2012/2013 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NEWFOUNDLAND AND LABRADOR

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EXECUTIVE SUMMARY

Conestoga-Rovers & Associates (CRA) was retained by the Newfoundland and Labrador Department of Environment and Conservation (DOEC) to complete the 2012/13 monitoring and maintenance program at the Come By Chance Secure Landfill (Site) located on Refinery Road in Come By Chance, Newfoundland and Labrador (NL) as shown on Figure 1. Site visits and field activities were completed in accordance with the DOEC Tier I schedule as outlined in the June 2012 Operations, Maintenance , and Monitoring (OMM) Manual.

The Come By Chance Secure Landfill covers an area of approximately 19,778 square metres (m^2) located approximately 2.5 km west of the Trans Canada Highway and approximately 4 km south of the Town of Come By Chance, Newfoundland and Labrador (NL). The landfill was constructed between 1994 and 1996 to facilitate the clean-up of hazardous waste associated with the Come By Chance Oil Refinery. Leachate containment is achieved through the use of a redundant liner system consisting of independent primary and secondary liners as well as a drainage pipe system to manage excess fluid and provide a means for leachate discharge. A groundwater drainage system (GWDS) was installed in March 2009 starting at the east side of the landfill and is graded at one percent toward the northeast corner, then along the north side, and eventually discharging beyond the gravel road west of the Site.

The work completed by CRA during the 2012/13 monitoring and maintenance program generally involved sampling of the primary and secondary leachate collection valve chambers in advance of pumping down the chambers by discharging to a nearby ditch, groundwater and surface water sampling, landfill cover inspection, groundwater drainage system inspection, clean-out inspection with cleaning (if required), and an assessment of potential infiltration sources into the leachate liner systems.

The summer Site sampling event was conducted in August 2012 with the leachate pumping event completed in November 2012 while the hydraulic pump down test of the secondary leachate chamber was completed in December 2012. A summary of the 2012/13 monitoring and maintenance program is provided below along with recommendations for future work.

E.1 SAMPLING SCHEDULE

In accordance with the OMM Manual, CRA recommend that future leachate sampling continue to be conducted using the Tier I schedule (once per year) since leachate

elevations were measured at less than 0.3 metres below the top of the valve chambers for the PLCS and SLCS again during the 2012 Site visit.

Monitoring and Maintenance Schedule: In accordance with the OMM Manual, CRA continue to recommend that groundwater, surface water, and leachate sampling be conducted using the Tier I schedule (once per year) since leachate elevations were measured at less than 0.3 metres below the top of the valve chambers for the PLCS and SLCS in 2012. In addition, the continued maintenance and inspection program for the landfill cover and groundwater drainage system clean-outs should be scheduled to coincide with the sampling program.

E.2 GROUNDWATER

In general, BTEX/mTPH, PAH, PCB, VOC, general chemistry, and metals analytical data show groundwater conditions to be of better quality compared to leachate analytical data; therefore, it does not appear that groundwater is being influenced by leachate from the secure landfill. Based on static groundwater levels measured during the 2012 Site visit, it also appears that groundwater infiltration may still be occurring at the northeastern area of the Site.

E.3 SURFACE WATER

In general, the BTEX/mTPH, PAH, PCB, VOC, and general chemistry analytical data show surface water conditions as dramatically distinct in comparison to the leachate analytical data. Two metals (aluminum and iron) reported exceedances in the upgradient and downgradient surface water samples whereas the leachate analytical data reported exceedances for one metal (iron); however, iron concentrations in the leachate were approximately 15 times that of the surface water samples. Based on this information, it does not appear that leachate is seeping from the landfill liners into the downgradient surface water; therefore, the secure landfill liners appear to be performing in accordance with their original intent of acting as a barrier between leachate accumulations within the landfill and surface water in the surrounding area.

E.4 LEACHATE AND POTENTIAL INFILTRATION SOURCES

In accordance with the OMM Manual, the pumping event consisted of two Site visits so that a desired flow rate of 15 L/min could be achieved. During the first Site visit for leachate pumping in November 2012, it was observed that the PLCS and SLCS valves

were in the open position with the discharge hose no longer connected to the PLCS valve. CRA determined in-flow rates by pumping down each valve chamber, measuring the change in head over a fixed period of time, then calculating in-flow. Maintaining these valves in the open position does not create any integrity issues for containment as the hydraulic head in the two leachate valve chambers has not risen above the ground surface. It was also noted that leachate elevations in the PLCS and SLCS for two consecutive Site visits were less than 0.3 metres below the top of the valve chambers.

A review of the current and historical leachate pumping volumes from the PLCS and SLCS valve chambers demonstrates that pumped leachate volumes have decreased since the installation of the groundwater drainage system. A comparison of the average pumped leachate volumes from the PLCS prior to and following installation of the groundwater drainage system shows a decrease of approximately 40 percent. In addition, a comparison of the average pumped leachate volumes from the SLCS prior to and following installation of the groundwater drainage system shows a decrease of approximately 60 percent. Consequently, it appears the groundwater drainage system has contributed to the reduction of volumes of pumped leachate from the PLCS and SLCS; however, significant volumes of leachate are still present within the two liners that require pumping on a regular basis.

E.5 LANDFILL COVER AND VEGETATION CONTROL

The landfill cover inspection was conducted on November 21, 2012, which indicated that minor maintenance is required. The only issue of concern related to maintenance is the cutting of vegetation, typically alders, which have reached 1.5 metres in height, considerably more than the OMM recommended height restriction of 0.3 metres. Meadow vole activity from tunneling and nesting was noted in numerous locations on the landfill cover; however, meadow voles typically limit their habitat to less than 300 mm from surface.

Upon reviewing the results of the elevation control survey, it was noted the elevation control points decreased by an average of 6.5 millimetres between the original elevations surveyed in August 2010 and the recent survey completed in November 2012. Based on this information, the difference in elevation of the control points indicate that very limited and insignificant settlement is occurring at the landfill cover, which in turn indicates the contents of the landfill are not settling.

E.6 GROUNDWATER DRAINAGE SYSTEM

Four GWDS clean-outs were previously installed as part of the original system construction; visual inspections confirmed that water was not present. The discharge location, previously located on the west side of the gravel service road, was excavated and reconstructed at the roadside embankment as part of redevelopment of the area, which was related to the construction of a new asphalt plant (J-1 Contracting) prior to the November 2012 Site visit; a rodent screen was not observed covering the pipe discharge. A very low flow of water was observed from the discharge of the GWDS.

Debris or blockages were not present in any of the clean-outs during the Site visit and combined with the water flow from the downgradient discharge, it was determined the GWDS was functioning properly and cleaning was not required.

E.7 HYDRAULIC CONNECTIVITY OF LINER SYSTEMS

A pump down test was completed that used the existing PLCS and SLCS manholes and monitoring wells to evaluate the potential for a hydraulic connection between the PLCS and SLCS. Pumping from the SLCS was completed over a 6 hour period in December 2012 during which leachate levels were monitored periodically in the PLCS. Over the 6 hour period, leachate in the PLCS dropped 0.063 metres; therefore, it was confirmed that hydraulic connection ***does*** exist between the PLCS and SLCS.

E.8 HYDRAULIC CONNECTIVITY OF LANDFILL TO GROUNDWATER

A pump down test was completed that used the existing SLCS manhole and monitoring wells to evaluate the potential for a hydraulic connection between the SLCS and groundwater in the immediate area of the landfill. Since the secondary liner forms the outermost layer of the landfill liner system and has historically required the pumping of large volumes of leachate, the pump down test involved the continual pumping of leachate from the SLCS manhole. Pumping from the SLCS was completed over a 6 hour in December 2012 during which groundwater levels in the nearby six monitor wells were gauged periodically. The two upgradient monitor wells reported an increase in groundwater elevations compared to starting groundwater elevations; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and upgradient groundwater. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of

approximately 14.0 masl, it appears that groundwater upgradient of the landfill is likely intercepted in the GWDS and directed around the landfill.

The two cross-gradient monitor wells reported an increase in groundwater elevation compared to starting groundwater elevations; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and cross-gradient groundwater. The surface water elevation of the adjacent brook was very near the relatively constant groundwater elevation at the cross-gradient monitor wells. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of approximately 14.0 masl, it ***does not*** appear that groundwater cross-gradient of the landfill has an impact on leachate elevations within the landfill during normal weather conditions. This may not be the case during very high precipitation events when the nearby brook has higher water flow with increased surface water elevations; however, the brook surface water elevation would have to increase by more than 0.6 metres before potentially affecting the landfill.

The two downgradient monitor wells reported a decrease in groundwater elevation compared to starting groundwater elevations; therefore, pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and downgradient groundwater. Based on the March 2009 AMEC Come By Chance Secure Landfill Groundwater Drainage System Construction Report, the extrapolated elevation of CO#4 would be relatively close to groundwater elevations at the nearby downgradient monitor wells; however, groundwater was measured at approximately 1.8 metres higher than the expected elevation of CO#4. Based on the information of a decrease in groundwater elevation at the downgradient monitor wells and depth of the secondary liner at the bottom of the landfill being constructed at an assumed elevation of approximately 14.0 masl, it ***does*** appear that a hydraulic connection exists between the secondary liner and groundwater downgradient from the landfill; however, it also appears the GWDS was not constructed to an effective depth between CO#2 and CO#4.

E.9 PRECIPITATION INFILTRATION POTENTIAL

A water balance for the landfill was originally intended to be calculated using potential precipitation infiltration in comparison to leachate volumes pumped from the landfill liner systems; however, leachate was not managed regularly to remove any accumulations except during semi-annual or annual pumping events associated with leachate and groundwater sampling. Therefore, potential precipitation infiltration was compared to volumes of leachate pumped from the SLCS and precipitation data.

Using local climatology data, landfill design drawings, combined with some default climate data assumptions in the HELP Model (Hydrologic Evaluation of Landfill Performance), CRA evaluated the top and side slopes of the landfill cover system based on two generalized groups of input parameters related to soil and landfill design as well as climate data that includes effects related to vegetative cover and topsoil.

The HELP model calculated an average annual precipitation of 1,315.6 mm, which was very near the actual average annual precipitation of 1,319.0 mm for Arnold's Cove, NL and 1,269.9 mm for Come By Chance, NL. The average annual infiltration or leakage through the landfill cover system was estimated at 3.4 mm per hectare per year at the top slope and 1.9 mm per hectare per year at the side slopes. The modeled infiltration multiplied by the area for the top and side slopes resulted in an estimated annual infiltration of approximately 2,650 L through the top slope and approximately 3,020 L through the side slopes for a combined annual infiltration of 5,670 L.

Only records for the SLCS pumping were available and as such, the estimated leachate generation from the HELP model was compared to leachate pumping volumes from the SLCS. Pumping volumes from the SLCS ranged from 19,475 L in February 2007 to 103,000 L in July 2007. The maximum and minimum pumping volumes coincided with extreme monthly precipitation data from Environment Canada – the lowest pumping volume in February 2007 reported 31 mm of precipitation while the highest pumping volume in July 2007 reported 334 mm of precipitation.

Based on the estimated annual leachate volume of 5,670 L generated from infiltration calculated using the HELP model, it is very obvious that leachate pumping volumes from the SLCS far exceed the estimated infiltration volume. When the pumping volumes of leachate from the PLCS are included, the difference is even more dramatic. Therefore, the liner systems of the landfill appear to be greatly influenced by the surrounding groundwater and indirectly by precipitation, thus confirming there are significant failures in the landfill liner systems.

E.10 POTENTIAL LINER SYSTEM DEFICIENCIES

Four potential failure mechanisms may be contributing to the high volumes of infiltration into the landfill liner systems as follows:

- Gas vent attachment to the landfill cover system that would permit precipitation to enter through a tear or failed weld between the vent pipe and liner.

- Leachate collection pipe liner wall penetrations through the boot where a tear or failed weld between the boot and liner would permit groundwater entry.
- Excessive and/or large punctures or tears in the liner systems that may have occurred during placement of the waste or as a result of differential settlement from the weight of the waste and large volumes of leachate/groundwater contained within the liner system.
- Construction of the landfill liner edges around the perimeter of the landfill.

The file review confirmed the construction detail used around the perimeter of the landfill for termination of the primary and secondary liners was essentially the same as the 1994 design drawings. The file review revealed the trenching detail was generally being followed during construction; however, the liner was noted to have pulled up about 25 % of the distance from the bottom of the trench after placement of the sand layer. Finally, the cover liner was specified to extend over and beyond the secondary and primary liner trenches, but there was no reference to welding of the primary or secondary liners to the cover liner. Based on this construction detail and when groundwater elevations are sufficiently high around the northeastern and eastern areas of the landfill, a route exists for possible groundwater infiltration into the landfill as the cover liner was not sealed to the primary and/or secondary liners.

E.11 RECOMMENDATIONS

Based on the findings of the 2012/13 monitoring and maintenance program along with data from previous monitoring programs, the following recommendations are offered for consideration by DOEC:

Monitoring and Maintenance Schedule: The leachate quality is continually reporting BTEX/TPH, PAH, PCB, general chemistry, and metals concentrations at levels that would not affect the surrounding environment, most notably groundwater and surface water. In addition, the landfill was constructed approximately 20 years ago and based on the historical analytical data reviewed in this report, it appears that leachate has reached a steady-state condition. Furthermore, groundwater infiltration has been evident for many years and has acted as a flushing mechanism for any contaminants that may have been present, although elevated levels of contaminants have not historically been identified. Therefore, CRA recommend that further monitoring of the landfill and pumping out of the PLCS and SLCS are not required; however, annual inspections should be continued to ensure the landfill cover system is not compromised by erosion. CRA understands that DOEC would prefer to continue monitoring activities at the landfill as a matter of due diligence.

Vegetation Control: CRA recommend that all vegetation on the landfill cover that measures over 0.3 metres in height should be cut down. This work can be completed in conjunction with vegetation control in the monitor well locations outside the fenced area of the landfill.

In addition, it was noted that access to two monitor wells (MW93-1 and MW93-1A) was somewhat difficult due to the excessive vegetative growth in the area with alders reaching heights of 1.8 metres. CRA recommend that alders be cut down in this location to better facilitate future field programs (i.e. the transport of field equipment such as water level meters, coolers, sample jars, etc.).

TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF APPENDICES

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by the Newfoundland and Labrador Department of Environment and Conservation (DOEC) to complete the 2012/13 monitoring and maintenance program at the Come By Chance Secure Landfill (Site) located on Refinery Road in Come By Chance, Newfoundland and Labrador (NL) as shown on Figure 1. Site visits and field activities were completed in accordance with the DOEC Tier I schedule as outlined in the June 2012 Operations, Maintenance , and Monitoring (OMM) Manual.

The work generally involved sampling of the primary and secondary leachate collection valve chambers in advance of pumping down the chambers by discharging to a nearby ditch, abandonment of two damaged monitor wells, installation of two replacement monitor wells, groundwater and surface water sampling, landfill cover inspection, and groundwater drainage system inspection, clean-out inspection with cleaning (if required), and an assessment of potential infiltration sources into the leachate liner systems.

The summer Site sampling event was conducted in August 2012 with the leachate pumping event completed in November 2012 while the hydraulic pump down test of the secondary leachate chamber was completed in December 2012.

2.0 SITE DESCRIPTION

The Come By Chance Secure Landfill covers an area of approximately 19,778 square metres (m^2) located approximately 2.5 km west of the Trans Canada Highway and approximately 4 km south of the Town of Come By Chance (Town), Newfoundland and Labrador (NL). The landfill was constructed between 1994 and 1996 to facilitate the clean-up of hazardous waste associated with the Come By Chance Oil Refinery. Leachate containment is achieved through the use of a redundant liner system consisting of independent primary and secondary liners as well as a drainage pipe system to manage excess fluid and provide a means for leachate discharge.

A groundwater drainage system was installed in March 2009 starting at the east side of the landfill and is graded at one percent toward the northeast corner, then along the north side, and eventually discharging beyond the gravel road west of the Site. The system consists of 140 metres of perforated PVC pipe, 150 mm in diameter, installed in a trench of washed crushed stone measuring approximately 600 mm x 600 mm wrapped in filter fabric and 110 metres of corrugated steel pipe, 200 mm in diameter.

3.0 METHODOLOGY

3.1 GROUNDWATER SAMPLING

On August 30, 2012, static water levels were measured using an electronic product/water interface probe at the on-Site monitor wells (Table 1). The monitor wells were then developed, allowed to recover, and sampled using dedicated, disposable bailers. Seven groundwater samples were collected from the on-Site monitor wells during each sample event, including one field duplicate (DUP-03) from MW93-1A. Note that two monitor well locations (MW93-1 and MW93-2) were surrounded with very high vegetative growth in the area; alders were still noted to reach a height of approximately 1.8 metres.

All groundwater samples collected from the six existing monitor wells (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) were submitted for analysis of benzene, toluene, ethylbenzene, xylene (BTEX), modified total petroleum hydrocarbons (mTPH), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), general chemistry, and metals. Groundwater samples were submitted to Maxxam Analytics Inc. (Maxxam) in Bedford, Nova Scotia for analysis except BTEX/mTPH samples that were submitted to Maxxam in St. John's, NL.

3.2 SURFACE WATER SAMPLING

Surface water sampling was intended to demonstrate background analyte concentrations from the upgradient sample location (SURFACE-UP) and assess potential leachate infiltration into surface water by sampling downgradient (SURFACE-DOWN). The previous SURFACE-DOWN location was destroyed as a result of an industrial development with an asphalt plant (Refer to Photograph 5 of Appendix A); therefore, a new SURFACE-DOWN location was selected and sampled in November 2012. The surface water locations are located southeast of the fenced area and upstream (SURFACE-UP) along with one southwest of the Site beyond the gravel road and downstream (SURFACE-DOWN), both of which were submitted for analysis of BTEX/mTPH, PAHs, PCBs, VOCs, general chemistry, and metals that included hexavalent and total chromium. All surface water samples were submitted to Maxxam in Bedford, NS for analysis except BTEX/mTPH samples that were submitted to Maxxam in St. John's, NL. GPS co-ordinates using NAD27 (UTM Zone 21) geo-reference were also recorded for the two surface water sample locations (Table 2), which are shown on Figure 2.

3.3 LEACHATE SAMPLING AND PUMPING

CRA collected leachate samples on August 30, 2012 from the primary and secondary containment leachate systems (PLCS and SLCS, respectively) for BTEX/mTPH, PAHs, PCBs, VOCs, general chemistry, metals, and toxicity. All leachate samples were submitted to Maxxam in Bedford, NS for analysis except BTEX/mTPH samples that were submitted to Maxxam in St. John's, NL; toxicity samples were submitted to Stantec Consulting Ltd. (Stantec) in St. John's, NL. Note that all laboratories are CALA certified for the respective analyses that were completed. GPS co-ordinates using NAD27 (UTM Zone 21) geo-reference were confirmed for the two leachate collection system valve chamber sample locations (Table 2), which are shown on Figure 2. Field data recorded prior to and during the PLCS and SLCS leachate discharge events are presented in Tables 3 and 4, respectively.

Leachate analytical data was required to determine if pumping down the PLCS and SLCS valve chambers and discharging into a nearby ditch was permitted under the Provincial Environmental Control Water and Sewer Regulations, Schedule A (2003) for the respective comparison criteria, where available. The tabulated analytical results from each sampling event were presented to DOEC for review and approval. Since the drainage ditch location planned for leachate discharge is within the Town boundaries, approval was also requested from the Town prior to discharging leachate from both collection systems into the nearby ditch.

3.4 LANDFILL COVER INSPECTION AND ELEVATION CONTROL

A landfill cover visual inspection was completed during the Site visit in November 2012 when less foliage was present on the vegetation with a more detailed inspection documented in Table 5 in accordance with the OMM Manual (Refer to Photograph 6 of Appendix A). The comprehensive landfill cover inspection conducted in November 2012 assessed the following:

- Height of vegetation;
- Condition of landfill vents;
- Condition of slopes
- Condition of lateral drains.
- Evidence or erosion/animal burrows

The ability to accurately measure potential settlement of the landfill cover was recently incorporated into the landfill surface with the installation of concrete elevation control points that were established at four locations on the landfill cover in 2010. GPS co-ordinates using NAD27 (UTM Zone 21) geo-reference were available for the four

elevation control points and landfill vent locations (Table 2), which are shown on Figure 2. In addition, results of the elevational control point survey are presented in Table 6.

3.5 GROUNDWATER DRAINAGE SYSTEM

Historically, large volumes of leachate from the SLCS were required to be pumped during each Site visit, which was previously suspect to be a result of groundwater infiltration into the secondary liner. Consequently, a Groundwater Drainage System (GWDS) was installed in 2009 outside the fenced area of the secure landfill along the eastern and northern boundaries at an elevation that was anticipated to intercept groundwater and divert it through the drainage system.

A visual inspection of the groundwater drainage system was conducted during the August 2012 Site visit to determine if cleaning was required and/or if groundwater was present in the clean-out locations. GPS co-ordinates using NAD27 (UTM Zone 21) geo-reference were available for the four clean-out locations (Table 2), which are shown on Figure 2. Following construction of an asphalt plant on the western side of the gravel road beyond the secure landfill, the former discharge location for the GWDS was destroyed and relocated to an area immediately adjacent to the gravel road. Refer to Photographs 2 to 4 of Appendix A showing a typical clean-out location during the 2012 Site visit and the new discharge location, which did not have a rodent grill attached.

4.0 GUIDELINE FRAMEWORK

4.1 GROUNDWATER

As specified in the OMM Manual, petroleum hydrocarbon compound concentrations (BTEX/TPH) in groundwater were assessed in relation to the Atlantic Risk-Based Corrective Action (RBCA) Version 2.0 (March 2007) Tier I Risk-Based Screening Levels (RBSLs) for a commercial property with non-potable groundwater and coarse-grained soil.

PAH, PCB, VOC, metals, and general chemistry concentrations 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" dated April 15, 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

4.2 SURFACE WATER

As specified in the OMM Manual, BTE, PAH, VOC, metals (including trivalent and hexavalent chromium), and general chemistry concentrations in surface water were evaluated in relation to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life (Freshwater or FAL). The FAL were from the Canadian Environmental Quality Guidelines (Update 7.0, September 2007).

TPH in surface water was evaluated in relation to the British Columbia Contaminated Sites Regulation (B.C. Reg. 375/96) Schedule 6 Generic Numerical Water Standards for Aquatic Life (Aquatic Life Generic Standards - freshwater) for Total Petroleum Hydrocarbons.

4.3 LEACHATE

As specified in the OMM Manual, leachate was assessed in relation to the Newfoundland and Labrador Regulation 65/03, Environmental Control Water and Sewage Regulations, 2003, Schedule "A", under the Water Resources Act (Filed May 23, 2003) (referred to as Schedule "A" of the DOEC Regulations); and the CCME CWQGs for the Protection of FAL, updated 2007.

5.0 ANALYTICAL RESULTS

5.1 GROUNDWATER

Groundwater analytical results for BTEX/mTPH, PAHs, PCBs, VOCs, general chemistry, and metals are presented in Tables 7 to 12, respectively. Sample locations are shown on Figure 2 and Laboratory Certificates of Analyses are included as Appendix B. Additional discussion is presented in Section 6.1 regarding the groundwater analytical results.

5.1.1 BTEX/mTPH IN GROUNDWATER

Laboratory analytical results for BTEX/mTPH from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 7, all of which reported BTEX/mTPH concentrations as non-detectable and below the applicable guidelines.

One field duplicate was also collected from MW93-1A during the August 2012 sampling event, which reported BTEX/mTPH concentrations consistent with the original sample results.

5.1.2 PAHs IN GROUNDWATER

Laboratory analytical results for PAHs from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 8, all of which reported PAH concentrations as non-detectable or below the applicable guidelines.

In addition, one field duplicate was also collected from MW93-1A that reported PAH concentrations consistent with the original sample results.

5.1.3 PCBs IN GROUNDWATER

Laboratory analytical results for PCBs from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 9, all of which reported PCB concentrations as non-detectable and below the applicable guidelines.

In addition, one field duplicate was collected from MW93-1A that also reported PCB concentrations consistent with the original sample results.

5.1.4 VOCs IN GROUNDWATER

Laboratory analytical results for VOCs from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 10, all of which reported VOC concentrations as non-detectable or below the applicable guidelines.

In addition, one field duplicate was collected from MW93-1A that also reported VOC concentrations consistent with the original sample results.

5.1.5 GENERAL CHEMISTRY IN GROUNDWATER

Laboratory analytical results for general chemistry from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 11, all of which reported general chemistry concentrations as non-detectable or below the applicable guidelines.

In addition, Maxxam conducted a laboratory duplicate analysis for Nitrogen on MW93-1A collected in August 2012, which reported Nitrogen concentrations as consistent with the original sample results. One field duplicate was collected from MW93-1A that also reported general chemistry concentrations consistent with the original sample results.

5.1.6 METALS IN GROUNDWATER

Laboratory analytical results for metals from the six groundwater samples (MW93-1, MW93-1A, MW93-2, MW93-2A, MW10-1, and MW10-1A) are presented in Table 12, all of which reported metals concentrations as non-detectable or below the applicable guidelines.

In addition, Maxxam conducted a laboratory duplicate analysis for metals on MW93-1A collected in August 2012, which reported metals concentrations as consistent with the original sample results. One field duplicate was collected from MW93-1A that also reported metals concentrations consistent with the original sample results.

5.2 SURFACE WATER

Surface water analytical results for BTEX/mTPH, PAHs, PCBs, VOCs, general chemistry, and metals that included hexavalent chromium were compared to applicable guidelines are shown in Tables 13 to 18, respectively. Sample locations are shown on Figure 2 and Laboratory Certificates of Analyses are included as Appendix B. Additional discussion is presented in Section 6.2 regarding the surface water analytical results.

5.2.1 BTEX/mTPH IN SURFACE WATER

Laboratory analytical results for BTEX/mTPH from the two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 13, both of which reported BTE, and petroleum hydrocarbon concentrations as non-detectable and below the applicable comparison criteria.

5.2.2 PAHs IN SURFACE WATER

Laboratory analytical results for PAHs from the two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 14, both all of which reported PAH concentrations as non-detectable or below the applicable guidelines.

5.2.3 PCBs IN SURFACE WATER

Laboratory analytical results for PCBs from the two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 15, all of which reported PCB concentrations as non-detectable. Note that CCME CWQGs (FAL) does not specify a criterion for PCBs in surface water.

5.2.4 VOCs IN SURFACE WATER

Laboratory analytical results for VOCs from the two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 16, both all of which reported VOC concentrations as non-detectable and below the applicable guidelines.

5.2.5 GENERAL CHEMISTRY IN SURFACE WATER

Laboratory analytical results for general chemistry from the two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 17, both of which reported general chemistry concentrations as non-detectable or below the applicable guidelines.

5.2.6 METALS IN SURFACE WATER

Laboratory analytical results for metals from two surface water samples (SURFACE-UP and SURFACE-DOWN) collected in November 2012 are presented in Table 18, all of which reported metals concentrations as non-detectable or below the applicable guidelines except exceedances for aluminum and iron.

The upgradient sample collected in November 2012 reported aluminum and iron exceedances at concentrations very similar. The summary table below demonstrates the difference in concentrations between the upgradient reference sample and the downgradient sample.

Summary Table of Upgradient vs. Downgradient Surface Water Sample Exceedances – November 2012			
Analyte	**Upgradient Concentration (µg/L)**	**Downgradient Concentration (µg/L)**	**Difference**
Aluminum	*113*	*117*	1.04 x
Iron	387	*382*	0.99 x

#.## Exceeds CCME CWQGs

The above-noted exceedances were identified in previous monitoring reports from 2008 to 2011.

5.3 LEACHATE SAMPLING

Leachate analytical results for BTEX/mTPH, PAHs, PCBs, VOCs, general chemistry, and metals are presented in Tables 19 to 24, respectively. Sample locations are shown on Figure 2 and Laboratory Certificates of Analyses are included as Appendix B. In addition, PLCS and SLCS toxicity analytical results for 2012 as reported by Stantec are

included as Appendix C. Further discussion is presented in Section 6.3 regarding the leachate analytical results.

5.3.1 BTEX/mTPH IN LEACHATE

Laboratory analytical results for BTEX/mTPH from the two leachate samples (PLCS and SLCS) collected in August 2012 are presented in Table 19, both of which reported BTEX/mTPH concentrations as very low or non-detectable. TPH concentrations were also below the Schedule A criterion for Provincial Environmental Control Water and Sewer regulations. In addition, BTE and TPH concentrations were below the BC and CCME CWQGs FAL criteria, respectively.

In addition, one field duplicate (DUP-04) was collected from PLCS that also reported BTEX/mTPH concentrations consistent with the original sample results.

5.3.2 PAHs IN LEACHATE

Laboratory analytical results for PAHs from the two leachate samples (PLCS and SLCS) collected in August 2012 are presented in Table 20, both of which reported PAH concentrations as very low or non-detectable and below CCME CWQGs (FAL), where applicable. Provincial regulations or guidelines for PAHs do not exist in consideration of discharging an effluent into a drainage ditch.

In addition, Maxxam conducted a laboratory duplicate analysis for PAHs on PLCS collected in August 2012, which reported PAH concentrations as consistent with the original sample results. One field duplicate (DUP-04) was collected from PLCS that also reported PAH concentrations consistent with the original sample results.

5.3.3 PCBs IN LEACHATE

Laboratory analytical results for PCBs from the two leachate samples (PLCS and SLCS) collected in August 2012 are presented in Table 21, both of which reported PCB concentrations as non-detectable. Provincial regulations or guidelines for PCBs do not exist in consideration of discharging an effluent into a drainage ditch and the CCME CWQGs (FAL) do not specify criteria for PCBs.

In addition, Maxxam conducted a laboratory duplicate analysis for PCBs on PLCS collected in August 2012, which reported PCB concentrations as consistent with the

original sample results. One field duplicate (DUP-04) was collected from PLCS that also reported PCB concentrations consistent with the original sample results.

5.3.4 VOCs IN LEACHATE

Laboratory analytical results for VOCs from the two leachate samples (PLCS and SLCS) collected in August 2012 are presented in Table 22, both of which reported VOC concentrations as non-detectable. Provincial regulations or guidelines for VOCs do not exist in consideration of discharging an effluent into a drainage ditch.

In addition, one field duplicate (DUP-04) was collected from PLCS that also reported VOC concentrations consistent with the original sample results.

5.3.5 GENERAL CHEMISTRY IN LEACHATE

Laboratory analytical results for general chemistry from the two leachate samples (PLCS and SLCS) collected in August 2012 are presented in Table 23, both of which reported general chemistry concentrations as non-detectable or below the applicable guidelines.

In addition, one field duplicate (DUP-04) was collected from PLCS that also reported general chemistry concentrations consistent with the original sample results.

5.3.6 METALS IN LEACHATE

Laboratory analytical results for metals from the two leachate samples (PLCS and SLCS) collected during the August 2012 sampling event are presented in Table 24, both of which reported metals concentrations as non-detectable or below the Provincial regulations except iron. This exceedance was previously reported during the August 2011 sampling event at PLCS as well as the 2008 and October 2009 sampling events at SLCS.

In addition, one field duplicate (DUP-04) was collected from PLCS that generally reported metals concentrations consistent with the original sample results.

5.3.7 TOXICITY IN LEACHATE

Leachate samples from the PLCS and SLCS were also submitted for toxicity analysis, which concluded the effluent from the PLCS and SLCS were non-toxic to rainbow trout with zero mortality for both samples after 96 hours.

6.0 DISCUSSION

6.1 GROUNDWATER

A review of groundwater analytical data from the August 2012 sampling event was compared to leachate analytical data collected from the PLCS and SLCS to determine if leachate appeared to be impacting groundwater. In general, BTEX/mTPH, PAH, PCB, VOC, general chemistry, and metals analytical data show groundwater conditions to be of better quality compared to leachate analytical data; therefore, it does not appear that groundwater is being influenced by leachate from the secure landfill. Groundwater data that includes previous monitoring programs from 2008 to 2012 is included in Appendix D.

Based on static groundwater levels measured during the 2012 Site visit, groundwater was confirmed to flow in a southwesterly direction toward Come By Chance Cove. In addition, static groundwater elevations in 2012 from the three sets of monitor wells and two surface water sample locations were compared to the PLCS and SLCS leachate elevations in the valve chambers. The groundwater elevations at MW93-1 and MW93-1A were measured at approximately 0.56 and 0.98 metres above the leachate elevation at the SLCS valve chamber, respectively. In comparison, groundwater elevations at MW93-2, MW93-2A, MW10-1, and MW10-1A measured approximately 0.9 to 1.8 metres below the leachate elevation at the SLCS valve chamber.

6.2 SURFACE WATER

A review of the downgradient surface water analytical data from the August 2012 sampling event was compared to leachate analytical data to determine if leachate may be impacting the surface water. In general, the BTEX/mTPH, PAH, PCB, VOC, and general chemistry analytical data show surface water conditions as dramatically distinct in comparison to the leachate analytical data. Two metals (aluminum and iron) reported exceedances in the upgradient and downgradient surface water samples whereas the leachate analytical data reported exceedances for one metal (iron); however, iron concentrations in the leachate were approximately 15 times that of the surface water samples. Surface water data that includes previous monitoring programs from 2008 to 2012 is included in Appendix D. Based on this information, it does not appear that leachate is seeping from the landfill liners into the downgradient surface water; therefore, the secure landfill liners appear to be performing in accordance with their original intent of acting as a barrier between leachate accumulations within the landfill and surface water in the surrounding area.

6.3 LEACHATE

Prior to pumping and discharging leachate from the PLCS and SLCS, all analytical parameters were reviewed for compliance with Schedule A. In addition, copies of the results were submitted to DOEC and the Town for approval prior to the pumping event. On October 18 and November 1, 2012, approvals for discharge were received from DOEC and the Town, respectively. In accordance with the OMM Manual, the pumping event consisted of two Site visits so that a desired flow rate of 15 L/min was achieved on two successive days.

During the initial leachate pumping event in November 2012, it was observed that the PLCS and SLCS valves were in the open position with the discharge hose no longer connected to the PLCS valve. CRA determined in-flow rates by pumping down each valve chamber, measuring the change in head over a fixed period of time, then calculated in-flow rates. Maintaining these valves in the open position does not create any integrity issues for containment as the hydraulic head in the two leachate valve chambers has not risen above the ground surface.

6.3.1 NOVEMBER 2012 LEACHATE PUMPING EVENT

CRA returned to the Site on November 21, 2012 to initiate the leachate collection system pumping program. Approximately 12,200 Litres (L) were pumped from the PLCS valve chamber with a final measured in-flow rate of 14.9 L per minute (L/min) while approximately 24,900 L were pumped from the SLCS valve chamber with a final measured in-flow rate of 14.2 L/min. The desired in-flow rate of 15 L/min was achieved for the PLCS and SLCS during the initial pumping event.

CRA completed the subsequent leachate collection system pumping program on November 22, 2012. Approximately 6,500 L were pumped from the PLCS valve chamber with a final measured in-flow rate of 12.0 L/min while approximately 12,700 L were pumped from the SLCS valve chamber with a final measured in-flow rate of 12.2 L/min.

6.3.2 LEACHATE PUMPING EVALUATION

Volumes of leachate pumped and discharged from the PLCS and SLCS were compared to previous pumped volumes. A summary of leachate pumping from November 2000 to November 2012 is presented in the table below.

Summary of Leachate Pumping Volumes (Litres)			
Year	**Month**	**PLCS**	**SLCS**
2000	November	13,000	70,000
2003	November	15,000	56,000
2004	August	NA	45,000
2004	September	15,500	83,000
2004	October	NA	32,000
2006	October	NA	68,000
2007	February	6,000	63,000
2007	July	NA	103,000
2008	November	NA	74,000
Average Pre GWDS		***~12,500***	***66,000***
2009	August	3,406	19,475
2009	December	4,542	30,699
2010	February	3,406	21,350
2010	August	12,100	35,200
2011	January	8,600	30,200
2012	November	12,200	24,900
Average Post GWDS		***~7,400***	***~27,000***

GWDS: Groundwater drainage system installed in March 2009

NA: No leachate present / Not available

A review of the current and historical leachate pumping volumes from the PLCS and SLCS valve chambers demonstrates that pumped leachate volumes have decreased since the installation of the GWDS. A comparison of the average pumped leachate volumes from the PLCS prior to and following installation of the GWDS shows a decrease of approximately 40 percent. In addition, a comparison of the average pumped leachate volumes from the SLCS prior to and following installation of the GWDS shows a decrease of approximately 60 percent. Consequently, the GWDS appears to contribute to reduce volumes of pumped leachate from the PLCS and SLCS; however, significant volumes of leachate are still present within the two liners that require pumping on a regular basis.

