		106	%	80 - 120
			Total Manganese (Mn)	2015/12/14		98	%	80 - 120
			Total Molybdenum (Mo)	2015/12/14		99	%	80 - 120
			Total Nickel (Ni)	2015/12/14		100	%	80 - 120
			Total Phosphorus (P)	2015/12/14		105	%	80 - 120
			Total Potassium (K)	2015/12/14		101	%	80 - 120
			Total Selenium (Se)	2015/12/14		98	%	80 - 120
			Total Silver (Ag)	2015/12/14		98	%	80 - 120
			Total Sodium (Na)	2015/12/14		104	%	80 - 120
			Total Strontium (Sr)	2015/12/14		96	%	80 - 120
			Total Thallium (Tl)	2015/12/14		100	%	80 - 120
			Total Tin (Sn)	2015/12/14		97	%	80 - 120
			Total Titanium (Ti)	2015/12/14		100	%	80 - 120
			Total Uranium (U)	2015/12/14		108	%	80 - 120
			Total Vanadium (V)	2015/12/14		97	%	80 - 120
			Total Zinc (Zn)	2015/12/14		99	%	80 - 120
4311572	BAN	Method Blank	Total Aluminum (Al)	2015/12/14	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Boron (B)	2015/12/14	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2015/12/14	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2015/12/14	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2015/12/14	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2015/12/14	ND, RDL=50		ug/L	
			Total Lead (Pb)	2015/12/14	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2015/12/14	ND, RDL=100		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Manganese (Mn)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2015/12/14	ND, RDL=100		ug/L	
			Total Potassium (K)	2015/12/14	ND, RDL=100		ug/L	
			Total Selenium (Se)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2015/12/14	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2015/12/14	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2015/12/14	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2015/12/14	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2015/12/14	7.3, RDL=5.0		ug/L	
4311572	BAN	RPD	Total Aluminum (Al)	2015/12/14	0.22		%	20
			Total Iron (Fe)	2015/12/14	NC		%	20
			Total Manganese (Mn)	2015/12/14	0.18		%	20
4311574	VWA	Matrix Spike	Total Mercury (Hg)	2015/12/14		100	%	80 - 120
4311574	VWA	Spiked Blank	Total Mercury (Hg)	2015/12/14		102	%	80 - 120
4311574	VWA	Method Blank	Total Mercury (Hg)	2015/12/14	ND, RDL=0.013		ug/L	
4311574	VWA	RPD	Total Mercury (Hg)	2015/12/14	NC		%	20
4311578	MLB	Matrix Spike	Total Aluminum (Al)	2015/12/14		106	%	80 - 120
			Total Antimony (Sb)	2015/12/14		100	%	80 - 120
			Total Arsenic (As)	2015/12/14		95	%	80 - 120
			Total Barium (Ba)	2015/12/14		97	%	80 - 120
			Total Beryllium (Be)	2015/12/14		97	%	80 - 120
			Total Bismuth (Bi)	2015/12/14		100	%	80 - 120
			Total Boron (B)	2015/12/14		100	%	80 - 120
			Total Cadmium (Cd)	2015/12/14		100	%	80 - 120
			Total Calcium (Ca)	2015/12/14		102	%	80 - 120
			Total Chromium (Cr)	2015/12/14		97	%	80 - 120
			Total Cobalt (Co)	2015/12/14		98	%	80 - 120
			Total Copper (Cu)	2015/12/14		95	%	80 - 120
			Total Iron (Fe)	2015/12/14		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Lead (Pb)	2015/12/14		98	%	80 - 120
			Total Magnesium (Mg)	2015/12/14		105	%	80 - 120
			Total Manganese (Mn)	2015/12/14		99	%	80 - 120
			Total Molybdenum (Mo)	2015/12/14		101	%	80 - 120
			Total Nickel (Ni)	2015/12/14		97	%	80 - 120
			Total Phosphorus (P)	2015/12/14		107	%	80 - 120
			Total Potassium (K)	2015/12/14		100	%	80 - 120
			Total Selenium (Se)	2015/12/14		98	%	80 - 120
			Total Silver (Ag)	2015/12/14		98	%	80 - 120
			Total Sodium (Na)	2015/12/14		NC	%	80 - 120
			Total Strontium (Sr)	2015/12/14		97	%	80 - 120
			Total Thallium (Tl)	2015/12/14		98	%	80 - 120
			Total Tin (Sn)	2015/12/14		100	%	80 - 120
			Total Titanium (Ti)	2015/12/14		102	%	80 - 120
			Total Uranium (U)	2015/12/14		100	%	80 - 120
			Total Vanadium (V)	2015/12/14		98	%	80 - 120
			Total Zinc (Zn)	2015/12/14		94	%	80 - 120
4311578	MLB	Spiked Blank	Total Aluminum (Al)	2015/12/14		106	%	80 - 120
			Total Antimony (Sb)	2015/12/14		97	%	80 - 120
			Total Arsenic (As)	2015/12/14		94	%	80 - 120
			Total Barium (Ba)	2015/12/14		97	%	80 - 120
			Total Beryllium (Be)	2015/12/14		97	%	80 - 120
			Total Bismuth (Bi)	2015/12/14		99	%	80 - 120
			Total Boron (B)	2015/12/14		100	%	80 - 120
			Total Cadmium (Cd)	2015/12/14		99	%	80 - 120
			Total Calcium (Ca)	2015/12/14		102	%	80 - 120
			Total Chromium (Cr)	2015/12/14		98	%	80 - 120
			Total Cobalt (Co)	2015/12/14		98	%	80 - 120
			Total Copper (Cu)	2015/12/14		96	%	80 - 120
			Total Iron (Fe)	2015/12/14		101	%	80 - 120
			Total Lead (Pb)	2015/12/14		99	%	80 - 120
			Total Magnesium (Mg)	2015/12/14		103	%	80 - 120
			Total Manganese (Mn)	2015/12/14		99	%	80 - 120
			Total Molybdenum (Mo)	2015/12/14		100	%	80 - 120
			Total Nickel (Ni)	2015/12/14		98	%	80 - 120
			Total Phosphorus (P)	2015/12/14		105	%	80 - 120
			Total Potassium (K)	2015/12/14		100	%	80 - 120
			Total Selenium (Se)	2015/12/14		98	%	80 - 120
			Total Silver (Ag)	2015/12/14		98	%	80 - 120
			Total Sodium (Na)	2015/12/14		105	%	80 - 120
			Total Strontium (Sr)	2015/12/14		98	%	80 - 120
			Total Thallium (Tl)	2015/12/14		99	%	80 - 120
			Total Tin (Sn)	2015/12/14		100	%	80 - 120
			Total Titanium (Ti)	2015/12/14		102	%	80 - 120
			Total Uranium (U)	2015/12/14		100	%	80 - 120
			Total Vanadium (V)	2015/12/14		100	%	80 - 120
			Total Zinc (Zn)	2015/12/14		96	%	80 - 120
4311578	MLB	Method Blank	Total Aluminum (Al)	2015/12/14	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2015/12/14	ND, RDL=1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Barium (Ba)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Boron (B)	2015/12/14	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2015/12/14	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2015/12/14	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2015/12/14	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2015/12/14	ND, RDL=50		ug/L	
			Total Lead (Pb)	2015/12/14	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2015/12/14	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2015/12/14	ND, RDL=100		ug/L	
			Total Potassium (K)	2015/12/14	ND, RDL=100		ug/L	
			Total Selenium (Se)	2015/12/14	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2015/12/14	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2015/12/14	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2015/12/14	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2015/12/14	ND, RDL=0.10		ug/L	

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Vanadium (V)	2015/12/14	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2015/12/14	ND, RDL=5.0		ug/L	
4311578	MLB	RPD	Total Aluminum (Al)	2015/12/14	NC		%	20
4311587	LGE	Matrix Spike [BMR014-01]	Decachlorobiphenyl	2015/12/15		68	%	30 - 130
			Aroclor 1254	2015/12/15		83	%	30 - 130
4311587	LGE	Spiked Blank	Decachlorobiphenyl	2015/12/15		86	%	30 - 130
			Aroclor 1254	2015/12/15		86	%	30 - 130
4311587	LGE	Method Blank	Decachlorobiphenyl	2015/12/15		75	%	30 - 130
			Aroclor 1016	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1221	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1232	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1248	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1242	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1254	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1260	2015/12/15	ND, RDL=0.050		ug/L	
4311587	LGE	RPD [BMR013-01]	Aroclor 1016	2015/12/15	NC		%	40
			Aroclor 1221	2015/12/15	NC		%	40
			Aroclor 1232	2015/12/15	NC		%	40
			Aroclor 1248	2015/12/15	NC		%	40
			Aroclor 1242	2015/12/15	NC		%	40
			Aroclor 1254	2015/12/15	NC		%	40
			Aroclor 1260	2015/12/15	NC		%	40
4312184	ARS	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2015/12/15		96	%	80 - 120
4312184	ARS	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2015/12/15		104	%	80 - 120
4312184	ARS	Method Blank	Nitrogen (Ammonia Nitrogen)	2015/12/15	0.055, RDL=0.050		mg/L	
4312184	ARS	RPD	Nitrogen (Ammonia Nitrogen)	2015/12/15	NC		%	20
4312208	TMO	QC Standard	Turbidity	2015/12/14		103	%	80 - 120
4312208	TMO	Method Blank	Turbidity	2015/12/14	ND, RDL=0.10		NTU	
4312208	TMO	RPD	Turbidity	2015/12/14	NC		%	20
4312223	TMO	QC Standard	Turbidity	2015/12/14		102	%	80 - 120
4312223	TMO	Method Blank	Turbidity	2015/12/14	ND, RDL=0.10		NTU	
4312223	TMO	RPD	Turbidity	2015/12/14	7.6		%	20
4314078	SMT	Matrix Spike	Total Organic Carbon (C)	2015/12/16		106	%	80 - 120
4314078	SMT	Spiked Blank	Total Organic Carbon (C)	2015/12/16		107	%	80 - 120
4314078	SMT	Method Blank	Total Organic Carbon (C)	2015/12/16	ND, RDL=0.50		mg/L	

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Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4314078	SMT	RPD	Total Organic Carbon (C)	2015/12/16	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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FUNDAMENTAL LABORATORY ACCEPTANCE GUIDELINE

Invoice To:
Fracflow Consultants Inc
ATTN: Karen Andrews
154 Major's Path
St. John's, NL
A1A 5A1
Client Contact:
Ingrid Lawlor

Maxxam Job #:	B5P4044
Date Received:	2015/12/09
Your C.O.C. #:	540677-01-01
Maxxam Project Manager:	Leonard Muise
Quote #:	B57514

No discrepancies noted.

Report Comments

Received Date:	**2015/12/09**	**Time:**	**11:01**	**By:**	
Inspected Date:		**Time:**		**By:**	
FLAG Created Date:		**Time:**		**By:**	

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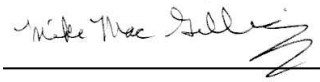
Maxxam Job #: B5P4044
Report Date: 2015/12/16

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Mike MacGillivray, Scientific Specialist (Inorganics)

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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49-55 Elizabeth Ave, St. John's, NEWFOUNDLAND Canada A1A 1W9 Tel:(709) 754 0203 Toll-Free:(888) 492-7227 Fax:(709) 754 8612 www.maxxam.ca

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#11664 Fracflow Consultants Inc	Company Name		Quotation #	B57514	Maxxam Job #	Bottle Order #:
Contact Name	Karen Andrews	Contact Name	Ingrid Lawlor/ Glenn Bursey	P.O. #		B594044	540677
Address	154 Major's Path St. John's NL A1A 5A1	Address		Project #	New Harbour	Chain Of Custody Record	Project Manager
Phone	(709) 739-7270 Fax: (709) 753-5101	Phone	(709) 739-7270 Fax:	Project Name		C#540677-01-01	Leonard Muise
Email	karen_ffc@nfld.net, ffc_nf@nfld.net	Email	ingrid_ffc@nfld.net, glenn_ffc@ns.aliantzinc.ca	Site #			
				Sampled By	GB/JR/LL		

Regulatory Criteria

Special Instructions

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

Samples must be kept cool (< 10°C) from time of sampling until delivery to maxxam

Analysis Requested

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	Atlantic RCAp-MS Total Metals in Water	PCBs in water by GC/ECD	Mercury - Total (CVAA,LL)	Metals Water Diss. MS (as rec'd)	# of Bottles	Comments
1	SID#307196	3073-NH-SW-POND	Dec 7/15		surface WATER	N	N	X	X	X		6	
2	SID#307197	3073-NH-SW-STREAM	Dec 7/15		surface WATER	N	N	X	X	X		6	
3	SID#307198	3073-NH-SW-UPSTREAM	Dec 7/15		surface WATER	N	N	X	X	X		6	
4	SID#307199	3073-NH-MW01	Dec 7/15		ground WATER	N	Y		X	X	X	4	
5	SID#307200	3073-NH-MW02							X	X	X		
6	SID#307201	3073-NH-MW03	Dec 7/15		ground WATER	N	Y		X	X	X	4	
7	SID#307202	3073-NH-MW04	Dec 7/15		ground WATER	N	Y		X	X	X	4	[redacted] 2015 DEC 9 11:01
8	SID#307203	3073-NH-MW05A	Dec 7/15		ground WATER	N	Y		X	X	X	4	
9	SID#307204	3073-NH-MW06	Dec 7/15		ground WATER	N	Y		X	X	X	4	
10	SID#307205	3073-NH-MW07	Dec 7/15		ground WATER	N	Y		X	X	X	4	

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT [X]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____
Rush Confirmation Number _____ *(call lab for #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Ingrid Lawlor / Glenn Bursey	Dec 7/15	18:00	Jenna Raymond / Jenna Raymond	Dec 8/15	8:00	
			Amelia Clarke	2015/12/08	8:35am	

Lab Use Only		
Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
☐	6.7, 7.9, 6.4	☐ Yes ☐ No

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

ERICA CHAFE
Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam
A Bureau Veritas Group Company

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49-55 Elizabeth Ave, St. John's, NEWFOUNDLAND Canada A1A 1W9 Tel:(709) 754 0203 Toll-Free:(888) 492-7227 Fax:(709) 754 8612 www.maxxam.ca

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#11664 Fracflow Consultants Inc	Company Name		Quotation #	B57514	Maxxam Job #	Bottle Order #:
Contact Name	Karen Andrews	Contact Name	Ingrid Lawlor/ Glenn Bursey	P.O. #		B5P4044	540677
Address	154 Major's Path St. John's NL A1A 5A1	Address		Project #	New Harbour	Chain Of Custody Record	Project Manager
Phone	(709) 739-7270 Fax: (709) 753-5101	Phone	(709) 739-7270 Fax:	Project Name		C#540677-02-01	Leonard Muise
Email	karen_ffc@nfld.net, ffc_nf@nfld.net	Email	ingrid_ffc@nfld.net, glenn_ffc@ns.aliantzinc.ca	Site #			
				Sampled By	GB/JR/IL		

Regulatory Criteria

Special Instructions

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

Samples must be kept cool (< 10°C) from time of sampling until delivery to Maxxam

Analysis Requested

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT [X]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____
Rush Confirmation Number _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	Atlantic RCAp-MS Total Metals in Witic Water	PCB's in water by GC/ECD	Mercury - Total (CVAA,LL)	Metals Water Diss. MS (as rec'd)	# of Bottles	Comments
1	SID#307206	3073-NH-MW08	Dec 7/15		Ground Water	N	Y		X	X	X	4	
2	SID#307207	3073-NH-MW-DUP1	Dec 7/15		Ground Water	N	Y		X	X	X	4	
3													
4													
5													
6													
7													
8													2015 DEC 9 11:01
9													
10													

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
Ingrid Lawlor / Glenn Bursey	Dec 7/15	18:00	Annette Clarke	2015/12/18	3:35 pm			6.7, 7.9, 6.4	Yes / No
			ERICA CHAFE						

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Site Location: NEW HARBOUR
Your C.O.C. #: 540677-01-01

Attention:Glenn Bursey

Fracflow Consultants Inc
154 Major's Path
St. John's, NL
A1A 5A1

Report Date: 2015/12/17
Report #: R3810202
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5P5078
Received: 2015/12/10, 10:31

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Mercury - Total (CVAA,LL) (1)	1	2015/12/14	2015/12/15	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Diss. MS (as rec'd) (1)	1	N/A	2015/12/15	ATL SOP 00058	EPA 6020A R1 m
PCBs in water by GC/ECD (1)	1	2015/12/14	2015/12/15	ATL SOP 00107	EPA 8082A m
PCB Aroclor sum (water) (1)	1	N/A	2015/12/15		Auto Calc.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Bedford

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902)420-0203 Ext:236

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		BMW093		
Sampling Date		2015/12/08		
COC Number		540677-01-01		
	UNITS	**3073-NH-MW02**	**RDL**	**QC Batch**
Metals				
Total Mercury (Hg)	ug/L	ND	0.013	4311923

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		BMW093		
Sampling Date		2015/12/08		
COC Number		540677-01-01		
	UNITS	**3073-NH-MW02**	**RDL**	**QC Batch**
Metals				
Dissolved Aluminum (Al)	ug/L	51	5.0	4313329
Dissolved Antimony (Sb)	ug/L	ND	1.0	4313329
Dissolved Arsenic (As)	ug/L	ND	1.0	4313329
Dissolved Barium (Ba)	ug/L	2.4	1.0	4313329
Dissolved Beryllium (Be)	ug/L	ND	1.0	4313329
Dissolved Bismuth (Bi)	ug/L	ND	2.0	4313329
Dissolved Boron (B)	ug/L	ND	50	4313329
Dissolved Cadmium (Cd)	ug/L	ND	0.010	4313329
Dissolved Calcium (Ca)	ug/L	2500	100	4313329
Dissolved Chromium (Cr)	ug/L	ND	1.0	4313329
Dissolved Cobalt (Co)	ug/L	ND	0.40	4313329
Dissolved Copper (Cu)	ug/L	ND	2.0	4313329
Dissolved Iron (Fe)	ug/L	ND	50	4313329
Dissolved Lead (Pb)	ug/L	ND	0.50	4313329
Dissolved Magnesium (Mg)	ug/L	830	100	4313329
Dissolved Manganese (Mn)	ug/L	4.6	2.0	4313329
Dissolved Molybdenum (Mo)	ug/L	ND	2.0	4313329
Dissolved Nickel (Ni)	ug/L	ND	2.0	4313329
Dissolved Phosphorus (P)	ug/L	ND	100	4313329
Dissolved Potassium (K)	ug/L	260	100	4313329
Dissolved Selenium (Se)	ug/L	ND	1.0	4313329
Dissolved Silver (Ag)	ug/L	ND	0.10	4313329
Dissolved Sodium (Na)	ug/L	8800	100	4313329
Dissolved Strontium (Sr)	ug/L	9.0	2.0	4313329
Dissolved Thallium (Tl)	ug/L	ND	0.10	4313329
Dissolved Tin (Sn)	ug/L	ND	2.0	4313329
Dissolved Titanium (Ti)	ug/L	2.1	2.0	4313329
Dissolved Uranium (U)	ug/L	ND	0.10	4313329
Dissolved Vanadium (V)	ug/L	ND	2.0	4313329
Dissolved Zinc (Zn)	ug/L	ND	5.0	4313329

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		BMW093		
Sampling Date		2015/12/08		
COC Number		540677-01-01		
	UNITS	**3073-NH-MW02**	**RDL**	**QC Batch**
PCBs				
Aroclor 1016	ug/L	ND	0.050	4311587
Aroclor 1221	ug/L	ND	0.050	4311587
Aroclor 1232	ug/L	ND	0.050	4311587
Aroclor 1248	ug/L	ND	0.050	4311587
Aroclor 1242	ug/L	ND	0.050	4311587
Aroclor 1254	ug/L	ND	0.050	4311587
Aroclor 1260	ug/L	ND	0.050	4311587
Calculated Total PCB	ug/L	ND	0.050	4310977
Surrogate Recovery (%)				
Decachlorobiphenyl	%	53		4311587

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.4°C

Results relate only to the items tested.