6.3.3 HYDRAULIC CONNECTIVITY OF LINER SYSTEMS

A pump down test was completed that used the existing PLCS and SLCS manholes and monitoring wells to evaluate the potential for a hydraulic connection between the PLCS and SLCS. Since the secondary liner forms the outermost layer of the landfill liner

system and has historically required the pumping of dramatically more volumes of leachate compared to the PLCS, the pump down test involved the continual pumping of leachate from the SLCS manhole. Pumping from the SLCS was completed over a 6 hour period on December 18, 2012 during which leachate levels were monitored periodically in the PLCS. Over the 6 hour period, leachate in the PLCS dropped 0.063 metres; therefore, it was confirmed that hydraulic connection ***does*** exist between the PLCS and SLCS. Field measurements recorded during the pump down test are presented in Table 27.

6.3.4 HYDRAULIC CONNECTIVITY OF LANDFILL TO GROUNDWATER

A pump down test was completed that used the existing SLCS manhole and monitoring wells to evaluate the potential for a hydraulic connection between the SLCS and groundwater in the immediate area of the landfill. Since the secondary liner forms the outermost layer of the landfill liner system and has historically required the pumping of large volumes of leachate, the pump down test involved the continual pumping of leachate from the SLCS manhole. Pumping from the SLCS was completed over a 6 hour period on December 18, 2012 during which groundwater levels in the nearby six monitor wells were gauged periodically. The static leachate level in the SLCS at the start of pumping was 15.068 masl and was maintained at a level of approximately 12.1 to 13.5 masl throughout the pump down test. Field measurements recorded during the pump down test are presented in Table 27.

The two upgradient monitor wells (MW93-1 and MW93-1A) are located approximately 95 metres northeast of the landfill and reached depths of 11.2 and 7.8 masl with a ground surface elevation of approximately 16.3 masl; however, the landfill and these two monitor wells are separated by the GWDS at an approximate elevation of 13.5 masl. Groundwater levels measured in these two monitor wells reported an increase in groundwater elevations of 0.043 and 0.007 masl compared to starting groundwater elevations of 13.309 and 14.173 masl, respectively; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and upgradient groundwater. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of approximately 14.0 masl, it appears that groundwater upgradient of the landfill is likely intercepted in the GWDS and directed around the landfill.

The two cross-gradient monitor wells (MW93-2 and MW93-2A) are located approximately 40 metres south of the landfill and reached depths of 11.8 and 7.8 masl with a ground surface elevation of approximately 14.3 masl. Groundwater levels

measured in these two monitor wells reported an increase in groundwater elevation of 0.001 metres in MW93-2 and a decrease in groundwater elevation of 0.001 metres in MW93-2A compared to starting groundwater elevations of 15.468 and 16.037 masl for MW93-2 and MW93-2A, respectively; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and cross-gradient groundwater. The surface water elevation of the adjacent brook was measured as 13.4 masl during the pumping event, which was very near the relatively constant groundwater elevation at MW93-2; groundwater in MW93-2A typically reported a constant elevation of 14.2 masl. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of approximately 14.0 masl, it ***does not*** appear that groundwater cross-gradient of the landfill has an impact on leachate elevations within the landfill during normal weather conditions. This may not be the case during very high precipitation events when the nearby brook has higher water flow with increased surface water elevations; however, the brook surface water elevation would have to increase by more than 0.6 metres before potentially affecting the landfill.

The two downgradient monitor wells (MW10-1 and MW10-1A) are located approximately 40 metres northwest of the landfill and reached depths of 11.0 and 10.2 masl with a ground surface elevation of approximately 15.8 masl. Groundwater levels measured in these two monitor wells reported a decrease in groundwater elevation of 0.002 and 0.009 metres in MW10-1 and MW10-1A compared to starting groundwater elevations of 13.447 and 13.509 masl, respectively; therefore, pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and downgradient groundwater. Based on the March 2009 AMEC Come By Chance Secure Landfill Groundwater Drainage System Construction Report, a 1 % grade was used to construct the GWDS with a starting elevation of 14.00 masl at CO#1; therefore, the extrapolated elevation of CO#4 would be approximately 11.70 masl. The location of CO#4 is about 20 metres north of MW10-1 and MW10-1A and due the proximity of CO#4 to these monitor wells, groundwater elevations would be estimated as relatively close to the same depth as CO#4; however, groundwater elevations at the two nearby monitor wells were measured at approximately 13.5 masl, which is about 1.8 metres higher than the expected elevation of CO#4. When this information is combined with the GWDS discharge pipe inspection indicating little to no water in CO#4, it appears that CO#4 may have been constructed at a higher elevation than anticipated. Based on the information of a decrease in groundwater elevation at MW10-1 and MW10-1A and depth of the secondary liner at the bottom of the landfill being constructed at an assumed elevation of approximately 14.0 masl, it ***does*** appear that a hydraulic connection exists between the secondary liner and groundwater

downgradient from the landfill; however, it also appears the GWDS was not constructed to an effective depth between CO#2 and CO#4.

6.3.5 PRECIPITATION INFILTRATION POTENTIAL

A water balance for the landfill was originally intended to be calculated using potential precipitation infiltration in comparison to leachate volumes pumped from the landfill liner systems; however, leachate was not managed regularly to remove any accumulations except during semi-annual or annual pumping events associated with leachate and groundwater sampling. Therefore, potential precipitation infiltration was compared to volumes of leachate pumped from the SLCS and precipitation data. Leachate Pumping Volumes versus Monthly Precipitation and Static Groundwater Levels is presented in Table 28.

Using local climatology data, landfill design drawings, combined with some default climate data assumptions in the HELP Model (Hydrologic Evaluation of Landfill Performance), CRA calculated evaluated the top and side slopes of the landfill cover system. The HELP model requires two generalized groups of input parameters related to soil and design as well as climate data that includes effects related to vegetative cover and topsoil.

The HELP model calculated an average annual precipitation of 1,315.6 mm, which was very near the actual average annual precipitation of 1,319.0 mm for Arnold's Cove, NL and 1,269.9 mm for Come By Chance, NL according to Environment Canada's Canadian Climate Normals 1971-2000 (Climate Normals and Averages). The average annual infiltration or leakage through the landfill cover system was estimated as 3.4 mm per hectare per year at the top slope and 1.9 metres per hectare per year at the side slopes. Using the 1994 BAE Group design drawings for the landfill, the calculated area of the top slope was 0.078 hectares (ha) or 780 square metres (m^2) while the area of the side slopes was 0.159 ha or 1,590 m^2. The modeled infiltration multiplied by the area for the top and side slopes resulted in an estimated annual infiltration of approximately 2,650 L through the top slope and approximately 3,020 L through the side slopes for a combined annual infiltration of 5,670 L.

Only records for the SLCS pumping were available and as such, the estimated leachate generation from the HELP model was compared to leachate pumping volumes from the SLCS. Pumping volumes from the SLCS ranged from 19,475 L in February 2007 to 103,000 L in July 2007. The maximum and minimum pumping volumes coincided with extreme monthly precipitation data from Environment Canada – the lowest pumping

volume in February 2007 reported 31 mm of precipitation while the highest pumping volume in July 2007 reported 334 mm of precipitation.

Based on the estimated annual leachate generation from infiltration calculated using the HELP model of 5,670 L, it is very obvious that leachate pumping volumes from the SLCS far exceed the estimated infiltration volume. When the pumping volumes of leachate from the PLCS are included, the difference is even more dramatic. Therefore, the liner systems of the landfill appear to be greatly influenced by the surrounding groundwater and indirectly by precipitation, thus confirming there are significant failures in the landfill liner systems.

6.3.6 POTENTIAL LINER SYSTEM DEFICIENCIES

The integrity of any landfill containment system is contingent on the level of quality control implemented during construction of the containment system components. The primary point of failure beyond those that occur as a result of poor construction practices is where the geosynthetic materials attach to objects such as gas vents or leachate collection pipes, and structures such as manholes. In the case of this Site, four potential failure mechanisms may be contributing to the high volumes of infiltration into the landfill liner systems as follows:

- Gas vent attachment to the landfill cover system that would permit precipitation to enter through a tear or failed weld between the vent pipe and liner.
- Leachate collection pipe liner wall penetrations through the boot where a tear or failed weld between the boot and liner would permit groundwater entry.
- Excessive and/or large punctures or tears in the liner systems that may have occurred during placement of the waste or as a result of differential settlement from the weight of the waste and large volumes of leachate contained within the liner system.
- Construction of the landfill liner edges around the perimeter of the landfill.

A file review of photographs taken during construction confirmed the gas vents and leachate collection pipes were welded to the liner systems during construction. Information related to the placement of waste in the landfill was not located with the exception that waste was categorized into two types with Type A being placed near the primary liner and Type B being spatially placed in the centre of the landfill so that Type A was completely surrounded the Type B waste.

The file review did confirm the construction detail used around the perimeter of the landfill for termination of the primary and secondary liners, which was essentially the same as identified in the 1994 BAE Group design drawings. Figure 5 shows a reproduced version of the 1994 construction detail. This detail specified the secondary liner would terminate in a trench excavated approximately 1.10 metres in depth with the liner draping over the inner wall of the trench, but not extending across the bottom or up the opposite wall of the trench. The primary liner was then specified to extend over and beyond the secondary liner trench, then drape over the inner wall of this trench in the same manner as the secondary liner trench. The file review revealed the trenching detail was generally being followed during construction; however, the liner was noted to have pulled up about 25 % of the distance from the bottom of the trench after placement of the sand layer. Finally, the cover liner was specified to extend over and beyond the secondary and primary liner trenches, but there was no reference to welding of the primary or secondary liners to the cover liner. Based on this construction detail and when groundwater elevations are sufficiently high around the northeastern and eastern areas of the landfill, a route exists for possible groundwater infiltration into the landfill as the cover liner was not sealed to the primary and/or secondary liners.

6.4 LANDFILL COVER INSPECTION

A landfill cover inspection was conducted on November 21, 2012. Notable items resulting from the landfill cover inspection are outlined below:

- Vegetation height reaching 1.5 metres, typically alders, which exceeds the OMM requirement of maximum vegetation height of 0.3 metres.
- Landfill vents in good condition and not obstructed.
- No evidence of erosion or large animal burrows on the landfill cover.
- Evidence of vole activity with tunnels and nesting activities in at least six locations; however, voles limit their activities to the top 300 mm and are not expected to impact the integrity of the landfill cap membrane.
- Slopes in good condition and covered with vegetation with no signs of erosion.
- Lateral drains dry with occasional areas of standing water.

Landfill cover inspection data from previous monitoring programs is included in Appendix D.

Upon reviewing the results of the elevation control survey, it was noted the elevation control points increased slightly in elevation by an average of 6.5 millimetres between the original elevations surveyed in August 2010 and the recent survey completed in

November 2012. Based on this information, the difference in elevation of the control points indicate that very limited and insignificant settlement is occurring at the landfill cover, which in turn indicates the contents of the landfill are not settling.

6.5 GROUNDWATER DRAINAGE SYSTEM

Four GWDS clean-outs were previously installed as part of the original system construction; visual inspections confirmed that water was not present. The discharge location, previously located on the west side of the gravel service road, was excavated and reconstructed at the roadside embankment as part of redevelopment of the area, which was related to the construction of a new asphalt plant (J-1 Contracting) prior to the November 2012 Site visit; a rodent screen was not observed covering the pipe discharge (Refer to Photograph 4 of Appendix A). A very low flow of water was observed from the discharge of the GWDS.

Debris or blockages were not present in any of the clean-outs during the Site visit and combined with the water flow from the downgradient discharge, it was determined the GWDS was functioning properly and cleaning was not required.

7.0 SUMMARY AND RECOMMENDATIONS

Conestoga-Rovers & Associates (CRA) was retained by the Newfoundland and Labrador Department of Environment and Conservation (DOEC) to complete the 2012/13 monitoring and maintenance program at the Come By Chance Secure Landfill (Site) located on Refinery Road in Come By Chance, Newfoundland and Labrador (NL) as shown on Figure 1. Site visits and field activities were completed in accordance with the DOEC 2012 Operations and Maintenance Manual (OMM).

The Come By Chance Secure Landfill covers an area of approximately 19,778 square metres (m^2) located approximately 2.5 km west of the Trans Canada Highway and approximately 4 km south of the Town, NL. The landfill was constructed between 1994 and 1996 to facilitate the clean-up of hazardous waste associated with the Come By Chance Oil Refinery. Leachate containment is achieved through the use of a redundant liner system consisting of independent primary and secondary liners as well as a drainage pipe system to manage excess fluid and provide a means for leachate discharge.

A groundwater drainage system was installed in March 2009 starting at the east side of the landfill and is graded at one percent toward the northeast corner, then along the north side, and eventually discharging beyond the gravel road west of the Site.

The work completed by CRA during the 2012/13 monitoring and maintenance program involved sampling of the primary and secondary leachate collection valve chambers in advance of pumping down the chambers by discharging to a nearby ditch, groundwater and surface water sampling, landfill cover inspection, and groundwater drainage system inspection, and clean-out repairs. In addition, a hydraulic connectivity investigation was conducted to determine if surrounding groundwater was influencing leachate levels and if a hydraulic connection existed between the primary and secondary liners.

The Site visit with leachate, groundwater, and surface water sampling was conducted in August 2012, the leachate pumping event was completed in November 2012, and the hydraulic connectivity investigation was conducted in December 2012. Information regarding the 2012/13 monitoring and maintenance program is summarized below in Section 7.1 with recommendations provided in Section 7.2.

7.1 2012/13 MONITORING AND MAINTENANCE SUMMARY

7.1.1 GROUNDWATER

In general, BTEX/mTPH, PAH, PCB, VOC, general chemistry, and metals analytical data show groundwater conditions to be of better quality compared to leachate analytical data; therefore, it does not appear that groundwater is being influenced by leachate from the secure landfill. Based on static groundwater levels measured during the 2012 Site visit, it also appears that groundwater infiltration may still be occurring at the northeastern area of the Site.

7.1.2 SURFACE WATER

In general, the BTEX/mTPH, PAH, PCB, VOC, and general chemistry analytical data show surface water conditions as dramatically distinct in comparison to the leachate analytical data. Two metals (aluminum and iron) reported exceedances in the upgradient and downgradient surface water samples whereas the leachate analytical data reported exceedances for one metal (iron); however, iron concentrations in the leachate were approximately 15 times that of the surface water samples. Based on this information, it does not appear that leachate is seeping from the landfill liners into the downgradient surface water; therefore, the secure landfill liners appear to be performing in accordance with their original intent of acting as a barrier between leachate accumulations within the landfill and surface water in the surrounding area.

7.1.3 LEACHATE

In accordance with the OMM, both pumping events consisted of two Site visits so that a desired flow rate of 15 L/min could be achieved on two successive days. During the Site visit for leachate pumping in November 2012, it was observed that the PLCS and SLCS valves were permanently in the open position with the discharge hose no longer connected to the PLCS valve. CRA determined in-flow rates by pumping down each valve chamber, measuring the change in head over a fixed period of time, then calculating in-flow. It was also noted that leachate elevations in the PLCS and SLCS for two consecutive Site visits were less than 0.3 metres below the top of the valve chambers.

A review of the current and historical leachate pumping volumes from the PLCS and SLCS valve chambers demonstrates that pumped leachate volumes have decreased since the installation of the groundwater drainage system. A comparison of the average

pumped leachate volumes from the PLCS prior to and following installation of the groundwater drainage system shows a decrease of approximately 40 percent. In addition, a comparison of the average pumped leachate volumes from the SLCS prior to and following installation of the groundwater drainage system shows a decrease of approximately 60 percent. Consequently, it appears the groundwater drainage system has contributed to the reduction of volumes of pumped leachate from the PLCS and SLCS; however, significant volumes of leachate are still present within the two liners that require pumping on a regular basis.

7.1.4 LANDFILL COVER

The landfill cover inspection was conducted on November 21, 2012, which indicated that minor maintenance is required. The only issue of concern related to maintenance is the cutting of vegetation, typically alders, which have reached 1.5 metres in height, considerably more than the OMM recommended height restriction of 0.3 metres. Meadow vole activity from tunneling and nesting was noted in numerous locations on the landfill cover; however, meadow voles typically limit their habitat to less than 300 mm from surface.

Upon reviewing the results of the elevation control survey, it was noted the elevation control points decreased by an average of 6.5 millimetres between the original elevations surveyed in August 2010 and the recent survey completed in November 2012. Based on this information, the difference in elevation of the control points indicate that very limited and insignificant settlement is occurring at the landfill cover, which in turn indicates the contents of the landfill are not settling.

7.1.5 GROUNDWATER DRAINAGE SYSTEM

Four GWDS clean-outs were previously installed as part of the original system construction; visual inspections confirmed that water was not present. The discharge location, previously located on the west side of the gravel service road, was excavated and reconstructed at the roadside embankment as part of redevelopment of the area, which was related to the construction of a new asphalt plant (J-1 Contracting) prior to the November 2012 Site visit; a rodent screen was not observed covering the pipe discharge. A very low flow of water was observed from the discharge of the GWDS.

Debris or blockages were not present in any of the clean-outs during the Site visit and combined with the water flow from the downgradient discharge, it was determined the GWDS was functioning properly and cleaning was not required.

7.1.6 HYDRAULIC CONNECTIVITY OF LINER SYSTEMS

A pump down test was completed that used the existing PLCS and SLCS manholes and monitoring wells to evaluate the potential for a hydraulic connection between the PLCS and SLCS. Pumping from the SLCS was completed over a 6 hour period in December 2012 during which leachate levels were monitored periodically in the PLCS. Over the 6 hour period, leachate in the PLCS dropped 0.063 metres; therefore, it was confirmed that hydraulic connection ***does*** exist between the PLCS and SLCS.

7.1.7 HYDRAULIC CONNECTIVITY OF LANDFILL TO GROUNDWATER

A pump down test was completed that used the existing SLCS manhole and monitoring wells to evaluate the potential for a hydraulic connection between the SLCS and groundwater in the immediate area of the landfill. Since the secondary liner forms the outermost layer of the landfill liner system and has historically required the pumping of large volumes of leachate, the pump down test involved the continual pumping of leachate from the SLCS manhole. Pumping from the SLCS was completed over a 6 hour in December 2012 during which groundwater levels in the nearby six monitor wells were gauged periodically. The two upgradient monitor wells reported an increase in groundwater elevations compared to starting groundwater elevations; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and upgradient groundwater. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of approximately 14.0 masl, it appears that groundwater upgradient of the landfill is likely intercepted in the GWDS and directed around the landfill.

The two cross-gradient monitor wells reported an increase in groundwater elevation compared to starting groundwater elevations; therefore, it did not appear that pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and cross-gradient groundwater. The surface water elevation of the adjacent brook was very near the relatively constant groundwater elevation at the cross-gradient monitor wells. Since the secondary liner at the bottom of the landfill was constructed at an assumed elevation of approximately 14.0 masl, it ***does not*** appear that groundwater cross-gradient of the landfill has an impact on leachate elevations within the landfill

during normal weather conditions. This may not be the case during very high precipitation events when the nearby brook has higher water flow with increased surface water elevations; however, the brook surface water elevation would have to increase by more than 0.6 metres before potentially affecting the landfill.

The two downgradient monitor wells reported a decrease in groundwater elevation compared to starting groundwater elevations; therefore, pumping down leachate from the SLCS provided confirmation of a hydraulic connection between the SLCS and downgradient groundwater. Based on the March 2009 AMEC Come By Chance Secure Landfill Groundwater Drainage System Construction Report, the extrapolated elevation of CO#4 would be relatively close to groundwater elevations at the nearby downgradient monitor wells; however, groundwater was measured at approximately 1.8 metres higher than the expected elevation of CO#4. Based on the information of a decrease in groundwater elevation at the downgradient monitor wells and depth of the secondary liner at the bottom of the landfill being constructed at an assumed elevation of approximately 14.0 masl, it ***does*** appear that a hydraulic connection exists between the secondary liner and groundwater downgradient from the landfill; however, it also appears the GWDS was not constructed to an effective depth between CO#2 and CO#4.

7.1.8 PRECIPITATION INFILTRATION POTENTIAL

A water balance for the landfill was originally intended to be calculated using potential precipitation infiltration in comparison to leachate volumes pumped from the landfill liner systems; however, leachate was not managed regularly to remove any accumulations except during semi-annual or annual pumping events associated with leachate and groundwater sampling. Therefore, potential precipitation infiltration was compared to volumes of leachate pumped from the SLCS and precipitation data.

Using local climatology data, landfill design drawings, combined with some default climate data assumptions in the HELP Model (Hydrologic Evaluation of Landfill Performance), CRA calculated evaluated the top and side slopes of the landfill cover system based on two generalized groups of input parameters related to soil and landfill design as well as climate data that includes effects related to vegetative cover and topsoil.

The HELP model calculated an average annual precipitation of 1,315.6 mm, which was very near the actual average annual precipitation of 1,319.0 mm for Arnold's Cove, NL and 1,269.9 mm for Come By Chance, NL. The average annual infiltration or leakage through the landfill cover system was estimated at 3.4 mm per hectare per year at the

top slope and 1.9 mm per hectare per year at the side slopes. The modeled infiltration multiplied by the area for the top and side slopes resulted in an estimated annual infiltration of approximately 2,650 L through the top slope and approximately 3,020 L through the side slopes for a combined annual infiltration of 5,670 L.

Only records for the SLCS pumping were available and as such, the estimated leachate generation from the HELP model was compared to leachate pumping volumes from the SLCS. Pumping volumes from the SLCS ranged from 19,475 L in February 2007 to 103,000 L in July 2007. The maximum and minimum pumping volumes coincided with extreme monthly precipitation data from Environment Canada – the lowest pumping volume in February 2007 reported 31 mm of precipitation while the highest pumping volume in July 2007 reported 334 mm of precipitation.

Based on the estimated annual leachate volume of 5,670 L generated from infiltration calculated using the HELP model, it is very obvious that leachate pumping volumes from the SLCS far exceed the estimated infiltration volume. When the pumping volumes of leachate from the PLCS are included, the difference is even more dramatic. Therefore, the liner systems of the landfill appear to be greatly influenced by the surrounding groundwater and indirectly by precipitation, thus confirming there are significant failures in the landfill liner systems.

7.1.9 POTENTIAL LINER SYSTEM DEFICIENCIES

Four potential failure mechanisms may be contributing to the high volumes of infiltration into the landfill liner systems as follows:

- Gas vent attachment to the landfill cover system that would permit precipitation to enter through a tear or failed weld between the vent pipe and liner.
- Leachate collection pipe liner wall penetrations through the boot where a tear or failed weld between the boot and liner would permit groundwater entry.
- Excessive and/or large punctures or tears in the liner systems that may have occurred during placement of the waste or as a result of differential settlement from the weight of the waste and large volumes of leachate/groundwater contained within the liner system.
- Construction of the landfill liner edges around the perimeter of the landfill.

The file review confirmed the construction detail used around the perimeter of the landfill for termination of the primary and secondary liners was essentially the same as the 1994 design drawings. The file review revealed the trenching detail was generally

being followed during construction; however, the liner was noted to have pulled up about 25 % of the distance from the bottom of the trench after placement of the sand layer. Finally, the cover liner was specified to extend over and beyond the secondary and primary liner trenches, but there was no reference to welding of the primary or secondary liners to the cover liner. Based on this construction detail and when groundwater elevations are sufficiently high around the northeastern and eastern areas of the landfill, a route exists for possible groundwater infiltration into the landfill as the cover liner was not sealed to the primary and/or secondary liners.

7.2 RECOMMENDATIONS

Based on the findings of the 2012/13 monitoring and maintenance program along with data from previous monitoring programs, the following recommendations are offered for consideration by DOEC:

Monitoring and Maintenance Schedule: The leachate quality is continually reporting BTEX/TPH, PAH, PCB, general chemistry, and metals concentrations at levels that would not affect the surrounding environment, most notably groundwater and surface water. In addition, the landfill was constructed approximately 20 years ago and based on the historical analytical data reviewed in this report, it appears that leachate has reached a steady-state condition. Furthermore, groundwater infiltration has been evident for many years and has acted as a flushing mechanism for any contaminants that may have been present, although elevated levels of contaminants have not historically been identified. Therefore, CRA recommend that further monitoring of the landfill and pumping out of the PLCS and SLCS are not required; however, annual inspections should be continued to ensure the landfill cover system is not compromised by erosion. CRA understands that DOEC would prefer to continue monitoring activities at the landfill as a matter of due diligence.

Vegetation Control: CRA recommend that all vegetation on the landfill cover that measures over 0.3 metres in height should be cut down. This work can be completed in conjunction with vegetation control in the monitor well locations outside the fenced area of the landfill.

In addition, it was noted that access to two monitor wells (MW93-1 and MW93-1A) was somewhat difficult due to the excessive vegetative growth in the area with alders reaching heights of 1.8 metres. CRA recommend that alders be cut down in this location to better facilitate future field programs (i.e. the transport of field equipment such as water level meters, coolers, sample jars, etc.).

8.0 REFERENCES

Design Drawings entitled "*Come By Chance Rehabilitation of Waste Disposal Sites*" prepared by The BAE Group for Newfoundland and Labrador Department of Environment and Lands, dated April 1994.

Report entitled "*Annual Summary Report, 2009/2010 Environmental Monitoring and Maintenance Program, Come By Chance Secure Landfill, Come By Chance, Newfoundland*" prepared by Pinchin Leblanc Environmental Limited for Newfoundland and Labrador Department of Environment and Conservation, dated May 2010.

Report entitled "*Annual Summary Report 2010/2011 Monitoring and Maintenance Program, Come By Chance Secure Landfill, Come By Chance, NL*" prepared by CRA Limited for Newfoundland and Labrador Department of Environment and Conservation, dated March 2011.

Report entitled "*2011/2012 Monitoring and Maintenance Program, Come By Chance Secure Landfill, Come By Chance, NL*" prepared by CBCL Limited for Newfoundland and Labrador Department of Environment and Conservation, dated May 24, 2012.

Report entitled "*Come By Chance Secure Landfill – Operations, Maintenance and Monitoring (OMM) Manual*" prepared by Newfoundland and Labrador Department of Environment and Conservation, Pollution Prevention Division, dated June 2012.

User's Guide entitled "*The Hydrologic Evaluation of Landfill Performance (HELP) Model for Version 3; EPA/600/R-94/168a*" prepared by Schroeder, P.R. et al with the USEPA in Washington, D.C., USA.

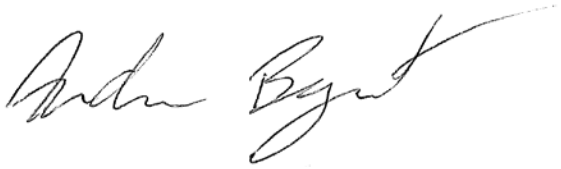
Computer Model entitled "*The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation for Version 3; EPA/600/R-94/168b*" prepared by Schroeder, P.R. et al with the USEPA in Washington, D.C., USA.

Climate Data entitled "*National Climate Data and Information Archive, Canadian Climate Normals 1971-2000 (Climate Normals and Averages) – Arnold's Cove and Come By Chance*" published by Environment Canada; http://climate.weatheroffice.gc.ca.

9.0 CLOSURE

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES



Brian Luffman, P. Eng. Andrew Bryant, B.Sc.

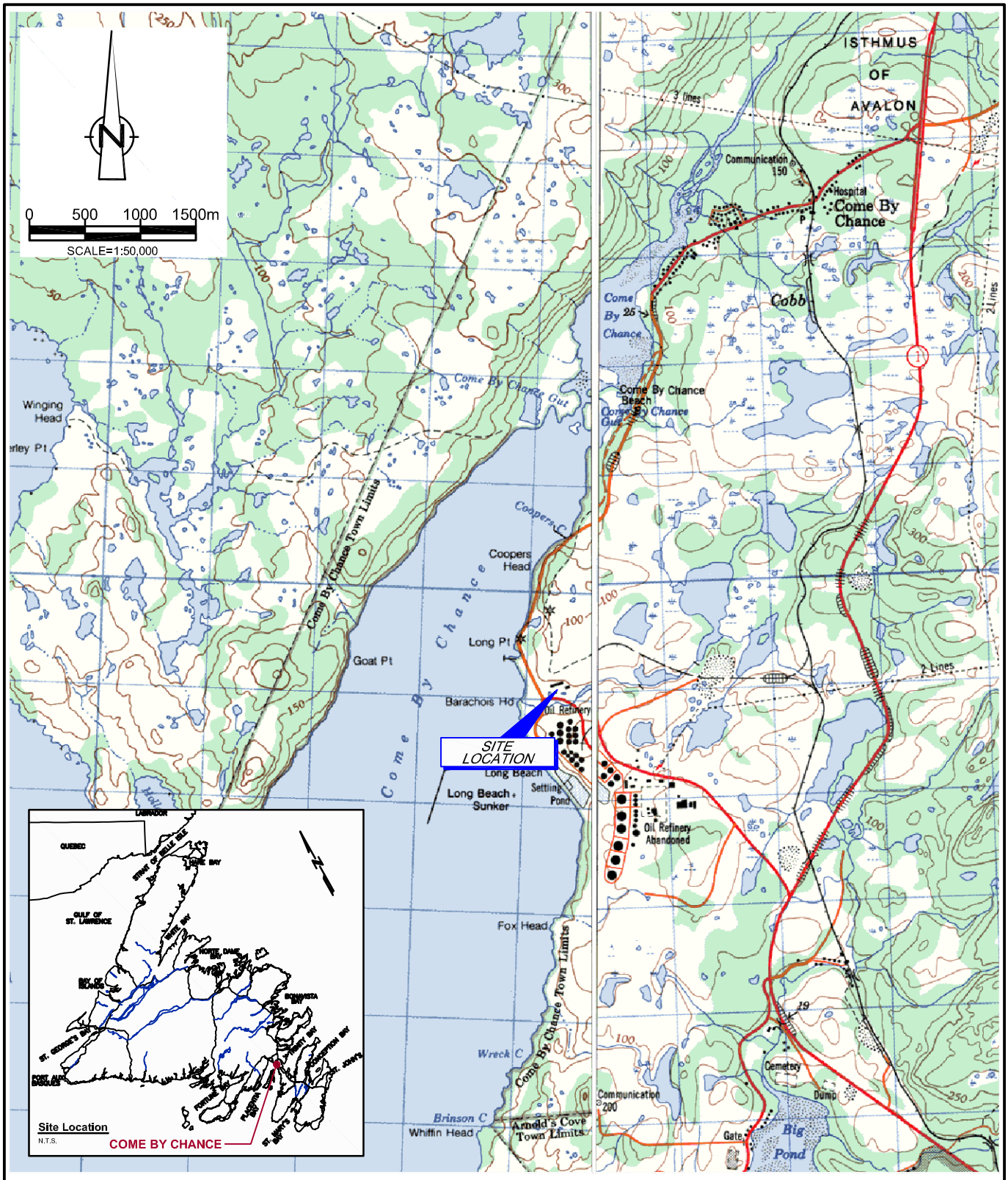


figure 1

SITE LOCATION MAP
2012/2013 MONITORING AND MAINTENANCE PROGRAM
DEPT. OF ENVIRONMENT AND CONSERVATION
Come By Chance Secure Landfill, Come By Chance, NL

056680-02 GN-NL001

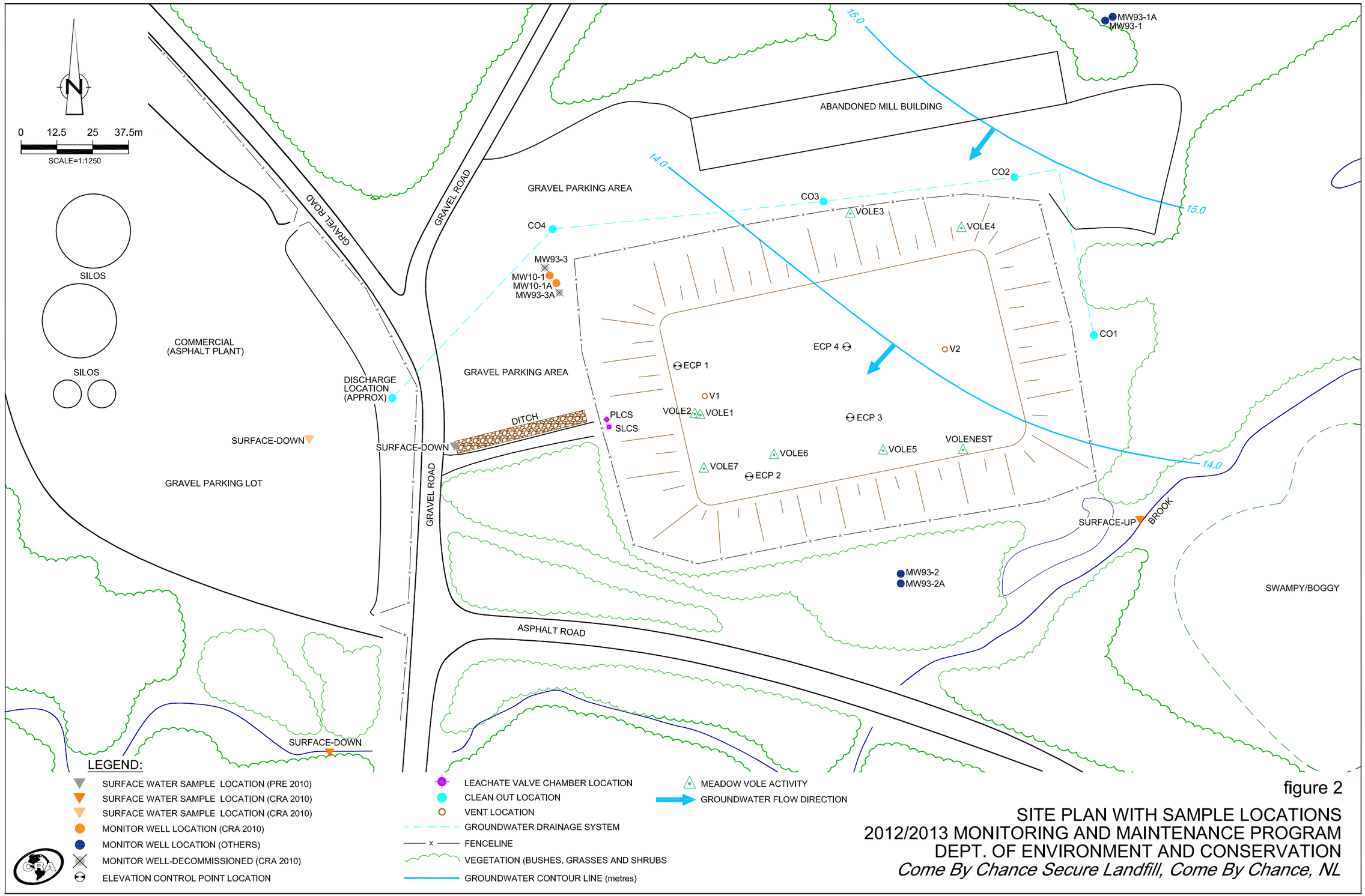
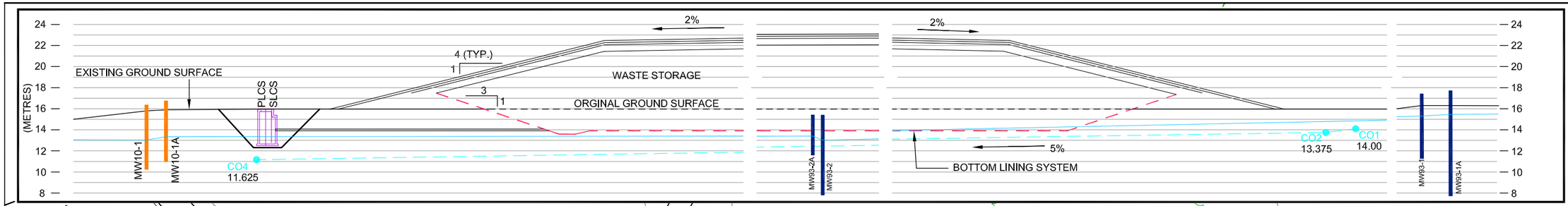