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4311587	LGE	Matrix Spike	Decachlorobiphenyl	2015/12/15		68	%	30 - 130
			Aroclor 1254	2015/12/15		83	%	30 - 130
4311587	LGE	Spiked Blank	Decachlorobiphenyl	2015/12/15		86	%	30 - 130
			Aroclor 1254	2015/12/15		86	%	30 - 130
4311587	LGE	Method Blank	Decachlorobiphenyl	2015/12/15		75	%	30 - 130
			Aroclor 1016	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1221	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1232	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1248	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1242	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1254	2015/12/15	ND, RDL=0.050		ug/L	
			Aroclor 1260	2015/12/15	ND, RDL=0.050		ug/L	
4311587	LGE	RPD	Aroclor 1016	2015/12/15	NC		%	40
			Aroclor 1221	2015/12/15	NC		%	40
			Aroclor 1232	2015/12/15	NC		%	40
			Aroclor 1248	2015/12/15	NC		%	40
			Aroclor 1242	2015/12/15	NC		%	40
			Aroclor 1254	2015/12/15	NC		%	40
			Aroclor 1260	2015/12/15	NC		%	40
4311923	VWA	Matrix Spike	Total Mercury (Hg)	2015/12/15		87	%	80 - 120
4311923	VWA	Spiked Blank	Total Mercury (Hg)	2015/12/15		101	%	80 - 120
4311923	VWA	Method Blank	Total Mercury (Hg)	2015/12/15	ND, RDL=0.013		ug/L	
4311923	VWA	RPD	Total Mercury (Hg)	2015/12/15	0		%	20
4313329	BAN	Matrix Spike	Dissolved Aluminum (Al)	2015/12/15		103	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/15		100	%	80 - 120
			Dissolved Arsenic (As)	2015/12/15		100	%	80 - 120
			Dissolved Barium (Ba)	2015/12/15		99	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/15		99	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/15		99	%	80 - 120
			Dissolved Boron (B)	2015/12/15		100	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/15		103	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/15		NC	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/15		100	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/15		101	%	80 - 120
			Dissolved Copper (Cu)	2015/12/15		99	%	80 - 120
			Dissolved Iron (Fe)	2015/12/15		103	%	80 - 120
			Dissolved Lead (Pb)	2015/12/15		99	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/15		106	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/15		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/15		103	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/15		101	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/15		108	%	80 - 120
			Dissolved Potassium (K)	2015/12/15		100	%	80 - 120
			Dissolved Selenium (Se)	2015/12/15		105	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silver (Ag)	2015/12/15		103	%	80 - 120
			Dissolved Sodium (Na)	2015/12/15		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/15		NC	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/15		99	%	80 - 120
			Dissolved Tin (Sn)	2015/12/15		102	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/15		105	%	80 - 120
			Dissolved Uranium (U)	2015/12/15		NC	%	80 - 120
			Dissolved Vanadium (V)	2015/12/15		100	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/15		98	%	80 - 120
4313329	BAN	Spiked Blank	Dissolved Aluminum (Al)	2015/12/15		103	%	80 - 120
			Dissolved Antimony (Sb)	2015/12/15		100	%	80 - 120
			Dissolved Arsenic (As)	2015/12/15		98	%	80 - 120
			Dissolved Barium (Ba)	2015/12/15		96	%	80 - 120
			Dissolved Beryllium (Be)	2015/12/15		100	%	80 - 120
			Dissolved Bismuth (Bi)	2015/12/15		100	%	80 - 120
			Dissolved Boron (B)	2015/12/15		103	%	80 - 120
			Dissolved Cadmium (Cd)	2015/12/15		100	%	80 - 120
			Dissolved Calcium (Ca)	2015/12/15		102	%	80 - 120
			Dissolved Chromium (Cr)	2015/12/15		100	%	80 - 120
			Dissolved Cobalt (Co)	2015/12/15		100	%	80 - 120
			Dissolved Copper (Cu)	2015/12/15		99	%	80 - 120
			Dissolved Iron (Fe)	2015/12/15		103	%	80 - 120
			Dissolved Lead (Pb)	2015/12/15		100	%	80 - 120
			Dissolved Magnesium (Mg)	2015/12/15		108	%	80 - 120
			Dissolved Manganese (Mn)	2015/12/15		102	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/12/15		101	%	80 - 120
			Dissolved Nickel (Ni)	2015/12/15		101	%	80 - 120
			Dissolved Phosphorus (P)	2015/12/15		106	%	80 - 120
			Dissolved Potassium (K)	2015/12/15		100	%	80 - 120
			Dissolved Selenium (Se)	2015/12/15		104	%	80 - 120
			Dissolved Silver (Ag)	2015/12/15		100	%	80 - 120
			Dissolved Sodium (Na)	2015/12/15		107	%	80 - 120
			Dissolved Strontium (Sr)	2015/12/15		100	%	80 - 120
			Dissolved Thallium (Tl)	2015/12/15		99	%	80 - 120
			Dissolved Tin (Sn)	2015/12/15		102	%	80 - 120
			Dissolved Titanium (Ti)	2015/12/15		107	%	80 - 120
			Dissolved Uranium (U)	2015/12/15		101	%	80 - 120
			Dissolved Vanadium (V)	2015/12/15		100	%	80 - 120
			Dissolved Zinc (Zn)	2015/12/15		98	%	80 - 120
4313329	BAN	Method Blank	Dissolved Aluminum (Al)	2015/12/15	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Arsenic (As)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Bismuth (Bi)	2015/12/15	ND, RDL=2.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Boron (B)	2015/12/15	ND, RDL=50		ug/L	
			Dissolved Cadmium (Cd)	2015/12/15	ND, RDL=0.010		ug/L	
			Dissolved Calcium (Ca)	2015/12/15	ND, RDL=100		ug/L	
			Dissolved Chromium (Cr)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Cobalt (Co)	2015/12/15	ND, RDL=0.40		ug/L	
			Dissolved Copper (Cu)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Iron (Fe)	2015/12/15	ND, RDL=50		ug/L	
			Dissolved Lead (Pb)	2015/12/15	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2015/12/15	ND, RDL=100		ug/L	
			Dissolved Manganese (Mn)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Nickel (Ni)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Phosphorus (P)	2015/12/15	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2015/12/15	ND, RDL=100		ug/L	
			Dissolved Selenium (Se)	2015/12/15	ND, RDL=1.0		ug/L	
			Dissolved Silver (Ag)	2015/12/15	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2015/12/15	ND, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Thallium (Tl)	2015/12/15	ND, RDL=0.10		ug/L	
			Dissolved Tin (Sn)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Titanium (Ti)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Uranium (U)	2015/12/15	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2015/12/15	ND, RDL=2.0		ug/L	
			Dissolved Zinc (Zn)	2015/12/15	ND, RDL=5.0		ug/L	
4313329	BAN	RPD	Dissolved Aluminum (Al)	2015/12/15	NC		%	20
			Dissolved Antimony (Sb)	2015/12/15	NC		%	20

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2015/12/15	0.91		%	20
			Dissolved Barium (Ba)	2015/12/15	NC		%	20
			Dissolved Beryllium (Be)	2015/12/15	NC		%	20
			Dissolved Bismuth (Bi)	2015/12/15	NC		%	20
			Dissolved Boron (B)	2015/12/15	NC		%	20
			Dissolved Cadmium (Cd)	2015/12/15	NC		%	20
			Dissolved Calcium (Ca)	2015/12/15	0.64		%	20
			Dissolved Chromium (Cr)	2015/12/15	NC		%	20
			Dissolved Cobalt (Co)	2015/12/15	NC		%	20
			Dissolved Copper (Cu)	2015/12/15	NC		%	20
			Dissolved Iron (Fe)	2015/12/15	NC		%	20
			Dissolved Lead (Pb)	2015/12/15	NC		%	20
			Dissolved Magnesium (Mg)	2015/12/15	0.63		%	20
			Dissolved Manganese (Mn)	2015/12/15	NC		%	20
			Dissolved Molybdenum (Mo)	2015/12/15	NC		%	20
			Dissolved Nickel (Ni)	2015/12/15	NC		%	20
			Dissolved Phosphorus (P)	2015/12/15	NC		%	20
			Dissolved Potassium (K)	2015/12/15	0.88		%	20
			Dissolved Selenium (Se)	2015/12/15	NC		%	20
			Dissolved Silver (Ag)	2015/12/15	NC		%	20
			Dissolved Sodium (Na)	2015/12/15	0.97		%	20
			Dissolved Strontium (Sr)	2015/12/15	0.65		%	20
			Dissolved Thallium (Tl)	2015/12/15	NC		%	20
			Dissolved Tin (Sn)	2015/12/15	NC		%	20
			Dissolved Titanium (Ti)	2015/12/15	NC		%	20
			Dissolved Uranium (U)	2015/12/15	0.80		%	20
			Dissolved Vanadium (V)	2015/12/15	NC		%	20
			Dissolved Zinc (Zn)	2015/12/15	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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FUNDAMENTAL LABORATORY ACCEPTANCE GUIDELINE

Invoice To:
Fracflow Consultants Inc
ATTN: Karen Andrews
154 Major's Path
St. John's, NL
A1A 5A1
Client Contact:
Glenn Bursey

Maxxam Job #:	B5P5078
Date Received:	2015/12/10
Your C.O.C. #:	540677-01-01
Maxxam Project Manager:	Leonard Muise
Quote #:	B57514

No discrepancies noted.

Report Comments

Received Date:	**2015/12/10**	**Time:**	**10:31**	**By:**	
Inspected Date:		**Time:**		**By:**	
FLAG Created Date:		**Time:**		**By:**	

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Maxxam Job #: B5P5078
Report Date: 2015/12/17

Fracflow Consultants Inc
Site Location: NEW HARBOUR
Sampler Initials: GB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin MacDonald, Inorganics Supervisor

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#11664 Fracflow Consultants Inc	Company Name		Quotation #	B57514	Maxxam Job #	Bottle Order #:
Contact Name	Karen Andrews	Contact Name	Ingrid Lawlor/ Glenn Bursey	P.O. #		B5P5078	540677
Address	154 Major's Path St. John's NL A1A 5A1	Address		Project #	New Harbour	Chain Of Custody Record	Project Manager
Phone	(709) 739-7270 Fax: (709) 753-5101	Phone	(709) 739-7270 Fax:	Project Name		C#540677-01-01	Leonard Muise
Email	karen_ffc@nfld.net, ffc_nf@nfld.net	Email	ingrid_ffc@nfld.net, glenn_ffc@ns.aliantzinc.ca	Site #			
				Sampled By	GB/IL		

Regulatory Criteria

Special Instructions

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

Samples must be kept cool (< 10°C) from time of sampling until delivery to maxxam

Analysis Requested

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT ☒

(will be applied if Rush TAT is not specified)

Standard TAT = 5-7 Working days for most tests.

Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: _____ Time Required: _____ ☐

Rush Confirmation Number _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Atlantic RCAp-MS Total Metals in Water	PCBs in water by GC/ECD	Mercury - Total (CVAA,LL)	Metals Water Diss. MS (as rec'd)	# of Bottles	Comments
1	SID#307196	3073-NH-SW-POND						X	X	X			
2	SID#307197	3073-NH-SW-STREAM						X	X	X			
3	SID#307198	3073-NH-SW-UPSTREAM						X	X	X			
4	SID#307199	3073-NH-MW01							X	X	X		
* 5	SID#307200	3073-NH-MW02	Dec 8/15		WATER	N	Y		X	X	X	4	
6	SID#307201	3073-NH-MW03							X	X	X		
7	SID#307202	3073-NH-MW04							X	X	X		
8	SID#307203	3073-NH-MW05A							X	X	X		
9	SID#307204	3073-NH-MW06							X	X	X		
10	SID#307205	3073-NH-MW07							X	X	X		

* * RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
G. Glen Bursey	15/12/09	9:25	ERICA CHAFE	15/12/09	9:25	

Lab Use Only			
Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?	2015 DEC 10 10:31
☐	4.3/4.4/4.5.	☐ Yes ☐ No	

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

APPENDIX D

Historical Data

(from CRA Report 2014/2015 Monitoring and Maintenance Program, Upper Trinity South (New Harbour) Waste Disposal Site, New Harbour Barrens, Newfoundland and Labrador, Appendix C)

TABLE C1

HISTORICAL GROUNDWATER ANALYTICAL DATA - PCBs (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Sample Location	Sample Date												Criteria*
	Feb 2007	Nov 2007	May 2008	Mar 2009 [1]	Mar 2009 [2]	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	
MW-01	-	<	<	<	<	0.07	<	<	< (0.06)	<	<	<	7.8
MW-02	-	<	<	-	-	<	< (0.06)	-	<	-	<	<	
MW-03	< (0.4)	<	<	<	-	<	< (0.06)	<	<	<	<	<	
MW-04	-	<	<	<	-	<	<	<	<	<	<	<	
MW-05	<	<	<	<	-	<	<	<	<	-	<	-	
MW-05A	-	-	-	-	-	-	-	-	-	-	-	<	
MW-06	-	<	<	-	-	<	<	<	< (0.06)	< (0.06)	<	<	
MW-06 DUP-02	-	-	-	-	-	-	-	-	-	-	-	<	
MW-07	-	<	<	<	<	<	<	<	<	<	<	<	
MW-DUP	-	-	-	-	-	-	<	-	-	-	<	-	
MW-08	-	-	-	-	-	-	-	<	<	<	<	<	
MW-08 DUP-01	-	-	-	-	-	-	-	-	-	<	-	-	
RDL	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	

Analysis completed for all samples from 2007 to 2012 except March 2009[2] were completed by AMEC.

Analysis completed for samples from March 2009[2], 2013, and 2014 were completed by Maxxam Analytics Inc. in Bedford, NS.

Data from February 2007 to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC and dated March 29, 2013.

* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

MW = Monitor Well

MW-DUP = Field Duplicate of MW-07.

MW-08 DUP-01 = Field Duplicate of MW-08.

< = Parameter below detection limit

< (0.00) = Parameter below elevated detection limit

- = No sample collected

0.0 = above criteria

RDL = Reportable Detection Limit

TABLE C2

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL [1]	Criteria [2]	MW-01											MW-02						
			Feb 2007	Nov 2007	May 2008	Jan 2009	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	Feb 2007	Nov 2007	May 2008	Oct 2009	Jan 2010	Dec 2011	Nov 2014
Aluminum (Al)	5.0	-	558,000	3,530	75	72.5	176	109	250	234	130	72.4	59	3,540	70	34	56.9	45.6	432	77
Antimony (Sb)	1.0	20,000	<	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<	<	< (2)	< (2)	<	<
Arsenic (As)	1.0	1,900	77	<	4	< (2)	< (2)	< (2)	<	<	<	<	<	<	<	<	< (2)	< (2)	<	<
Barium (Ba)	1.0	29,000	870	15.1	2.1	< (5)	< (5)	< (5)	2	1.7	3.2	2.2	1.7	17.6	2.7	3.0	< (5)	< (5)	4.7	2.5
Beryllium (Be)	1.0	67	36.9	0.2	<	< (2)	< (2)	< (2)	<	<	<	<	<	0.5	<	<	< (2)	< (2)	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Boron (B)	5.0	45,000	-	-	-	-	5.6	<	<	< (50)	< (50)	<	<	-	-	-	<	<	< (50)	<
Cadmium (Cd)	0.017	2.7	1.792	0.380	0.058	0.021	0.020	0.026	0.020	<	<	0.017	0.046	0.158	1.010	0.057	0.039	<	0.056	0.026
Calcium (Ca)	100	-	81,600	2,070	2,400	-	5,200	2,000	2,200	2,040	2,530	2,530	2,600	2,670	1,350	1,330	1,700	1,300	1,910	1,900
Chromium (Cr)	1.0	810	82	2	<	<	<	<	<	<	<	<	<	10.8	<	<	<	<	<	3.7
Cobalt (Co)	0.4	66	**79.85**	2	< (1)	<	< (4)	<	<	0.4	0.95	0.65	<	7	< (1)	< (1)	0.86	1.04	0.53	0.59
Copper (Cu)	2.0	87	**1,250**	12	2	5	18.5	3.1	3	<	<	<	<	29	1	4	8.3	<	7.1	4.2
Iron (Fe)	50	-	75,000	2,180	246	140	107	<	290	167	968	100	<	4,170	64	59	<	<	245	220
Lead (Pb)	0.5	25	**192.7**	4	< (1)	<	<	<	<	<	<	<	<	6	< (1)	< (1)	<	<	0.62	<
Magnesium (Mg)	100	-	15,500	642	745	-	1,400	600	500	611	602	721	730	1,150	449	479	600	500	258	620
Manganese (Mn)	2.0	-	2,120	58	31	34	20.5	9.7	17	15.9	83.3	52.7	13	150	13	19	8.3	33.4	4.5	24.0
Mercury (Hg)	0.013	0.29 [3]	< (0.02)	< (0.02)	0.13	0.08	0.030	0.11	-	-	-	0.033	0.017	< (0.01)	< (0.02)	0.03	-	0.015	-	<
Molybdenum (Mo)	2.0	9,200	16	< (5)	< (5)	<	<	<	<	<	<	<	<	< (5)	< (5)	< (5)	<	<	<	<
Nickel (Ni)	2.0	490	43	< (5)	< (5)	<	<	<	<	<	<	<	<	5	< (5)	< (5)	<	<	<	<
Phosphorus (P)	100	-	32,200	127	<	-	<	200	140	-	<	<	130	336	<	<	<	200	-	110
Potassium (K)	100	-	9,180	595	212	-	2,100	200	150	166	275	266	180	546	239	148	400	200	238	250
Selenium (Se)	1.0	63	1	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Silver (Ag)	0.1	1.5	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Sodium (Na)	100	2,300,000	11,800	4,090	4,750	-	12,000	3,700	4,300	4,140	5,810	4,390	4,900	12,100	4,510	5,210	5,100	5,200	5,020	5,400
Strontium (Sr)	2.0	-	-	-	-	-	13.4	6.9	7	6.9	12.3	10.2	9	-	-	-	6	6	5	9.7
Thallium (Tl)	0.1	510	-	-	-	-	<	<	<	<	<	<	<	-	-	-	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	-	<	<	<	<	<	<	3.2	-	-	-	<	<	<	<
Titanium (Ti)	2.0	-	-	-	-	-	6.4	4.8	6	6.8	3.0	2.5	<	-	-	-	<	<	24	<
Uranium (U)	0.1	420	-	-	-	-	<	<	<	<	<	<	<	-	-	-	<	<	<	<
Vanadium (V)	2.0	250	108	< (5)	< (5)	<	<	<	<	<	<	<	<	3	< (5)	< (5)	<	<	<	<
Zinc (Zn)	5.0	1,100	825	12	5	6	37.3	8.4	6	5.5	5.2	9.4	6.3	22	4	6	21.1	<	19.5	7.2
pH	-	6.5 - 9.0	6.04	7.3	5.96	6.23	6.15	6.05	6.25	5.88	6.81	-	-	5.62	6.05	5.94	6.1	5.59	7.15	-
Hardness	1,000	-	268,000	7,880	9,080	8,370	19,000	7,000	8,000	-	8,800	-	-	11,500	5,220	5,220	7,000	5,000	-	-

Notes:

RDL = Reportable Detection Limit
MW = Monitor Well
- = Not analysed/No criteria

< = Parameter below detection limit
< (0.0) = Parameter below elevated detection limit
0.0 = above criteria

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 and 2014 was completed by Maxxam Analytics Inc. in Bedford, NS.
Data to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC, dated March 29, 2013.

1. Typical Reportable Detection Limit referenced based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
2. Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
3. Based on Coarse-grained soil conditions.