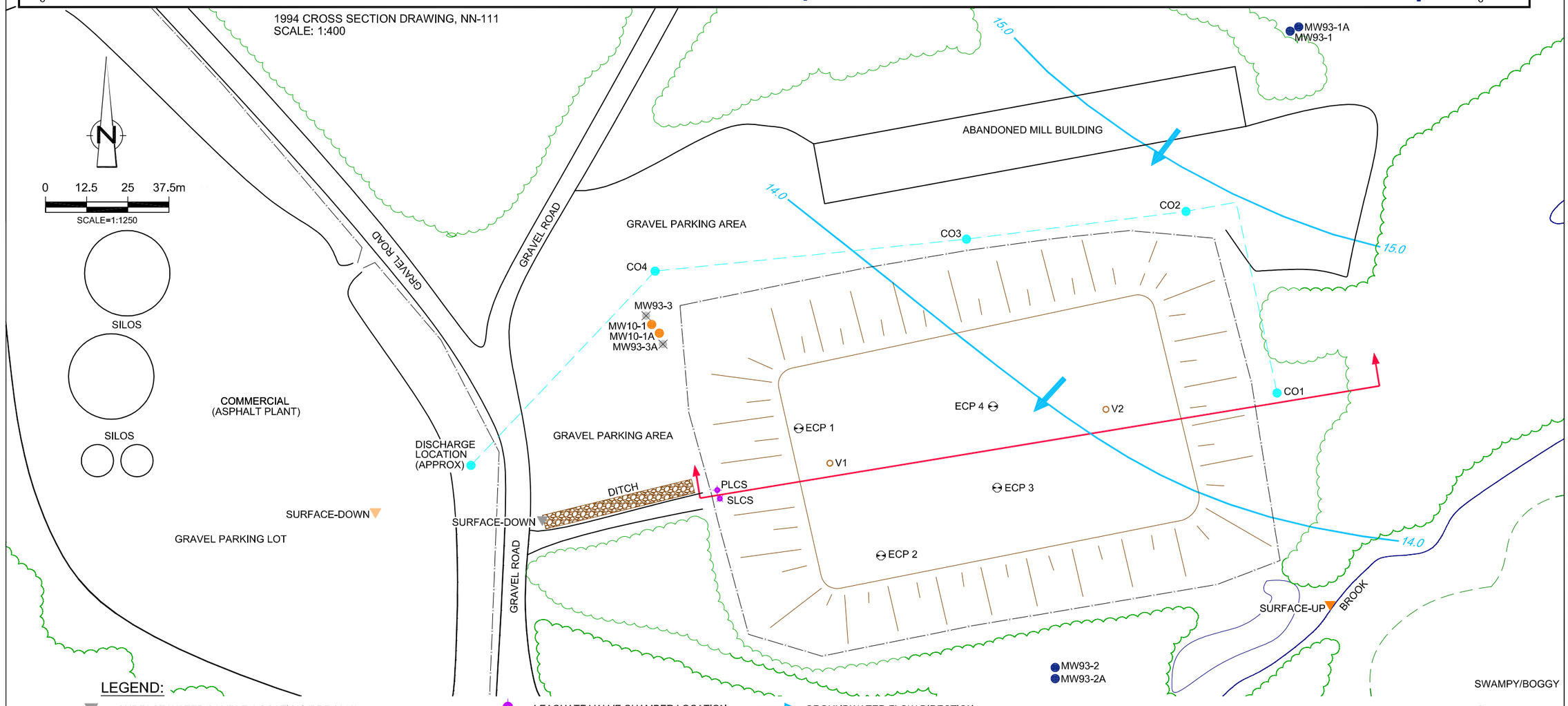
figure 2

SITE PLAN WITH SAMPLE LOCATIONS
2012/2013 MONITORING AND MAINTENANCE PROGRAM
DEPT. OF ENVIRONMENT AND CONSERVATION
Come By Chance Secure Landfill, Come By Chance, NL

056680-02 GN-NL002



1994 CROSS SECTION DRAWING, NN-111
SCALE: 1:400



LEGEND:

- SURFACE WATER SAMPLE LOCATION (PRE 2010)
- SURFACE WATER SAMPLE LOCATION (CRA 2010)
- SURFACE WATER SAMPLE LOCATION (CRA 2010)
- MONITOR WELL LOCATION (CRA 2010)
- MONITOR WELL LOCATION (OTHERS)
- MONITOR WELL-DECOMMISSIONED (CRA 2010)
- ELEVATION CONTROL POINT LOCATION
- LEACHATE VALVE CHAMBER LOCATION
- CLEAN OUT LOCATION
- VENT LOCATION
- GROUNDWATER DRAINAGE SYSTEM
- FENCELINE
- GROUNDWATER CONTOUR LINE (metres)
- GROUNDWATER FLOW DIRECTION

figure 3

SITE PLAN WITH CROSS SECTION
2012/2013 MONITORING AND MAINTENANCE PROGRAM
DEPT. OF ENVIRONMENT AND CONSERVATION
Come By Chance Secure Landfill, Come By Chance, NL

056680-02 GN-NL002

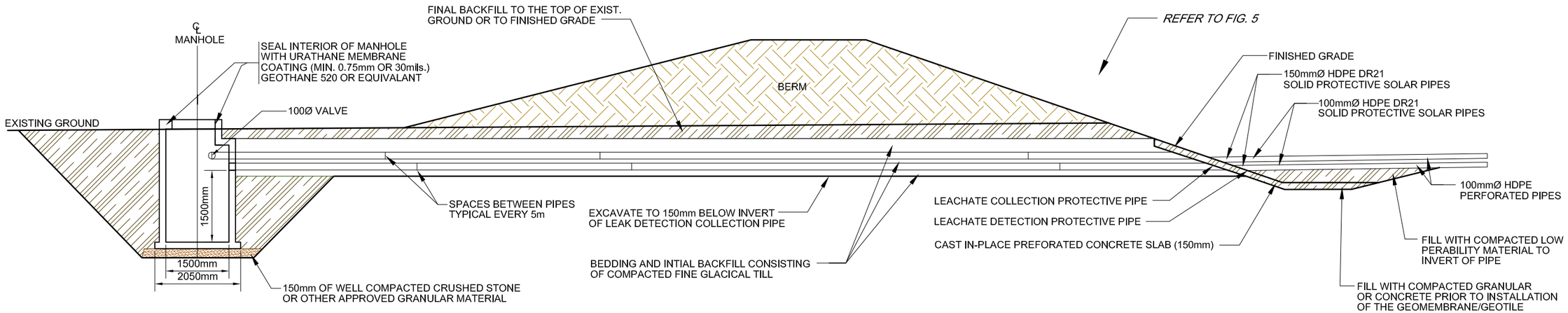


figure 4

DRAINAGE AND SLAB DETAILS
2012/2013 MONITORING AND MAINTENANCE PROGRAM
DEPT. OF ENVIRONMENT AND CONSERVATION
Come By Chance Secure Landfill, Come By Chance, NL

NOT TO SCALE

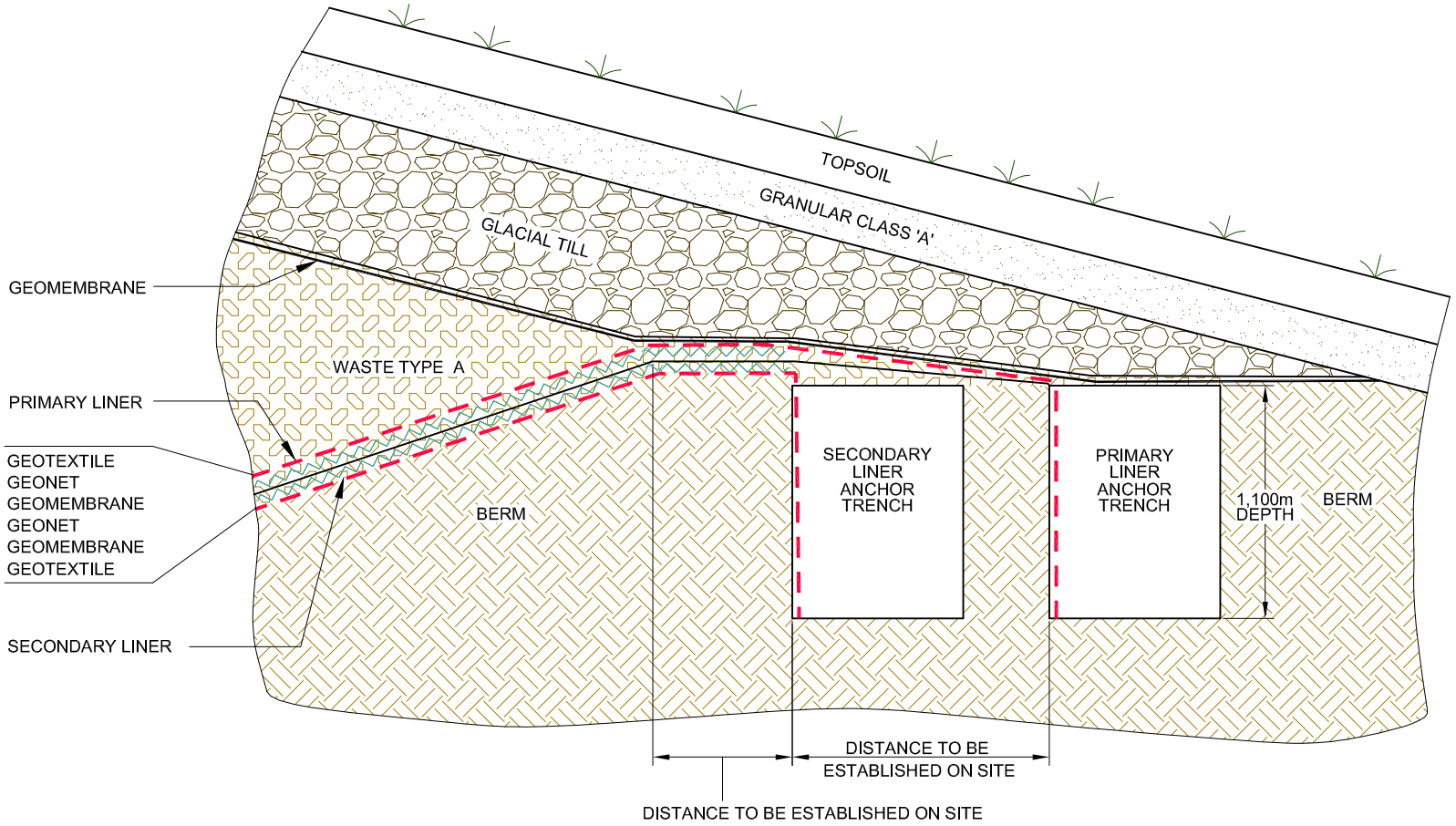


figure 5

1994 PERIMETER TRENCH DESIGN DETAIL 1 BASED ON 1994 CONSTRUCTION DRAWINGS
2012/2013 MONITORING AND MAINTENANCE PROGRAM
DEPT. OF ENVIRONMENT AND CONSERVATION
Come By Chance Secure Landfill, Come By Chance, NL

TABLE 1

STATIC WATER LEVELS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

ID	Ground Surface Elevation	Length of Stick-up	TOC Elevation	Groundwater Depth	Water Elevation
				Dec 2012	Dec 2012
	(masl)	(m)	(masl)	(mbTOC)	(masl)
PLCS	15.960	-	15.960	0.89	15.070
SLCS	15.955	-	15.955	0.892	15.063
MW 93-1	16.300	1.100	17.400	1.780	15.620
MW 93-1A	16.310	1.400	17.710	1.669	16.041
MW 93-2	14.290	1.100	15.390	2.111	13.279
MW 93-2A	14.310	1.100	15.410	1.234	14.176
MW 10-1	15.790	0.846	16.636	3.188	13.448
MW 10-1A	15.890	0.854	16.744	3.234	13.510
SW-1	-	-	-	-	9.270
SW-2	-	-	-	-	12.555
SW-3	-	-	-	-	13.385

Notes:

m = Metres
TOC = Top of Casing
masl = Metres Above Sea Level
mbTOC = Metres Below Top of Casing

TABLE 2

GPS CO-ORDINATES OF KEY SITE FEATURES
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

ID	NORTHING	EASTING
	(m)	(m)
PLCS	5299282.569	724372.496
SLCS	5299280.034	724373.295
MW 93-1	5299421.760	724546.360
MW 93-1A	5299422.020	724548.440
MW 93-2	5299235.085	724470.927
MW 93-2A	5299232.673	724472.066
MW 10-1	5299332.811	724352.601
MW 10-1A	5299330.374	724354.471
SURFACE UP	5299241.840	724543.520
SURFACE DOWN	5299166.473	724273.883
ECP 1	5299300.345	724396.495
ECP 2	5299262.242	724421.331
ECP 3	5299284.519	724455.814
ECP 4	5299308.292	724454.469
CLEAN-OUT 1	5299162.490	724361.549
CLEAN-OUT2	5299172.051	724428.014
CLEAN-OUT 3	5299117.496	724456.616
CLEAN-OUT 4	5299348.991	724353.634
VENT 1	5299290.775	724406.665
VENT 2	5299307.780	724490.445
VOLE NEST	5299271.950	724496.792
VOLE 1	5299266.509	724404.806
VOLE 2	5299284.585	724403.246
VOLE 3	5299354.435	724457.444
VOLE 4	5299349.388	724496.201
VOLE 5	5299271.722	724468.868
VOLE 6	5299270.250	724430.847
VOLE 7	5299301.319	724397.222

Notes:

All points recorded using Universal Transverse Mercator Zone 21 as coordinate system

PLCS = Primary Leachate Collection System Valve Chamber
SLCS = Secondary Leachate Collection System Valve Chamber
MW = Monitoring Well
ECP = Elevation Control Point
VOLE = Meadow Vole Hole

TABLE 3

LEACHATE SAMPLING AND PUMPING INFORMATION
PRIMARY LEACHATE COLLECTION SYSTEM
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

PLCS LEACHATE SAMPLING					PLCS PUMPING EVENT				
Date	**Weather**	**Valve Condition**	**Initial head (mbTOVC)**	**Analysis Conducted Sample Condition**	**Date**	**Weather**	**Valve Condition**	**Final Flow Rate (L/min)**	**Pumping Time (hours)**
August 30, 2012	Sunny, +20 °C	Unknown*	0.6	BTEX, TPH, Gen. Chem., Metals, PAH, VOC, PCB, Toxicity	November 21, 2012	Overcast, -1 °C	Open, flowing freely, hose disconnected	14.9	5

Notes:

Always maintain samples at 4°C

Plan to deliver samples to analytical laboratory within 3 days of sampling

mbTOVC - Metres from water level to top of valve chamber

*PLCS valve chamber completely filled with leachate; therefore, unable to inspect valve

Elevation of Top of PLCS Valve Chamber = 15.960 m

Containers Required For Analysis

BTEX:	3 x 40 mL amber glass vials (filled, with no headspace)
TPH:	2 x 250 mL amber glass
Gen Chem:	1 x 1 L plastic
PAHs:	2 x 250 mL amber glass
VOCs:	3 x 40 mL amber glass vials (filled, with no headspace)
PCBs:	2 x 250 mL glass
Metals:	1 x 50 mL plastic tube or 1 x 250 mL plastic
Toxicity:	2 x 20 L plastic food grade

TABLE 4

LEACHATE SAMPLING AND PUMPING INFORMATION
SECONDARY LEACHATE COLLECTION SYSTEM
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

SLCS LEACHATE SAMPLING					SLCS PUMPING EVENT				
Date	**Weather**	**Valve Condition**	**Initial head (mbTOVC)**	**Analysis Conducted Sample Condition**	**Date**	**Weather**	**Valve Condition**	**Final Flow Rate (L/min)**	**Pumping Time (hours)**
August 30, 2012	Sunny, +20 °C	Unknown*	0.6	BTEX, TPH, Gen. Chem., Metals, PAH, VOC, PCB, Toxicity	November 21, 2012	Overcast, -1 °C	Open, flowing freely, hose disconnected	14.2	1.5

Notes:

Always maintain samples at 4°C

Plan to deliver samples to analytical laboratory within 3 days of sampling

mbTOVC - Metres from water level to top of manhole

*SLCS valve chamber completely filled with leachate; therefore, unable to inspect valve

Elevation of Top of SLCS Valve Chamber = 15.96 m

Containers Required For Analysis

BTEX:	3 x 40 mL amber glass vials (filled, with no headspace)
TPH:	2 x 250 mL amber glass
Gen Chem:	1 x 1 L plastic
PAHs:	2 x 250 mL amber glass
VOCs:	3 x 40 mL amber glass vials (filled, with no headspace)
PCBs:	2 x 250 mL glass
Metals:	1 x 50 mL plastic tube or 1 x 250 mL plastic
Toxicity:	2 x 20 L plastic food grade

TABLE 5

LANDFILL CAP INSPECTION FORM
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Date	Weather	Landfill Cap Inspection					Elevational Survey Control Points			
		Vegetative Height (metres)	Vent Condition	Evidence of Erosion / Animal Burrows	Condition of Slopes	Condition of Lateral Drains	Point 1	Point 2	Point 3	Point 4
November 21, 2012	Overcast, -1 °C	0 - 1.5 m	No damage, not obstructed	8 Meadow Vole Communites	No erosion, damage noted	Dry, occasional puddles, grassy	20.460	20.467	20.945	21.192

Notes: Elevations measured using an assumed benchmark of 15.960 m at top of PLCS valve chamber

TABLE 6

ELEVATIONAL CONTROL POINT SURVEY DATA
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Original Survey Date:				Jul 16, 2010	
Recent Survey Date:				Nov 21, 2012	
Location	**Original Elevation**	**2010**		**2012**	
		Survey	**DIFF**	**Survey**	**DIFF**
PLCS	15.960	-	-	-	-
ECP1	20.439	20.388	0.051	20.450	-0.011
ECP2	20.442	20.405	0.037	20.467	-0.025
ECP3	20.935	20.896	0.039	20.945	-0.010
ECP4	21.212	21.162	0.050	21.192	0.020

Notes:

BM = PLCS
All measurements are in metres.
ECP = Elevational Control Point
DIFF = Difference of original versus current elevations
(Positive indicates amount of settlement)

TABLE 7

GROUNDWATER ANALYTICAL DATA - BTEX/mTPH (mg/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)				
						TPuH C_6-C_{10}	TExH C_{10}-C_{21}	TExH C_{21}-C_{32}	Modified TPH	Comments
MW 93-1	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
MW 93-1A	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
DUP-03	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 93-2	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
MW 93-2A	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 10-1	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 10-1A	Aug 30, 2012	<	<	<	<	<	<	<	<	-
RDL		0.001	0.001	0.001	0.002	0.01	0.05	0.1	0.1	-
Atlantic RBCA Tier I RBSLs [1]		**20**	**20**	**20**	**20**	**na**	**na**	**na**	**20**	**Gasoline**
									20	**Diesel / #2 Fuel Oil**
									20	**# 6 Oil**

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
1 Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Level (RBSL) Table values {commercial/non-potable/coarse grained soil}.

RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
0.0 = above criteria
<(#) = Parameter below specified detection limit
DUP-03 = Field Duplicate of MW 93-1A
MW = Monitor Well

TPuH = Total Purgeable Hydrocarbons
TExH = Total Extractable Hydrocarbons
TPH = Total Petroleum Hydrocarbons
Modified TPH = mTPH = TExH + TPuH
TPH = mTPH + BTEX

G = Gasoline
FO = Fuel Oil
LO = Lube Oil
W = Weathered

TABLE 8

GROUNDWATER ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1	MW 93-1A	DUP-03	MW 93-2	MW 93-2A	MW 10-1	MW 10-1A	RDL	Criteria*
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
1-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	0.05	1,800
2-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	0.05	1,800
Acenaphthene	ug/L	<	<	<	<	<	<	<	0.01	600
Acenaphthylene	ug/L	<	<	<	<	<	<	<	0.01	1.8
Anthracene	ug/L	<	<	<	<	<	<	<	0.01	2.4
Benzo(a)anthracene	ug/L	<	<	<	<	<	<	<	0.01	4.7
Benzo(a)pyrene	ug/L	<	<	<	<	<	<	<	0.01	0.8
Benzo(b)fluoranthene	ug/L	<	<	<	<	<	<	<	0.01	0.75
Benzo(g,h,i)perylene	ug/L	<	<	<	<	<	<	<	0.01	0.2
Benzo(j)fluoranthene	ug/L	<	<	<	<	<	<	<	0.01	-
Benzo(k)fluoranthene	ug/L	<	<	<	<	<	<	<	0.01	0.4
Chrysene	ug/L	<	<	<	<	<	<	<	0.01	1
Dibenz(a,h)anthracene	ug/L	<	<	<	<	<	<	<	0.01	0.52
Fluoranthene	ug/L	<	<	<	<	<	<	<	0.01	130
Fluorene	ug/L	<	<	<	<	<	<	<	0.01	400
Indeno(1,2,3-cd)pyrene	ug/L	<	<	<	<	<	<	<	0.01	0.2
Naphthalene	ug/L	<	<	<	<	<	<	<	0.20	1,400
Perylene	ug/L	<	<	<	<	<	<	0.017	0.01	-
Phenanthrene	ug/L	<	<	<	<	0.012	<	<	0.01	580
Pyrene	ug/L	<	<	<	<	<	<	<	0.01	68

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* 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-
RDL = Reportable Detection Limit **0.0**
MW = Monitor Well
- = Not analysed/No criteria
< = Parameter below detection limit
DUP-03 = Field Duplicate of MW 93-1A

TABLE 9

GROUNDWATER ANALYTICAL DATA - PCBs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1	MW 93-1A	DUP-03	MW 93-2	MW 93-2A	MW 10-1	MW 10-1A	RDL	Criteria*
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Total PCBs	ug/L	<	<	<	<	<	<	<	0.05	7.8

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* 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 **0.0** = above criteria
MW = Monitor Well
< = Parameter below detection limit
DUP-03= Field Duplicate of MW 93-1A

TABLE 10

GROUNDWATER ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1	MW 93-1A	DUP-03	MW 93-2	MW 93-2A	MW 10-1	MW 10-1A	RDL	Criteria*
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Benzene	ug/L	<	<	<	<	<	<	<	1.00	44
Bromodichloromethane	ug/L	<	<	<	<	<	<	<	1.00	85,000
Bromoform	ug/L	<	<	<	<	<	<	<	1.00	380
Bromomethane	ug/L	<	<	<	<	<	<	<	3.00	5.6
Carbon Tetrachloride	ug/L	<	<	<	<	<	<	<	1.00	0.79
Chlorobenzene	ug/L	<	<	<	<	<	<	<	1.00	630
Chloroethane	ug/L	<	<	<	<	<	<	<	8.00	-
Chloroform	ug/L	<	<	<	<	<	<	<	1.00	2.4
Chloromethane	ug/L	<	<	<	<	<	<	<	8.00	-
Dibromochloromethane	ug/L	<	<	<	<	<	<	<	1.00	82,000
1,2-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	0.50	4,600
1,3-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	1.00	9,600
1,4-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	1.00	8
1,1-Dichloroethane	ug/L	<	<	<	<	<	<	<	2.00	320
1,2-Dichloroethane	ug/L	<	<	<	<	<	<	<	1.00	1.6
1,1-Dichloroethylene	ug/L	<	<	<	<	<	<	<	0.50	1.6
cis-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	2.00	1.6
trans-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	2.00	1.6
1,2-Dichloropropane	ug/L	<	<	<	<	<	3.00	6.80	1.00	16
cis-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	2.00	5.2
trans-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	1.00	5.2
Ethylbenzene	ug/L	<	<	<	<	<	<	<	1.00	2,300
Methylene Chloride(Dichloromethane)	ug/L	<	<	<	<	<	<	<	3.00	610
Xylenes	ug/L	<	<	<	<	<	<	<	2.00	4,200
Styrene	ug/L	<	<	<	<	<	<	<	1.00	1,300
Tetrachloroethylene	ug/L	<	<	<	<	<	<	<	1.00	1.6
1,1,2,2-Tetrachloroethane	ug/L	<	<	<	<	<	<	<	1.00	3.2
Toluene	ug/L	<	<	<	<	<	<	<	1.00	18,000
Trichloroethylene	ug/L	<	<	<	<	<	<	<	1.00	1.6
1,1,1-Trichloroethane	ug/L	<	<	<	<	<	<	<	1.00	640
1,1,2-Trichloroethane	ug/L	<	<	<	<	<	<	<	1.00	4.7
Trichlorofluoromethane (FREON 11)	ug/L	<	<	<	<	<	<	<	8.00	2,500
Vinyl Chloride	ug/L	<	<	<	<	<	<	<	0.50	0.5

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.

* 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 **0.0** = above criteria
MW = Monitor Well
-= Not analysed/No criteria
< = Parameter below detection limit
DUP-03= Field Duplicate of MW 93-1A

TABLE 11

GROUNDWATER ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1	MW 93-1A	DUP-03	MW 93-2	MW 93-2A	MW 10-1	MW 10-1A	RDL	Criteria*
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Anion Sum	me/L	6.51	6.5	6.47	6.36	1.37	3.24	2.11	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	270	260	250	210.0	11.0	140	77.0	1.00	-
Calculated TDS	mg/L	338	334	334	353.0	96.0	174	122.0	1.00	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	4.7	5.2	5.4	2.60	<	1.1	<	1.00	-
Cation Sum	me/L	6.14	5.89	5.94	5.99	1.44	3.11	1.98	N/A	-
Hardness (CaCO3)	mg/L	150	140	150	250	34	140	84	1.00	-
Ion Balance (% Difference)	%	2.92	4.92	4.27	3.00	2.49	2.05	3.18	N/A	-
Langelier Index (@ 20C)	N/A	0.815	0.826	0.846	0.90	-3.03	0.365	-0.60	N/A	-
Langelier Index (@ 4C)	N/A	0.566	0.577	0.597	0.65	-3.28	0.115	-0.85	N/A	-
Nitrate (N)	mg/L	<	<	<	<	<	0.16	0.08	0.05	-
Saturation pH (@ 20C)	N/A	7.45	7.5	7.5	7.22	9.28	7.55	8.00	N/A	-
Saturation pH (@ 4C)	N/A	7.69	7.75	7.75	7.47	9.53	7.8	8.25	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	280	260	260	220	12	140	77	30	-
Carbonaceous BOD	mg/L	-	-	-	-	-	-	-	5.00	-
Dissolved Chloride (Cl)	mg/L	11	30	30	20	17	3.8	4	1	-
Colour	TCU	<	<	<	<	41.00	5.6	7.70	5.00	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	-	-	-	-	-	0.00	-
Nitrate + Nitrite	mg/L	<	<	<	<	<	0.16	0.08	0.05	-
Nitrite (N)	mg/L	<	<	<	<	<	<	<	0.01	-
Nitrogen (Ammonia Nitrogen)	mg/L	<	<	<	<	0.40	<	0.11	0.05	-
Total Organic Carbon (C)	mg/L	<	1.4	1.5	0.88	22.00	2.7	8.70	0.50	-
Orthophosphate (P)	mg/L	<	<	<	<	<	<	<	0.01	-
pH	pH	8.26	8.33	8.35	8.12	6.25	7.91	7.40	N/A	-
Phenols-4AAP	mg/L	-	-	-	-	-	-	-	0.00	12,000
Reactive Silica (SiO2)	mg/L	5.3	9.1	9.1	18.00	5.70	7.4	10.00	0.50	-
Total Suspended Solids (TSS)	mg/L	-	-	-	-	-	-	-	2	-
Dissolved Sulphate (SO4)	mg/L	33	19	20	71	32	17	21	2	-
Sulphide	mg/L	-	-	-	-	-	-	-	0.02	-
Turbidity	NTU	590	5.9	5.7	4.0	120.0	26	240.0	0.1	-
Conductivity	uS/cm	580	580	590	580	150	300	200	1	-
Total Oil & Grease	mg/L	-	-	-	-	-	-	-	5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* 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 **0.0** = above criteria
MW = Monitor Well
- = Not analysed/No criteria
< = Parameter below detection limit
DUP-03= Field Duplicate of MW 93-1A

TABLE 12

GROUNDWATER ANALYTICAL DATA - METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1	MW 93-1A	DUP-03	MW 93-2	MW 93-2A	MW 10-1	MW 10-1A	RDL	Criteria*
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Aluminum (Al)	ug/L	13.9	6.8	13.0	<5.0	246	21.7	39.8	5.0	-
Antimony (Sb)	ug/L	<	<	<	<	<	<	<	1.0	20,000
Arsenic (As)	ug/L	<	<	<	1.7	<	<	<	1.0	1,900
Barium (Ba)	ug/L	80.0	103	107	196	34.6	42.1	37.7	1.0	29,000
Beryllium (Be)	ug/L	<	<	<	<	<	<	<	1.0	67
Bismuth (Bi)	ug/L	<	<	<	<	<	<	<	2.0	-
Boron (B)	ug/L	78	118	118	991	<	<	<	5.0	45,000
Cadmium (Cd)	ug/L	<	<	<	<	1.50	0.060	0.044	0.017	2.7
Calcium (Ca)	ug/L	35500	32800	33000	77400	9930	49500	29400	100	-
Chromium (Cr)	ug/L	<	<	<	<	<	<	<	1.0	810/140[(1)]
Cobalt (Co)	ug/L	0.58	<	<	<	0.82	<	8.15	0.4	66
Copper (Cu)	ug/L	<	<	6.8	<	2.7	6.4	8.5	2.0	87
Iron (Fe)	ug/L	<	50	55	54	8530	<	726	50	-
Lead (Pb)	ug/L	0.70	<	<	<	1.41	<	<	0.5	25
Magnesium (Mg)	ug/L	15000	15000	15400	14700	2240	3600	2520	100	-
Manganese (Mn)	ug/L	131	106	103	732	3490	10.5	618	2.0	-
Molybdenum (Mo)	ug/L	15.0	11.9	10.7	<	<	2.0	<	2.0	9,200
Nickel (Ni)	ug/L	<	<	<	<	<	2.6	9.1	2.0	490
Phosphorus (P)	ug/L	<	<	<	<	<	<	<	100	-
Potassium (K)	ug/L	2660	1680	1730	1280	1090	1510	874	100	-
Selenium (Se)	ug/L	<	<	<	<	<	<	<	1.0	63
Silver (Ag)	ug/L	<	<	<	<	<	<	<	0.1	1.5
Sodium (Na)	ug/L	70400	68200	68600	20300	9110	7020	5750	100	2,300,000
Strontium (Sr)	ug/L	247	246	249	229	40.3	104	67.0	2.0	-
Thallium (Tl)	ug/L	<	<	<	<	<	<	<	0.1	510
Tin (Sn)	ug/L	<	<	<	<	<	<	<	2.0	-
Titanium (Ti)	ug/L	<	<	<	<	<	<	<	2.0	-
Uranium (U)	ug/L	1.24	0.23	0.21	0.23	<	0.27	<	0.1	-
Vanadium (V)	ug/L	<	<	<	<	<	<	<	2.0	250
Zinc (Zn)	ug/L	<	<	<	<	835	8.0	15.5	5.0	1,100

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* 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 **0.0** = above criteria
MW = Monitor Well
- = Not analysed/No criteria
< = Parameter below detection limit
DUP-03= Field Duplicate of MW 93-1A
(1) Criteria for Total Chromium = 810 ug/L, Criteria for Chromium (VI) = 140 ug/L

TABLE 13

SURFACE WATER ANALYTICAL DATA - BTEX/mTPH (mg/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)				
						TPuH C_6-C_{10}	TExH C_{10}-C_{21}	TExH C_{21}-C_{32}	Modified TPH	Comments
SURFACE UP	Nov 07, 2012	<	<	<	<	<	<	<	<	-
SURACE DOWN	Nov 07, 2012	<	<	<	<	<	<	<	<	-
RDL		0.001	0.001	0.001	0.002	0.01	0.05	0.1	0.1	-
2012 RBCA Tier I Ecological Screening Levels for the Protection of Aquatic Life [1]		**2.10**	**0.77**	**0.32**	**0.33**	**-**	**-**	**-**	**1.5**	**Gasoline**
									0.1	**Diesel /#2 Fuel Oil**
									0.1	**#6 Oil**

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
1. Atlantic RBCA (Risk-Based Corrective Action) Version 3.0 (July 2012) Tier I Surface Water Screening Levels for the Protection of Freshwater and Marine Aquatic Life (mg/L)

RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
DUP = Laboratory duplicate
0.0 = above criteria

TPuH = Total Purgeable Hydrocarbons
TExH = Total Extractable Hydrocarbons
TPH = Total Petroleum Hydrocarbons
Modified TPH = mTPH = TExH + TPuH
TPH = mTPH + BTEX

G = Gasoline
FO = Fuel Oil
LO = Lube Oil
W = Weathered

TABLE 14

SURFACE WATER ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP	SURFACE DOWN	RDL	Criteria*
		Nov 07, 2012	Nov 07, 2012		
1-Methylnaphthalene	ug/L	<	<	0.05	-
2-Methylnaphthalene	ug/L	<	<	0.05	-
Acenaphthene	ug/L	<	<	0.01	5.8
Acenaphthylene	ug/L	<	<	0.01	-
Anthracene	ug/L	<	<	0.01	0.012
Benzo(a)anthracene	ug/L	<	<	0.01	0.018
Benzo(a)pyrene	ug/L	<	<	0.01	0.015
Benzo(b)fluoranthene	ug/L	<	<	0.01	-
Benzo(g,h,i)perylene	ug/L	<	<	0.01	-
Benzo(j)fluoranthene	ug/L	<	<	0.01	-
Benzo(k)fluoranthene	ug/L	<	<	0.01	-
Chrysene	ug/L	<	<	0.01	-
Dibenz(a,h)anthracene	ug/L	<	<	0.01	-
Fluoranthene	ug/L	<	<	0.01	0.04
Fluorene	ug/L	<	<	0.01	3.0
Indeno(1,2,3-cd)pyrene	ug/L	<	<	0.01	-
Naphthalene	ug/L	<	<	0.2	1.1
Perylene	ug/L	<	<	0.01	-
Phenanthrene	ug/L	0.011	0.012	0.01	0.4
Pyrene	ug/L	<	<	0.01	0.025

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0**
- = Not analysed/No criteria
< = Parameter below detection limit

TABLE 15

SURFACE WATER ANALYTICAL DATA - TOTAL PCBs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP	SURFACE DOWN	RDL	Criteria*
		Nov 07, 2012	Nov 07, 2012		
Total PCBs	ug/L	<	<	0.05	-

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0** = above criteria
< = Parameter below detection limit

TABLE 16

SURFACE WATER ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP	SURFACE DOWN	RDL	Criteria*
		Nov 07, 2012	Nov 07, 2012		
Benzene	ug/L	<	<	1	370
Bromodichloromethane	ug/L	<	<	1	-
Bromoform	ug/L	<	<	1	-
Bromomethane	ug/L	<	<	3	-
Carbon Tetrachloride	ug/L	<	<	1	13.3
Chlorobenzene	ug/L	<	<	1	1.3
Chloroethane	ug/L	<	<	8	-
Chloroform	ug/L	<	<	1	1.8
Chloromethane	ug/L	<	<	8	-
Dibromochloromethane	ug/L	<	<	1	-
1,2-Dichlorobenzene	ug/L	<	<	0.5	0.7
1,3-Dichlorobenzene	ug/L	<	<	1	150
1,4-Dichlorobenzene	ug/L	<	<	1	26
1,1-Dichloroethane	ug/L	<	<	2	-
1,2-Dichloroethane	ug/L	<	<	1	100
1,1-Dichloroethylene	ug/L	<	<	0.5	-
cis-1,2-Dichloroethylene	ug/L	<	<	2	-
trans-1,2-Dichloroethylene	ug/L	<	<	2	-
1,2-Dichloropropane	ug/L	<	<	1	-
cis-1,3-Dichloropropene	ug/L	<	<	2	-
trans-1,3-Dichloropropene	ug/L	<	<	1	-
Ethylbenzene	ug/L	<	<	1	90
Methylene Chloride(Dichloromethane)	ug/L	<	<	3	98.1
o-Xylene	ug/L	<	<	1	-
p+m-Xylene	ug/L	<	<	2	-
Styrene	ug/L	<	<	1	300
Tetrachloroethylene	ug/L	<	<	1	72
1,1,2,2-Tetrachloroethane	ug/L	<	<	1	-
Toluene	ug/L	<	<	1	111
Trichloroethylene	ug/L	<	<	1	2.0
1,1,1-Trichloroethane	ug/L	<	<	1	-
1,1,2-Trichloroethane	ug/L	<	<	1	-
Trichlorofluoromethane (FREON 11)	ug/L	<	<	8	21
Vinyl Chloride	ug/L	<	<	0.5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0** = above criteria
-= Not analysed/No criteria
< = Parameter below detection limit