TABLE C2

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL [1]	Criteria [2]	MW-03												MW-04										
			Feb 2007	Nov 2007	Nov 2007	May 2008	Mar 2009 [1]	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	Feb 2007	Nov 2007	Jul 2008	Jan 2009	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014
Aluminum (Al)	5.0	-	5,450	129	145	45	146	120	87.9	190	163	78.4	167	140	275,000	1,580	41	105	197	131	60	84.1	1,610	53.8	53
Antimony (Sb)	1.0	20,000	<	<	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<	<	< (2)	< (2)	< (2)	<	<	<	<	<
Arsenic (As)	1.0	1,900	3	1	1	<	6	< (2)	7.8	4	7.4	6.6	9.9	1	15	2	13	8	11.1	3.1	2	2	3.2	2.3	<
Barium (Ba)	1.0	29,000	64.8	25.5	25.0	7.7	12	29.3	13.4	6	9.8	10.2	12.1	4.9	356.0	14.7	34.8	92	20.4	25.8	12	14.9	51.1	11.7	6.1
Beryllium (Be)	1.0	67	1.6	<	0.2	0.3	< (2)	< (2)	< (2)	<	<	<	<	<	40.5	0.3	<	< (2)	< (2)	< (2)	<	<	<	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.8	<	<	<	<	<	<	<	<
Boron (B)	5.0	45,000	-	-	-	-	-	29.2	22.9	11	< (50)	< (50)	<	<	-	-	-	-	22.4	37.1	22	< (50)	< (50)	<	<
Cadmium (Cd)	0.017	2.7	0.109	0.067	0.221	0.102	<	0.049	0.018	< (0.02)	0.063	<	0.03	<	1.013	0.059	0.166	<	<	<	< (0.02)	<	0.101	<	0.052
Calcium (Ca)	100	-	15,800	11,300	10,500	5,060	-	15,000	13,000	7,000	8,780	10,800	11,900	7,300	34,600	17,500	32,500	-	19,000	9,400	6,700	8,710	15,700	8,970	5,900
Chromium (Cr)	1.0	810	7.0	<	<	<	<	1.7	<	<	<	<	<	<	37.0	1	1	<	1.1	<	<	<	2.9	<	<
Cobalt (Co)	0.4	66	12	5	5	9	6	1.98	5.49	4.6	4.75	3.63	6.18	2.6	100	4	14	8.38	7.21	2.87	1.9	2.42	11.1	4.11	2.9
Copper (Cu)	2.0	87	3	4	4	4	<	5.0	<	<	3.5	<	2.1	<	137	6	<	2	2.6	<	<	<	5.3	<	4.1
Iron (Fe)	50	-	6,680	2,410	2230	312	1,400	4,390	1,590	1,500	1,030	9,570	3,220	6,800	64,100	1,170	2,430	7,600	2,030	2,020	1,100	1,950	6,530	1,680	590
Lead (Pb)	0.5	25	19	4	4	< (1)	<	1.11	<	<	<	<	0.97	<	63	2	3	0.8	<	1.14	0.6	0.68	2.44	<	<
Magnesium (Mg)	100	-	4,000	2,470	2,410	1,140	-	3,200	3,600	1,600	2,160	1,610	2,910	690	7,680	5,380	10,100	-	5,000	1,900	1,200	1,740	3,160	1,860	1,200
Manganese (Mn)	2.0	-	2,040	1,010	964	171	3,800	721	3,930	1,900	2,090	1,570	3020	550	8,950	2,370	6,740	2,500	4,510	925	370	549	1,300	465	190
Mercury (Hg)	0.013	0.29 [3]	0.02	< (0.02)	< (0.02)	0.04	**0.68**	0.037	**0.46**	-	-	-	0.26	0.025	< (0.01)	< (0.02)	< (0.02)	0.01	0.18	0.083	-	-	-	0.022	0.037
Molybdenum (Mo)	2.0	9,200	< (5)	< (5)	< (5)	< (5)	<	<	<	<	<	<	<	<	8	< (5)	< (5)	<	2.4	<	<	<	<	<	<
Nickel (Ni)	2.0	490	5	< (5)	< (5)	< (5)	<	<	<	<	6	<	2.8	<	22	< (5)	< (5)	3	<	<	<	<	3.3	<	<
Phosphorus (P)	100	-	1,090	312	199	20	-	200	<	110	-	<	<	130	11,100	93	28	-	<	100	130	-	335	104	110
Potassium (K)	100	-	6,560	3,630	3,540	633	-	4,800	2,400	1,100	1,350	1,730	1760	280	4,810	3,150	4,440	-	3,600	2,900	1,500	2,130	2,900	1200	660
Selenium (Se)	1.0	63	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Silver (Ag)	0.1	1.5	<	<	<	<	<	<	<	<	<	<	<	<	0.1	<	0.7	<	<	<	<	<	<	<	<
Sodium (Na)	100	2,300,000	189,000	102,000	103,000	24,500	-	96,000	73,000	32,000	32,300	37,000	36,200	7,200	60,700	91,200	149,000	-	88,000	77,000	40,000	41,900	43,500	32,800	23,000
Strontium (Sr)	2.0	-	-	-	-	-	-	56.2	38.0	21	22.9	50.5	38.2	27	-	-	-	-	51.9	34	24	29	89.7	29.1	21
Thallium (Tl)	0.1	510	-	-	-	-	-	<	<	<	<	<	<	<	-	-	-	-	<	<	<	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	-	-	<	<	<	<	<	<	5.3	-	-	-	-	<	<	<	<	<	<	8.6
Titanium (Ti)	2.0	-	-	-	-	-	-	11.9	2.9	4	7.4	2.5	8.6	2.6	-	-	-	-	10.2	30.6	6	8.6	56.0	3.5	<
Uranium (U)	0.1	420	-	-	-	-	-	<	0.11	<	<	<	0.13	<	-	-	-	-	<	<	<	<	0.19	<	<
Vanadium (V)	2.0	250	9	< (5)	< (5)	< (5)	<	2.4	<	<	<	<	<	<	43	< (5)	5	4	<	3	<	<	3.6	<	<
Zinc (Zn)	5.0	1,100	41	6	5	30	<	58.2	7.4	9	18.3	<	9.1	<	212	4	8	6	16.2	<	7	7.7	19.3	7	23
pH	-	6.5 - 9.0	6.66	6.6	6.61	5.96	6.95	6.94	6.57	7.27	6.93	7.11	-	-	6.01	6.53	6.69	6.84	6.8	6.75	7.45	6.68	7.08	-	-
Hardness	1,000	-	56,000	38,400	38,401	17,400	70,700	51,000	48,000	24,000	-	3,400	-	-	118	65,900	50,700	37,700	69,000	31,000	22,000	-	52,000	-	-

Notes:

RDL = Reportable Detection Limit
MW = Monitor Well
- = Not analysed/No criteria

< = Parameter below detection limit
< (0.0) = Parameter below elevated detection lim
0.0 = above criteria

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3. Based on Coarse-grained soil conditions.

TABLE C2

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL [1]	Criteria [2]	MW-05									MW-05A	MW-06											MW-DUP02
			Feb 2007	Nov 2007	May 2008	Jan 2009	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Aug 2013	Nov 2014	Feb 2007	Nov 2007	May 2008	Jan 2009	Oct 2009	Jan 2010	Dec 2010	Dec 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	Nov 2014
Aluminum (Al)	5.0	-	57,100	7,880	288	209	168	95.7	200	133	191	91	8,540	485	179	44.1	112	< (50)	160	180	176	247	1,910	180	160
Antimony (Sb)	1.0	20,000	<	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<
Arsenic (As)	1.0	1,900	17	1	<	< (2)	< (2)	< (2)	<	<	1.6	<	3	<	<	< (2)	< (2)	< (20)	2	2	1.7	2.9	2.3	1.8	1.8
Barium (Ba)	1.0	29,000	114.0	23.4	1.4	< (5)	< (5)	< (5)	2	4	22.4	3.6	55.9	9.6	6.9	16	26.4	< (50)	8	8	4.6	7.4	3.4	2.4	1.8
Beryllium (Be)	1.0	67	20.8	0.2	<	< (2)	< (2)	< (2)	<	<	<	<	0.7	<	<	< (2)	< (2)	< (20)	<	<	<	<	<	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	< (20)	<	<	<	<	<	<	<
Boron (B)	5.0	45,000	-	-	-	-	<	<	<	<	<	<	-	-	-	-	468	693	170	180	142	96	<	<	<
Cadmium (Cd)	0.017	2.7	0.627	0.192	0.059	0.020	0.067	<	< (0.02)	0.061	0.032	0.041	0.364	0.122	0.082	0.051	0.038	<	< (0.02)	< (0.02)	<	<	0.2	0.014	<
Calcium (Ca)	100	-	14,300	2,330	1,310	-	3,700	2,300	2,800	3,740	19,800	2,700	52,000	30,900	26,600	-	79,000	150,000	28,000	28,000	22,400	14,800	1,170	13,000	14,000
Chromium (Cr)	1.0	810	15.0	5.0	<	<	<	<	<	<	<	1.3	14.6	<	<	<	<	< (10)	<	<	<	<	1.7	<	<
Cobalt (Co)	0.4	66	27	4	< (1)	1.06	0.63	<	<	0.48	0.66	2.2	12	6	4	3.68	6.35	< (4)	4.2	4	2.93	2.58	0.83	2.20	2.1
Copper (Cu)	2.0	87	**237**	39	7	7	16.0	2.8	3	9.2	4.1	9.7	42	5	7	7	5.5	< (20)	2	2	2.7	<	3.1	2.2	<
Iron (Fe)	50	-	12,390	2,940	124	120	105	< (50)	79	65	3,640	890	10,276	513	178	< (50)	637	< (500)	3,100	3,200	2,870	8,380	3,330	8,000	8,600
Lead (Pb)	0.5	25	**57**	11	< (1)	0.5	<	<	<	<	1.36	0.92	**26**	< (1)	< (1)	<	<	< (5)	<	<	<	1.19	1.82	1.80	<
Magnesium (Mg)	100	-	3,490	616	502	-	1,300	800	790	825	1,090	860	11,400	5,840	5,210	-	15,000	30,000	4,600	4,800	3,920	2,400	644	2,300	2,400
Manganese (Mn)	2.0	-	487	77	15	35	26.3	11.8	20	10.7	283	580	1,830	905	520	890	1,060	889	380	400	355	480	32.4	400	410
Mercury (Hg)	0.013	0.29 [3]	< (0.01)	0.06	**1.44**	**0.85**	0.013	0.078	-	-	0.17	0.042	< (0.01)	< (0.02)	0.04	< (0.01)	0.11	0.047	-	-	-	-	0.072	0.017	0.013
Molybdenum (Mo)	2.0	9,200	3	< (5)	< (5)	<	13.6	<	<	<	8.2	<	< (5)	< (5)	< (5)	<	<	< (20)	<	<	<	<	<	<	<
Nickel (Ni)	2.0	490	20	< (5)	< (5)	<	<	<	<	<	2.3	7.5	6	< (5)	< (5)	<	2.3	< (20)	<	<	<	2.5	<	<	<
Phosphorus (P)	100	-	3,550	373	6	-	<	100	<	-	<	150	1,340	60	30	-	100	<	<	180	-	182	123	450	410
Potassium (K)	100	-	1,530	405	446	-	900	100	210	524	<	1900	20,100	9,220	10,200	-	22,000	33,000	9,000	9,000	5,180	3,540	159	2,600	2500
Selenium (Se)	1.0	63	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	< (10)	<	<	<	<	<	<	<
Silver (Ag)	0.1	1.5	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	< (1)	<	<	<	<	<	<	<
Sodium (Na)	100	2,300,000	6,800	10,200	4,030	-	8,200	4,900	5,400	5,200	9,050	14,000	53,400	27,600	21,800	-	56,000	72,000	20,000	20,000	11,800	10,000	6,220	6,200	6,000
Strontium (Sr)	2.0	-	-	-	-	-	10.2	7.8	8	8.1	136	12	-	-	-	-	228	392	70	71	56	51.9	8.7	34.0	35
Thallium (Tl)	0.1	510	-	-	-	-	<	<	<	<	<	<	-	-	-	-	<	< (1)	<	<	<	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	-	<	<	<	<	<	2.4	-	-	-	-	<	< (20)	<	<	<	<	3.7	2.5	2.5
Titanium (Ti)	2.0	-	-	-	-	-	3.3	<	4	2	5.8	5.3	-	-	-	-	7.0	< (20)	6	6	5.6	7.8	46.9	7.3	5.7
Uranium (U)	0.1	420	-	-	-	-	<	<	<	<	0.52	<	-	-	-	-	<	< (1)	<	<	<	<	0.22	<	<
Vanadium (V)	2.0	250	19	6	< (5)	<	<	<	<	<	<	<	10	< (5)	< (5)	<	<	< (20)	<	<	<	<	2.6	<	<
Zinc (Zn)	5.0	1,100	163	25	6	10	20.2	5.2	12	28	19.6	49	52	10	14	8	46.5	< (50)	15	14	8.9	6.1	17.3	9.1	<
pH	-	6.5 - 9.0	6.09	6.1	6.3	6.09	6.18	5.92	6.7	6.34	-	-	6.13	6.11	6.31	6.42	6.36	6.82	7.1	7.02	6.98	6.96	-	-	-
Hardness	1,000	-	50,100	8,350	5,330	6,840	14,000	9,000	10,000	-	-	-	177,000	101,000	87,900	94,450	260,000	510,000	88,000	91,000	-	47,000	-	-	-