TABLE 17

SURFACE WATER ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP	SURFACE DOWN	RDL	Criteria*
		Nov 07, 2012	Nov 07, 2012		
Anion Sum	me/L	0.610	0.630	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	7.6	8.2	1	-
Calculated TDS	mg/L	38.0	39.0	1	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	<	<	1	-
Cation Sum	me/L	0.650	0.650	N/A	-
Hardness (CaCO3)	mg/L	14	14	1	-
Ion Balance (% Difference)	%	3.17	1.56	N/A	-
Langelier Index (@ 20C)	N/A	-2.97	-2.95	N/A	-
Langelier Index (@ 4C)	N/A	-3.22	-3.20	N/A	-
Nitrate (N)	mg/L	0.054	0.058	0.05	13
Saturation pH (@ 20C)	N/A	9.83	9.80	N/A	-
Saturation pH (@ 4C)	N/A	10.1	10.0	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	7.6	8.2	30	-
Carbonaceous BOD	mg/L	-	-	5	-
Dissolved Chloride (Cl)	mg/L	12	12	1	-
Colour	TCU	67	78	5	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	0.002	-
Nitrate + Nitrite	mg/L	0.054	0.058	0.05	-
Nitrite (N)	mg/L	<	<	0.01	0.06
Nitrogen (Ammonia Nitrogen)	mg/L	<	<	0.05	-
Total Organic Carbon (C)	mg/L	7.9	7.9	0.5	-
Orthophosphate (P)	mg/L	<	<	0.01	-
pH	pH	6.86	6.85	N/A	6.5 - 9
Phenols-4AAP	mg/L	-	-	0.001	-
Reactive Silica (SiO2)	mg/L	2.1	2.2	0.5	-
Total Suspended Solids (TSS)	mg/L	-	-	2	-
Dissolved Sulphate (SO4)	mg/L	5.7	5.8	2	-
Sulphide	mg/L	-	-	0.02	-
Turbidity	NTU	0.72	0.88	0.1	-
Conductivity	uS/cm	66	67	1	-
Total Oil & Grease	mg/L	-	-	5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0** = above criteria
-= Not analysed/No criteria
< = Parameter below detection limit

TABLE 18

SURFACE WATER ANALYTICAL DATA - TOTAL METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP	SURFACE DOWN	RDL	Criteria*
		Nov 07, 2012	Nov 07, 2012		
Aluminum (Al)	ug/L	**113**	**117**	5.0	100(1)
Antimony (Sb)	ug/L	<	<	1.0	-
Arsenic (As)	ug/L	<	<	1.0	5.0
Barium (Ba)	ug/L	8.9	8.6	1.0	-
Beryllium (Be)	ug/L	<	<	1.0	-
Bismuth (Bi)	ug/L	<	<	2.0	-
Boron (B)	ug/L	<	<	5.0	-
Cadmium (Cd)	ug/L	<	<	0.017	0.015/0.036(2)
Calcium (Ca)	ug/L	3,870	3,890	100	-
Chromium (Cr)	ug/L	<	<	1.0	8.9(3)
Hexavalent Chromium (Cr^{6+})	ug/L	<	<	1.0	1.0
Cobalt (Co)	ug/L	<	<	0.4	-
Copper (Cu)	ug/L	<	<	2.0	2(4)
Iron (Fe)	ug/L	**387**	**382**	50	300
Lead (Pb)	ug/L	<	<	0.50	1, 2(5)
Magnesium (Mg)	ug/L	1,040	1,050	100	-
Manganese (Mn)	ug/L	41.2	38.0	2.0	-
Molybdenum (Mo)	ug/L	<	<	2.0	73.00
Nickel (Ni)	ug/L	<	<	2.0	25, 65(6)
Phosphorus (P)	ug/L	<	<	100	-
Potassium (K)	ug/L	363	400	100	-
Selenium (Se)	ug/L	<	<	1.0	1.0
Silver (Ag)	ug/L	<	<	0.1	0.1
Sodium (Na)	ug/L	7,930	7,880	100	-
Strontium (Sr)	ug/L	13.4	13.3	2.0	-
Thallium (Tl)	ug/L	<	<	0.1	0.8
Tin (Sn)	ug/L	<	<	2.0	-
Titanium (Ti)	ug/L	3.1	2.7	2.0	-
Uranium (U)	ug/L	<	<	0.10	-
Vanadium (V)	ug/L	<	<	2.0	-
Zinc (Zn)	ug/L	<	<	5.0	30
Hardness (CaCO3)	mg/L	14.0	14.0	1.0	-
pH	N/A	6.86	6.85	-	6.5 - 9

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit
- = Not analysed/No criteria
< = Parameter below 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 = $10^{\{0.86[\log(\text{hardness})]-3.2\}}$

(3) Criteria for Chromium (III) = 8.9 ug/L, Criteria for Chromium (VI) = 1.0 ug/L

(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 19

LEACHATE ANALYTICAL DATA - BTEX/mTPH (mg/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)					
						C_6-C_{10}	C_{10}-C_{16}	C_{16}-C_{21}	C_{21}-C_{32}	Modified TPH	Comments
PLCS	Aug 30, 2012	<	<	<	<	<	<	<	<	<	-
DUP-04	Aug 30, 2012	<	<	<	<	<	0.073	0.1	<	0.18	No resemblance to petroleum products in fuel oil range.
SLCS	Aug 30, 2012	<	<	<	<	<	0.059	0.1	<	0.16	No resemblance to petroleum products in fuel oil range.
RDL		0.0013	0.0013	0.0013	0.0026	0.013	0.05	0.05	0.1	0.1	-
Schedule A Water & Sewer Regulations [1]		-	-	-	-	-	-		-	15	-
2007 CCME Freshwater Aquatic Life Guidelines [2]		**4.00**	**2.00**	**0.39**	**-**	**-**	**-**	**-**	**-**	**-**	**Gasoline**
										-	**Diesel /#2 Fuel Oil**
										-	**#6 Oil**
2012 Tier I Surface Water ESL - Freshwater [3]		**2.10**	**0.77**	**0.32**	**0.33**	**-**	**-**	**-**	**-**	**1.5**	**Gasoline**
										0.1	**Diesel /#2 Fuel Oil**
										0.1	**#6 Oil**

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.

1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.
2. 2007 CCME Freshwater Aquatic Life Guidelines
3 Atlantic Risk-Based Corrective Action (RBCA) Tier I Surface Water Ecological Screening Level (ESL) Table values for protection of freshwater and marine aquatic life.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
0.00 = above criteria

TABLE 20

LEACHATE ANALYTICAL DATA - PAHs (ug/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	PLCS	DUP-04	SLCS	RDL	Criteria	
	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		NL [1]	CCME [2]
1-Methylnaphthalene	<	<	<	0.05	-	-
2-Methylnaphthalene	<	<	<	0.05	-	-
Acenaphthene	0.041	0.01	0.019	0.01	-	580
Acenaphthylene	<	<	0.018	0.01	-	-
Anthracene	<(0.15)	<(0.040)	<(0.20)	0.01	-	1.2
Benzo(a)anthracene	0.039	0.013	0.064	0.01	-	1.8
Benzo(a)pyrene	<	<	<	0.01	-	1.5
Benzo(b)fluoranthene	<	<	<	0.01	-	-
Benzo(g,h,i)perylene	<	<	<	0.01	-	-
Benzo(j)fluoranthene	<	<	<	0.01	-	-
Benzo(k)fluoranthene	<	<	<	0.01	-	-
Chrysene	0.064	0.024	0.10	0.01	-	-
Dibenz(a,h)anthracene	<	<	<	0.01	-	-
Fluoranthene	0.18	0.046	0.37	0.01	-	4
Fluorene	0.049	0.014	0.031	0.01	-	300
Indeno(1,2,3-cd)pyrene	<	<	<	0.01	-	-
Naphthalene	<	<	<	0.2	-	110
Perylene	<	<	<	0.01	-	-
Phenanthrene	<(0.20)	<(0.060)	<(0.30)	0.01	-	40
Pyrene	0.85	0.23	1.8	0.01	-	2.5

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS
1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.

2. CCME Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (2007 - Update 7.1)
with a dilution factor of 100 based on distance between ditch and receiving waters and percolation through soil.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System

0.0 = above CCME Criteria

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

TABLE 21

LEACHATE ANALYTICAL DATA - TOTAL PCBs (ug/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	PLCS	DUP-04	SLCS	RDL	Criteria[1]
	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Total PCBs	<	<	<	0.05	-

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.

PLCS = Primary Leachate Collection System < = Parameter below detection limit
SLCS = Secondary Leachate Collection System **0.0** = above Criteria

RDL = Reportable Detection Limit - = Not analysed/No criteria
DUP-04 = Field Duplicate of PLCS

TABLE 22

LEACHATE ANALYTICAL DATA - VOCs (ug/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	PLCS	DUP-04	SLCS	RDL
	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012	
Benzene	<	<	<	1
Bromodichloromethane	<	<	<	1
Bromoform	<	<	<	1
Bromomethane	<	<	<	3
Carbon Tetrachloride	<	<	<	1
Chlorobenzene	<	<	<	1
Chloroethane	<	<	<	8
Chloroform	<	<	<	1
Chloromethane	<	<	<	8
Dibromochloromethane	<	<	<	1
1,2-Dichlorobenzene	<	<	<	0.5
1,3-Dichlorobenzene	<	<	<	1
1,4-Dichlorobenzene	<	<	<	1
1,1-Dichloroethane	<	<	<	2
1,2-Dichloroethane	<	<	<	1
1,1-Dichloroethylene	<	<	<	0.5
cis-1,2-Dichloroethylene	<	<	<	2
trans-1,2-Dichloroethylene	<	<	<	2
1,2-Dichloropropane	<	<	<	1
cis-1,3-Dichloropropene	<	<	<	2
trans-1,3-Dichloropropene	<	<	<	1
Ethylbenzene	<	<	<	1
Methylene Chloride(Dichloromethane)	<	<	<	3
o-Xylene	<	<	<	1
p+m-Xylene	<	<	<	2
Styrene	<	<	<	1
Tetrachloroethylene	<	<	<	1
1,1,2,2-Tetrachloroethane	<	<	<	1
Toluene	<	<	<	1
Trichloroethylene	<	<	<	1
1,1,1-Trichloroethane	<	<	<	1
1,1,2-Trichloroethane	<	<	<	1
Trichlorofluoromethane (FREON 11)	<	<	<	8
Vinyl Chloride	<	<	<	0.5

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System

< = Parameter below detection limit
0.0 = above Criteria

RDL = Reportable Detection Limit

- = Not analysed/No criteria

TABLE 23

LEACHATE ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	PLCS	DUP-04	SLCS	RDL	Criteria[1]
		Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Anion Sum	me/L	12.5	9.53	12.3	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	520	390	500	1	-
Calculated TDS	mg/L	624	564	647	1	1,000
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.6	2.3	2.2	1	-
Cation Sum	me/L	10.7	12.3	12.0	N/A	-
Hardness (CaCO3)	mg/L	470	530	500	1	-
Ion Balance (% Difference)	%	7.94	12.9	1.07	N/A	-
Langelier Index (@ 20C)	N/A	1.10	1.11	1.04	N/A	-
Langelier Index (@ 4C)	N/A	0.856	0.864	0.787	N/A	-
Nitrate (N)	mg/L	0.061	0.41	0.067	0.05	10
Saturation pH (@ 20C)	N/A	6.63	6.69	6.63	N/A	-
Saturation pH (@ 4C)	N/A	6.87	6.94	6.87	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	530	390	510	30.00	-
Dissolved Chloride (Cl)	mg/L	39	31	44	1	1,000
Colour	TCU	10	10	12	5	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	<	-	<	0.002	25
Nitrate + Nitrite	mg/L	0.061	0.41	0.067	0.05	-
Nitrite (N)	mg/L	<	<	<	0.01	-
Nitrogen (Ammonia Nitrogen)	mg/L	0.53	0.45	0.50	0.05	2
Total Organic Carbon (C)	mg/L	16(5)	20 (5)	20(5)	0.5	-
Orthophosphate (P)	mg/L	<	<	<	0.01	-
pH	pH	7.73	7.8	7.66	N/A	5.5 - 9.0
Phenols-4AAP	mg/L	0.012	-	0.014	0.001	0.10
Reactive Silica (SiO2)	mg/L	17	14	15	0.5	-
Total Suspended Solids (TSS)	mg/L	9.8	-	24	2.0	30
Dissolved Sulphate (SO4)	mg/L	43	36	44	2.0	-
Sulphide	mg/L	<	-	0.060	0.02	0.50
Turbidity	NTU	160	12	280	0.1	-
Conductivity	uS/cm	1,000	820	1,100	1	-
Total Oil & Grease	mg/L	<	-	<	5.00	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.

1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System

0.0 = above Criteria

< = Parameter below detection limit
<(0.0) = Parameter below elevated detection limit
DUP-04 = Field Duplicate of PLCS

RDL = Reportable Detection Limit
- = Not analysed/No criteria

TABLE 24

LEACHATE ANALYTICAL DATA - TOTAL METALS (ug/L)
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	PLCS	DUP-04	SLCS	RDL	Criteria[1]
	Aug 30, 2012	Aug 30, 2012	Aug 30, 2012		
Aluminum (Al)	14.2	22.2	16.3	5	-
Antimony (Sb)	<	<	<	1	-
Arsenic (As)	<	1.0	1.1	1	500
Barium (Ba)	72.7	85.7	78.2	1	5,000
Beryllium (Be)	<	<	<	1	-
Bismuth (Bi)	<	<	<	2	-
Boron (B)	1,500	1,890	2,500	5	5,000
Cadmium (Cd)	<	<	<	0.017	50
Calcium (Ca)	140,000	159,000	147,000	100	-
Chromium (Cr)	<	<	<	1	1,000
Hexavalent Chromium (Cr^{6+})	<	<	<	1	50
Cobalt (Co)	<	<	1.04	0.4	-
Copper (Cu)	<	<	<	2	300
Iron (Fe)	5,470	**14,300**	**15,100**	50	10,000
Lead (Pb)	<	<	<	0.5	200
Magnesium (Mg)	28,800	32,900	33,200	100	-
Manganese (Mn)	7,270	8,770	8,250	2	-
Mercury (Hg)	<	<	<	0.013	5
Molybdenum (Mo)	<	<	7.20	2	-
Nickel (Ni)	<	<	2.40	2	500
Phosphorus (P)	<	<	<	100	0.5
Potassium (K)	5,840	5,800	8,870	100	-
Selenium (Se)	<	<	<	1	10
Silver (Ag)	<	<	<	0.1	50
Sodium (Na)	21,100	23,700	26,600	100	-
Strontium (Sr)	318	362	369	2	-
Thallium (Tl)	<	<	<	0.1	-
Tin (Sn)	<	<	<	2	-
Titanium (Ti)	<	2.00	<	2	-
Uranium (U)	0.79	0.94	5.05	1	-
Vanadium (V)	<	<	<	2	-
Zinc (Zn)	<	6.50	8.30	5	500

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
1. Schedule A of NL Environmental Control Water and Sewer Regulations, 2003.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System

0.0 = above Criteria

< = Parameter below detection limit
<(0.0) = Parameter below elevated detection limit
DUP-04 = Field Duplicate of PLCS
RDL = Reportable Detection Limit
- = Not analysed/No criteria

LEACHATE PUMPING LOG
COME BY CHANCE SECURE LANDFILL, COME BY CHANCE, NL

NAME: PRIMARY
CHAMBER DIAMETER: 1.46 m
AREA: 1.67 m^2

NOV 21/12

INTERVAL	PUMPING / FILLING	DEPTH (mbtoc)		TIME		CALCULATIONS				
		START	END	START	END	ΔD (m)	VOLUME (m^3)	ΔT	Q (L/min)	< 15 L/min?
1	Pump	0.684	2.692	10:49	10:57	2.008	3.353	8	419	NA
2	Fill	2.692	2.466	10:57	11:09	0.226	0.337	12	31.4	N
3	Pump	2.466	2.050	11:09	11:13	0.384	0.641	4	160	NA
4	Pump Bleeds Down									
5										
6	~~Pump~~ Fill	3.326	3.089	1:34	1:46	0.239	0.399	12	33.2	N
7	↑	3.089	2.571	1:46	2:36	0.518	0.865	51	17.0	N
8		3.320	3.150	2:56	3:00	0.170	0.284	10	28.4	N
9		3.150	2.610	3:00	3:38	0.540	0.902	38	30.1	N
10		3.300	3.106	3:45	3:55	0.194	0.324	10	32.4	N
11		3.106	2.965	3:55	4:05	0.141	0.235	10	23.5	N
12		2.965	2.790	4:05	4:15	0.175	0.292	10	29.2	N
13		2.790	2.620	4:15	4:25	0.170	0.284	10	28.4	N
14		2.620	2.460	4:25	4:35	0.160	0.267	10	26.7	N
15		2.460	2.291	4:35	4:45	0.169	0.282	10	28.2	N
16		3.250	3.078	4:53	5:03	0.172	0.287	10	28.7	N
17		3.078	2.925	5:03	5:13	0.153	0.256	10	25.6	N
18		2.925	2.795	5:13	5:23	0.130	0.217	10	21.7	N
19		2.795	2.615	5:23	5:33	0.180	0.301	10	30.1	N
20		2.615	2.465	5:33	5:43	0.150	0.250	10	25.0	N
21		2.465	2.330	5:43	5:53	0.135	0.225	10	22.5	N
22		2.330	2.210	5:53	6:03	0.120	0.200	10	20.0	N
23		2.210	2.110	6:03	6:13	0.100	0.167	10	16.7	N
24		2.910	2.010	6:13	6:23	0.100	0.167	10	16.7	N
25	↓	2.010	1.912	6:23	6:33	0.098	0.164	10	16.4	N
26	~~Pump~~ Fill	1.912	1.823	6:33	6:43	0.089	0.149	10	14.9	✓
27										
28										
29										
30										

LEACHATE PUMPING LOG
COME BY CHANCE SECURE LANDFILL, COME BY CHANCE, NL

NAME: SECONDARY
CHAMBER DIAMETER: 1.46 m
AREA: 1.67 m^2

Nov 21/12

INTERVAL	PUMPING / FILLING	DEPTH (mbtoc)		TIME		CALCULATIONS				
		START	END	START	END	ΔD (m)	VOLUME (m^3)	ΔT	Q (L/min)	< 15 L/min?
1	Pump	0.591	2.955	10:58	11:08	2.364	3.948	10	395	NA
2	Fill	2.955	2.393	11:08	11:13	0.562	0.936	5	188	N
3	"	2.393	1.947	11:13	11:19	0.446	0.745	6	124	N
4	"	1.947	1.545	11:32						
5	Pump	BREAKDOWN.								
6										
7		2.788	1.750	2:39	2:57	1.038	1.733	18	96.3	N
8		3.004	2.884	3:47	3:57	0.120	0.200	10	20.0	N
9		2.884	2.765	3:57	4:07	0.099	0.165	10	16.5	N
10		2.765	2.675	4:07	4:17	0.090	0.150	10	15.0	N
11		2.695	2.610	4:17	4:27	0.085	0.142	10	14.2	✓
12										
13										
14										
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16										
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TABLE 27

PUMPING TEST ON SURROUNDING WATER LEVELS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

	PLCS			MW10-1			MW10-1A			MW93-1			MW93-1A		
TOC Elevation (masl)	15.96			16.636			16.744			17.4			17.71		
	Time	TOC to H_2O (m)	H_2O Elevation (masl)	Time	TOC to H_2O (m)	H_2O Elevation (masl)	Time	TOC to H_2O (m)	H_2O Elevation (masl)	Time	TOC to H_2O (m)	H_2O Elevation (masl)	Time	TOC to H_2O (m)	H_2O Elevation (masl)
	11:17 AM	0.890	15.070	11:30 AM	3.189	13.447	11:30 AM	3.235	13.509	11:35 AM	1.752	15.648	11:35 AM	1.673	16.037
	11:30 AM	0.906	15.054	12:35 PM	3.187	13.449	12:35 PM	3.239	13.505	12:30 PM	1.746	15.654	12:30 PM	1.667	16.043
	11:55 AM	0.912	15.048	1:30 PM	3.194	13.442	1:30 PM	3.238	13.506	1:25 PM	1.724	15.676	1:25 PM	1.666	16.044
	12:05 PM	0.917	15.043	2:45 PM	3.19	13.446	2:45 PM	3.242	13.502	2:40 PM	1.724	15.676	2:40 PM	1.667	16.043
	12:25 PM	0.922	15.038	3:35 PM	3.191	13.445	3:35 PM	3.241	13.503	3:30 PM	1.718	15.682	3:30 PM	1.667	16.043
	12:40 PM	0.927	15.033	5:00 PM	3.191	13.445	5:00 PM	3.244	13.5	4:50 PM	1.709	15.691	4:50 PM	1.666	16.044
	1:20 PM	0.929	15.031	Total Change (m)		0.002	Total Change (m)		0.009	Total Change (m)		-0.043	Total Change (m)		-0.007
	1:36 PM	0.931	15.029												
	2:30 PM	0.933	15.027												
	2:50 PM	0.934	15.026												
	3:15 PM	0.939	15.021												
	3:25 PM	0.943	15.017												
	4:00 PM	0.947	15.013												
	4:30 PM	0.950	15.010												
	5:00 PM	0.949	15.011												
	5:15 PM	0.953	15.007												
	Total Change (m)		0.063												

	MW93-2			MW93-2A		
TOC Elevation (masl)	15.390			15.41		
	Time	TOC to H_2O (m)	H_2O Elevation	Time	TOC to H_2O (m)	H_2O Elevation
	11:30 AM	2.081	13.309	11:30 AM	1.237	14.173
	12:40 PM	2.08	13.310	12:40 PM	1.237	14.173
	1:30 PM	2.08	13.310	1:30 PM	1.237	14.173
	2:30 PM	2.08	13.310	2:30 PM	1.238	14.172
	3:30 PM	2.08	13.310	3:30 PM	1.238	14.172
	4:30 PM	2.081	13.309	4:30 PM	1.239	14.171
	5:10 PM	2.08	13.310	5:10 PM	1.238	14.172
	Total Change (m)		-0.001	Total Change (m)		0.001

TOC = Top of Chamber/Casing
masl = metres above sea level
PLCS = Primary Leachate Collection System

TABLE 28

LEACHATE PUMPING VOLUMES vs. ANNUAL PRECIPITATION AND STATIC GROUNDWATER LEVELS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

	Summary of Leachate Pumping Volumes (Litres)				Precipitation Data	Groundwater Elevation (masl)									
	Year	Month	PLCS	SLCS	Monthly (mm)	PLCS	SLCS	MW 93-1	MW 93-1A	MW 93-2	MW 93-2A	MW 93-3*	MW 93-3A*	MW 10-1	MW 10-1A
Pre GWDS	2000	November	13,000	70,000	145	--	--	--	--	--	--	--	--	--	--
	2003	November	15,000	56,000	124	--	--	--	--	--	--	--	--	--	--
	2004	August	NA	45,000	156	--	--	--	15.83	14.83	--	--	Dry	--	--
		September	15,500	83,000	196	--	--	--	17.30	14.81	--	--	--	--	--
		October	NA	32,000	147	--	--	--	17.55	15.11	--	--	14.70	--	--
	2006	October	NA	68,000	78	--	--	--	15.60	13.26	--	--	12.53	--	--
	2007	February	6,000	63,000	58	--	--	--	--	--	--	--	--	--	--
		July	NA	103,000	334	--	--	--	--	--	--	--	--	--	--
	2008	November	NA	74,000	142	--	--	--	--	--	--	--	--	--	--
	Average		***~12,500***	***~66,000***	***153***										
Post GWDS	2009	August	3,406	19,475	113	--	--	--	--	--	--	--	--	--	--
		December	4,542	30,699	93	--	--	--	--	--	--	--	--	--	--
	2010	February	3,406	21,350	31	--	--	--	--	--	--	--	--	--	--
		August	12,100	35,200	77	15.41	15.44	15.70	16.07	13.31	13.95	--	--	13.62	13.66
	2011	January	8,600	30,200	112	15.23	15.24	15.48	16.07	13.24	14.04	--	--	13.38	13.46
	2012	November	12,200	24,900	164	14.34	14.35	13.70	14.40	11.13	12.80	--	--	10.19	10.23
	Average		***~7,400***	***~27,000***	***98***										

PLCS Primary Leachate Collection System

SLCS Secondary Leachate Collection System

GWDS Groundwater Drainage System

masl metres above sea level.

-- No measurement

* Decommissioned in July 2010.

APPENDIX A

SITE PHOTOGRAPHS

Photo 1: View, looking west, of the vegetative overgrowth around MW 93-1 and MW 93-1A during the August 2012 sampling event.

Photo 2: View, looking southeast, toward Clean-out 2 with the landfill fencing in the background

Photo 3: View of Clean-out 3.

Photo 4: View, looking northeast, of new discharge location of groundwater interception system during the August 2012 Site visit, which is located within the boundaries of the newly constructed asphalt plant. Note discharge pipe without a rodent screen.

Photo 5: View, looking northwest, of the former SURFACE-DOWN location following construction of a new asphalt plant in 2011.

Photo 6: View of typical Meadow Vole activity observed during the November 2012 landfill cover inspection.

Photo 7: View, looking west, during the initial leachate pump and discharge event in November 2012.

Photo 8: View, looking west, while preparing for the December 2012 pump down test of the SLCS valve chamber.

Photo 9: View, looking southeast, of the vegetative overgrowth around MW93-2 and MW93-2A during December 2012 pump down test.

APPENDIX B

LABORATORY CERTIFICATES OF ANALYSES

Maxxam

Success Through Science®

Your Project #: 056680-02
Site#: COME BY CHANCE M&M
Your C.O.C. #: B088782

Attention: Brian Luffman
Conestoga-Rovers and Associates Ltd
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2012/09/11

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2D4739
Received: 2012/09/01, 11:04

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	10	N/A	2012/09/06	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	10	N/A	2012/09/07	ATL SOP 00013	Based on EPA310.2
Chloride (1)	10	N/A	2012/09/10	ATL SOP 00014	Based on SM4500-Cl-
Str. Acid Diss. Cyanide water (1,4)	2	N/A	2012/09/06	ATL SOP 00040	Based on EPA335.3
Colour (1)	10	N/A	2012/09/10	ATL SOP 00020	Based on SM2120C
Hexavalent Cr Low Level (Sub fr Bedford) (2)	2	2012/09/06	2012/09/07		
Conductance - water (1)	10	N/A	2012/09/06	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	3	N/A	2012/09/07	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3) (1)	7	N/A	2012/09/10	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL) (1)	3	2012/09/07	2012/09/07	ATL SOP 00026	Based on EPA245.1
Metals Water Diss. MS (as rec'd) (1)	7	N/A	2012/09/08	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS (1)	1	2012/09/05	2012/09/06	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS (1)	2	2012/09/06	2012/09/07	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	2	N/A	2012/09/10		
Ion Balance (% Difference) (1)	8	N/A	2012/09/11		
Anion and Cation Sum (1)	2	N/A	2012/09/07		
Anion and Cation Sum (1)	8	N/A	2012/09/11		
Nitrogen Ammonia - water (1)	2	N/A	2012/09/06	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water (1)	8	N/A	2012/09/10	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	10	N/A	2012/09/10	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	10	N/A	2012/09/10	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	10	N/A	2012/09/10	ATL SOP 00018	Based on ASTMD3867
PAH in Water by GC/MS (SIM) (1)	11	2012/09/05	2012/09/06	ATL SOP 00103	Based on EPA 8270C
PCBs in water by GC/ECD (1)	7	2012/09/06	2012/09/10	ATL SOP 00107	Based on EPA8082
PCBs in water by GC/ECD (1)	4	2012/09/06	2012/09/11	ATL SOP 00107	Based on EPA8082
Phenols (4-AAP) (1)	2	N/A	2012/09/11	ATL SOP 00039	Based on EPA 420.2
pH (1)	10	N/A	2012/09/06	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	10	N/A	2012/09/10	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	2	N/A	2012/09/10		
Sat. pH and Langelier Index (@ 20C) (1)	8	N/A	2012/09/11		
Sat. pH and Langelier Index (@ 4C) (1)	2	N/A	2012/09/10		
Sat. pH and Langelier Index (@ 4C) (1)	8	N/A	2012/09/11		
Reactive Silica (1)	10	N/A	2012/09/07	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	10	N/A	2012/09/07	ATL SOP 00023	Based on EPA 375.4
Sulphide (3)	2	N/A	2012/09/06	CAM SOP-00455	SM 4500-S G
Total Dissolved Solids (TDS calc) (1)	2	N/A	2012/09/10		
Total Dissolved Solids (TDS calc) (1)	8	N/A	2012/09/11		
Organic carbon - Total (TOC) (1)	10	N/A	2012/09/10	ATL SOP 00037	Based on SM5310C
Total Oil and Grease - Water (1)	2	2012/09/07	2012/09/10	ATL SOP 00101	Based on EPA1664
Total Suspended Solids (1)	2	N/A	2012/09/10	ATL SOP 00007	based on EPA 160.2
Turbidity (1)	10	N/A	2012/09/07	ATL SOP 00011	based on EPA 180.1
Volatile Organic Compounds in Water (1)	10	2012/09/07	2012/09/10	ATL SOP 00122	Based on EPA624

../2

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford
(2) This test was performed by Bedford to Burnaby Env
(3) This test was performed by Maxxam Analytics Mississauga
(4) Strong acid dissociable cyanide value may include contribution from thiocyanate.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203 Ext:289

==========

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.

Total cover pages: 2

Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OS1057		OS1058			OS1060	OS1060			OS1061		
Sampling Date		2012/08/30		2012/08/30			2012/08/30	2012/08/30			2012/08/30		
	Units	**PLCS**	**RDL**	**SLCS**	**RDL**	**QC Batch**	**MW93-1**	**MW93-1 Lab-Dup**	**RDL**	**QC Batch**	**MW93-1A**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	12.5	N/A	12.3	N/A	2958383	6.51		N/A	2958383	6.50	N/A	2958383
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	520	1.0	500	1.0	2958380	270		1.0	2958380	260	1.0	2958380
Calculated TDS	mg/L	624	1.0	647	1.0	2958388	338		1.0	2958388	334	1.0	2958388
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.6	1.0	2.2	1.0	2958380	4.7		1.0	2958380	5.2	1.0	2958380
Cation Sum	me/L	10.7	N/A	12.0	N/A	2958383	6.14		N/A	2958383	5.89	N/A	2958383
Hardness (CaCO3)	mg/L	470	1.0	500	1.0	2958381	150		1.0	2958381	140	1.0	2958381
Ion Balance (% Difference)	%	7.94	N/A	1.07	N/A	2958382	2.92		N/A	2958382	4.92	N/A	2958382
Langelier Index (@ 20C)	N/A	1.10		1.04		2958386	0.815			2958386	0.826		2958386
Langelier Index (@ 4C)	N/A	0.856		0.787		2958387	0.566			2958387	0.577		2958387
Nitrate (N)	mg/L	0.061	0.050	0.067	0.050	2958384	<0.050		0.050	2958384	<0.050	0.050	2958384
Saturation pH (@ 20C)	N/A	6.63		6.63		2958386	7.45			2958386	7.50		2958386
Saturation pH (@ 4C)	N/A	6.87		6.87		2958387	7.69			2958387	7.75		2958387
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	530	50	510	50	2961273	280		25	2961273	260	25	2961273
Dissolved Chloride (Cl)	mg/L	39	1.0	44	1.0	2961277	11		1.0	2961277	30	1.0	2961277
Colour	TCU	10	5.0	12	5.0	2961284	<5.0		5.0	2961284	<5.0	5.0	2961284
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.0020	0.0020	<0.0020	0.0020	2961491							
Nitrate + Nitrite	mg/L	0.061	0.050	0.067	0.050	2961286	<0.050		0.050	2961286	<0.050	0.050	2961286
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	2961289	<0.010		0.010	2961289	<0.010	0.010	2961289
Nitrogen (Ammonia Nitrogen)	mg/L	0.53	0.050	0.50	0.050	2960191	<0.050	<0.050	0.050	2962914	<0.050	0.050	2962919
Total Organic Carbon (C)	mg/L	16(1)	5.0	20(1)	5.0	2964775	<5.0(2)		5.0	2964775	1.4	0.50	2964775
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	2961285	<0.010		0.010	2961285	<0.010	0.010	2961285
pH	pH	7.73	N/A	7.66	N/A	2960983	8.26		N/A	2960983	8.33	N/A	2960983
Phenols-4AAP	mg/L	0.012	0.0010	0.014	0.0010	2966437							
Reactive Silica (SiO2)	mg/L	17	0.50	15	0.50	2961280	5.3		0.50	2961280	9.1	0.50	2961280
Total Suspended Solids	mg/L	9.8	1.0	24	2.0	2961076							
Dissolved Sulphate (SO4)	mg/L	43	10	44	10	2961278	33		2.0	2961278	19	2.0	2961278
Sulphide	mg/L	<0.020	0.020	0.060	0.020	2961247							
Turbidity	NTU	160	0.50	280	1.0	2962413	590		5.0	2962413	5.9	0.10	2962413
Conductivity	uS/cm	1000	1.0	1100	1.0	2960985	580		1.0	2960985	580	1.0	2960985

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to sample matrix.
(2) - Reporting limit was increased due to turbidity.

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OS1057		OS1058			OS1060	OS1060			OS1061		
Sampling Date		2012/08/30		2012/08/30			2012/08/30	2012/08/30			2012/08/30		
	Units	**PLCS**	**RDL**	**SLCS**	**RDL**	**QC Batch**	**MW93-1**	**MW93-1 Lab-Dup**	**RDL**	**QC Batch**	**MW93-1A**	**RDL**	**QC Batch**
Subcontracted Analysis													
Subcontract Parameter	N/A	ATTACHED	N/A	ATTACHED	N/A	2961053							
Petroleum Hydrocarbons													
Total Oil & Grease	mg/L	<5.0	5.0	<5.0	5.0	2962401							

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

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OS1062		OS1063		OS1064		OS1065		OS1066		OS1114		
Sampling Date		2012/08/30		2012/08/30		2012/08/30		2012/08/30		2012/08/30		2012/08/30		
	Units	**MW93-2**	**RDL**	**MW93-2A**	**RDL**	**MW10-1**	**RDL**	**MW10-1A**	**RDL**	**DUP-03**	**RDL**	**DUP-04**	**RDL**	**QC Batch**
Calculated Parameters														
Anion Sum	me/L	6.36	N/A	1.37	N/A	3.24	N/A	2.11	N/A	6.47	N/A	9.53	N/A	2958383
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	210	1.0	11	1.0	140	1.0	77	1.0	250	1.0	390	1.0	2958380
Calculated TDS	mg/L	353	1.0	96.0	1.0	174	1.0	122	1.0	334	1.0	564	1.0	2958388
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.6	1.0	<1.0	1.0	1.1	1.0	<1.0	1.0	5.4	1.0	2.3	1.0	2958380
Cation Sum	me/L	5.99	N/A	1.44	N/A	3.11	N/A	1.98	N/A	5.94	N/A	12.3	N/A	2958383
Hardness (CaCO3)	mg/L	250	1.0	34	1.0	140	1.0	84	1.0	150	1.0	530	1.0	2958381
Ion Balance (% Difference)	%	3.00	N/A	2.49	N/A	2.05	N/A	3.18	N/A	4.27	N/A	12.9	N/A	2958382
Langelier Index (@ 20C)	N/A	0.903		-3.03		0.365		-0.597		0.846		1.11		2958386
Langelier Index (@ 4C)	N/A	0.654		-3.28		0.115		-0.847		0.597		0.864		2958387
Nitrate (N)	mg/L	<0.050	0.050	<0.050	0.050	0.16	0.050	0.077	0.050	<0.050	0.050	0.41	0.050	2958384
Saturation pH (@ 20C)	N/A	7.22		9.28		7.55		8.00		7.50		6.69		2958386
Saturation pH (@ 4C)	N/A	7.47		9.53		7.80		8.25		7.75		6.94		2958387
Inorganics														
Total Alkalinity (Total as CaCO3)	mg/L	220	25	12	5.0	140	25	77	5.0	260	25	390	25	2961273
Dissolved Chloride (Cl)	mg/L	20	1.0	17	1.0	3.8	1.0	4.2	1.0	30	1.0	31	1.0	2961277
Colour	TCU	<5.0	5.0	41	5.0	5.6	5.0	7.7	5.0	<5.0	5.0	10	5.0	2961284
Nitrate + Nitrite	mg/L	<0.050	0.050	<0.050	0.050	0.16	0.050	0.077	0.050	<0.050	0.050	0.41	0.050	2961286
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	2961289
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	0.40	0.050	<0.050	0.050	0.11	0.050	<0.050	0.050	0.45	0.050	2962919
Total Organic Carbon (C)	mg/L	0.88	0.50	22(1)	5.0	2.7	0.50	8.7	0.50	1.5	0.50	20(1)	5.0	2964777
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	2961285
pH	pH	8.12	N/A	6.25	N/A	7.91	N/A	7.40	N/A	8.35	N/A	7.80	N/A	2960983
Reactive Silica (SiO2)	mg/L	18	0.50	5.7	0.50	7.4	0.50	10	0.50	9.1	0.50	14	0.50	2961280
Dissolved Sulphate (SO4)	mg/L	71	10	32	2.0	17	2.0	21	2.0	20	2.0	36	2.0	2961278
Turbidity	NTU	4.0	0.10	120	1.0	26	0.10	240	1.0	5.7	0.10	12	0.10	2962415
Conductivity	uS/cm	580	1.0	150	1.0	300	1.0	200	1.0	590	1.0	820	1.0	2960985

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to sample matrix.

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		OS1057	OS1058	OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**SLCS**	**DUP-04**	**RDL**	**QC Batch**
Metals						
Total Mercury (Hg)	ug/L	<0.013	<0.013	<0.013	0.013	2963008

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OS1057		OS1058	OS1060	OS1060	OS1061		
Sampling Date		2012/08/30		2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**QC Batch**	**SLCS**	**MW93-1**	**MW93-1 Lab-Dup**	**MW93-1A**	**RDL**	**QC Batch**
Metals									
Dissolved Aluminum (Al)	ug/L				13.9	12.1	6.8	5.0	2961238
Total Aluminum (Al)	ug/L	14.2	2959644	16.3				5.0	2961010
Dissolved Antimony (Sb)	ug/L				<1.0	<1.0	<1.0	1.0	2961238
Total Antimony (Sb)	ug/L	<1.0	2959644	<1.0				1.0	2961010
Dissolved Arsenic (As)	ug/L				<1.0	<1.0	<1.0	1.0	2961238
Total Arsenic (As)	ug/L	<1.0	2959644	1.1				1.0	2961010
Dissolved Barium (Ba)	ug/L				80.0	79.4	103	1.0	2961238
Total Barium (Ba)	ug/L	72.7	2959644	78.2				1.0	2961010
Dissolved Beryllium (Be)	ug/L				<1.0	<1.0	<1.0	1.0	2961238
Total Beryllium (Be)	ug/L	<1.0	2959644	<1.0				1.0	2961010
Dissolved Bismuth (Bi)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Bismuth (Bi)	ug/L	<2.0	2959644	<2.0				2.0	2961010
Dissolved Boron (B)	ug/L				78	78	118	50	2961238
Total Boron (B)	ug/L	1500	2959644	2500				50	2961010
Dissolved Cadmium (Cd)	ug/L				<0.017	<0.017	<0.017	0.017	2961238
Total Cadmium (Cd)	ug/L	<0.017	2959644	<0.017				0.017	2961010
Dissolved Calcium (Ca)	ug/L				35500	36000	32800	100	2961238
Total Calcium (Ca)	ug/L	140000	2959644	147000				100	2961010
Dissolved Chromium (Cr)	ug/L				<1.0	<1.0	<1.0	1.0	2961238
Total Chromium (Cr)	ug/L	<1.0	2959644	<1.0				1.0	2961010
Dissolved Cobalt (Co)	ug/L				0.58	0.61	<0.40	0.40	2961238
Total Cobalt (Co)	ug/L	<0.40	2959644	1.04				0.40	2961010
Dissolved Copper (Cu)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Copper (Cu)	ug/L	<2.0	2959644	<2.0				2.0	2961010
Dissolved Iron (Fe)	ug/L				<50	<50	50	50	2961238
Total Iron (Fe)	ug/L	5470	2959644	15100				50	2961010
Dissolved Lead (Pb)	ug/L				0.70	0.69	<0.50	0.50	2961238
Total Lead (Pb)	ug/L	<0.50	2959644	<0.50				0.50	2961010
Dissolved Magnesium (Mg)	ug/L				15000	14900	15000	100	2961238
Total Magnesium (Mg)	ug/L	28800	2959644	33200				100	2961010
Dissolved Manganese (Mn)	ug/L				131	129	106	2.0	2961238
Total Manganese (Mn)	ug/L	7270	2959644	8250				2.0	2961010
Dissolved Molybdenum (Mo)	ug/L				15.0	15.1	11.9	2.0	2961238
Total Molybdenum (Mo)	ug/L	<2.0	2959644	7.2				2.0	2961010

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OS1057		OS1058	OS1060	OS1060	OS1061		
Sampling Date		2012/08/30		2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**QC Batch**	**SLCS**	**MW93-1**	**MW93-1 Lab-Dup**	**MW93-1A**	**RDL**	**QC Batch**
Dissolved Nickel (Ni)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Nickel (Ni)	ug/L	<2.0	2959644	2.4				2.0	2961010
Dissolved Phosphorus (P)	ug/L				<100	<100	<100	100	2961238
Total Phosphorus (P)	ug/L	<100	2959644	<100				100	2961010
Dissolved Potassium (K)	ug/L				2660	2610	1680	100	2961238
Total Potassium (K)	ug/L	5840	2959644	8870				100	2961010
Dissolved Selenium (Se)	ug/L				<1.0	<1.0	<1.0	1.0	2961238
Total Selenium (Se)	ug/L	<1.0	2959644	<1.0				1.0	2961010
Dissolved Silver (Ag)	ug/L				<0.10	<0.10	<0.10	0.10	2961238
Total Silver (Ag)	ug/L	<0.10	2959644	<0.10				0.10	2961010
Dissolved Sodium (Na)	ug/L				70400	69500	68200	100	2961238
Total Sodium (Na)	ug/L	21100	2959644	26600				100	2961010
Dissolved Strontium (Sr)	ug/L				247	246	246	2.0	2961238
Total Strontium (Sr)	ug/L	318	2959644	369				2.0	2961010
Dissolved Thallium (Tl)	ug/L				<0.10	<0.10	<0.10	0.10	2961238
Total Thallium (Tl)	ug/L	<0.10	2959644	<0.10				0.10	2961010
Dissolved Tin (Sn)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Tin (Sn)	ug/L	<2.0	2959644	<2.0				2.0	2961010
Dissolved Titanium (Ti)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Titanium (Ti)	ug/L	<2.0	2959644	<2.0				2.0	2961010
Dissolved Uranium (U)	ug/L				1.24	1.22	0.23	0.10	2961238
Total Uranium (U)	ug/L	0.79	2959644	5.05				0.10	2961010
Dissolved Vanadium (V)	ug/L				<2.0	<2.0	<2.0	2.0	2961238
Total Vanadium (V)	ug/L	<2.0	2959644	<2.0				2.0	2961010
Dissolved Zinc (Zn)	ug/L				<5.0	<5.0	<5.0	5.0	2961238
Total Zinc (Zn)	ug/L	<5.0	2959644	8.3				5.0	2961010

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OS1062	OS1063	OS1064	OS1065	OS1066	OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**MW93-2**	**MW93-2A**	**MW10-1**	**MW10-1A**	**DUP-03**	**DUP-04**	**RDL**	**QC Batch**
Metals									
Dissolved Aluminum (Al)	ug/L	<5.0	246	21.7	39.8	13.0		5.0	2961238
Total Aluminum (Al)	ug/L						22.2	5.0	2961010
Dissolved Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0		1.0	2961238
Total Antimony (Sb)	ug/L						<1.0	1.0	2961010
Dissolved Arsenic (As)	ug/L	1.7	<1.0	<1.0	<1.0	<1.0		1.0	2961238
Total Arsenic (As)	ug/L						1.0	1.0	2961010
Dissolved Barium (Ba)	ug/L	196	34.6	42.1	37.7	107		1.0	2961238
Total Barium (Ba)	ug/L						85.7	1.0	2961010
Dissolved Beryllium (Be)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0		1.0	2961238
Total Beryllium (Be)	ug/L						<1.0	1.0	2961010
Dissolved Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0		2.0	2961238
Total Bismuth (Bi)	ug/L						<2.0	2.0	2961010
Dissolved Boron (B)	ug/L	991	<50	<50	<50	118		50	2961238
Total Boron (B)	ug/L						1890	50	2961010
Dissolved Cadmium (Cd)	ug/L	<0.017	1.50	0.060	0.044	<0.017		0.017	2961238
Total Cadmium (Cd)	ug/L						<0.017	0.017	2961010
Dissolved Calcium (Ca)	ug/L	77400	9930	49500	29400	33000		100	2961238
Total Calcium (Ca)	ug/L						159000	100	2961010
Dissolved Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0		1.0	2961238
Total Chromium (Cr)	ug/L						<1.0	1.0	2961010
Dissolved Cobalt (Co)	ug/L	<0.40	0.82	<0.40	8.15	<0.40		0.40	2961238
Total Cobalt (Co)	ug/L						<0.40	0.40	2961010
Dissolved Copper (Cu)	ug/L	<2.0	2.7	6.4	8.5	6.8		2.0	2961238
Total Copper (Cu)	ug/L						<2.0	2.0	2961010
Dissolved Iron (Fe)	ug/L	54	8530	<50	726	55		50	2961238
Total Iron (Fe)	ug/L						14300	50	2961010
Dissolved Lead (Pb)	ug/L	<0.50	1.41	<0.50	<0.50	<0.50		0.50	2961238
Total Lead (Pb)	ug/L						<0.50	0.50	2961010
Dissolved Magnesium (Mg)	ug/L	14700	2240	3600	2520	15400		100	2961238
Total Magnesium (Mg)	ug/L						32900	100	2961010
Dissolved Manganese (Mn)	ug/L	732	3490	10.5	618	103		2.0	2961238
Total Manganese (Mn)	ug/L						8770	2.0	2961010
Dissolved Molybdenum (Mo)	ug/L	<2.0	<2.0	2.0	<2.0	10.7		2.0	2961238
Total Molybdenum (Mo)	ug/L						<2.0	2.0	2961010
Dissolved Nickel (Ni)	ug/L	<2.0	<2.0	2.6	9.1	<2.0		2.0	2961238

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OS1062	OS1063	OS1064	OS1065	OS1066	OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**MW93-2**	**MW93-2A**	**MW10-1**	**MW10-1A**	**DUP-03**	**DUP-04**	**RDL**	**QC Batch**
Total Nickel (Ni)	ug/L						<2.0	2.0	2961010
Dissolved Phosphorus (P)	ug/L	<100	<100	<100	<100	<100		100	2961238
Total Phosphorus (P)	ug/L						<100	100	2961010
Dissolved Potassium (K)	ug/L	1280	1090	1510	874	1730		100	2961238
Total Potassium (K)	ug/L						5800	100	2961010
Dissolved Selenium (Se)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0		1.0	2961238
Total Selenium (Se)	ug/L						<1.0	1.0	2961010
Dissolved Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10		0.10	2961238
Total Silver (Ag)	ug/L						<0.10	0.10	2961010
Dissolved Sodium (Na)	ug/L	20300	9110	7020	5750	68600		100	2961238
Total Sodium (Na)	ug/L						23700	100	2961010
Dissolved Strontium (Sr)	ug/L	229	40.3	104	67.0	249		2.0	2961238
Total Strontium (Sr)	ug/L						362	2.0	2961010
Dissolved Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10		0.10	2961238
Total Thallium (Tl)	ug/L						<0.10	0.10	2961010
Dissolved Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0		2.0	2961238
Total Tin (Sn)	ug/L						<2.0	2.0	2961010
Dissolved Titanium (Ti)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0		2.0	2961238
Total Titanium (Ti)	ug/L						2.0	2.0	2961010
Dissolved Uranium (U)	ug/L	0.23	<0.10	0.27	<0.10	0.21		0.10	2961238
Total Uranium (U)	ug/L						0.94	0.10	2961010
Dissolved Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0		2.0	2961238
Total Vanadium (V)	ug/L						<2.0	2.0	2961010
Dissolved Zinc (Zn)	ug/L	<5.0	835	8.0	15.5	<5.0		5.0	2961238
Total Zinc (Zn)	ug/L						6.5	5.0	2961010

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		OS1057		OS1057		OS1058		OS1059	OS1060	OS1061		
Sampling Date		2012/08/30		2012/08/30		2012/08/30		2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**RDL**	**PLCS Lab-Dup**	**RDL**	**SLCS**	**RDL**	**SURFACE-UP**	**MW93-1**	**MW93-1A**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons												
1-Methylnaphthalene	ug/L	<0.050	0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	2959473
2-Methylnaphthalene	ug/L	<0.050	0.050	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	2959473
Acenaphthene	ug/L	0.041	0.010	0.018	0.010	0.019	0.010	<0.010	<0.010	<0.010	0.010	2959473
Acenaphthylene	ug/L	<0.010	0.010	<0.010	0.010	0.018	0.010	<0.010	<0.010	<0.010	0.010	2959473
Anthracene	ug/L	<0.15(1)	0.15	<0.060(1)	0.060	<0.20(1)	0.20	<0.010	<0.010	<0.010	0.010	2959473
Benzo(a)anthracene	ug/L	0.039	0.010	0.020	0.010	0.064	0.010	<0.010	<0.010	<0.010	0.010	2959473
Benzo(a)pyrene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Benzo(b)fluoranthene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Benzo(g,h,i)perylene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Benzo(j)fluoranthene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Benzo(k)fluoranthene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Chrysene	ug/L	0.064	0.010	0.037	0.010	0.10	0.010	<0.010	<0.010	<0.010	0.010	2959473
Dibenz(a,h)anthracene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Fluoranthene	ug/L	0.18	0.010	0.079(2)	0.010	0.37	0.010	<0.010	<0.010	<0.010	0.010	2959473
Fluorene	ug/L	0.049	0.010	0.019	0.010	0.031	0.010	<0.010	<0.010	<0.010	0.010	2959473
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Naphthalene	ug/L	<0.20	0.20	<0.20	0.20	<0.20	0.20	<0.20	<0.20	<0.20	0.20	2959473
Perylene	ug/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010	0.010	2959473
Phenanthrene	ug/L	<0.020(1)	0.020	<0.040(1)	0.040	<0.30(1)	0.30	<0.010	<0.010	<0.010	0.010	2959473
Pyrene	ug/L	0.85	0.010	0.38(2)	0.010	1.8	0.010	<0.010	<0.010	<0.010	0.010	2959473
Surrogate Recovery (%)												
D10-Anthracene	%	91		96		96		88	103	92		2959473
D14-Terphenyl	%	92		86		99(3)		93	94(3)	95		2959473
D8-Acenaphthylene	%	94		95		96		89	97	97		2959473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated PAH RDL(s) due to matrix / co-extractive interference.
(2) - Duplicate: < 10 % of compounds in multi-component analysis in violation.
(3) - PAH sample contained sediment.

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		OS1062	OS1063	OS1064	OS1065	OS1066		OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		2012/08/30		
	Units	**MW93-2**	**MW93-2A**	**MW10-1**	**MW10-1A**	**DUP-03**	**RDL**	**DUP-04**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons										
1-Methylnaphthalene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	<0.050	0.050	2959473
2-Methylnaphthalene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	<0.050	0.050	2959473
Acenaphthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.010	0.010	2959473
Acenaphthylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.040(1)	0.040	2959473
Benzo(a)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.013	0.010	2959473
Benzo(a)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Benzo(b)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Benzo(j)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Chrysene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.024	0.010	2959473
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.046	0.010	2959473
Fluorene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.014	0.010	2959473
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	2959473
Naphthalene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20	0.20	2959473
Perylene	ug/L	<0.010	<0.010	<0.010	0.017	<0.010	0.010	<0.010	0.010	2959473
Phenanthrene	ug/L	<0.010	0.012	<0.010	<0.010	<0.010	0.010	<0.060(1)	0.060	2959473
Pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.23	0.010	2959473
Surrogate Recovery (%)										
D10-Anthracene	%	102	92	107	90	102		86		2959473
D14-Terphenyl	%	97	87	101(2)	93(2)	96		86		2959473
D8-Acenaphthylene	%	96	87	97	88	97		97		2959473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated PAH RDL(s) due to matrix / co-extractive interference.
(2) - PAH sample contained sediment.

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		OS1057	OS1058	OS1060	OS1061		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**SLCS**	**MW93-1**	**MW93-1A**	**RDL**	**QC Batch**
Chlorobenzenes							
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	2962500
1,3-Dichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,4-Dichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		OS1057	OS1058	OS1060	OS1061		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**SLCS**	**MW93-1**	**MW93-1A**	**RDL**	**QC Batch**
Volatile Organics							
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1,2,2-Tetrachloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1,2-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1-Dichloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	2962500
1,1-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	2962500
1,2-Dichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,2-Dichloropropane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromodichloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromoform	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromomethane	ug/L	<3.0	<3.0	<3.0	<3.0	3.0	2962500
Carbon Tetrachloride	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chloroethane	ug/L	<8.0	<8.0	<8.0	<8.0	8.0	2962500
Chloroform	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chloromethane	ug/L	<8.0	<8.0	<8.0	<8.0	8.0	2962500
cis-1,2-Dichloroethylene	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	2962500
cis-1,3-Dichloropropene	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	2962500
Dibromochloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Ethylene Dibromide	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Methylene Chloride(Dichloromethane)	ug/L	<3.0	<3.0	<3.0	<3.0	3.0	2962500
o-Xylene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
p+m-Xylene	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	2962500
Styrene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Tetrachloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
trans-1,2-Dichloroethylene	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	2962500
trans-1,3-Dichloropropene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Trichloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Trichlorofluoromethane (FREON 11)	ug/L	<8.0	<8.0	<8.0	<8.0	8.0	2962500
Vinyl Chloride	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	2962500
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	99	99	99	99		2962500
D4-1,2-Dichloroethane	%	106	104	103	105		2962500
D8-Toluene	%	101	99	100	100		2962500

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		OS1062	OS1063	OS1064	OS1065	OS1066	OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**MW93-2**	**MW93-2A**	**MW10-1**	**MW10-1A**	**DUP-03**	**DUP-04**	**RDL**	**QC Batch**
Chlorobenzenes									
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	2962500
1,3-Dichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,4-Dichlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chlorobenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		OS1062	OS1063	OS1064	OS1065	OS1066	OS1114		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**MW93-2**	**MW93-2A**	**MW10-1**	**MW10-1A**	**DUP-03**	**DUP-04**	**RDL**	**QC Batch**
Volatile Organics									
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1,2,2-Tetrachloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1,2-Trichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,1-Dichloroethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2962500
1,1-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	2962500
1,2-Dichloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
1,2-Dichloropropane	ug/L	<1.0	<1.0	3.0	6.8	<1.0	<1.0	1.0	2962500
Benzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromodichloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromoform	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Bromomethane	ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	2962500
Carbon Tetrachloride	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chloroethane	ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	8.0	2962500
Chloroform	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Chloromethane	ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	8.0	2962500
cis-1,2-Dichloroethylene	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2962500
cis-1,3-Dichloropropene	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2962500
Dibromochloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Ethylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Ethylene Dibromide	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Methylene Chloride(Dichloromethane)	ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	2962500
o-Xylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
p+m-Xylene	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2962500
Styrene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Tetrachloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
trans-1,2-Dichloroethylene	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	2962500
trans-1,3-Dichloropropene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Trichloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	2962500
Trichlorofluoromethane (FREON 11)	ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	8.0	2962500
Vinyl Chloride	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	2962500
Surrogate Recovery (%)									
4-Bromofluorobenzene	%	100	99	100	99	98	98		2962500
D4-1,2-Dichloroethane	%	104	103	104	104	105	104		2962500
D8-Toluene	%	101	100	102	101	101	100		2962500

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		OS1057	OS1057	OS1058	OS1059	OS1060	OS1061	OS1062		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**PLCS**	**PLCS Lab-Dup**	**SLCS**	**SURFACE-UP**	**MW93-1**	**MW93-1A**	**MW93-2**	**RDL**	**QC Batch**
PCBs										
Total PCB	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	2961017
Surrogate Recovery (%)										
Decachlorobiphenyl	%	67	71	68(1)	65	54(2)	91	94		2961017

Maxxam ID		OS1063		OS1064	OS1065	OS1066	OS1114		
Sampling Date		2012/08/30		2012/08/30	2012/08/30	2012/08/30	2012/08/30		
	Units	**MW93-2A**	**QC Batch**	**MW10-1**	**MW10-1A**	**DUP-03**	**DUP-04**	**RDL**	**QC Batch**
PCBs									
Total PCB	ug/L	<0.050	2961017	<0.050	<0.050	<0.050	<0.050	0.050	2963005
Surrogate Recovery (%)									
Decachlorobiphenyl	%	66	2961017	89	85	96	35		2963005

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - PCB sample contained sediment. PCB:Unidentified (possibly halogenated) compounds detected.
(2) - PCB sample contained sediment.

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Report Date: 2012/09/11

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GENERAL COMMENTS

Sample OS1057-01: Poor RCAp Ion Balance due to sample matrix.

Sample OS1114-01: Poor RCAp Ion Balance due to sample matrix.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2959473	D10-Anthracene	2012/09/05	94	30 - 130	100	30 - 130	109	%				
2959473	D14-Terphenyl	2012/09/05	90	30 - 130	100	30 - 130	101	%				
2959473	D8-Acenaphthylene	2012/09/05	86	30 - 130	99	30 - 130	98	%				
2959473	1-Methylnaphthalene	2012/09/06	80(1)	30 - 130	93	30 - 130	<0.050	ug/L	NC(2)	40		
2959473	2-Methylnaphthalene	2012/09/06	83(1)	30 - 130	97	30 - 130	<0.050	ug/L	NC(2)	40		
2959473	Acenaphthene	2012/09/06	92(1)	30 - 130	102	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Acenaphthylene	2012/09/06	81(1)	30 - 130	94	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Anthracene	2012/09/06	77(1)	30 - 130	89	30 - 130	<0.010	ug/L	NC(3, 2)	40		
2959473	Benzo(a)anthracene	2012/09/06	84(1)	30 - 130	102	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Benzo(a)pyrene	2012/09/06	88(1)	30 - 130	94	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Benzo(b)fluoranthene	2012/09/06	88(1)	30 - 130	88	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Benzo(g,h,i)perylene	2012/09/06	94(1)	30 - 130	108	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Benzo(j)fluoranthene	2012/09/06	81(1)	30 - 130	85	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Benzo(k)fluoranthene	2012/09/06	80(1)	30 - 130	82	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Chrysene	2012/09/06	81(1)	30 - 130	91	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Dibenz(a,h)anthracene	2012/09/06	83(1)	30 - 130	92	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Fluoranthene	2012/09/06	80(1)	30 - 130	92	30 - 130	<0.010	ug/L	78.0(4, 5, 2)	40		
2959473	Fluorene	2012/09/06	89(1)	30 - 130	104	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Indeno(1,2,3-cd)pyrene	2012/09/06	87(1)	30 - 130	98	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Naphthalene	2012/09/06	78(1)	30 - 130	90	30 - 130	<0.20	ug/L	NC(2)	40		
2959473	Perylene	2012/09/06	86(1)	30 - 130	95	30 - 130	<0.010	ug/L	NC(2)	40		
2959473	Phenanthrene	2012/09/06	86(1)	30 - 130	100	30 - 130	<0.010	ug/L	NC(3, 2)	40		
2959473	Pyrene	2012/09/06	81(1)	30 - 130	91	30 - 130	<0.010	ug/L	76.0(4, 5, 2)	40		
2959644	Total Aluminum (Al)	2012/09/06	101	80 - 120	105	80 - 120	5.8, RDL=5.0	ug/L				
2959644	Total Antimony (Sb)	2012/09/06	101	80 - 120	106	80 - 120	<1.0	ug/L				
2959644	Total Arsenic (As)	2012/09/06	95	80 - 120	97	80 - 120	<1.0	ug/L				
2959644	Total Barium (Ba)	2012/09/06	95	80 - 120	97	80 - 120	<1.0	ug/L				
2959644	Total Beryllium (Be)	2012/09/06	98	80 - 120	101	80 - 120	<1.0	ug/L				
2959644	Total Bismuth (Bi)	2012/09/06	98	80 - 120	101	80 - 120	<2.0	ug/L				
2959644	Total Boron (B)	2012/09/06	98	80 - 120	102	80 - 120	<50	ug/L				
2959644	Total Cadmium (Cd)	2012/09/06	94	80 - 120	97	80 - 120	<0.017	ug/L				
2959644	Total Calcium (Ca)	2012/09/06	99	80 - 120	100	80 - 120	<100	ug/L				
2959644	Total Chromium (Cr)	2012/09/06	95	80 - 120	99	80 - 120	<1.0	ug/L				
2959644	Total Cobalt (Co)	2012/09/06	96	80 - 120	99	80 - 120	<0.40	ug/L				
2959644	Total Copper (Cu)	2012/09/06	92	80 - 120	96	80 - 120	<2.0	ug/L				
2959644	Total Iron (Fe)	2012/09/06	104	80 - 120	107	80 - 120	<50	ug/L	NC	25		
2959644	Total Lead (Pb)	2012/09/06	94	80 - 120	96	80 - 120	<0.50	ug/L				
2959644	Total Magnesium (Mg)	2012/09/06	105	80 - 120	108	80 - 120	<100	ug/L				
2959644	Total Manganese (Mn)	2012/09/06	99	80 - 120	102	80 - 120	<2.0	ug/L				
2959644	Total Molybdenum (Mo)	2012/09/06	96	80 - 120	103	80 - 120	<2.0	ug/L				

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Report Date: 2012/09/11

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2959644	Total Nickel (Ni)	2012/09/06	95	80 - 120	100	80 - 120	<2.0	ug/L				
2959644	Total Phosphorus (P)	2012/09/06	102	80 - 120	101	80 - 120	<100	ug/L				
2959644	Total Potassium (K)	2012/09/06	101	80 - 120	100	80 - 120	<100	ug/L				
2959644	Total Selenium (Se)	2012/09/06	94	80 - 120	98	80 - 120	<1.0	ug/L				
2959644	Total Silver (Ag)	2012/09/06	100	80 - 120	100	80 - 120	<0.10	ug/L				
2959644	Total Sodium (Na)	2012/09/06	NC	80 - 120	105	80 - 120	<100	ug/L				
2959644	Total Strontium (Sr)	2012/09/06	94	80 - 120	95	80 - 120	<2.0	ug/L				
2959644	Total Thallium (Tl)	2012/09/06	97	80 - 120	99	80 - 120	<0.10	ug/L				
2959644	Total Tin (Sn)	2012/09/06	99	80 - 120	101	80 - 120	<2.0	ug/L				
2959644	Total Titanium (Ti)	2012/09/06	99	80 - 120	105	80 - 120	<2.0	ug/L				
2959644	Total Uranium (U)	2012/09/06	105	80 - 120	106	80 - 120	<0.10	ug/L				
2959644	Total Vanadium (V)	2012/09/06	98	80 - 120	101	80 - 120	<2.0	ug/L				
2959644	Total Zinc (Zn)	2012/09/06	94	80 - 120	98	80 - 120	<5.0	ug/L				
2960191	Nitrogen (Ammonia Nitrogen)	2012/09/06	92	80 - 120	101	80 - 120	<0.050	mg/L	NC	25	104	80 - 120
2960983	pH	2012/09/06							0.2	25	100	80 - 120
2960985	Conductivity	2012/09/06			100	80 - 120	<1.0	uS/cm	0.7	25		
2961010	Total Aluminum (Al)	2012/09/06	103	80 - 120	104	80 - 120	<5.0	ug/L				
2961010	Total Antimony (Sb)	2012/09/06	107	80 - 120	112	80 - 120	<1.0	ug/L				
2961010	Total Arsenic (As)	2012/09/06	96	80 - 120	98	80 - 120	<1.0	ug/L				
2961010	Total Barium (Ba)	2012/09/06	NC	80 - 120	99	80 - 120	<1.0	ug/L				
2961010	Total Beryllium (Be)	2012/09/06	99	80 - 120	105	80 - 120	<1.0	ug/L				
2961010	Total Bismuth (Bi)	2012/09/06	101	80 - 120	107	80 - 120	<2.0	ug/L				
2961010	Total Boron (B)	2012/09/06	NC	80 - 120	108	80 - 120	<50	ug/L				
2961010	Total Cadmium (Cd)	2012/09/06	95	80 - 120	97	80 - 120	<0.017	ug/L				
2961010	Total Calcium (Ca)	2012/09/06	102	80 - 120	103	80 - 120	<100	ug/L				
2961010	Total Chromium (Cr)	2012/09/06	96	80 - 120	99	80 - 120	<1.0	ug/L				
2961010	Total Cobalt (Co)	2012/09/06	96	80 - 120	99	80 - 120	<0.40	ug/L				
2961010	Total Copper (Cu)	2012/09/06	91	80 - 120	97	80 - 120	<2.0	ug/L				
2961010	Total Iron (Fe)	2012/09/07	107	80 - 120	110	80 - 120	<50	ug/L	NC	25		
2961010	Total Lead (Pb)	2012/09/06	95	80 - 120	99	80 - 120	<0.50	ug/L				
2961010	Total Magnesium (Mg)	2012/09/06	108	80 - 120	112	80 - 120	<100	ug/L				
2961010	Total Manganese (Mn)	2012/09/07	99	80 - 120	104	80 - 120	<2.0	ug/L	NC	25		
2961010	Total Molybdenum (Mo)	2012/09/06	101	80 - 120	107	80 - 120	<2.0	ug/L				
2961010	Total Nickel (Ni)	2012/09/06	96	80 - 120	101	80 - 120	<2.0	ug/L				
2961010	Total Phosphorus (P)	2012/09/06	101	80 - 120	104	80 - 120	<100	ug/L				
2961010	Total Potassium (K)	2012/09/06	101	80 - 120	104	80 - 120	<100	ug/L				
2961010	Total Selenium (Se)	2012/09/06	94	80 - 120	97	80 - 120	<1.0	ug/L				
2961010	Total Silver (Ag)	2012/09/06	101	80 - 120	105	80 - 120	<0.10	ug/L				
2961010	Total Sodium (Na)	2012/09/06	NC	80 - 120	107	80 - 120	<100	ug/L				
2961010	Total Strontium (Sr)	2012/09/06	93	80 - 120	100	80 - 120	<2.0	ug/L				

Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2961010	Total Thallium (Tl)	2012/09/06	100	80 - 120	104	80 - 120	<0.10	ug/L				
2961010	Total Tin (Sn)	2012/09/06	103	80 - 120	106	80 - 120	<2.0	ug/L				
2961010	Total Titanium (Ti)	2012/09/06	101	80 - 120	106	80 - 120	<2.0	ug/L				
2961010	Total Uranium (U)	2012/09/06	108	80 - 120	110	80 - 120	<0.10	ug/L				
2961010	Total Vanadium (V)	2012/09/06	98	80 - 120	102	80 - 120	<2.0	ug/L				
2961010	Total Zinc (Zn)	2012/09/07	96	80 - 120	100	80 - 120	<5.0	ug/L	2.4	25		
2961017	Decachlorobiphenyl	2012/09/10	67	30 - 130	51	30 - 130	56	%				
2961017	Total PCB	2012/09/10	101(6)	70 - 130	126	70 - 130	<0.050	ug/L	NC(7)	40		
2961076	Total Suspended Solids	2012/09/10					<1.0	mg/L	11.8	25	99	80 - 120
2961238	Dissolved Aluminum (Al)	2012/09/08	99(8)	80 - 120	98	80 - 120	<5.0	ug/L	NC(9)	25		
2961238	Dissolved Antimony (Sb)	2012/09/08	113(8)	80 - 120	110	80 - 120	<1.0	ug/L	NC(9)	25		
2961238	Dissolved Arsenic (As)	2012/09/08	100(8)	80 - 120	98	80 - 120	<1.0	ug/L	NC(9)	25		
2961238	Dissolved Barium (Ba)	2012/09/08	NC(8)	80 - 120	96	80 - 120	<1.0	ug/L	0.7(9)	25		
2961238	Dissolved Beryllium (Be)	2012/09/08	103(8)	80 - 120	100	80 - 120	<1.0	ug/L	NC(9)	25		
2961238	Dissolved Bismuth (Bi)	2012/09/08	101(8)	80 - 120	103	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Boron (B)	2012/09/08	102(8)	80 - 120	101	80 - 120	<50	ug/L	NC(9)	25		
2961238	Dissolved Cadmium (Cd)	2012/09/08	99(8)	80 - 120	98	80 - 120	<0.017	ug/L	NC(9)	25		
2961238	Dissolved Calcium (Ca)	2012/09/08	NC(8)	80 - 120	98	80 - 120	<100	ug/L	1.5(9)	25		
2961238	Dissolved Chromium (Cr)	2012/09/08	95(8)	80 - 120	94	80 - 120	<1.0	ug/L	NC(9)	25		
2961238	Dissolved Cobalt (Co)	2012/09/08	94(8)	80 - 120	94	80 - 120	<0.40	ug/L	NC(9)	25		
2961238	Dissolved Copper (Cu)	2012/09/08	92(8)	80 - 120	94	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Iron (Fe)	2012/09/08	102(8)	80 - 120	102	80 - 120	<50	ug/L	NC(9)	25		
2961238	Dissolved Lead (Pb)	2012/09/08	97(8)	80 - 120	98	80 - 120	<0.50	ug/L	NC(9)	25		
2961238	Dissolved Magnesium (Mg)	2012/09/08	NC(8)	80 - 120	101	80 - 120	<100	ug/L	1.1(9)	25		
2961238	Dissolved Manganese (Mn)	2012/09/08	NC(8)	80 - 120	100	80 - 120	<2.0	ug/L	1.7(9)	25		
2961238	Dissolved Molybdenum (Mo)	2012/09/08	NC(8)	80 - 120	101	80 - 120	<2.0	ug/L	0.9(9)	25		
2961238	Dissolved Nickel (Ni)	2012/09/08	95(8)	80 - 120	96	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Phosphorus (P)	2012/09/08	109(8)	80 - 120	105	80 - 120	<100	ug/L	NC(9)	25		
2961238	Dissolved Potassium (K)	2012/09/08	103(8)	80 - 120	102	80 - 120	<100	ug/L	1.7(9)	25		
2961238	Dissolved Selenium (Se)	2012/09/08	99(8)	80 - 120	97	80 - 120	<1.0	ug/L	NC(9)	25		
2961238	Dissolved Silver (Ag)	2012/09/08	95(8)	80 - 120	101	80 - 120	<0.10	ug/L	NC(9)	25		
2961238	Dissolved Sodium (Na)	2012/09/08	NC(8)	80 - 120	98	80 - 120	<100	ug/L	1.3(9)	25		
2961238	Dissolved Strontium (Sr)	2012/09/08	NC(8)	80 - 120	98	80 - 120	<2.0	ug/L	0.6(9)	25		
2961238	Dissolved Thallium (Tl)	2012/09/08	101(8)	80 - 120	101	80 - 120	<0.10	ug/L	NC(9)	25		
2961238	Dissolved Tin (Sn)	2012/09/08	107(8)	80 - 120	101	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Titanium (Ti)	2012/09/08	101(8)	80 - 120	98	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Uranium (U)	2012/09/08	108(8)	80 - 120	107	80 - 120	<0.10	ug/L	1.9(9)	25		
2961238	Dissolved Vanadium (V)	2012/09/08	98(8)	80 - 120	96	80 - 120	<2.0	ug/L	NC(9)	25		
2961238	Dissolved Zinc (Zn)	2012/09/08	98(8)	80 - 120	98	80 - 120	<5.0	ug/L	NC(9)	25		
2961247	Sulphide	2012/09/06	88	80 - 120	92	80 - 120	<0.020	mg/L	NC	20		

Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2961273	Total Alkalinity (Total as CaCO3)	2012/09/07	NC	80 - 120	103	80 - 120	<5.0	mg/L	1.9	25	105	80 - 120
2961277	Dissolved Chloride (Cl)	2012/09/10	99	80 - 120	101	80 - 120	<1.0	mg/L	1.2	25	103	80 - 120
2961278	Dissolved Sulphate (SO4)	2012/09/07	101	80 - 120	103	80 - 120	<2.0	mg/L	NC	25	105	80 - 120
2961280	Reactive Silica (SiO2)	2012/09/07	NC	80 - 120	100	80 - 120	<0.50	mg/L	0.4	25	106	75 - 125
2961284	Colour	2012/09/10					<5.0	TCU	NC	25	102	80 - 120
2961285	Orthophosphate (P)	2012/09/10	76(4, 10)	80 - 120	99	80 - 120	<0.010	mg/L	NC	25	97	80 - 120
2961286	Nitrate + Nitrite	2012/09/10	97	80 - 120	100	80 - 120	<0.050	mg/L	NC	25	102	80 - 120
2961289	Nitrite (N)	2012/09/10	99	80 - 120	99	80 - 120	<0.010	mg/L	NC	25	100	80 - 120
2961491	Strong Acid Dissoc. Cyanide (CN)	2012/09/06	90	80 - 120	104	80 - 120	<0.0020	mg/L	NC	25		
2962401	Total Oil & Grease	2012/09/10	82	70 - 130	81	70 - 130	<5.0	mg/L	NC	40		
2962413	Turbidity	2012/09/07					<0.10	NTU	NC	25	100	80 - 120
2962415	Turbidity	2012/09/07					<0.10	NTU	3.8	25	100	80 - 120
2962500	1,2-Dichlorobenzene	2012/09/09	111	70 - 130	108	70 - 130	<0.50	ug/L	NC	40		
2962500	1,3-Dichlorobenzene	2012/09/09	111	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
2962500	1,4-Dichlorobenzene	2012/09/09	111	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
2962500	Chlorobenzene	2012/09/09	105	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
2962500	1,1,1-Trichloroethane	2012/09/09	111	70 - 130	110	70 - 130	<1.0	ug/L	NC	40		
2962500	1,1,2,2-Tetrachloroethane	2012/09/09	105	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
2962500	1,1,2-Trichloroethane	2012/09/09	105	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
2962500	1,1-Dichloroethane	2012/09/09	105	70 - 130	108	70 - 130	<2.0	ug/L	NC	40		
2962500	1,1-Dichloroethylene	2012/09/09	111	70 - 130	112	70 - 130	<0.50	ug/L	NC	40		
2962500	1,2-Dichloroethane	2012/09/09	116	70 - 130	117	70 - 130	<1.0	ug/L	NC	40		
2962500	1,2-Dichloropropane	2012/09/09	100	70 - 130	107	70 - 130	<1.0	ug/L	NC	40		
2962500	4-Bromofluorobenzene	2012/09/09	101	70 - 130	100	70 - 130	99	%				
2962500	Benzene	2012/09/09	112	70 - 130	112	70 - 130	<1.0	ug/L	NC	40		
2962500	Bromodichloromethane	2012/09/09	100	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
2962500	Bromoform	2012/09/09	89	70 - 130	94	70 - 130	<1.0	ug/L	NC	40		
2962500	Bromomethane	2012/09/09	74	70 - 130	93	70 - 130	<3.0	ug/L	NC	40		
2962500	Carbon Tetrachloride	2012/09/09	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
2962500	Chloroethane	2012/09/09	111	70 - 130	109	70 - 130	<8.0	ug/L	NC	40		
2962500	Chloroform	2012/09/09	105	70 - 130	108	70 - 130	<1.0	ug/L	NC	40		
2962500	Chloromethane	2012/09/09	79	70 - 130	86	70 - 130	<8.0	ug/L	NC	40		
2962500	cis-1,2-Dichloroethylene	2012/09/09	110	70 - 130	112	70 - 130	<2.0	ug/L	NC	40		
2962500	cis-1,3-Dichloropropene	2012/09/09	111	70 - 130	117	70 - 130	<2.0	ug/L	NC	40		
2962500	D4-1,2-Dichloroethane	2012/09/09	102	70 - 130	102	70 - 130	103	%				
2962500	D8-Toluene	2012/09/09	102	70 - 130	102	70 - 130	101	%				
2962500	Dibromochloromethane	2012/09/09	95	70 - 130	102	70 - 130	<1.0	ug/L	NC	40		
2962500	Ethylbenzene	2012/09/09	111	70 - 130	113	70 - 130	<1.0	ug/L	NC	40		
2962500	Ethylene Dibromide	2012/09/09	110	70 - 130	112	70 - 130	<1.0	ug/L	NC	40		
2962500	Methylene Chloride(Dichloromethane)	2012/09/09	105	70 - 130	113	70 - 130	<3.0	ug/L	NC	40		

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Maxxam Job #: B2D4739
Report Date: 2012/09/11

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02

Sampler Initials: MM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2962500	o-Xylene	2012/09/09	115	70 - 130	117	70 - 130	<1.0	ug/L	NC	40		
2962500	p+m-Xylene	2012/09/09	115	70 - 130	115	70 - 130	<2.0	ug/L	NC	40		
2962500	Styrene	2012/09/09	115	70 - 130	115	70 - 130	<1.0	ug/L	NC	40		
2962500	Tetrachloroethylene	2012/09/09	116	70 - 130	116	70 - 130	<1.0	ug/L	NC	40		
2962500	Toluene	2012/09/09	NC	70 - 130	114	70 - 130	<1.0	ug/L	NC	40		
2962500	trans-1,2-Dichloroethylene	2012/09/09	111	70 - 130	116	70 - 130	<2.0	ug/L	NC	40		
2962500	trans-1,3-Dichloropropene	2012/09/09	105	70 - 130	114	70 - 130	<1.0	ug/L	NC	40		
2962500	Trichloroethylene	2012/09/09	110	70 - 130	111	70 - 130	<1.0	ug/L	NC	40		
2962500	Trichlorofluoromethane (FREON 11)	2012/09/09	105	70 - 130	110	70 - 130	<8.0	ug/L	NC	40		
2962500	Vinyl Chloride	2012/09/09	105	70 - 130	109	70 - 130	<0.50	ug/L	NC	40		
2962914	Nitrogen (Ammonia Nitrogen)	2012/09/10	90(11)	80 - 120	100	80 - 120	<0.050	mg/L	NC(12)	25	103	80 - 120
2962919	Nitrogen (Ammonia Nitrogen)	2012/09/10	95	80 - 120	100	80 - 120	<0.050	mg/L	NC	25	103	80 - 120
2963005	Decachlorobiphenyl	2012/09/11	104	30 - 130	120	30 - 130	35	%				
2963005	Total PCB	2012/09/11	104	70 - 130	111	70 - 130	<0.050	ug/L	NC	40		
2963008	Total Mercury (Hg)	2012/09/07	99	80 - 120	100	80 - 120	<0.013	ug/L	NC	25	100	80 - 120
2964775	Total Organic Carbon (C)	2012/09/10	90	80 - 120	92	80 - 120	<0.50	mg/L	NC	25		

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2964777	Total Organic Carbon (C)	2012/09/10	91	80 - 120	93	80 - 120	<0.50	mg/L	NC	25		
2966437	Phenols-4AAP	2012/09/11	99	80 - 120	102	80 - 120	<0.0010	mg/L	NC	25	101	N/A

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
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 blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Matrix Spike Parent ID [OS1059-05]
(10) - Poor spike recovery due to matrix interference, recovery confirmed by repeat analysis.
(11) - Matrix Spike Parent ID [OS1060-06]
(12) - Duplicate Parent ID [OS1060-06]
(2) - Duplicate Parent ID [OS1057-05]
(3) - Elevated PAH RDL(s) due to matrix / co-extractive interference.
(4) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(5) - Duplicate: < 10 % of compounds in multi-component analysis in violation.
(6) - Matrix Spike Parent ID [OS1058-02]
(7) - Duplicate Parent ID [OS1057-02]

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(8) - Matrix Spike Parent ID [OS1060-03]
(9) - Duplicate Parent ID [OS1060-03]

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Validation Signature Page

Maxxam Job #: B2D4739

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

Eric Dearman, Scientific Specialist

Brad Newman, Scientific Specialist

Robin Smith-Armstrong, Bedford SemiVol Spvsr

Mike Macgillivray, Scientific Specialist (Inorganics)

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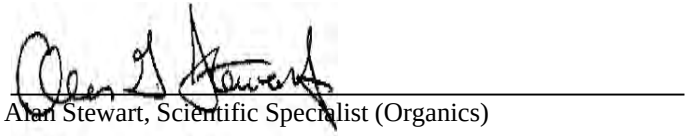
Validation Signature Page

Maxxam Job #: B2D4739

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



Alan Stewart, 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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MAXXAM Chain of Custody Record

COC #: B 088782 Page 1 of 2

This column for lab use only

Client Code 16275

Maxxam Job # B204739

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			0.1	0.1	0.1	

Integrity YES NO Integrity / Checklist by

Labelled by Location / Bin #

INVOICE INFORMATION:

Company Name: Conestoga Rovers & Associates
Contact Name: Brian Luffman
Address: 1118 Topsail Road
St. John's, NL Postal Code A1B 3N7
Email: datanl@craworld.com, bluffman@craworld.com
Ph: (709) 364-5353 Fax: (709) 364-5368

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name: Same
Address:
Postal Code
Email:
Ph: Fax:

PO #
Project # / Phase # 056EE0-02
Project Name / Site Location
Quote B24460
Site # Come by Chance M&M
Task Order #
Sampled by Mike Maher / Andrew Bryant

TURNAROUND TIME

Standard ☒
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted: 0

Guideline Requirements / Detection Limits / Special Instructions

Please c.c. datanl@craworld.com

TPH Must Done in NL

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	VOCs / PCBs	Cyanide / Sulfides	Total Phenolics	TSS / Chromium III & VI	Total Oil & Grease
1 PLCS	Leachate	Aug 30/12	25				T			X						X				X		X	X	X	X	X
2 SLCS	Leachate	Aug 30/12	25				T			X						X				X		X	X	X	X	X
3 SURFACE-UP	Surface	Aug 30/12	~~15~~													X				X		X				
4 MW93-1	Ground	Aug 30/12	16	X			D									X				X		X				
5 MW93-1A	Ground	Aug 30/12	16	X			D									X				X		X				
6 MW93-2	Ground	Aug 30/12	16	X			D									X				X		X				
7 MW93-2A	Ground	Aug 30/12	16	X			D									X				X		X				
8 MW10-1	Ground	Aug 30/12	16	X			D									X				X		X				
9 MW10-1A	Ground	Aug 30/12	16	X			D									X				X		X				
10 DUP-03	Ground	Aug 30/12	16	X			D									X				X		X				

SHIPPED FROM

MAXXAM NL

GROUNDWATER Field Filtered & Preserved for Metals

RELINQUISHED BY: (Signature/Print) Date Time
Andrew Bryant AUG 31/12 1:00pm
ANDREW BRYANT

RECEIVED BY: (Signature/Print) Date Time
PMChaplin 2012/09/31 2:25pm
JOE GARNETT

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 10

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MAXXAM Chain of Custody Record

COC #: B 088783 Page 2 of 2

This column for labs use only

Client Code: 16275

Maxxam Job #: B204734

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			0.1	0.1	0.1	

Integrity: YES (NO) — Integrity / Checklist by:

Labelled by: — Location / Bin #:

INVOICE INFORMATION:

Company Name: Conestoga-Rovers & Associates
Contact Name: Brian Luffman
Address: 1118 Topsail Road
St. John's NL Postal Code A1B 3N7
Email: datanl@craworld.com, bluffman@craworld.com
Ph: (709)364-5353 Fax: (709)364-5368

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name: SAME
Address:
Postal Code
Email:
Ph: Fax:

PO #:
Project # / Phase #: 056680-02
Project Name / Site Location:
Quote: B24460
Site #: Come by Chance M&M
Task Order #:
Sampled by: Mike Maher / Andrew Bryant

TURNAROUND TIME

Standard ☒
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted: 0

Guideline Requirements / Detection Limits / Special Instructions

Please c.c. datanl@craworld.com

TPH Must Done in NL

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default: Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Soil Poly Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	VOCs / PCBs
1	DUP-04	Leachate	Aug 30/12	16				X			X						X				X	X
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

SHIPPED FROM

MAXXAM NL

Field Filtered & Preserved for Metals

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Andrew Bryant	AUG 30/12	1:00 pm	PMChaplin	2012/08/31	225pm
ANDREW BRYANT			JOE GARNETT		

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 10

Your Project #: DB2D4739
Site Location: 056680-02
Your C.O.C. #: 08357157

Attention: BEDFORD CLIENT SERVICE
MAXXAM ANALYTICS
200 BLUEWATER ROAD, SUITE 105
BEDFORD, NS
CANADA B4B 1G9

Report Date: 2012/09/07

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B279486
Received: 2012/09/06, 09:15

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chromium, Hexavalent	2	N/A	2012/09/06	BBY6SOP-00015	SM-3500Cr B

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Morgan Melnychuk, Burnaby Project Manager
Email: MMelnychuk@maxxam.ca
Phone# (604) 638-8034

==========

This report has been generated and distributed using a secure automated process.
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.

Total cover pages: 1

Maxxam Job #: B279486
Report Date: 2012/09/07

MAXXAM ANALYTICS
Client Project #: DB2D4739
Site Location: 056680-02

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EJ9461	EJ9462		
Sampling Date		2012/08/30	2012/08/30		
	UNITS	**PLCS (OS1057-10R)**	**SLCS (OS1058-10R)**	**RDL**	**QC Batch**
Metals					
Hex. Chromium (Cr 6+)	mg/L	<0.0010	<0.0010	0.0010	6145742

RDL = Reportable Detection Limit

Maxxam Job #: B279486
Report Date: 2012/09/07

MAXXAM ANALYTICS
Client Project #: DB2D4739
Site Location: 056680-02

Package 1	6.7°C

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

General Comments

Maxxam Job #: B279486
Report Date: 2012/09/07

MAXXAM ANALYTICS
Client Project #: DB2D4739
Site Location: 056680-02

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6145742	Hex. Chromium (Cr 6+)	2012/09/06	92	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20

N/A = Not Applicable
RPD = Relative Percent Difference
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 to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B279486

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

Andy Lu, Data Validation Coordinator

==========

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Your Project #: 056680
Site Location: COME BY CHANCE SECURE LANDFILL
Your C.O.C. #: B 088785

Attention: Brian Luffman
Conestoga-Rovers and Associates Ltd
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2012/09/17

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2D7409
Received: 2012/09/07, 09:14

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonaceous BOD (1)	2	N/A	2012/09/12	ATL SOP 00041	Based on APHA 5210B

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203 Ext:289

==========

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.

Total cover pages: 1

Maxxam Job #: B2D7409
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680
Site Location: COME BY CHANCE SECURE LANDFILL
Sampler Initials: AB

RESULTS OF ANALYSES OF WATER

Maxxam ID		OT4661	OT4662		
Sampling Date		2012/09/05 16:15	2012/09/05 16:15		
	Units	**PLCS**	**SLCS**	**RDL**	**QC Batch**
Inorganics					
Carbonaceous BOD	mg/L	<5.0	<5.0	5.0	2962441

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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.maxxam.ca

Maxxam Job #: B2D7409
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680
Site Location: COME BY CHANCE SECURE LANDFILL
Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2962441	Carbonaceous BOD	2012/09/12	100	80 - 120	<5.0	mg/L	NC	25	89	80 - 120

N/A = Not Applicable
RPD = Relative Percent Difference
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

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.maxxam.ca

Maxxam Job #: B2D7409
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680
Site Location: COME BY CHANCE SECURE LANDFILL
Sampler Initials: AB

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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Validation Signature Page

Maxxam Job #: B2D7409

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

Mike Macgillivray, Scientific Specialist (Inorganics)

==========

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 Analytics International Corporation
200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49 Elizabeth Ave., St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 088785 Page 1 of 1

This column for lab use only

Client Code 16275

Maxxam Job # B2D7409

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			7.7	7.1	7.6	

Integrity (YES / NO) Integrity / Checklist by 4/17

Labelled by Location / Bin #

INVOICE INFORMATION:

Company Name: Conestoga-Rovers & Associates Ltd

Contact Name: Brian Cuffman

Address: 1118 Topsail Rd. PO Box 8353

STN A St. John's, NL Postal Code A1B 3N7

Email: bluffman@CRAworld.com, datanl@CRAworld.com

Ph: 709-364-5353 Fax: 709-364-5368

REPORT INFORMATION (if differs from invoice):

Company Name:

Contact Name: SAME

Address:

Postal Code

Email:

Ph: Fax:

PO #

Project # / Phase # 056680

Project Name / Site Location Come by Chance Secure Landfill

Quote E24460

Site # Come by Chance M&M

Task Order #

Sampled by A. Bryant

TURNAROUND TIME

Standard ☒

10 day ☐

If RUSH Specify Date:

Pre-schedule rush work

Charge for # Jars used but not submitted D

Guideline Requirements / Detection Limits / Special Instructions

Please c.c. datanl@CRAworld.com & abryant@CRAworld.com

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest: Method Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Rec'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	Hexavalent Chromium	B.O.D.
1 SURFACE-UP	Surface	Sept. 5/12 3:30	2x50mL	No	No		T														X	X
2 PLCS	Leachate	Sept. 5/12 4:15	1x500mL	No	No																	X
3 SLCS	Leachate	Sept. 5/12 4:15	1x500mL	No	No																	X
4																						
5																						
6																						
7																						
8																						
9																						
10																						

SHIPPED FROM MAXXAM NL

RELINQUISHED BY: (Signature/Print) Andrew Bryant Date Sept. 6/12 Time 9:00

RECEIVED BY: (Signature/Print) Date 2012 09 06 Time 9:40

ERIN FRASER

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 10

Your Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your C.O.C. #: B 088782

Attention: Brian Luffman
Conestoga-Rovers and Associates Ltd
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2012/09/17

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2D4730
Received: 2012/08/31, 14:25

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	10	2012/09/05	2012/09/07	ATL SOP 00198	Based on Atl. PIRI
TEH in Water (PIRI)	1	2012/09/05	2012/09/10	ATL SOP 00198	Based on Atl. PIRI
VPH in Water (PIRI) (1)	6	2012/09/07	2012/09/13	ATL SOP 00118	Based on Atl. PIRI
VPH in Water (PIRI) (1)	4	2012/09/10	2012/09/13	ATL SOP 00118	Based on Atl. PIRI
VPH in Water (PIRI) (1)	1	2012/09/10	2012/09/14	ATL SOP 00118	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	10	N/A	2012/09/14		Based on Atl. PIRI
ModTPH (T1) Calc. for Water	1	N/A	2012/09/15		Based on Atl. PIRI

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bedford

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Rob Whelan, Project Manager
Email: RWhelan@maxxam.ca
Phone# (709) 754-0203

==========

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Total cover pages: 1

Maxxam Job #: B2D4730
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Sampler Initials: MM

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		OS1030	OS1032	OS1033	OS1034	OS1035		
Sampling Date		2012/08/30	2012/08/30	2012/08/30	2012/08/30	2012/08/30		
COC Number		B 088782	B 088782	B 088782	B 088782	B 088782		
	Units	**PLCS**	**SLCS**	**SURFACE-UP**	**MW93-1**	**MW93-1A**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/L	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	0.0013	2969005
Toluene	mg/L	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	0.0013	2969005
Ethylbenzene	mg/L	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	0.0013	2969005
Xylene (Total)	mg/L	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	0.0026	2969005
C6 - C10 (less BTEX)	mg/L	<0.013	<0.013	<0.013	<0.013	<0.013	0.013	2969005
>C10-C16 Hydrocarbons	mg/L	<0.050	0.059	<0.050	<0.050	<0.050	0.050	2959672
>C16-C21 Hydrocarbons	mg/L	<0.050	0.10	<0.050	<0.050	<0.050	0.050	2959672
>C21-<C32 Hydrocarbons	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	2959672
Modified TPH (Tier1)	mg/L	<0.10	0.16	<0.10	<0.10	<0.10	0.10	2958248
Reached Baseline at C32	mg/L	Yes	Yes	Yes	Yes	Yes	N/A	2959672
Hydrocarbon Resemblance	mg/L		SEECOMMENT (1)				N/A	2959672
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	133 (2)	96	118	104	102		2959672
n-Dotriacontane - Extractable	%	136 (3)	95	120	103 (4)	103		2959672
Isobutylbenzene - Volatile	%	94 (5)	96 (5)	96 (5)	95 (5)	93 (5)		2969005

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) No resemblance to petroleum products in fuel oil range.
(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(3) Isobutylbenzene/n-Dotriacontane recovery(ies) not within acceptance limits. Analysis repeated with similar results.
(4) TEH sample contained sediment.
(5) VPH analysis performed on previously opened vial.

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.maxxam.ca

Maxxam Job #: B2D4730
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Sampler Initials: MM

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		OS1036			OS1037		OS1038		
Sampling Date		2012/08/30			2012/08/30		2012/08/30		
COC Number		B 088782			B 088782		B 088782		
	Units	**MW93-2**	**RDL**	**QC Batch**	**MW93-2A**	**QC Batch**	**MW10-1**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.0013	0.0013	2969005	<0.0010	2970359	<0.0010	0.0010	2969005
Toluene	mg/L	<0.0013	0.0013	2969005	<0.0010	2970359	<0.0010	0.0010	2969005
Ethylbenzene	mg/L	<0.0013	0.0013	2969005	<0.0010	2970359	<0.0010	0.0010	2969005
Xylene (Total)	mg/L	<0.0026	0.0026	2969005	<0.0020	2970359	<0.0020	0.0020	2969005
C6 - C10 (less BTEX)	mg/L	<0.013	0.013	2969005	<0.010	2970359	<0.010	0.010	2969005
>C10-C16 Hydrocarbons	mg/L	<0.050	0.050	2959672	<0.050	2959672	<0.050	0.050	2959672
>C16-C21 Hydrocarbons	mg/L	<0.050	0.050	2959672	<0.050	2959672	<0.050	0.050	2959672
>C21-<C32 Hydrocarbons	mg/L	<0.10	0.10	2959672	<0.10	2959672	<0.10	0.10	2959672
Modified TPH (Tier1)	mg/L	<0.10	0.10	2958248	<0.10	2958248	<0.10	0.10	2958248
Reached Baseline at C32	mg/L	Yes	N/A	2959672	Yes	2959672	Yes	N/A	2959672
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	99		2959672	100	2959672	95		2959672
n-Dotriacontane - Extractable	%	99		2959672	99 (1)	2959672	97		2959672
Isobutylbenzene - Volatile	%	97 (2)		2969005	99 (3)	2970359	95		2969005

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) TEH sample contained sediment.
(2) VPH analysis performed on previously opened vial.
(3) VPH sample analysed past recommended hold time as per client request.

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.maxxam.ca

Maxxam Job #: B2D4730
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Sampler Initials: MM

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		OS1039	OS1040		OS1041		
Sampling Date		2012/08/30	2012/08/30		2012/08/30		
COC Number		B 088782	B 088782		B 088782		
	Units	**MW10-1A**	**DUP-03**	**RDL**	**DUP-04**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/L	<0.0010	<0.0010	0.0010	<0.0013	0.0013	2969005
Toluene	mg/L	<0.0010	<0.0010	0.0010	<0.0013	0.0013	2969005
Ethylbenzene	mg/L	<0.0010	<0.0010	0.0010	<0.0013	0.0013	2969005
Xylene (Total)	mg/L	<0.0020	<0.0020	0.0020	<0.0026	0.0026	2969005
C6 - C10 (less BTEX)	mg/L	<0.010	<0.010	0.010	<0.013	0.013	2969005
>C10-C16 Hydrocarbons	mg/L	<0.050	<0.050	0.050	0.073	0.050	2959672
>C16-C21 Hydrocarbons	mg/L	<0.050	<0.050	0.050	0.10	0.050	2959672
>C21-<C32 Hydrocarbons	mg/L	<0.10	<0.10	0.10	<0.10	0.10	2959672
Modified TPH (Tier1)	mg/L	<0.10	<0.10	0.10	0.18	0.10	2958248
Reached Baseline at C32	mg/L	Yes	Yes	N/A	Yes	N/A	2959672
Hydrocarbon Resemblance	mg/L				SEECOMMENT (1)	N/A	2959672
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	111	102		98		2959672
n-Dotriacontane - Extractable	%	110 (2)	103		98		2959672
Isobutylbenzene - Volatile	%	94	95		93 (3)		2969005

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) No resemblance to petroleum products in fuel oil range.
(2) TEH sample contained sediment.
(3) VPH analysis performed on previously opened vial.

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.maxxam.ca

Maxxam Job #: B2D4730
Report Date: 2012/09/17

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Sampler Initials: MM

GENERAL COMMENTS

Results relate only to the items tested.

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.maxxam.ca

Conestoga-Rovers and Associates Ltd
Attention: Brian Luffman
Client Project #: 056680-02
P.O. #:
Site Location: COME BY CHANCE M&M

Quality Assurance Report

Maxxam Job Number: ZB2D4730

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2959672 SPI	Matrix Spike	Isobutylbenzene - Extractable	2012/09/07		92	%	30 - 130
		n-Dotriacontane - Extractable	2012/09/07		104	%	30 - 130
		>C10-C16 Hydrocarbons	2012/09/07		108	%	30 - 130
		>C16-C21 Hydrocarbons	2012/09/07		120	%	30 - 130
		>C21-<C32 Hydrocarbons	2012/09/07		89	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2012/09/07		99	%	30 - 130
		n-Dotriacontane - Extractable	2012/09/07		106	%	30 - 130
		>C10-C16 Hydrocarbons	2012/09/07		107	%	30 - 130
		>C16-C21 Hydrocarbons	2012/09/07		116	%	30 - 130
		>C21-<C32 Hydrocarbons	2012/09/07		99	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2012/09/07		99	%	30 - 130
		n-Dotriacontane - Extractable	2012/09/07		99	%	30 - 130
		>C10-C16 Hydrocarbons	2012/09/07	<0.050		mg/L	
		>C16-C21 Hydrocarbons	2012/09/07	<0.050		mg/L	
		>C21-<C32 Hydrocarbons	2012/09/07	<0.10		mg/L	
	RPD	>C10-C16 Hydrocarbons	2012/09/07	NC		%	40
		>C16-C21 Hydrocarbons	2012/09/07	NC		%	40
		>C21-<C32 Hydrocarbons	2012/09/07	NC		%	40
2969005 TWE	Matrix Spike	Isobutylbenzene - Volatile	2012/09/13		95	%	70 - 130
		Benzene	2012/09/13		104	%	70 - 130
		Toluene	2012/09/13		109	%	70 - 130
		Ethylbenzene	2012/09/13		109	%	70 - 130
		Xylene (Total)	2012/09/13		113	%	70 - 130
	Spiked Blank	Isobutylbenzene - Volatile	2012/09/13		93	%	70 - 130
		Benzene	2012/09/13		107	%	70 - 130
		Toluene	2012/09/13		109	%	70 - 130
		Ethylbenzene	2012/09/13		106	%	70 - 130
		Xylene (Total)	2012/09/13		112	%	70 - 130
	Method Blank	Isobutylbenzene - Volatile	2012/09/13		95	%	70 - 130
		Benzene	2012/09/13	<0.0010		mg/L	
		Toluene	2012/09/13	<0.0010		mg/L	
		Ethylbenzene	2012/09/13	<0.0010		mg/L	
		Xylene (Total)	2012/09/13	<0.0020		mg/L	
		C6 - C10 (less BTEX)	2012/09/13	<0.010		mg/L	
	RPD	Benzene	2012/09/13	NC		%	40
		Toluene	2012/09/13	NC		%	40
		Ethylbenzene	2012/09/13	NC		%	40
		Xylene (Total)	2012/09/13	NC		%	40
		C6 - C10 (less BTEX)	2012/09/13	NC		%	40
2970359 THL	Matrix Spike	Isobutylbenzene - Volatile	2012/09/14		92	%	70 - 130
		Benzene	2012/09/14		109	%	70 - 130
		Toluene	2012/09/14		113	%	70 - 130
		Ethylbenzene	2012/09/14		117	%	70 - 130
		Xylene (Total)	2012/09/14		117	%	70 - 130
	Spiked Blank	Isobutylbenzene - Volatile	2012/09/14		99	%	70 - 130
		Benzene	2012/09/14		110	%	70 - 130
		Toluene	2012/09/14		112	%	70 - 130
		Ethylbenzene	2012/09/14		114	%	70 - 130
		Xylene (Total)	2012/09/14		116	%	70 - 130
	Method Blank	Isobutylbenzene - Volatile	2012/09/14		103	%	70 - 130
		Benzene	2012/09/14	<0.0010		mg/L	
		Toluene	2012/09/14	<0.0010		mg/L	
		Ethylbenzene	2012/09/14	<0.0010		mg/L	
		Xylene (Total)	2012/09/14	<0.0020		mg/L	
		C6 - C10 (less BTEX)	2012/09/14	<0.010		mg/L	

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.maxxam.ca

Conestoga-Rovers and Associates Ltd
Attention: Brian Luffman
Client Project #: 056680-02
P.O. #:
Site Location: COME BY CHANCE M&M

Quality Assurance Report (Continued)

Maxxam Job Number: ZB2D4730

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2970359	THL	RPD	Benzene	2012/09/14	NC		%	40
			Toluene	2012/09/14	NC		%	40
			Ethylbenzene	2012/09/14	NC		%	40
			Xylene (Total)	2012/09/14	NC		%	40
			C6 - C10 (less BTEX)	2012/09/14	NC		%	40

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 to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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Validation Signature Page

Maxxam Job #: B2D4730

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

Paula Chaplin

Paula Chaplin, Project Manager

==========

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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Your P.O. #: 20-014525
Your Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your C.O.C. #: B 088859

Attention: Brian Luffman
Conestoga-Rovers and Associates Ltd
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2012/11/16

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2H5752
Received: 2012/11/08, 12:15

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	2	2012/11/13	2012/11/15	ATL SOP 00198	Based on Atl. PIRI
VPH in Water (PIRI)	2	2012/11/09	2012/11/10	ATL SOP 00200	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	2	N/A	2012/11/15		Based on Atl. PIRI

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Rob Whelan, Project Manager
Email: RWhelan@maxxam.ca
Phone# (709) 754-0203

==========

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Total cover pages: 1

Maxxam Job #: B2H5752
Report Date: 2012/11/16

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		PN7251	PN7252		
Sampling Date		2012/11/07	2012/11/07		
Received Temperature (°C)		8.5	8.5		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Petroleum Hydrocarbons					
Benzene	mg/L	<0.0010	<0.0010	0.0010	3031337
Toluene	mg/L	<0.0010	<0.0010	0.0010	3031337
Ethylbenzene	mg/L	<0.0010	<0.0010	0.0010	3031337
Xylene (Total)	mg/L	<0.0020	<0.0020	0.0020	3031337
C6 - C10 (less BTEX)	mg/L	<0.010	<0.010	0.010	3031337
>C10-C16 Hydrocarbons	mg/L	<0.050	<0.050	0.050	3034166
>C16-C21 Hydrocarbons	mg/L	<0.050	<0.050	0.050	3034166
>C21-<C32 Hydrocarbons	mg/L	<0.10	<0.10	0.10	3034166
Modified TPH (Tier1)	mg/L	<0.10	<0.10	0.10	3029718
Reached Baseline at C32	mg/L	YES	YES	N/A	3034166
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%	98	97		3034166
Isobutylbenzene - Volatile	%	88	88		3031337
n-Dotriacontane - Extractable	%	96	100		3034166

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

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Maxxam Job #: B2H5752
Report Date: 2012/11/16

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

GENERAL COMMENTS

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.maxxam.ca

Maxxam Job #: B2H5752
Report Date: 2012/11/16

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
3031337	Isobutylbenzene - Volatile	2012/11/13	93	70 - 130	89	70 - 130	100	%		
3031337	Benzene	2012/11/09	95	70 - 130	90	70 - 130	<0.0010	mg/L	NC	40
3031337	Toluene	2012/11/09	90	70 - 130	90	70 - 130	<0.0010	mg/L	NC	40
3031337	Ethylbenzene	2012/11/09	90	70 - 130	90	70 - 130	<0.0010	mg/L	NC	40
3031337	Xylene (Total)	2012/11/09	93	70 - 130	92	70 - 130	<0.0020	mg/L	NC	40
3031337	C6 - C10 (less BTEX)	2012/11/09					<0.010	mg/L	NC	40
3034166	Isobutylbenzene - Extractable	2012/11/15	106	30 - 130	101	30 - 130	100	%		
3034166	n-Dotriacontane - Extractable	2012/11/15	105(1)	30 - 130	107	30 - 130	99	%		
3034166	>C10-C16 Hydrocarbons	2012/11/15	12(2)	30 - 130	91	30 - 130	<0.050	mg/L	NC	40
3034166	>C16-C21 Hydrocarbons	2012/11/15	9.0(2)	30 - 130	104	30 - 130	<0.050	mg/L	NC	40
3034166	>C21-<C32 Hydrocarbons	2012/11/15	7.0(2)	30 - 130	81	30 - 130	<0.10	mg/L	NC	40

N/A = Not Applicable
RPD = Relative Percent Difference
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 to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Fuel/lube oil range recovery(ies) not within acceptance limits. Insufficient sample to repeat.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Validation Signature Page

Maxxam Job #: B2H5752

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

Paula Chaplin, Project Manager

==========

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www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 088859 Page 1 of 1

This column for lab use only:

Client Code 16275

Maxxam Job # B2H5752

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			8.7	8.7	8.0	

Integrity YES (NO) Integrity / Checklist by MD

Labelled by MD Location / Bin #

INVOICE INFORMATION:

Company Name: Conestoga-Rovers & Associates
Contact Name: Brian Luffman
Address: 1118 Topsail Road, St. John's Station "A" Postal Code A1B 3N7
Email: datanl@CRAworld.com, bluffman@craworld.com
Ph: (709) 364-5353 Fax: (709) 364-5368

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name:
Address: SAME Postal Code
Email:
Ph: Fax:

PO # 20-044525
Project # / Phase # 056680-02
Project Name / Site Location
Quote B24460
Site # Come by Chance M&M
Task Order #
Sampled by Andrew Bryant/Peter Gillingham

TURNAROUND TIME
Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted 10

Guideline Requirements / Detection Limits / Special Instructions

Please c.c. datanl@craworld.com

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Soil (Potable), NS Fuel Hydrocarbons Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	VOCs [redacted]	PCBs
1	SURFACE-UP	Surface	Nov. 7/12 10:00AM	15	X			T									X				X	X	X
2	SURFACE-DOWN	Surface	Nov. 7/12 10:15AM	15	X			T									X				X	X	X
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

50mL orange cap bullets field preserved for total metals

RELINQUISHED BY: (Signature/Print) Andrew Bryant/ANDREW BRYANT Date NOV. 8/12 Time 930AM

RECEIVED BY: (Signature/Print) Date 12/11/08 Time 13:15pm

White: Maxxam Yellow: Mail Pink: Client

Your P.O. #: 20-014525
Your Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your C.O.C. #: B088859

Attention: Brian Luffman
Conestoga-Rovers and Associates Ltd
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2012/11/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2H6200
Received: 2012/11/09, 10:10