Notes:

RDL = Reportable Detection Limit
MW = Monitor Well
- = Not analysed/No criteria

< = Parameter below detection limit
< (0.0) = Parameter below elevated detection lim
0.0 = above criteria

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 and 2014 was completed by Maxxam Analytics Inc. in Bedford, NS.
Data to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC, dated March 29, 2013.

1. Typical Reportable Detection Limit referenced based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
2. Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
3. Based on Coarse-grained soil conditions.

TABLE C2

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL [1]	Criteria [2]	MW-07													MW-DUP		MW-08						
			Feb 2007	Nov 2007	May 2008	May 2008	Jan 2009	Jan 2009	Oct 2009	Jan 2010	Dec 2010	Dec 2011	Dec 2011	Nov 2012	Aug 2013	Aug 2013	Nov 2014	Mar 2010	Dec 2010	Dec 2011	Nov 2012	Nov 2012	Aug 2013	Nov 2014
Aluminum (Al)	5.0	-	4,527	1,740	982	1,170	830	822	2,460	1,100	2,900	1,760	1,860	4,320	1,910	1,930	2,300	626	640	1,210	1,160	1,190	1,410	1,100
Antimony (Sb)	1.0	20,000	<	<	<	<	< (2)	< (2)	< (2)	< (2)	<	<	<	<	<	<	1.4	< (2)	<	<	<	<	<	<
Arsenic (As)	1.0	1,900	2	<	2	1	< (2)	< (2)	< (2)	< (2)	1	<	<	2.5	2.3	1.9	2.3	< (2)	<	<	1.1	1.1	3.3	<
Barium (Ba)	1.0	29,000	18.7	4.8	2.4	2.8	< (5)	< (5)	< (5)	< (5)	5	3.5	3.4	9.1	3.4	4.1	13	< (5)	6	7.2	7.0	7.1	5.1	5.7
Beryllium (Be)	1.0	67	0.4	0.1	<	<	< (2)	< (2)	< (2)	< (2)	<	<	<	<	<	<	<	< (2)	<	<	<	<	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Boron (B)	5.0	45,000	-	-	-	-	-	-	< (10)	<	<	< (50)	< (50)	< (50)	<	<	<	6	<	< (50)	< (50)	< (50)	<	<
Cadmium (Cd)	0.017	2.7	0.122	0.024	0.118	0.103	0.020	0.019	0.032	<	0.03	<	<	0.068	0.2	0.023	0.17	0.018	0.02	0.022	0.043	0.040	0.036	0.0274
Calcium (Ca)	100	-	3,690	1,040	791	758	-	-	1,200	500	2,000	1,130	1,080	2,040	1,170	1,170	6,000	800	810	840	729	711	593	1,400
Chromium (Cr)	1.0	810	4.0	1	<	1	<	<	2.4	<	2	1.4	1.3	4.5	1.7	1.7	6.1	<	<	<	<	<	<	1.3
Cobalt (Co)	0.4	66	4	2	< (1)	1	0.93	0.93	0.87	0.48	0.7	0.64	0.60	1.28	0.83	0.9	1.6	0.58	1.1	0.61	0.57	0.63	0.4	<
Copper (Cu)	2.0	87	14	5	3	3	<	3	4.0	<	2	2.9	2.7	7.1	3.1	3.2	44	8.8	7	15.4	13.1	12.9	11.7	7.3
Iron (Fe)	50	-	2,910	1,130	2,120	2,490	1,200	1,200	1,820	1,280	2,300	1,990	1,980	4,680	3,330	3,310	4,500	411	590	513	399	415	791	290
Lead (Pb)	0.5	25	3	1	< (1)	1	<	<	2.26	0.63	1.9	1.64	1.66	5.02	1.82	1.78	4.9	1.2	<	0.6	<	0.52	<	<
Magnesium (Mg)	100	-	962	837	490	354	-	-	700	500	450	312	323	430	644	656	740	34.7	560	546	484	518	403	530
Manganese (Mn)	2.0	-	67	19	38	45	23	22	28.9	18.7	36	30.3	29.2	78.2	32.4	33.4	110	200	41	30.9	24.8	27.7	12.7	18
Mercury (Hg)	0.013	0.29 [3]	< (0.01)	< (0.02)	0.13	0.09	0.07	0.08	0.13	0.043	-	-	-	-	0.072	0.072	0.097	<	-	-	-	-	0.048	0.013
Molybdenum (Mo)	2.0	9,200	< (5)	< (5)	< (5)	< (5)	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Nickel (Ni)	2.0	490	7	< (5)	< (5)	< (5)	<	<	<	<	<	<	<	3.5	<	6.1	9.3	2.7	6	5	5.3	5.5	2.9	<
Phosphorus (P)	100	-	383	104	55	66	-	-	100	100	< (1,000)	-	-	146	123	143	420	<	<	-	<	<	<	130
Potassium (K)	100	-	463	221	170	290	-	-	300	<	< (1,000)	180	190	320	159	251	5500	500	310	334	242	281	202	260
Selenium (Se)	1.0	63	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Silver (Ag)	0.1	1.5	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.13	<	<	0.2	<	<	0.13	<
Sodium (Na)	100	2,300,000	4,220	4,680	3,830	3,950	-	-	9,200	5,800	9, 300	8,270	8,090	21,700	6,220	6,210	27,000	5,400	4,400	4,340	5,000	5,210	3,700	4,900
Strontium (Sr)	2.0	-	-	-	-	-	-	-	9.1	< (5)	13	7.6	7.8	12.5	8.7	8.5	22	< (5)	8	7.1	7.9	8.4	6.5	8.4
Thallium (Tl)	0.1	510	-	-	-	-	-	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	-	-	-	<	<	<	<	<	<	3.7	3.3	4.4	<	<	<	<	<	<	<
Titanium (Ti)	2.0	-	-	-	-	-	-	-	54.8	19.1	49	40.4	40.6	120	46.9	45	89	7.8	8	18.2	18.2	15.9	21.9	15
Uranium (U)	0.1	420	-	-	-	-	-	-	0.14	<	0.2	0.17	0.18	0.82	0.22	0.21	0.59	0.1	<	0.1	<	<	<	<
Vanadium (V)	2.0	250	6	< (5)	< (5)	< (5)	<	<	2.6	<	<	<	<	6.9	2.6	2.3	5.5	<	<	<	<	<	<	<
Zinc (Zn)	5.0	1,100	15	9	8	19	11	15	24	8.6	17	8.3	10.8	26.6	17.3	14.8	140	16.5	30	20.2	28.2	28.6	19.2	19
pH	-	6.5 - 9.0	4.92	5.01	5.2	5.45	4.65	4.47	4.71	4.86	6.05	5.59	5.59	5.74	-	-	-	5.21	5.21	5.74	5.15	5.16	-	-
Hardness	1,000	-	13,200	5,890	3,990	3,870	5,740	5,500	6,000	3,000	7,000	-	-	6,900	-	-	-	4,000	4,000	-	3,800	3,900	-	-

Notes:

RDL = Reportable Detection Limit
MW = Monitor Well
- = Not analysed/No criteria

< = Parameter below detection limit
< (0.0) = Parameter below elevated detection lim
0.0 = above criteria

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 and 2014 was completed by Maxxam Analytics Inc. in Bedford, NS.
Data to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC, dated March 29, 2013.

1. Typical Reportable Detection Limit referenced based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
2. Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
3. Based on Coarse-grained soil conditions.

TABLE C3

HISTORICAL SURFACE WATER ANALYTICAL DATA - PCBs (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Sample Location	Sample Date											Criteria*
	Feb 2007	Nov 2007	May 2008	Mar 2009	Sep 2009	Jan 2010	Nov 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	
SW-POND	-	<	<	<	<	<	<	< (0.06)	<	<	<	na
SW-POND-1	-	-	-	-	<	-	-	< (0.06)	-	-	-	
SW-UPSTREAM	-	-	-	-	-	-	-	-	-	-	<	
SW-STREAM	-	<	<	<	<	< (0.06)	<	<	<	<	<	
RDL	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	

Analysis completed by AMEC for all samples from 2007 to 2012.
Analysis for 2013 samples were completed by Maxxam Analytics Inc. in Bedford, NS.