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	2	N/A	2012/11/15	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	2	N/A	2012/11/14	ATL SOP 00013	Based on EPA310.2
Chloride (1)	2	N/A	2012/11/14	ATL SOP 00014	Based on SM4500-Cl-
Colour (1)	2	N/A	2012/11/15	ATL SOP 00020	Based on SM2120C
Chromium 3+ by calculation (1)	2	2012/11/13	2012/11/21		
Hexavalent Cr Low Level (Sub fr Bedford) (2)	3	2012/11/14	2012/11/21		
Conductance - water (1)	2	N/A	2012/11/15	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	2	N/A	2012/11/15	ATL SOP 00048	Based on SM2340B
Metals Water Total MS (1)	2	2012/11/14	2012/11/14	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	2	N/A	2012/11/16		
Anion and Cation Sum (1)	2	N/A	2012/11/15		
Nitrogen Ammonia - water (1)	2	N/A	2012/11/14	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	2	N/A	2012/11/15	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	2	N/A	2012/11/14	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	2	N/A	2012/11/15	ATL SOP 00018	Based on ASTMD3867
PAH in Water by GC/MS (SIM) (1)	2	2012/11/14	2012/11/16	ATL SOP 00103	Based on EPA 8270C
PCBs in water by GC/ECD (1)	2	2012/11/14	2012/11/15	ATL SOP 00107	Based on EPA8082
pH (1)	2	N/A	2012/11/15	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	2	N/A	2012/11/15	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	2	N/A	2012/11/16		
Sat. pH and Langelier Index (@ 4C) (1)	2	N/A	2012/11/16		
Reactive Silica (1)	2	N/A	2012/11/14	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	2	N/A	2012/11/15	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc) (1)	2	N/A	2012/11/16		
Organic carbon - Total (TOC) (1)	2	N/A	2012/11/14	ATL SOP 00037	Based on SM5310C
Turbidity (1)	2	N/A	2012/11/15	ATL SOP 00011	based on EPA 180.1
Volatile Organic Compounds in Water (1)	2	2012/11/15	2012/11/16	ATL SOP 00122	Based on EPA624

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford
(2) This test was performed by Bedford to Burnaby Env

../2

Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203 Ext:289

==========

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Total cover pages: 2

Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

RESULTS OF ANALYSES OF WATER

Maxxam ID		PN9443		PN9444	PO9032		
Sampling Date		2012/11/07 10:00		2012/11/07 10:15	2012/11/07 10:15		
	Units	**SURFACE-UP**	**QC Batch**	**SURFACE-DOWN**	**SURFACE-A**	**RDL**	**QC Batch**
Calculated Parameters							
Anion Sum	me/L	0.610	3034699	0.630		N/A	3034699
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	7.6	3034696	8.2		1.0	3034696
Calculated TDS	mg/L	38.0	3031295	39.0		1.0	3034702
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	3034696	<1.0		1.0	3034696
Cation Sum	me/L	0.650	3034699	0.650		N/A	3034699
Chromium (+3)	mg/L	<0.001	3034808	<0.001		0.001	3034808
Hardness (CaCO3)	mg/L	14	3034697	14		1.0	3034697
Ion Balance (% Difference)	%	3.17	3034698	1.56		N/A	3034698
Langelier Index (@ 20C)	N/A	-2.97	3034700	-2.95			3034700
Langelier Index (@ 4C)	N/A	-3.22	3034701	-3.20			3034701
Nitrate (N)	mg/L	0.054	3031291	0.058		0.050	3031291
Saturation pH (@ 20C)	N/A	9.83	3034700	9.80			3034700
Saturation pH (@ 4C)	N/A	10.1	3034701	10.0			3034701
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	7.6	3034640	8.2		5.0	3034640
Dissolved Chloride (Cl)	mg/L	12	3034642	12		1.0	3034642
Colour	TCU	67	3034645	78		25	3034645
Nitrate + Nitrite	mg/L	0.054	3034647	0.058		0.050	3034647
Nitrite (N)	mg/L	<0.010	3034648	<0.010		0.010	3034648
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	3035611	<0.050		0.050	3035611
Total Organic Carbon (C)	mg/L	7.9	3035762	7.9		0.50	3035762
Orthophosphate (P)	mg/L	<0.010	3034646	<0.010		0.010	3034646
pH	pH	6.86	3036979	6.85		N/A	3036979
Reactive Silica (SiO2)	mg/L	2.1	3034644	2.2		0.50	3034644
Dissolved Sulphate (SO4)	mg/L	5.7	3034643	5.8		2.0	3034643
Turbidity	NTU	0.72	3036970	0.88		0.10	3036970
Conductivity	uS/cm	66	3036982	67		1.0	3036982
Subcontracted Analysis							
Subcontract Parameter	N/A	ATTACHED	3035777	ATTACHED	ATTACHED	N/A	3035777

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

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Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Metals					
Total Aluminum (Al)	ug/L	113	117	5.0	3035426
Total Antimony (Sb)	ug/L	<1.0	<1.0	1.0	3035426
Total Arsenic (As)	ug/L	<1.0	<1.0	1.0	3035426
Total Barium (Ba)	ug/L	8.9	8.6	1.0	3035426
Total Beryllium (Be)	ug/L	<1.0	<1.0	1.0	3035426
Total Bismuth (Bi)	ug/L	<2.0	<2.0	2.0	3035426
Total Boron (B)	ug/L	<50	<50	50	3035426
Total Cadmium (Cd)	ug/L	<0.017	<0.017	0.017	3035426
Total Calcium (Ca)	ug/L	3870	3890	100	3035426
Total Chromium (Cr)	ug/L	<1.0	<1.0	1.0	3035426
Total Cobalt (Co)	ug/L	<0.40	<0.40	0.40	3035426
Total Copper (Cu)	ug/L	<2.0	<2.0	2.0	3035426
Total Iron (Fe)	ug/L	387	382	50	3035426
Total Lead (Pb)	ug/L	<0.50	<0.50	0.50	3035426
Total Magnesium (Mg)	ug/L	1040	1050	100	3035426
Total Manganese (Mn)	ug/L	41.2	38.0	2.0	3035426
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	2.0	3035426
Total Nickel (Ni)	ug/L	<2.0	<2.0	2.0	3035426
Total Phosphorus (P)	ug/L	<100	<100	100	3035426
Total Potassium (K)	ug/L	363	400	100	3035426
Total Selenium (Se)	ug/L	<1.0	<1.0	1.0	3035426
Total Silver (Ag)	ug/L	<0.10	<0.10	0.10	3035426
Total Sodium (Na)	ug/L	7930	7880	100	3035426
Total Strontium (Sr)	ug/L	13.4	13.3	2.0	3035426
Total Thallium (Tl)	ug/L	<0.10	<0.10	0.10	3035426
Total Tin (Sn)	ug/L	<2.0	<2.0	2.0	3035426
Total Titanium (Ti)	ug/L	3.1	2.7	2.0	3035426
Total Uranium (U)	ug/L	<0.10	<0.10	0.10	3035426
Total Vanadium (V)	ug/L	<2.0	<2.0	2.0	3035426
Total Zinc (Zn)	ug/L	<5.0	<5.0	5.0	3035426

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
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Sampler Initials: AB

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons					
1-Methylnaphthalene	ug/L	<0.050	<0.050	0.050	3035418
2-Methylnaphthalene	ug/L	<0.050	<0.050	0.050	3035418
Acenaphthene	ug/L	<0.010	<0.010	0.010	3035418
Acenaphthylene	ug/L	<0.010	<0.010	0.010	3035418
Anthracene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(a)anthracene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(a)pyrene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(b)fluoranthene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(j)fluoranthene	ug/L	<0.010	<0.010	0.010	3035418
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	0.010	3035418
Chrysene	ug/L	<0.010	<0.010	0.010	3035418
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	0.010	3035418
Fluoranthene	ug/L	<0.010	<0.010	0.010	3035418
Fluorene	ug/L	<0.010	<0.010	0.010	3035418
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	0.010	3035418
Naphthalene	ug/L	<0.20	<0.20	0.20	3035418
Perylene	ug/L	<0.010	<0.010	0.010	3035418
Phenanthrene	ug/L	0.011	0.012	0.010	3035418
Pyrene	ug/L	<0.010	<0.010	0.010	3035418
Surrogate Recovery (%)					
D10-Anthracene	%	91	95		3035418
D14-Terphenyl	%	97	98		3035418
D8-Acenaphthylene	%	94	94		3035418

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2H6200
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Conestoga-Rovers and Associates Ltd
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VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Chlorobenzenes					
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	0.50	3037372
1,3-Dichlorobenzene	ug/L	<1.0	<1.0	1.0	3037372
1,4-Dichlorobenzene	ug/L	<1.0	<1.0	1.0	3037372
Chlorobenzene	ug/L	<1.0	<1.0	1.0	3037372

RDL = Reportable Detection Limit
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VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Volatile Organics					
1,1,1-Trichloroethane	ug/L	<1.0	<1.0	1.0	3037372
1,1,2,2-Tetrachloroethane	ug/L	<1.0	<1.0	1.0	3037372
1,1,2-Trichloroethane	ug/L	<1.0	<1.0	1.0	3037372
1,1-Dichloroethane	ug/L	<2.0	<2.0	2.0	3037372
1,1-Dichloroethylene	ug/L	<0.50	<0.50	0.50	3037372
1,2-Dichloroethane	ug/L	<1.0	<1.0	1.0	3037372
1,2-Dichloropropane	ug/L	<1.0	<1.0	1.0	3037372
Benzene	ug/L	<1.0	<1.0	1.0	3037372
Bromodichloromethane	ug/L	<1.0	<1.0	1.0	3037372
Bromoform	ug/L	<1.0	<1.0	1.0	3037372
Bromomethane	ug/L	<3.0	<3.0	3.0	3037372
Carbon Tetrachloride	ug/L	<1.0	<1.0	1.0	3037372
Chloroethane	ug/L	<8.0	<8.0	8.0	3037372
Chloroform	ug/L	<1.0	<1.0	1.0	3037372
Chloromethane	ug/L	<8.0	<8.0	8.0	3037372
cis-1,2-Dichloroethylene	ug/L	<2.0	<2.0	2.0	3037372
cis-1,3-Dichloropropene	ug/L	<2.0	<2.0	2.0	3037372
Dibromochloromethane	ug/L	<1.0	<1.0	1.0	3037372
Ethylbenzene	ug/L	<1.0	<1.0	1.0	3037372
Ethylene Dibromide	ug/L	<1.0	<1.0	1.0	3037372
Methylene Chloride(Dichloromethane)	ug/L	<3.0	<3.0	3.0	3037372
o-Xylene	ug/L	<1.0	<1.0	1.0	3037372
p+m-Xylene	ug/L	<2.0	<2.0	2.0	3037372
Styrene	ug/L	<1.0	<1.0	1.0	3037372
Tetrachloroethylene	ug/L	<1.0	<1.0	1.0	3037372
Toluene	ug/L	<1.0	<1.0	1.0	3037372
trans-1,2-Dichloroethylene	ug/L	<2.0	<2.0	2.0	3037372
trans-1,3-Dichloropropene	ug/L	<1.0	<1.0	1.0	3037372
Trichloroethylene	ug/L	<1.0	<1.0	1.0	3037372
Trichlorofluoromethane (FREON 11)	ug/L	<8.0	<8.0	8.0	3037372
Vinyl Chloride	ug/L	<0.50	<0.50	0.50	3037372

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Maxxam Job #: B2H6200
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Conestoga-Rovers and Associates Ltd
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Your P.O. #: 20-014525
Sampler Initials: AB

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
Surrogate Recovery (%)					
4-Bromofluorobenzene	%	99	100		3037372
D4-1,2-Dichloroethane	%	97	103		3037372
D8-Toluene	%	101	100		3037372

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		PN9443	PN9444		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15		
	Units	**SURFACE-UP**	**SURFACE-DOWN**	**RDL**	**QC Batch**
PCBs					
Total PCB	ug/L	<0.050	<0.050	0.050	3035511
Surrogate Recovery (%)					
Decachlorobiphenyl	%	73	68		3035511

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2H6200
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Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
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Package 1	8.5°C

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

GENERAL COMMENTS

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.maxxam.ca

Maxxam Job #: B2H6200
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Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3034640	Total Alkalinity (Total as CaCO3)	2012/11/14	97	80 - 120	102	80 - 120	<5.0	mg/L	NC	25	105	80 - 120
3034642	Dissolved Chloride (Cl)	2012/11/14	99	80 - 120	101	80 - 120	<1.0	mg/L	1.1	25	104	80 - 120
3034643	Dissolved Sulphate (SO4)	2012/11/15	87	80 - 120	102	80 - 120	<2.0	mg/L	NC	25	103	80 - 120
3034644	Reactive Silica (SiO2)	2012/11/14	100	80 - 120	101	80 - 120	<0.50	mg/L	0.4	25		
3034645	Colour	2012/11/15					<5.0	TCU	NC	25	105	80 - 120
3034646	Orthophosphate (P)	2012/11/15	86	80 - 120	97	80 - 120	<0.010	mg/L	NC	25	101	80 - 120
3034647	Nitrate + Nitrite	2012/11/15	95	80 - 120	97	80 - 120	<0.050	mg/L	NC	25	99	80 - 120
3034648	Nitrite (N)	2012/11/14	82	80 - 120	104	80 - 120	<0.010	mg/L	NC	25	104	80 - 120
3035418	D10-Anthracene	2012/11/16	86	30 - 130	98	30 - 130	100	%				
3035418	D14-Terphenyl	2012/11/16	95	30 - 130	97	30 - 130	105	%				
3035418	D8-Acenaphthylene	2012/11/16	87	30 - 130	105	30 - 130	103	%				
3035418	1-Methylnaphthalene	2012/11/16	NC	30 - 130	96	30 - 130	<0.050	ug/L	NC	40		
3035418	2-Methylnaphthalene	2012/11/16	66	30 - 130	103	30 - 130	<0.050	ug/L	NC	40		
3035418	Acenaphthene	2012/11/16	86	30 - 130	108	30 - 130	<0.010	ug/L	NC	40		
3035418	Acenaphthylene	2012/11/16	83	30 - 130	99	30 - 130	<0.010	ug/L	NC	40		
3035418	Anthracene	2012/11/16	81	30 - 130	97	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(a)anthracene	2012/11/16	86	30 - 130	87	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(a)pyrene	2012/11/16	83	30 - 130	95	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(b)fluoranthene	2012/11/16	83	30 - 130	95	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(g,h,i)perylene	2012/11/16	89	30 - 130	106	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(j)fluoranthene	2012/11/16	81	30 - 130	95	30 - 130	<0.010	ug/L	NC	40		
3035418	Benzo(k)fluoranthene	2012/11/16	79	30 - 130	90	30 - 130	<0.010	ug/L	NC	40		
3035418	Chrysene	2012/11/16	89	30 - 130	95	30 - 130	<0.010	ug/L	NC	40		
3035418	Dibenz(a,h)anthracene	2012/11/16	76	30 - 130	83	30 - 130	<0.010	ug/L	NC	40		
3035418	Fluoranthene	2012/11/16	90	30 - 130	99	30 - 130	<0.010	ug/L	NC	40		
3035418	Fluorene	2012/11/16	87	30 - 130	108	30 - 130	<0.010	ug/L	NC	40		
3035418	Indeno(1,2,3-cd)pyrene	2012/11/16	79	30 - 130	97	30 - 130	<0.010	ug/L	NC	40		
3035418	Naphthalene	2012/11/16	NC	30 - 130	102	30 - 130	<0.20	ug/L	NC	40		
3035418	Perylene	2012/11/16	85	30 - 130	95	30 - 130	<0.010	ug/L	NC	40		
3035418	Phenanthrene	2012/11/16	90	30 - 130	101	30 - 130	<0.010	ug/L	NC	40		
3035418	Pyrene	2012/11/16	91	30 - 130	97	30 - 130	<0.010	ug/L	NC	40		
3035426	Total Aluminum (Al)	2012/11/14	104	80 - 120	108	80 - 120	8.3, RDL=5.0	ug/L				
3035426	Total Antimony (Sb)	2012/11/14	99	80 - 120	75(1, 2)	80 - 120	<1.0	ug/L				
3035426	Total Arsenic (As)	2012/11/14	98	80 - 120	103	80 - 120	<1.0	ug/L	NC	25		
3035426	Total Barium (Ba)	2012/11/14	NC	80 - 120	101	80 - 120	<1.0	ug/L				
3035426	Total Beryllium (Be)	2012/11/14	106	80 - 120	110	80 - 120	<1.0	ug/L				
3035426	Total Bismuth (Bi)	2012/11/14	102	80 - 120	75(1, 2)	80 - 120	<2.0	ug/L				
3035426	Total Boron (B)	2012/11/14	100	80 - 120	75(1, 2)	80 - 120	<50	ug/L				
3035426	Total Cadmium (Cd)	2012/11/14	102	80 - 120	106	80 - 120	<0.017	ug/L				

Maxxam Job #: B2H6200
Report Date: 2012/11/21

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Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3035426	Total Calcium (Ca)	2012/11/14	94	80 - 120	101	80 - 120	<100	ug/L				
3035426	Total Chromium (Cr)	2012/11/14	102	80 - 120	107	80 - 120	<1.0	ug/L				
3035426	Total Cobalt (Co)	2012/11/14	104	80 - 120	107	80 - 120	<0.40	ug/L				
3035426	Total Copper (Cu)	2012/11/14	103	80 - 120	106	80 - 120	<2.0	ug/L				
3035426	Total Iron (Fe)	2012/11/14	103	80 - 120	108	80 - 120	<50	ug/L				
3035426	Total Lead (Pb)	2012/11/14	103	80 - 120	105	80 - 120	<0.50	ug/L				
3035426	Total Magnesium (Mg)	2012/11/14	107	80 - 120	111	80 - 120	<100	ug/L				
3035426	Total Manganese (Mn)	2012/11/14	101	80 - 120	104	80 - 120	<2.0	ug/L				
3035426	Total Molybdenum (Mo)	2012/11/14	103	80 - 120	76 (1, 2)	80 - 120	<2.0	ug/L				
3035426	Total Nickel (Ni)	2012/11/14	101	80 - 120	104	80 - 120	<2.0	ug/L				
3035426	Total Phosphorus (P)	2012/11/14	103	80 - 120	109	80 - 120	<100	ug/L				
3035426	Total Potassium (K)	2012/11/14	100	80 - 120	106	80 - 120	<100	ug/L				
3035426	Total Selenium (Se)	2012/11/14	100	80 - 120	104	80 - 120	<1.0	ug/L				
3035426	Total Silver (Ag)	2012/11/14	104	80 - 120	106	80 - 120	<0.10	ug/L				
3035426	Total Sodium (Na)	2012/11/14	103	80 - 120	109	80 - 120	<100	ug/L				
3035426	Total Strontium (Sr)	2012/11/14	97	80 - 120	102	80 - 120	<2.0	ug/L				
3035426	Total Thallium (Tl)	2012/11/14	102	80 - 120	76 (1, 2)	80 - 120	<0.10	ug/L				
3035426	Total Tin (Sn)	2012/11/14	102	80 - 120	77 (1, 2)	80 - 120	<2.0	ug/L				
3035426	Total Titanium (Ti)	2012/11/14	104	80 - 120	109	80 - 120	<2.0	ug/L				
3035426	Total Uranium (U)	2012/11/14	105	80 - 120	109	80 - 120	<0.10	ug/L	2.6	25		
3035426	Total Vanadium (V)	2012/11/14	103	80 - 120	107	80 - 120	<2.0	ug/L				
3035426	Total Zinc (Zn)	2012/11/14	103	80 - 120	89	80 - 120	<5.0	ug/L				
3035511	Decachlorobiphenyl	2012/11/15	63	30 - 130	67	30 - 130	59	%				
3035511	Total PCB	2012/11/15	79 (3)	70 - 130	89	70 - 130	<0.050	ug/L	NC	40		
3035611	Nitrogen (Ammonia Nitrogen)	2012/11/14	109	80 - 120	99	80 - 120	<0.050	mg/L	NC	25	102	80 - 120
3035762	Total Organic Carbon (C)	2012/11/14	NC	80 - 120	92	80 - 120	<0.50	mg/L	1.8	25		
3036970	Turbidity	2012/11/15							0.8	25	102	80 - 120
3036979	pH	2012/11/15							0	25	100	80 - 120
3036982	Conductivity	2012/11/15			99	80 - 120	<1.0	uS/cm	0.2	25		
3037372	1,2-Dichlorobenzene	2012/11/16	100	70 - 130	100	70 - 130	<0.50	ug/L	NC	40		
3037372	1,3-Dichlorobenzene	2012/11/16	100	70 - 130	102	70 - 130	<1.0	ug/L	NC	40		
3037372	1,4-Dichlorobenzene	2012/11/16	100	70 - 130	101	70 - 130	<1.0	ug/L	NC	40		
3037372	Chlorobenzene	2012/11/16	100	70 - 130	102	70 - 130	<1.0	ug/L	NC	40		
3037372	1,1,1-Trichloroethane	2012/11/16	105	70 - 130	105	70 - 130	<1.0	ug/L	NC	40		
3037372	1,1,2,2-Tetrachloroethane	2012/11/16	105	70 - 130	101	70 - 130	<1.0	ug/L	NC	40		
3037372	1,1,2-Trichloroethane	2012/11/16	105	70 - 130	101	70 - 130	<1.0	ug/L	NC	40		
3037372	1,1-Dichloroethane	2012/11/16	105	70 - 130	104	70 - 130	<2.0	ug/L	NC	40		
3037372	1,1-Dichloroethylene	2012/11/16	105	70 - 130	107	70 - 130	<0.50	ug/L	NC	40		
3037372	1,2-Dichloroethane	2012/11/16	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		

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Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3037372	1,2-Dichloropropane	2012/11/16	105	70 - 130	103	70 - 130	<1.0	ug/L	NC	40		
3037372	4-Bromofluorobenzene	2012/11/16	99	70 - 130	100	70 - 130	102	%				
3037372	Benzene	2012/11/16	109	70 - 130	107	70 - 130	<1.0	ug/L	1.3	40		
3037372	Bromodichloromethane	2012/11/16	100	70 - 130	99	70 - 130	<1.0	ug/L	NC	40		
3037372	Bromoform	2012/11/16	89	70 - 130	87	70 - 130	<1.0	ug/L	NC	40		
3037372	Bromomethane	2012/11/16	84	70 - 130	98	70 - 130	<3.0	ug/L	NC	40		
3037372	Carbon Tetrachloride	2012/11/16	100	70 - 130	97	70 - 130	<1.0	ug/L	NC	40		
3037372	Chloroethane	2012/11/16	121	70 - 130	109	70 - 130	<8.0	ug/L	NC	40		
3037372	Chloroform	2012/11/16	100	70 - 130	102	70 - 130	<1.0	ug/L	NC	40		
3037372	Chloromethane	2012/11/16	95	70 - 130	98	70 - 130	<8.0	ug/L	NC	40		
3037372	cis-1,2-Dichloroethylene	2012/11/16	110	70 - 130	107	70 - 130	<2.0	ug/L	NC	40		
3037372	cis-1,3-Dichloropropene	2012/11/16	111	70 - 130	111	70 - 130	<2.0	ug/L	NC	40		
3037372	D4-1,2-Dichloroethane	2012/11/16	100	70 - 130	97	70 - 130	99	%				
3037372	D8-Toluene	2012/11/16	102	70 - 130	100	70 - 130	101	%				
3037372	Dibromochloromethane	2012/11/16	100	70 - 130	97	70 - 130	<1.0	ug/L	NC	40		
3037372	Ethylbenzene	2012/11/16	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
3037372	Ethylene Dibromide	2012/11/16	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
3037372	Methylene Chloride(Dichloromethane)	2012/11/16	105	70 - 130	105	70 - 130	<3.0	ug/L	NC	40		
3037372	o-Xylene	2012/11/16	115	70 - 130	112	70 - 130	<1.0	ug/L	NC	40		
3037372	p+m-Xylene	2012/11/16	110	70 - 130	109	70 - 130	<2.0	ug/L	NC	40		
3037372	Styrene	2012/11/16	110	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
3037372	Tetrachloroethylene	2012/11/16	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
3037372	Toluene	2012/11/16	105	70 - 130	106	70 - 130	<1.0	ug/L	NC	40		
3037372	trans-1,2-Dichloroethylene	2012/11/16	116	70 - 130	115	70 - 130	<2.0	ug/L	NC	40		
3037372	trans-1,3-Dichloropropene	2012/11/16	105	70 - 130	109	70 - 130	<1.0	ug/L	NC	40		
3037372	Trichloroethylene	2012/11/16	106	70 - 130	105	70 - 130	<1.0	ug/L	NC	40		

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Maxxam Job #: B2H6200
Report Date: 2012/11/21

Conestoga-Rovers and Associates Ltd
Client Project #: 056680-02
Site Location: COME BY CHANCE M&M
Your P.O. #: 20-014525
Sampler Initials: AB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3037372	Trichlorofluoromethane (FREON 11)	2012/11/16	105	70 - 130	107	70 - 130	<8.0	ug/L	NC	40		
3037372	Vinyl Chloride	2012/11/16	116	70 - 130	120	70 - 130	<0.50	ug/L	NC	40		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
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 not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) - Low recovery due to pipetting error. Secondary QC is acceptable. No impact on data quality.
(3) - Matrix Spike Parent ID [PN9444-06]

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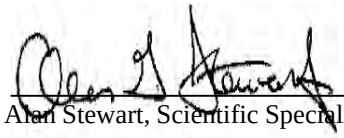
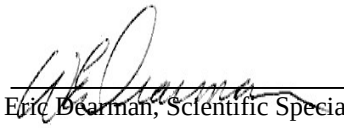
Validation Signature Page

Maxxam Job #: B2H6200

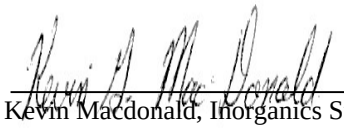
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



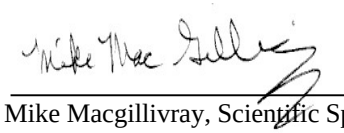
Alan Stewart, Scientific Specialist (Organics)



Eric Dearman, Scientific Specialist



Kevin Macdonald, Inorganics Supervisor



Mike Macgillivray, Scientific Specialist (Inorganics)

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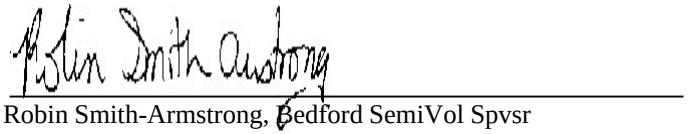

Robin Smith-Armstrong, Bedford SemiVol Spvsr

==========

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Maxxam Analytics International Corporation
200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49 Elizabeth Ave., St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 088859 Page 1 of 1

This column for lab use only

Client Code 16275

Maxxam Job # (Z) B2H6200

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			8.7	8.7	8.0	

Integrity YES NO | Integrity / Checklist by MB

Labelled by | Location / Bin # 34

INVOICE INFORMATION:

Company Name: Conestoga-Rovers & Associates
Contact Name: Brian Luffman
Address: 1118 Topsail Road, St. John's Station "A" Postal Code A1B 3N7
Email: datanl@CRAworld.com, bluffman@craworld.com
Ph: (709) 364-5353 Fax: (709) 364-5368

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name:
Address: SAME Postal Code
Email:
Ph: Fax:

PO # 20-04525
Project # / Phase # 056680-02
Project Name / Site Location
Quote B24460
Site # Come by Chance M&M
Task Order #
Sampled by Andrew Bryant/Peter Gillingham

TURNAROUND TIME

Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted 0

Guideline Requirements / Detection Limits / Special Instructions

Please c.c. datanl@craworld.com

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	VOCs	PCBs
1	SURFACE-UP	Surface	Nov. 7/12 10:00AM	15	X			T									X				X	X	X
2	SURFACE-DOWN	Surface	Nov. 7/12 10:15AM	15	X			T									X				X	X	X
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

50mL orange cap bullets field preserved for total metals

TPH Must Done in NL

RELINQUISHED BY: (Signature/Print) Date Time
Andrew Bryant/ANDREW BRYANT NOV.8/12 930AM

RECEIVED BY: (Signature/Print) Date Time
Janine Lockyer 2012/11/08 12:15pm
MANDY BUCHANAN

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 10

Your Project #: DB2H6200
Site Location: 056680-02
Your C.O.C. #: 08361182

Attention: BEDFORD SUBCONTRACT
MAXXAM ANALYTICS
200 BLUEWATER ROAD, SUITE 105
BEDFORD, NS
CANADA B4B 1G9

Report Date: 2012/11/20

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2A3947
Received: 2012/11/15, 09:30

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chromium, Hexavalent	3	N/A	2012/11/20	BBY6SOP-00015	SM-3500Cr B

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Morgan Melnychuk, Burnaby Project Manager
Email: MMelnychuk@maxxam.ca
Phone# (604) 638-8034

==========

This report has been generated and distributed using a secure automated process.
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Total cover pages: 1

Maxxam Job #: B2A3947
Report Date: 2012/11/20

MAXXAM ANALYTICS
Client Project #: DB2H6200
Site Location: 056680-02

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		FA0753	FA0754	FA0755		
Sampling Date		2012/11/07 10:00	2012/11/07 10:15	2012/11/07 10:15		
	UNITS	**SURFACE-UP (PN9443-03R)**	**SURFACE-DOWN (PN9444-03R)**	**SURFACE-A (PO9032-01R)**	**RDL**	**QC Batch**
Metals						
Hex. Chromium (Cr 6+)	mg/L	<0.0010	<0.0010	0.0014	0.0010	6360120

RDL = Reportable Detection Limit

Maxxam Job #: B2A3947
Report Date: 2012/11/20

MAXXAM ANALYTICS
Client Project #: DB2H6200
Site Location: 056680-02

Package 1	2.3°C

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

General Comments

Maxxam Job #: B2A3947
Report Date: 2012/11/20

MAXXAM ANALYTICS
Client Project #: DB2H6200
Site Location: 056680-02

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6360120	Hex. Chromium (Cr 6+)	2012/11/20	97	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20

N/A = Not Applicable
RPD = Relative Percent Difference
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.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B2A3947

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

Andy Lu, Data Validation Coordinator

==========

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APPENDIX C

STANTEC LETHALITY LABORATORY REPORTS

Stantec Consulting Ltd
Science Laboratory
422 Logy Bay Road
St. John's, NL A1A 5C6
Tel: (709) 576-4804
Fax: (709) 576-0008

Registered to ISO 9001:2000
ISO/IEC 17025:2005 Accredited
SCC-Food Scope (No. 268)
CALA – Environmental Scope (No. 2709)

Stantec

September 13, 2012
Project: 10938.
Lab Refer No.: B-3520-09

Report No.: 04600

Conestoga-Rovers & Associates
1118 Topsail Rd.
St. John's, NL
A1N 3N7
Tel: (709) 364-5353
Fax: (709) 364-5368

Attention: Brian Luffman

Dear Mr. Luffman,

Reference: Toxicology Testing Results

Please find enclosed the results of the 96-hour static bioassay conducted September 4 - 8, 2012. This toxicity test was performed on the PLCS - Come by Chance, NL effluent. This effluent was collected on August 30, 2012. The sample was received in acceptable condition.

Test conditions for a multi concentration test were followed according to the Reference Method: For Determining Acute Lethality of Effluents to Rainbow Trout (Report EPS 1/RM/13 Second Edition, December 2000 and May 2007 amendment). All tests parameters were maintained within the recommended levels outlined in the above protocol.

The PLCS - Come by Chance, NL effluent is not acutely lethal to the fish since less than 50.00 % of the fish died in the 100.00 % effluent during the 96 hour period. The SoftTox™ Program was used to calculate the LC50 value. The LC50 for the PLCS - Come by Chance, NL effluent was determined to be greater than 100.00 %.

Please call if you have any questions regarding these results.

Sincerely,

STANTEC CONSULTING LTD

Dianne Hunt-Hall, M.Env., B.Tech
Laboratory Supervisor, Science Laboratory

Attachments:
A- Bench Data Sheet(s)

Reference: Toxicology Testing Results

SAMPLE

Lab Refer.No.:	B-3520-09
Company:	Conestoga-Rovers & Associates
Sample Material:	PLCS - Come by Chance, NL
Sampling Method:	Grab
Sample Condition:	Received in acceptable condition
Collected:	August 30, 2012; 12:00 pm
Collected By:	A. Bryant

SAMPLE CHARACTERIZATION

Received (Date and Time):	August 31, 2012; 3:05 pm
Volume:	2 x 20 L
Temperature:	14.8°C
Dissolved Oxygen:	9.3 mg/L
pH:	7.4 pH units
Conductivity:	757 µS/cm
Colour:	Cloudy/turbid, yellow
Odour:	None
Storage:	96 hrs @ 4.0 ± 2.0 °C

DILUTION WATER CHARACTERIZATION (MONTHLY AVERAGE)

Source:	St. John's Dechlorinated
Dissolved Oxygen:	9.6 ± 0.4 mg/L
Conductivity:	128 ± 7 µS/cm
Hardness:	17 ± 8 mg/L
pH:	7.1 ± 0.2 pH units
Date Revised:	September 4, 2012

TEST CONDITIONS

Started (Date and Time):	September 4, 2012; 1:35 pm
Ended (Date and Time):	September 8, 2012; 1:35 pm
Type of Test:	Static Acute 96 hour LC_{50}
Volume of Test Solutions:	20 Litres
Photoperiod:	16h Light/08h Dark
Light Intensity:	393 Lux
Aeration Rate:	6.5 ± 1.0 mL/min.L^{-1}
Preaeration Time:	30 mins
Test Temperature:	15 ± 1 °C
Duration:	96 hours

TEST ORGANISM

Species:	Rainbow Trout (*Oncorhynchus mykiss*)		
Source:	Rainbow Springs Hatchery		
Batch Number:	12-11		
Number per Tank:	10		
% Mortality:	0.39 % (7 days prior to testing)		
Mean Fork Length (cm):	3.8 ± 0.3	Range (cm):	3.2 – 4.3
Mean Total Weight (g):	0.5 ± 0.1	Range (g):	0.3 – 0.7
Loading Density:	0.3 g/L		

Reference: Toxicology Testing Results

TEST RESULTS

Lab Refer No.:	B-3520-09
Sample Material:	PLCS - Come by Chance, NL
Collection Date:	August 30, 2012; 12:00 pm
Protocol:	EPS 1/RM/13
Test Type:	LC_{50}
LC_{50} value (static, acute):	> 100.00 %
95% Confidence Intervals:	100.00 % – Infinity

Effluent	Temp(°C)		D.O. (mg/L)		pH (units)		Cond.(µS/cm)		Mortality
Conc.(%)	Init.	Final	Init.	Final	Init.	Final	Init.	Final	(%)
100	14.6	14.5	10.0	9.9	7.9	8.3	742	495	0
50	14.4	14.6	9.9	9.6	7.5	8.3	437	445	0
25	14.5	14.6	9.8	9.7	7.6	7.7	289	297	0
12.5	14.7	14.5	9.8	9.6	7.8	7.6	211	221	0
6.25	14.7	14.6	9.7	9.5	7.5	7.5	178	186	0
0	15.6	14.9	9.9	9.7	7.4	7.3	129	137	0

COMMENTS:

- Arrival temperature of 23.8°C.
- The sample contained small suspended particles which partially settled during the bioassay.
- Samples have not been pH adjusted or filtered.
- The above analysis was conducted according to protocols indicated. The above results, which refer to the sample(s) tested only, are for your information and will be held in the strictest of confidence by this firm.
- Sample controls are considered a part of a sample test and as such are subject to the same treatment. (This includes, but is not limited to, aeration and temperature testing requirements.)

REFERENCE TOXICITY TEST DATA (LOG SCALE)

Test Organism:	*Oncorhynchus mykiss*
Toxicant:	Phenol
Fish Batch No.:	12-11
Reference Toxicant Date:	August 20 - 24, 2012
LC_{50} Value:	1.04 mg/L
95% Confidence Limits:	0.70 – 1.18 mg/L
Historic Mean ± 2 SD (Warning Limits):	0.98 ± 0.15 mg/L

Performed by: Stephanie Ryan/Trevor Bennett/Lana Combdon

Technical Reviewer: Jill Wheaton / Jill Wheaton
(Print Name/Signature)

Senior Reviewer: Suzette Winter
(Print Name/Signature) Date: Sept. 16th 2012

Reference: Toxicology Testing Results

ATTACHMENT A

Bench Data Sheet (s)

Jacques Whitford Environment Limited Laboratory Division	JWEL Lab Form: Bio-0010 Date: May 30, 2003

LC50 Fish Bioassay Data Sheet

Client: CRA
David McCoil/James O'Neill
1118 Topsail Road PO Box 8353
St. John's, NL
A1N 3N7
(709) 364-5353
(709) 364-5368

Sample ID # B-3520-09
Client # 121510938

Sample Material: PLCS
Test Period: 090412 (start)
090812 (finish)
Date Collected: 8/30/2012 Time Collected: 12:00 PM
Date Rec'd: 8/31/2012 Time Rec'd: 3:05 PM

Preaeration Time: 30
Test Org - Batch #: 12-11
Source: RSH
Test Start Date: 090412
Test Start Time: 1:35

Clarity (I): cloudy / turbid
Colour (I): yellow
Odour (I): none
Susp. Part. (I): small parts throughout
Other (I): Arrival temp @ 3.8°C. Collected by A.B.