Data from February 2007 to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC and dated March 29, 2013.

* Criteria does not exist

SW = Surface Water
SW-POND-1 = Field Duplicate of SW-POND.
< = Parameter below detection limit
< (0.00) = Parameter below elevated detection limit
- = No sample collected
RDL = Reportable Detection Limit

TABLE C4

HISTORICAL SURFACE WATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL *	Criteria**	SW-POND											
								SW-DUP1			SW-POND-1			
			Nov 2007	May 2008	Jan 2009	Sep 2009	Jan 2010	Nov 2010	Nov 2010	Dec 2011	Dec 2011	Nov 2012	Aug 2013	Nov 2014
Aluminum (Al)	5.0	100(1)	**190**	76	45.9	**180**	**635**	75.6	74.7	**202**	**262**	49.7	21.3	96
Antimony (Sb)	1.0	-	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<
Arsenic (As)	1.0	5.0	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<
Barium (Ba)	1.0	-	24.8	7.9	31	26	32.0	25	25.2	29.1	30.1	23.8	14	<
Beryllium (Be)	1.0	-	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<	<
Boron (B)	5.0	-	-	-	-	230	369	332	329	356	362	263	232	100
Cadmium (Cd)	0.017	0.009(2)	0.064	0.067	0.035	<	0.053	0.022	0.019	0.063	0.065	0.028	<	0.016
Calcium (Ca)	100	-	51,500	30,600	-	55,000	70,000	77,100	77,400	99,000	97,500	96,000	67,200	39,000
Chromium (Cr)	1.0	8.9(3)	<	<	<	<	1.7	<	<	<	<	<	<	<
Cobalt (Co)	0.4	-	6	2	6.21	4	4.83	2.2	2.13	2.98	3.50	2.18	<	0.54
Copper (Cu)	2.0	2(4)	**10**	3	**6**	**6**	**8.9**	**7.9**	**5.1**	**6.4**	**6.7**	**2.4**	<	**2.6**
Iron (Fe)	50	300	**377**	**318**	150	**480**	**1,170**	241	244	**523**	**682**	**405**	116	**320**
Lead (Pb)	0.50	1(5)	2	1	<	0.6	2.56	<	<	0.89	1.18	<	<	<
Magnesium (Mg)	100	-	6,970	5,520	-	6,100	7,800	6,200	6,190	9,100	8,890	8,220	5,750	3,100
Manganese (Mn)	2.0	-	1,850	1,350	2,400	1,200	1,760	1,170	1,170	1,670	1,750	1310	135	450
Mercury (Hg)	0.013	0.026	< (0.02)	< (0.02)	< (0.01)	-	<	-	-	-	-	-	<	<
Molybdenum (Mo)	2.0	73.00	< (5)	< (5)	<	<	<	<	<	<	<	<	<	<
Nickel (Ni)	2.0	25(6)	< (5)	< (5)	3	<	3.5	2	<	2.2	23	<	<	2
Phosphorus (P)	100	-	51	24	-	-	<	<	120	<	<	<	<	110
Potassium (K)	100	-	16,900	12,900	-	1,200	15,000	13,600	14,000	12,900	12,700	10,600	7,600	3,700
Selenium (Se)	1.0	1.0	<	<	<	<	<	1.2	<	<	<	<	<	<
Silver (Ag)	0.1	0.1	<	<	<	<	<	<	<	<	<	<	<	<
Sodium (Na)	100	-	145,000	129,000	-	78,000	98,000	63,600	65,300	48,700	47,800	44,500	35,300	16,000
Strontium (Sr)	2.0	-	-	-	-	180	198	187	193	261	256	243	180	94
Thallium (Tl)	0.1	0.8	-	-	-	<	<	<	<	<	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	<	<	<	<	<	<	<	<	<
Titanium (Ti)	2.0	-	-	-	-	16	31.7	10.4	10.1	26.3	33.8	7.9	<	9.4
Uranium (U)	0.10	-	-	-	-	<	<	<	<	<	<	<	<	<
Vanadium (V)	2.0	-	< (5)	< (5)	<	<	<	<	<	<	<	<	<	<
Zinc (Zn)	5.0	30	12	9	17	18	24.3	11.8	11.4	21.4	23.1	12.2	<	8.2
pH	-	6.5 - 9.0	7.38	6.92	7.45	7.13	7.13	7.79	7.87	7.66	7.65	7.87	7.31	7.53
Hardness	1,000	-	157,000	99,100	190,000	160,000	210,000	220,000	220,000	280,000	280,000	270,000	230,000	110

Notes:

RDL = Reportable Detection Limit
SW = Surface Water
- = Not analysed/No criteria
RDL = Reportable Detection Limit
- = Not analysed/No criteria
< = Parameter below detection limit
< (0.0) = Parameter below elevated detection limit
0.0 = above criteria

(1) Aluminum guideline = 5 ug/L at pH < 6.5
= 100 ug/L at pH ≥ 6.5

(2) Cadmium guideline = $10^{[0.83[\log(\text{hardness})]-2.46]}$

(3) Criteria for Chromium (III) = 8.9 ug/L

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 was completed by Maxxam Analytics Inc. in Bedford, NS.
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* Typical Reportable Detection Limit reference based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
** Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

(4) Copper guideline = 2 ug/L at $[CaCO_3]$ = 0-120 mg/L
= 3 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 4 ug/L at $[CaCO_3]$ >180 mg/L

(5) Lead guideline = 1 ug/L at $[CaCO_3]$ = 0-60 mg/L
= 2 ug/L at $[CaCO_3]$ = 60-120 mg/L
= 4 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 7 ug/L at $[CaCO_3]$ >180 mg/L

(6) Nickel guideline = 25 ug/L at $[CaCO_3]$ = 0-60 mg/L
= 65 ug/L at $[CaCO_3]$ = 60-120 mg/L
= 110 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 150 ug/L at $[CaCO_3]$ >180 mg/L

TABLE C4

HISTORICAL SURFACE WATER ANALYTICAL DATA - METALS (ug/L)
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL *	Criteria**	SW-STREAM										SW-UPSTREAM
			Nov 2007	May 2008	Jan 2009	Sep 2009	Jan 2010	Nov 2010	Dec 2011	Nov 2012	Aug 29, 2013	Nov 27, 2014	Nov 2014
Aluminum (Al)	5.0	100(1)	89	**132**	60.7	83	**88.3**	**125**	**155**	51.7	26.7	**790**	**240**
Antimony (Sb)	1.0	-	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<
Arsenic (As)	1.0	5.0	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<
Barium (Ba)	1.0	-	12.7	21.2	15	6	17.6	15.8	10.8	5.6	4.1	4.9	1.9
Beryllium (Be)	1.0	-	<	<	< (2)	< (2)	< (2)	<	<	<	<	<	<
Bismuth (Bi)	2.0	-	<	<	<	<	<	<	<	<	<	<	<
Boron (B)	5.0	-	-	-	-	140	224	171	203	151	171	<	<
Cadmium (Cd)	0.017	0.009(2)	<	0.099	0.018	<	<	0.020	<	<	<	0.035	<
Calcium (Ca)	100	-	31,100	46,700	-	20,000	45,000	41,200	43,200	36,200	36,500	5,000	1,000
Chromium (Cr)	1.0	8.9(3)	<	<	<	<	<	<	<	<	<	<	<
Cobalt (Co)	0.4	-	3	3	1.77	1	2.55	2.48	1.10	0.52	0.75	0.56	<
Copper (Cu)	2.0	2(4)	2	**6**	3	<	**3.4**	2.5	2.3	<	<	<	<
Iron (Fe)	50	300	167	**411**	100	190	180	235	265	98	63	**860**	220
Lead (Pb)	0.50	1(5)	1	1	<	<	0.51	<	<	<	<	**1.6**	<
Magnesium (Mg)	100	-	5,590	6,620	-	3,100	6,900	5,020	5,720	4,800	4,530	1,300	550
Manganese (Mn)	2.0	-	2,560	1,180	850	530	1,170	1,590	331	142	145	230	12
Mercury (Hg)	0.013	0.026	< (0.02)	< (0.02)	0.01	-	0.018	-	-	-	<	0.022	<
Molybdenum (Mo)	2.0	73.00	< (5)	< (5)	<	<	<	<	<	<	<	<	<
Nickel (Ni)	2.0	25(6)	< (5)	< (5)	<	<	<	<	<	<	<	<	<
Phosphorus (P)	100	-	23	42	-	-	<	<	<	<	<	220	<
Potassium (K)	100	-	13,900	12,900	-	8,100	14,000	11,800	9,530	7,520	7,970	1,100	220
Selenium (Se)	1.0	1.0	<	<	<	<	<	<	<	<	<	<	<
Silver (Ag)	0.1	0.1	<	<	<	<	<	<	<	<	<	<	<
Sodium (Na)	100	-	152,000	94,000	-	61,000	96,000	71,200	42,600	34,500	40,100	11,000	4,900
Strontium (Sr)	2.0	-	-	-	-	62	122	102	116	94.1	103	19	5.3
Thallium (Tl)	0.1	0.8	-	-	-	<	<	<	<	<	<	<	<
Tin (Sn)	2.0	-	-	-	-	<	<	<	<	<	<	<	<
Titanium (Ti)	2.0	-	-	-	-	5	11.0	10.9	16.2	4.7	<	45	5
Uranium (U)	0.10	-	-	-	-	<	<	<	<	<	<	<	<
Vanadium (V)	2.0	-	< (5)	< (5)	<	<	<	<	<	<	<	<	<
Zinc (Zn)	5.0	30	4	25	6	14	8.7	8	6.2	<	<	9	<
pH	-	6.5 - 9.0	6.92	7.43	7.16	6.93	6.32	7.12	7.21	7.55	7.13	5.89	6.16
Hardness	1,000	-	101,000	144,000	155,000	64,000	140,000	120,000	130,000	110,000	110,000	18	4.8

Notes:

RDL = Reportable Detection Limit
SW = Surface Water
- = Not analysed/No criteria
RDL = Reportable Detection Limit
- = Not analysed/No criteria
< = Parameter below detection limit
< (0.0) = Parameter below elevated detection limit
0.0 = above criteria

(1) Aluminum guideline = 5 ug/L at pH < 6.5
= 100 ug/L at pH ≥ 6.5

(2) Cadmium guideline = $10^{\{0.83[\log(\text{hardness})]-2.46\}}$

(3) Criteria for Chromium (III) = 8.9 ug/L

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 was completed by Maxxam Analytics Inc. in Bedford, NS.
Data to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC, dated March 29, 2013.

* Typical Reportable Detection Limit reference based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
** Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

(4) Copper guideline = 2 ug/L at $[CaCO_3]$ = 0-120 mg/L
= 3 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 4 ug/L at $[CaCO_3]$ >180 mg/L

(5) Lead guideline = 1 ug/L at $[CaCO_3]$ = 0-60 mg/L
= 2 ug/L at $[CaCO_3]$ = 60-120 mg/L
= 4 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 7 ug/L at $[CaCO_3]$ >180 mg/L

(6) Nickel guideline = 25 ug/L at $[CaCO_3]$ = 0-60 mg/L
= 65 ug/L at $[CaCO_3]$ = 60-120 mg/L
= 110 ug/L at $[CaCO_3]$ = 120-180 mg/L
= 150 ug/L at $[CaCO_3]$ >180 mg/L

TABLE C5

HISTORICAL SURFACE WATER ANALYTICAL DATA - GENERAL CHEMISTRY
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL *	Units	Criteria**	SW-POND							SW-DUP1	SW-POND-1				
				Feb 2007	Nov 2007	May 2008	Mar 2009	Sep 2009	Jan 2010	Nov 2010	Nov 2010	Dec 2011	Dec 2011	Nov 2012	Aug 2013	Nov 2014
Anion Sum	N/A	me/L	-	-	-	-	-	-	-	-	-	-	-	-	5.75	3.11
Bicarb. Alkalinity (calc. as CaCO3)	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	160,000	95,000
Calculated TDS	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	380,000	180,000
Carb. Alkalinity (calc. as CaCO3)	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	<	<
Cation Sum	N/A	me/L	-	-	-	-	-	-	-	-	-	-	-	-	7.29	3.07
Colour	5	TCU	-	-	98	77	34	110	75	68	76	72	64	22	13	38
Conductivity	1	µS/cm	-	-	1,190	927	1,010	1,100	1,100	720	720	850	850	770	560	290
Dissolved Chloride (Cl)	1,000	µg/L	-	-	165,000	195,000	104,000	110,000	110,000	63,000	63,000	46,000	46,000	-	24,000	18,000
DOC	500	µg/L		-	22,900	19,600	12,500	-	-	-	-	-	-	-	-	-
Dissolved Sulphate (SO4)	2,000	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	73,000	27,000
Hardness (CaCO3)	1,000	µg/L	-	-	157,000	99,100	190,000	160,000	210,000	220,000	220,000	280,000	280,000	270,000	230,000	110,000
Ion Balance (% Difference)	N/A	%	-	-	-	-	-	-	-	-	-	-	-	-	11.8	0.065
Langelier Index (@ 20C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-0.018	-0.284
Langelier Index (@ 4C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-0.266	-0.534
Nitrate as N	50	µg/L	13,000	-	8,650	8,480	8,360	5,200	7,700	6,900	6,900	4,600	4,700	3,600	-	1,700
Nitrite as N	15	µg/L	60	-	**84**	**369**	**69**	**220**	**120**	**190**	**190**	**100**	**90**	**68**	-	31
Nitrate + Nitrite	50	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	4,100	1,700
Nitrogen (Ammonia Nitrogen)	50	µg/L	-	-	33,000	641	30,000	13,000	24,000	12,000	13,000	9,000	11,000	-	4,000	1,300
Orthophosphate (P)	10	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	<	<
pH	N/A	pH	6.5 - 9	-	7.38	6.92	7.45	7.13	7.35	7.79	7.87	7.66	7.65	7.87	7.31	7.53
Reactive Silica (SiO2)	0.5	µg/L	-	-	-	-	-	6,100	6,600	6,800	6,900	6,200	6,300	7,700	5,700	5,000
Saturation pH (@ 20C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-	-	7.33	7.81
Saturation pH (@ 4C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-	-	7.58	8.06
Sulphate	10,000	µg/L		-	85,300	68,100	121,000	97,000	160,000	160,000	160,000	190,000	190,000	-	-	-
Total Alkalinity (Total as CaCO3)	30,000	µg/L	-	-	214,000	76,600	167,000	150,000	190,000	130,000	130,000	130,000	140,000	180,000	160,000	95,000
Total Dissolved Solids	10,000	µg/L		-	771,000	549,000	658,000	493,000	638,000	518,000	520,000	529,000	532,000	-	-	-
Total Organic Carbon (C)	500	µg/L	-	-	26,500	19,200	12,900	11,000	16000 (1)	12,000	12,000	10,000	10,000	9,300	14,000	6,900
Total Supended Solids	2,000	µg/L		-	6,000	2,000	3,000	-	-	-	-	-	-	-	-	-
Turbidity	0.1	NTU	-	-	5.7	1.4	2.0	4.20	9.40	2.1	1.7	7.0	6.1	1.4	180	2

Notes:

RDL = Reportable Detection Limit
SW = Surface Water

- = Not analysed/No criteria
< = Parameter below detection limit
0.0 = above criteria
(1)- Elevated reporting limit due to sample matrix

Analysis completed by AMEC for all samples from 2007 to 2012 .
Analysis of samples from 2013 was completed by Maxxam Analytics Inc. in Bedford, NS.
Data to November 2012 transcribed from the 2012-2013 Annual Report of Activities for the Upper Trinity South (New Harbour) Waste Disposal Site completed by AMEC, dated March 29, 2013.

* Typical Reportable Detection Limit reference based on Maxxam laboratory analysis, but RDL may be lower than shown for original data.
** Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

TABLE C5

HISTORICAL SURFACE WATER ANALYTICAL DATA - GENERAL CHEMISTRY
2013/14 MONITORING AND MAINTENANCE PROGRAM
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
NEW HARBOUR BARRENS, NL

Parameter	RDL *	Units	Criteria**	SW-STREAM											SW-UPSTREAM
				Feb 2007	Nov 2007	May 2008	Mar 2009	Sep 2009	Jan 2010	Nov 2010	Dec 2011	Nov 2012	Aug 2013	Nov 2014	Nov 2014
Anion Sum	N/A	me/L	-	-	-	-	-	-	-	-	-	-	3.84	0.71	0.2
Bicarb. Alkalinity (calc. as CaCO3)	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	76,000	5,000	<
Calculated TDS	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	250,000	46,000	17,000
Carb. Alkalinity (calc. as CaCO3)	1,000	µg/L	-	-	-	-	-	-	-	-	-	-	<	<	<
Cation Sum	N/A	me/L	-	-	-	-	-	-	-	-	-	-	4.04	0.89	0.32
Colour	5	TCU	-	-	96	72	49	100	58	57	42	39	28	190	71
Conductivity	1	µS/cm	-	-	1,070	936	1190	470	810	540	530	400	390	82	35
Dissolved Chloride (Cl)	1,000	µg/L	-	-	213,000	134,000	206,000	84,000	110,000	77,000	45,000	-	31,000	22,000	7,100
DOC	500	µg/L		-	21,700	17,800	17,900	-	-	-	-	-	-	-	-
Dissolved Sulphate (SO4)	2,000	µg/L	-	-	-	-	-	-	-	-	-	-	49,000	<	<
Hardness (CaCO3)	1,000	µg/L	-	-	101,000	144,000	155,000	64,000	140,000	120,000	130,000	110,000	110,000	18,000	4,800
Ion Balance (% Difference)	N/A	%	-	-	-	-	-	-	-	-	-	-	2.5	11.3	23.1
Langelier Index (@ 20C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-0.827	-4.01	NC
Langelier Index (@ 4C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-1.08	-4.27	NC
Nitrate as N	50	µg/L	13,000	-	7,710	7,400	12,500	1,200	13,000	8,000	8,000	4,600	-	<	55
Nitrite as N	15	µg/L	60	-	35	**492**	31	<	**110**	**100**	50	13	-	<	<
Nitrate + Nitrite	50	µg/L	-	-	-	-	-	-	-	-	-	-	5,800	<	55
Nitrogen (Ammonia Nitrogen)	50	µg/L	-	-	10,800	24,100	26,500	<	8,200	780	1.6	-	1,400	<	<
Orthophosphate (P)	10	µg/L	-	-	-	-	-	-	-	-	-	-	<	<	<
pH	N/A	pH	6.5 - 9	-	6.92	7.43	7.16	6.93	**6.32**	7.12	7.21	7.55	7.13	**5.89**	**6.16**
Reactive Silica (SiO2)	0.5	µg/L	-	-	-	-	-	4,700	5,500	5,200	5,500	5,300	6,300	2,400.0	2.5
Saturation pH (@ 20C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	7.96	9.9	NC
Saturation pH (@ 4C)	N/A	N/A	-	-	-	-	-	-	-	-	-	-	8.21	10.2	NC
Sulphate	10,000	µg/L		-	59,000	90,100	107,000	57,000	110,000	96,000	100,000	-	-	-	-
Total Alkalinity (Total as CaCO3)	30,000	µg/L	-	-	90,900	143,000	129,000	50,000	65,000	41,000	44,000	52,000	76,000	5,000	<
Total Dissolved Solids	10,000	µg/L		-	698,000	496,000	775,000	274,000	493,000	371,000	321,000	-	-	-	-
Total Organic Carbon (C)	500	µg/L	-	-	23,600	17,700	18,100	14,000	19,000	13,000	8,000	9,100	8,200	12,000	7,300
Total Supended Solids	2,000	µg/L		-	<	5,000	2,000	-	-	-	-	-	-	-	-
Turbidity	0.1	NTU	-	-	1.6	3.8	1.8	1.30	13	1.8	1.8	1.2	32	31	1.2

Notes:

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< = Parameter below detection limit
0.0 = above criteria
(1)- Elevated reporting limit due to sample matrix

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