Light Intensity: 393 lux
Int. Ammonia (ppm): N/A
Fin. Ammonia (ppm): 1

	Conc: 100%	Conc: ~~50%~~ 50%	Conc: ~~25%~~ 25%

Time	Day	Monit By	HR.	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)
1.05	090412	SR	INT		14.8	9.3	7.4	757				7.5 @ 090412						
1:35	1	1	0	—	14.6	10.0	7.9	~~742~~	—	14.4	9.9	~~457~~	437	—	14.5	9.8	7.6	289
10:30	090512	TB	24	—	14.4	9.7	8.3	671	—	14.5	9.4	8.2	481	—	14.5	9.5	8.0	287
10:35	090612	TB	48	—	14.5	10.0	8.3	555	—	14.5	9.9	8.2	433	—	14.5	10.0	7.9	289
1.30	090712	LC	72	—	14.4	9.9	8.3	500	—	14.6	9.5	8.2	435	—	14.5	9.6	7.8	290
1.35	090812	LC	96	—	14.5	9.9	8.3	445	—	14.6	9.6	8.3	445	—	14.6	9.7	7.7	297

Fish Behaviour Comments
LC50 Value: >100%
95% Conf Inter: 100 - ∞

All fish alive @ 96hrs w/ normal behaviour

Pretreatment: Composite ☒ Dissolved Oxygen ☒ Temp ☒ Water Hardness ☐ Other ☐

Comments: EPS1 / RM / 13 Second Edition - December 2000

Jacques Whitford Environment Limited Laboratory Division	JWEL Lab Form: Bio-0010 Date: May 30, 2003

LC50 Fish Bioassay Data Sheet

Client: CRA
David McCoil/James O'Neill
1118 Topsail Road PO Box 8353
St. John's, NL
A1N 3N7
(709) 364-5353
(709) 364-5368

Sample ID # B-3520-09
Client # 121510938

Sample Material: PLCS		Control/Dil Water: Declorinated Water	Clarity (F): Slightly cloudy
Test Period: 090412 (start)		Aeration Rate: 6.5 ± mL/min. L-1	Colour (F): pale yellow
090812 (finish)		Test Finish Date: 090812	Odour (F): none
Volume: 2x20. L		Test Finish Time: 1:35	Susp. Part. (F): partially settled
Duration: 96 h		Static: pH Ambient:	Other (F): N/A

Light Intensity: 393 lux

Storage: Stored from 083112-090412 @ 4±2°C. Tempered in 2 WBC 15±1°C

				Conc: 12.5%					Conc: 6.25%					Conc: Control 0%				
Time	Day	Monit By	HR.	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µS/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µS/cm)	Mort #	TEMP (C)	DO (mg/l)	pH	COND (µS/cm)
1:35	090412	SR	0	—	14.7	9.8	7.8	211	—	14.7	9.7	7.5	178	—	15.6	9.9	7.4	129
10:30	090512	TB	24	—	14.4	9.7	7.7	212	—	14.4	9.7	7.6	179	—	14.8	9.1	7.3	131
10:35	090612	TB	48	—	14.6	10.0	7.7	214	—	14.4	10.0	7.6	180	—	14.7	10.0	7.3	131
1:30	090712	LL	72	—	14.5	9.4	7.6	215	—	14.5	9.1	7.6	181	—	14.8	9.6	7.3	133
1:35	090812	LL	96	—	14.5	9.6	7.6	221	—	14.6	9.5	7.5	186	—	14.9	9.7	7.3	137

Fish Behaviour Comments

All fish alive @ 96hrs w/ normal behaviour →

Fish Measurements | Loading Density (g/l): 0.25

Fork Length (cm.): 4.2, 3.5, 3.8, 4.1, 3.9, 4.0, 3.8, 3.6, 3.7 Mean: 3.84 +/- 0.34

Wet Weight (g): 0.5, 0.4, 0.4, 0.6, 0.5, 0.5, 0.6, 0.4, 0.3 Mean: 0.49 +/- 0.12

4.3
0.7

SoftTox™ Bioassay Calculator

Test Date: 09.4/12 - 0908/12 Analyst: LC/SR/TB

B-@ 3520-09 **Control Group** CLA 10938

Number exposed: 10 Number dead: 0 Mortality: 0 %

Group Number	Concentration	Number Exposed	Number Dead	Percent Mortality
1	100.00	10	0	0 %
2	50.00	10	0	0 %
3	25.00	10	0	0 %
4	12.50	10	0	0 %
5	6.25	10	0	0 %

L.C. 50 Result: ~~0.00~~ LC 50% 12. > 100 i.

Upper 95% Confidence Limit: Infinity
Lower 95% Confidence Limit: 100.00

Calculated with *Binomial Probability*

Stantec Consulting Ltd
Science Laboratory
422 Logy Bay Road
St. John's, NL A1A 5C6
Tel: (709) 576-4804
Fax: (709) 576-0008

Registered to ISO 9001:2000
ISO/IEC 17025:2005 Accredited
SCC-Food Scope (No. 268)
CALA – Environmental Scope (No. 2709)

Stantec

September 13, 2012
Project: 10938.
Lab Refer No.: B-3521-09

Report No.: 04601

Conestoga-Rovers & Associates
1118 Topsail Rd.
St. John's, NL
A1N 3N7
Tel: (709) 364-5353
Fax: (709) 364-5368

Attention: Brian Luffman

Dear Mr. Luffman,

Reference: Toxicology Testing Results

Please find enclosed the results of the 96-hour static bioassay conducted September 4 - 8, 2012. This toxicity test was performed on the SLCS - Come by Chance, NL effluent. This effluent was collected on August 30, 2012. The sample was received in acceptable condition.

Test conditions for a multi concentration test were followed according to the Reference Method: For Determining Acute Lethality of Effluents to Rainbow Trout (Report EPS 1/RM/13 Second Edition, December 2000 and May 2007 amendment). All tests parameters were maintained within the recommended levels outlined in the above protocol.

The SLCS - Come by Chance, NL effluent is not acutely lethal to the fish since less than 50.00 % of the fish died in the 100.00 % effluent during the 96 hour period. The SoftTox™ Program was used to calculate the LC50 value. The LC50 for the SLCS - Come by Chance, NL effluent was determined to be greater than 100.00 %.

Please call if you have any questions regarding these results.

Sincerely,

STANTEC CONSULTING LTD

Dianne Hunt-Hall, M.Env., B.Tech
Laboratory Supervisor, Science Laboratory

Attachments:
A- Bench Data Sheet(s)

Reference: Toxicology Testing Results

SAMPLE

Lab Refer.No.:	B-3521-09
Company:	Conestoga-Rovers & Associates
Sample Material:	SLCS - Come by Chance, NL
Sampling Method:	Grab
Sample Condition:	Received in acceptable condition
Collected:	August 30, 2012; 12:00 pm
Collected By:	A. Bryant

SAMPLE CHARACTERIZATION

Received (Date and Time):	August 31, 2012; 3:05 pm
Volume:	2 x 20 L
Temperature:	14.7°C
Dissolved Oxygen:	8.0 mg/L
pH:	7.0 pH units
Conductivity:	809 µS/cm
Colour:	Cloudy/turbid, yellow
Odour:	None
Storage:	96 hrs @ 4.0 ± 2.0 °C

DILUTION WATER CHARACTERIZATION (MONTHLY AVERAGE)

Source:	St. John's Dechlorinated
Dissolved Oxygen:	9.6 ± 0.4 mg/L
Conductivity:	128 ± 7 µS/cm
Hardness:	17 ± 8 mg/L
pH:	7.1 ± 0.2 pH units
Date Revised:	September 4, 2012

TEST CONDITIONS

Started (Date and Time):	September 4, 2012; 1:30 pm
Ended (Date and Time):	September 8, 2012; 1:30 pm
Type of Test:	Static Acute 96 hour LC_{50}
Volume of Test Solutions:	20 Litres
Photoperiod:	16h Light/08h Dark
Light Intensity:	390 Lux
Aeration Rate:	6.5 ± 1.0 mL/min.L^{-1}
Preaeration Time:	30 mins
Test Temperature:	15 ± 1 °C
Duration:	96 hours

TEST ORGANISM

Species:	Rainbow Trout (*Oncorhynchus mykiss*)		
Source:	Rainbow Springs Hatchery		
Batch Number:	12-11		
Number per Tank:	10		
% Mortality:	0.39 % (7 days prior to testing)		
Mean Fork Length (cm):	4.2 ± 0.4	Range (cm):	3.5 – 4.6
Mean Total Weight (g):	0.6 ± 0.2	Range (g):	0.3 – 0.7
Loading Density:	0.3 g/L		

Reference: Toxicology Testing Results

TEST RESULTS

Lab Refer No.:	B-3521-09
Sample Material:	SLCS - Come by Chance, NL
Collection Date:	August 30, 2012; 12:00 pm
Protocol:	EPS 1/RM/13
Test Type:	LC_{50}
LC_{50} value (static, acute):	> 100.00 %
95% Confidence Intervals:	100.00 % – Infinity

Effluent Conc.(%)	Temp(°C)		D.O. (mg/L)		pH (units)		Cond.(µS/cm)		Mortality (%)
	Init.	Final	Init.	Final	Init.	Final	Init.	Final	
100	14.3	14.3	10.0	9.9	8.2	8.4	803	565	0
50	14.4	14.3	9.9	9.8	8.1	8.3	487	465	0
25	14.5	14.3	9.8	9.7	8.0	7.6	301	313	0
12.5	14.7	14.3	9.8	9.8	7.4	7.4	217	229	0
6.25	14.7	14.6	9.7	9.7	7.4	7.4	178	184	0
0	15.4	14.5	9.9	9.6	7.4	7.3	127	138	0

COMMENTS:

- Arrival temperature of 23.8°C.
- The sample contained small suspended particles which partially settled during the bioassay.
- Samples have not been pH adjusted or filtered.
- The above analysis was conducted according to protocols indicated. The above results, which refer to the sample(s) tested only, are for your information and will be held in the strictest of confidence by this firm.
- Sample controls are considered a part of a sample test and as such are subject to the same treatment. (This includes, but is not limited to, aeration and temperature testing requirements.)

REFERENCE TOXICITY TEST DATA (LOG SCALE)

Test Organism:	*Oncorhynchus mykiss*
Toxicant:	Phenol
Fish Batch No.:	12-11
Reference Toxicant Date:	August 20 - 24, 2012
LC_{50} Value:	1.04 mg/L
95% Confidence Limits:	0.70 – 1.18 mg/L
Historic Mean ± 2 SD (Warning Limits):	0.98 ± 0.15 mg/L

Performed by: Stephanie Ryan/Trevor Bennett/Lana Combdon

Technical Reviewer: Jill Wheaton / Jill Wheaton
(Print Name/Signature)

Senior Reviewer: Suzette Winter
(Print Name/Signature) Date: Sept. 16th 2012

Reference: Toxicology Testing Results

ATTACHMENT A

Bench Data Sheet (s)

Jacques Whitford Environment Limited Laboratory Division	JWEL Lab Form: Bio-0010 Date: May 30, 2003

LC50 Fish Bioassay Data Sheet

Client: CRA
David McCoil/James O'Neill
1118 Topsail Road PO Box 8353
St. John's, NL
A1N 3N7
(709) 364-5353
(709) 364-5368

Sample ID # B-3521-09
Client # 121510938

Sample Material: SLCS
Test Period: 090412 (start)
090812 (finish)
Date Collected: 8/30/2012 Time Collected: 12:00 PM
Date Rec'd: 8/31/2012 Time Rec'd: 3:05 PM

Preaeration Time: 30
Test Org - Batch #: 12 - 11
Source: RSH
Test Start Date: 090412
Test Start Time: 1:30

Clarity (I): cloudy / turbid.
Colour (I): yellow
Odour (I): none
Susp. Part. (I): small parts throughout.
Other (I): Arrival temp @ 2.3°C. Collected by A.B.

Light Intensity: 390 lux
Int. Ammonia (ppm): N.A
Fin. Ammonia (ppm): 1

	Conc: 100%				Conc: ~~50%~~ 50%				Conc: ~~25%~~ 25%				
Time	Day	Monit By	HR.	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µs/cm)
1.00	090412	SR	INT		14.7	8.0	7.0	809 @090412										301 @090412
1:30	1	1	0	—	14.3	10.0	8.2	~~749~~ 803	—	14.4	9.9	8.1	487	—	14.5	9.8	8.0	~~289~~
10:45	090612	TB	24	—	14.3	9.7	8.4	749	—	14.4	9.5	8.3	452	—	14.4	9.6	8.0	302
10:55	090612	TB	48	—	14.3	10.0	8.3	643	—	14.2	9.9	8.3	453	—	14.1	10.0	7.9	303
1:30 @ 40	090712	LC	72	—	14.2	9.9	8.3	572	—	14.3	9.5	8.3	454	—	14.2	9.4	7.8	305
1:30	090812	LC	96	—	14.3	9.9	8.4	565	—	14.3	9.8	8.3	465	—	14.3	9.7	7.6	313

Fish Behaviour Comments
LC50 Value: >100%
95% Conf Inter: 100 - ∞

All fish alive @ 96hrs w/ normal behaviour

Pretreatment: Composite ☒ Dissolved Oxygen ☒ Temp ☒ Water Hardness ☐ Other ☐

Comments: EPS1 / RM / 13 Second Edition - December 2000

Jacques Whitford Environment Limited Laboratory Division	JWEL Lab Form: Bio-0010 Date: May 30, 2003

LC50 Fish Bioassay Data Sheet

Client: CRA
David McCoil/James O'Neill
1118 Topsail Road PO Box 8353
St. John's, NL
A1N 3N7
(709) 364-5353
(709) 364-5368

Sample ID # B-3521-09
Client # 121510938

Sample Material: SLCS
Test Period: 090412 (start)
090812 (finish)
Volume: 2 x 20 L
Duration: 96 h

Control/Dil Water: Declorinated Water
Aeration Rate: 6.5 ± mL/min. L-1
Test Finish Date: 090812
Test Finish Time: 1:30
Static: pH Ambient:

Clarity (F): Slightly cloudy
Colour (F): pale yellow
Odour (F): none
Susp. Part. (F): partially settled
Other (F): N.A.

Light Intensity: 3910 lux

Storage: Stored from 083112 - 090412 @ 4±2°C. Tempered in a WB @ 15±1°C.

				Conc: 12.5%					Conc: 6.25%					Conc: Control 0%				
Time	Day	Monit By	HR.	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µS/cm)	Mort #	TEMP (°C)	DO (mg/l)	pH	COND (µS/cm)	Mort #	TEMP (C)	DO (mg/l)	pH	COND (µS/cm)
1:30	090412	OR	0	—	14.7	9.8	7.4	217	—	14.7	9.7	7.4	178	—	15.4	9.9	7.4	127
10:45	090512	TB	24	—	14.1	9.6	7.8	229	—	14.4	9.6	7.5	175	—	14.3	9.7	7.4	131
10:55	090612	TB	48	—	14.2	10.0	7.7	223	—	14.4	10.0	7.5	177	—	14.5	10.0	7.4	133
1:40	090712	LC	72	—	14.3	9.3	7.6	223	—	14.5	9.3	7.5	178	—	14.5	9.8	7.3	134
1:30	090812	LC	96	—	14.3	9.8	7.4	229	—	14.6	9.7	7.4	184	—	14.5	9.6	7.3	138

Fish Behaviour Comments

All fish alive @ 96hrs w/ normal behaviour

Fish Measurements | Loading Density (g/l): 0.29

Fork Length (cm.): 4.5, 4.4, 3.5, 4.4, 4.5, 4.5, 4.6, 3.5, 4.4, 3.7 Mean: 4.20 +/- 0.44

Wet Weight (g): 0.7, 0.7, 0.3, 0.6, 0.6, 0.7, 0.7, 0.3, 0.7, 0.4 Mean: 0.57 +/- 0.17

SoftTox™ Bioassay Calculator

Test Date: 090412-090812 Analyst: LC/SR/TB

B 3521-09 **Control Group** CRA 10938

Number exposed: 10 Number dead: 0 Mortality: 0 %

Group Number	Concentration	Number Exposed	Number Dead	Percent Mortality
1	100.00	10	0	0 %
2	50.00	10	0	0 %
3	25.00	10	0	0 %
4	12.50	10	0	0 %
5	6.25	10	0	0 %

LC_{090812}

L.C. 50 Result: ~~0.00~~ > 100 %

Upper 95% Confidence Limit: Infinity
Lower 95% Confidence Limit: 100.00

Calculated with *Binomial Probability*

APPENDIX D

PREVIOUS MONITORING DATA

TABLE D1

HISTORICAL STATIC GROUNDWATER LEVELS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Location	Ground Surface Elevation	Length of Stick-up	TOC Elevation	Groundwater Depth (mbToC)														
				Mar	Jul	Sep	Oct	Jun	Jul	Oct	Dec	Oct	Sep	Mar	Jul	Dec	Sep	Dec
	(masl)	(m)	(masl)	2004				2006				2007	2008	2009	2010		2011	2012
PLCS	15.960	--	15.960	--	--	--	--	--	--	--	--	--	--		0.55	0.73	0.59	0.89
SLCS	15.955	--	15.955	--	--	--	--	--	--	--	--	--	--	--	0.52	0.713	0.55	0.892
MW 93-1	16.300	1.100	17.400	--	--	--	--	--	--	--	--	--	--	1.975	1.703	1.915	1.921	1.780
MW 93-1A	16.310	1.400	17.710	0.39	1.88	0.41	0.16	2.06	1.68	2.11	1.84	1.67	2.17	2.50	1.638	1.636	2.204	1.669
MW 93-2	14.290	1.100	15.390	0.67	0.56	0.58	0.28	1.85	2.16	2.13	--	1.72	2.18	2.20	2.084	2.147	--	2.111
MW 93-2A	14.310	1.100	15.410	--	--	--	--	--	--	--	--	--	--	1.84	1.456	1.375	--	1.234
MW 93-3*	--	--	--	--	--	--	--	--	--	--	--	--	--	1.335	--	--	--	--
MW 93-3A*	--	--	--	2.37	Dry	--	1.20	Dry	3.21	3.37	--	3.32	Dry	3.52	--	--	--	--
MW 10-1	15.790	0.846	16.636	--	--	--	--	--	--	--	--	--	--	--	3.015	3.254	3.551	3.188
MW 10-1A	15.890	0.854	16.744	--	--	--	--	--	--	--	--	--	--	--	3.084	3.279	3.662	3.234

Location	Ground Surface Elevation	Length of Stick-up	TOC Elevation	Groundwater Elevation (masl)														
				Mar	Jul	Sep	Oct	Jun	Jul	Oct	Dec	Oct	Sep	Mar	Jul	Dec	Sep	Dec
	(masl)	(m)	(masl)	2004				2006				2007	2008	2009	2010		2011	2012
PLCS	15.960	--	15.960	--	--	--	--	--	--	--	--	--	--		15.410	15.230	15.370	14.340
SLCS	15.955	--	15.955	--	--	--	--	--	--	--	--	--	--	--	15.435	15.242	15.410	14.350
MW 93-1	16.300	1.100	17.400	--	--	--	--	--	--	--	--	--	--	15.425	15.697	15.485	14.039	13.705
MW 93-1A	16.310	1.400	17.710	17.320	15.830	17.300	17.550	15.650	16.030	15.600	15.870	16.040	15.540	15.210	16.072	16.074	13.756	14.405
MW 93-2	14.290	1.100	15.390	14.720	14.830	14.810	15.110	13.540	13.230	13.260	--	13.670	13.210	13.190	13.306	13.243	--	11.132
MW 93-2A	14.310	1.100	15.410	--	--	--	--	--	--	--	--	--	--	13.570	13.954	14.035	--	12.801
MW 93-3*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW 93-3A*	--	--	15.900	13.530	Dry	--	14.700	Dry	12.690	12.530	--	12.580	Dry	12.380	--	--	--	--
MW 10-1	15.790	0.846	16.636	--	--	--	--	--	--	--	--	--	--	--	13.621	13.382	12.409	10.194
MW 10-1A	15.890	0.854	16.744	--	--	--	--	--	--	--	--	--	--	--	13.660	13.465	12.298	10.231

Notes:

PLCS = Primary Leachate Collection System Valve Chamber
SLCS = Secondary Leachate Collection System Valve Chamber
MW = Monitor Well

m = Metres
TOC = Top of Casing

masl = Metres Above Sea Level
mbTOC = Metres Below Top of Casing

* = Monitor Well Decommissioned in July 2010

TABLE D2

HISTORICAL GROUNDWATER ANALYTICAL DATA - BTEX/mTPH
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)				
						TPuH C_6-C_{10}	TExH C_{10}-C_{21}	TExH C_{21}-C_{32}	Modified TPH	Comments
MW 93-1	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Aug 19, 2009[1]	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
MW 93-1A	2008 (AMEC)	<(0.2)	<(0.2)	<(0.2)	<(0.6)	<(0.05)[2]	<(0.05)[2]	<(0.05)[2]	<(0.15)[2]	-
	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
DUP-03	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 93-2	2008 (AMEC)	<(0.2)	<(0.2)	<(0.2)	<(0.6)	<(0.05)[2]	<(0.05)[2]	<(0.05)[2]	<(0.15)[2]	-
	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Jul 16, 2010[3]	-	-	-	-	-	<	<	-	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010[3]	-	-	-	-	-	<	<	-	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Aug 30, 2012	<(0.0013)	<(0.0013)	<(0.0013)	<(0.0026)	<(0.013)	<	<	<	-
MW 93-2A	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 10-1	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Jul 16, 2010[1]	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	0.4	0.4	possible lube oil fraction
	Aug 30, 2012	<	<	<	<	<	<	<	<	-
MW 10-1A	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010[1]	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Aug 30, 2012	<	<	<	<	<	<	<	<	-
Dup- A	Sep 02, 2011	<	<	<	<	<	<	<	<	-
RDL		0.001	0.001	0.001	0.002	0.01	0.05	0.1	0.1	-
Atlantic RBCA Tier I RBSLs*		6.9	20	20	20	na	na	na	20	Gasoline
									20	Diesel / #2 Fuel Oil
									20	# 6 Oil

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
1. Field Duplicate
2. Assumed transcript error by factor of 1,000 from Pinchin LeBlanc Environmental Table 2 from March 2010 OMM Report
3. Lab Duplicate
DUP-A= Field Dup of MW 10-1A
DUP-03= Field Dup of MW 93-1A

* Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Level (RBSL) Table values {commercial/non-potable/coarse grained soil}.

RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
0.0 = above criteria

TPuH = Total Purgeable Hydrocarbons
TExH = Total Extractable Hydrocarbons
TPH = Total Petroleum Hydrocarbons
Modified TPH = mTPH = TExH + TPuH
TPH = mTPH + BTEX

G = Gasoline
FO = Fuel Oil
LO = Lube Oil
W = Weathered

TABLE D3

HISTORICAL GROUNDWATER ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1							MW 93-1A						DUP-03	MW 93-2						RDL	Criteria*
		19-Aug-09	19-Aug-09 Field Dup	19-Aug-09 Lab Dup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12		
1-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.05	13,000
2-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.05	13,000
Acenaphthene	ug/L	<	<	<	<	<	0.01	<	<0.04	<	<	<	<	<	<	<0.04	<	<	<	<	<	0.01	1,700
Acenaphthylene	ug/L	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	2,000
Acridine	ug/L	-	-	-	<	<	-	-	-	-	<	<	-	-	-	-	-	<	<	-	-	0.05	-
Anthracene	ug/L	<	<	<	<	<	<	<	<0.01	<	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	12
Benzo(a)anthracene	ug/L	<	<	<	<	<	<	<	<0.01	<	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	5
Benzo(a)pyrene	ug/L	<	0.01	<	<	<	<	<	<0.01	<	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	1.9
Benzo(b)fluoranthene	ug/L	<	0.02	<	<	<	<	<	<0.05	<	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	7
Benzo(g,h,i)perylene	ug/L	<	0.02	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	0.2
Benzo(k)fluoranthene	ug/L	<	0.02	<	<	<	<	<	<0.05	<	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	0.4
Chrysene	ug/L	<	<	<	<	<	<	<	<0.04	<	<	<	<	<	<	<0.04	<	<	<	<	<	0.01	3
Dibenz(a,h)anthracene	ug/L	<	0.03	<	<	<	<	<	-	<	<	<	<	<	<	-	<	<	<	<	<	0.01	0.25
Fluoranthene	ug/L	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	130
Fluorene	ug/L	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	290
Indeno(1,2,3-cd)pyrene	ug/L	<	0.02	<	<	<	<	<	<0.05	<	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	0.27
Naphthalene	ug/L	<	<	<	<	<	<	<	-	<	<	<	<	<	<	-	<	<	<	<	<	0.20	5,900
Perylene	ug/L	<	<	<	<	<	<	<	-	<	<	<	<	<	<	-	<	<	<	<	<	0.01	-
Phenanthrene	ug/L	0.01	<	<	<	<	<	<	<0.04	0.01	<	<	<	<	<	<0.04	0.01	<	<	<	<	0.01	63
Pyrene	ug/L	<	<	<	<	<	<	<	<0.01	<	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	40
Quinoline	ug/L	-	-	-	<	<	-	-	-	-	<	<	-	-	-	-	-	<	<	-	-	0.05	-

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-A= Field Duplicate of MW-101A
DUP-03= Field Duplicate of MW 93-1A
(1)= Elevated PAH RDL(s) due to matrix/co-extractive interference

TABLE D3

HISTORICAL GROUNDWATER ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-2A					MW 10-1						MW 10-1A				DUP-A	RDL	Criteria*
		19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	16-Jul-10	16-Jul-10 DUP-01	13-Dec-10	13-Dec-10 DUP-02	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	2-Sep-11		
1-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.05	13,000
2-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.05	13,000
Acenaphthene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	1,700
Acenaphthylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	2,000
Acridine	ug/L	-	<	<	-	-	<	<	<	<	-	-	<	<	-	-	-	0.05	-
Anthracene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	12
Benzo(a)anthracene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	5
Benzo(a)pyrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	1.9
Benzo(b)fluoranthene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	7
Benzo(g,h,i)perylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	0.2
Benzo(k)fluoranthene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	0.4
Chrysene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	3
Dibenz(a,h)anthracene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	0.25
Fluoranthene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	130
Fluorene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	290
Indeno(1,2,3-cd)pyrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	0.27
Naphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.20	5,900
Perylene	ug/L	<	<	<	0.02	<	<	<	<	0.04	<	<	<	<	<	0.017	<	0.01	-
Phenanthrene	ug/L	0.01	<	<	<	0.012	<	<	<	<	<	<	<	<	<	<	<	0.01	63
Pyrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	40
Quinoline	ug/L	-	<	<	-	-	<	<	<	<	-	-	<	<	<	-	<	0.05	-

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-A= Field Duplicate of MW-101A
DUP-03= Field Duplicate of MW 93-1A
(1)= Elevated PAH RDL(s) due to matrix/co-extractive interference

TABLE D4

GROUNDWATER ANALYTICAL DATA - PCBs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Total PCBs (ug/L)
MW 93-1	Aug 19, 2009	<
	Aug 19, 2009	<[1]
	Aug 19, 2009	<[2]
	Jul 16, 2010	<
	Dec 13, 2010	<
	Sep 02, 2011	<
	Aug 30, 2012	<
MW 93-1A	AMEC 2008	<0.04
	Aug 19, 2009	0.1
	Jul 16, 2010	<
	Dec 13, 2010	<
	Sep 02, 2011	<
	Aug 30, 2012	<
DUP-03	Aug 30, 2012	<
MW 93-2	AMEC 2008	<0.04
	Aug 19, 2009	<
	Jul 16, 2010	<
	Dec 13, 2010	<
	Sep 02, 2011	<
	Aug 30, 2012	<
MW 93-2A	Aug 19, 2009	0.11
	Jul 16, 2010	<
	Dec 13, 2010	<
	Sep 02, 2011	<
	Aug 30, 2012	<
MW 10-1	Jul 16, 2010	<
	Jul 16, 2010	<[2]
	Dec 13, 2010	<
	Sep 02, 2011	<
	Aug 30, 2012	<
MW 10-1A	Jul 16, 2010	<
	Dec 13, 2010	<
	Dec 13, 2010	<[2]
	Sep 02, 2011	<
	Aug 30, 2012	<
DUP-A	Sep 02, 2011	<
RDL		0.05
Criteria* - Ontario MOE		0.2

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
1. Lab Duplicate
2. Field Duplicate
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Ground Water Condition

MW = Monitor Well
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-A = Field Duplicate of MW 10-1A
DUP-03= Field Duplicate of MW 93-1A
DUP-04= Field Duplicate of PLCS
RDL = Reportable Detection Limit
< = Parameter below detection limit
0.0 = above criteria

TABLE D5

HISTORICAL GROUNDWATER ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1							MW 93-1A						DUP-03	MW 93-2						RDL	Criteria*
		19-Aug-09	19-Aug-09 Field Dup	19-Aug-09 LabDup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12		
Benzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	1,900
Bromodichloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50,000
Bromoform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	840
Bromomethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	3.00	3.7
Carbon Tetrachloride	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	17
Chlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	500
Chloroethane	ug/L	<	<	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<	<	<	<10 (1)	<	8.00	-
Chloroform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	430
Chloromethane	ug/L	<	<	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<	<	<	<10 (1)	<	8.00	-
Dibromochloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50,000
1,2-Dichlorobenzene	ug/L	<	<	<	<	<	<0.7 (1)	<	<	<	<	<	<0.7 (1)	<	<	<	<	<	<	<0.7 (1)	<	0.50	7,600
1,3-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	7,600
1,4-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	7,600
1,1-Dichloroethane	ug/L	<	<	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<	<	<	<3 (1)	<	2.00	9,000
1,2-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	17
1,1-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.50	0.66
cis-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<	<	<	<3 (1)	<	2.00	70
trans-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.00	100
1,2-Dichloropropane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	9.3
cis-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.00	3.8
trans-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	3.8
Ethylbenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	28,000
Methylene Chloride(Dichloromethane)	ug/L	<	<	<	<	<	<4 (1)	<	<	<	<	<	<4 (1)	<	<	<	<	<	<	<4 (1)	<	3.00	50,000
o-Xylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5,600
p+m-Xylene	ug/L	<	<	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<	<	<	<3 (1)	<	2.00	5,600
Styrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	940
Tetrachloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5
1,1,2,2-Tetrachloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	22
Toluene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5,900
Trichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50
1,1,1-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	200
1,1,2-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	16,000
Trichlorofluoromethane (FREON 11)	ug/L	<	<	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<	<	<	<10 (1)	<	8.00	-
Vinyl Chloride	ug/L	<	<	<	<	<	<	<	0.2	<	<	<	<	<	<	0.2	<	<	<	<	<	0.50	0.5

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
-= Not analysed/No criteria
< = Parameter below detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-A= Field Duplicate of MW 10-1A
DUP-03= Field Duplicate of MW 93-1A
(1)=Elevated RDL for analyzed VOC(s)

TABLE D5

HISTORICAL GROUNDWATER ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-2A					MW 10-1						MW 10-1A				DUP- A	RDL	Criteria*
		19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	16-Jul-10 DUP-01	13-Dec-10 DUP-02	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	2-Sep-11		
Benzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	1,900
Bromodichloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50,000
Bromoform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	840
Bromomethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	3.00	3.7
Carbon Tetrachloride	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	17
Chlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	500
Chloroethane	ug/L	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<10 (1)	<	<10 (1)	8.00	-
Chloroform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	430
Chloromethane	ug/L	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<10 (1)	<	<10 (1)	8.00	-
Dibromochloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50,000
1,2-Dichlorobenzene	ug/L	<	<	<	<0.7 (1)	<	<	<	<	<	<0.7 (1)	<	<	<	<0.7 (1)	<	<0.7 (1)	0.50	7,600
1,3-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	7,600
1,4-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	7,600
1,1-Dichloroethane	ug/L	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<3 (1)	<	<3 (1)	2.00	9,000
1,2-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	17
1,1-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.50	0.66
cis-1,2-Dichloroethylene	ug/L	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<3 (1)	<	<3 (1)	2.00	70
trans-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.00	100
1,2-Dichloropropane	ug/L	<	<	<	<	<	<	<	<	4.00	2.00	<	<	2.00	7.00	3.00	7.00	1.00	9.3
cis-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.00	3.8
trans-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	1.00	<	<	<	1.00	<	<	<	1.00	3.8
Ethylbenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	28,000
Methylene Chloride(Dichloromethane)	ug/L	<	<	<	<4 (1)	<	<	<	<	<	<4 (1)	<	<	<	<4 (1)	<	<4 (1)	3.00	50,000
o-Xylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5,600
p+m-Xylene	ug/L	<	<	<	<3 (1)	<	<	<	<	<	<3 (1)	<	<	<	<3 (1)	<	<3 (1)	2.00	5,600
Styrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	940
Tetrachloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5
1,1,2,2-Tetrachloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	22
Toluene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	5,900
Trichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	50
1,1,1-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	200
1,1,2-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.00	16,000
Trichlorofluoromethane (FREON 11)	ug/L	<	<	<	<10 (1)	<	<	<	<	<	<10 (1)	<	<	<	<10 (1)	<	<10 (1)	8.00	-
Vinyl Chloride	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.50	0.5

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
-= Not analysed/No criteria
< = Parameter below detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-A= Field Duplicate of MW 10-1A
DUP-03= Field Duplicate of MW 93-1A
(1)=Elevated RDL for analyzed VOC(s)

TABLE D6

HISTORICAL GROUNDWATER ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1						MW 93-1A						DUP-03	MW 93-2							RDL	Criteria*
		19-Aug-09	19-Aug-09 Field Dup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	19-Aug-09 Lab Dup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12		
Anion Sum	me/L	6.10	7.22	5.87	5.52	7.47	6.51	-	7.22	7.33	7.46	5.61	6.5	6.47	-	6.90	-	6.30	6.58	6.42	6.36	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	236.0	292.0	229.0	210.0	304.0	270	-	285.0	293.0	297.0	216.0	260	250	-	232.0	-	205.0	219.0	210.0	210.0	1.00	-
Calculated TDS	mg/L	338.0	375.0	313.0	313.0	389.0	338	265.0	447.0	390.0	401.0	302.0	334	334	331.0	380.0	-	346.0	368.0	361.0	353.0	1.00	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.00	3.00	3.00	2.00	4.00	4.7	-	3.00	3.00	2.00	3.00	5.2	5.4	-	1.00	-	1.00	1.00	2.00	2.60	1.00	-
Cation Sum	me/L	6.60	6.77	5.62	5.90	6.90	6.14	-	9.57	7.02	7.19	5.35	5.89	5.94	-	6.50	-	5.66	6.19	6.10	5.99	N/A	-
Hardness (CaCO3)	mg/L	160	160	120	120	180	150	205	210	170	170	120	140	150	245	270	-	240	250	260	250	1.00	-
Ion Balance (% Difference)	%	4.00	3.22	2.18	3.33	3.97	2.92	-	14.00	2.16	1.84	2.37	4.92	4.27	-	2.60	-	5.35	3.05	2.56	3.00	N/A	-
Langelier Index (@ 20C)	N/A	0.50	0.62	0.47	0.38	0.80	0.815	-	0.70	0.62	0.61	0.55	0.826	0.846	-	0.50	-	0.53	0.54	0.68	0.90	N/A	-
Langelier Index (@ 4C)	N/A	0.30	0.37	0.22	0.13	0.55	0.566	0.00	0.45	0.37	0.36	0.31	0.577	0.597	-	0.30	-	0.28	0.29	0.43	0.65	N/A	-
Nitrate (N)	mg/L	<	<	<	<0.05	<0.05	<	-	<	<	<0.05	<0.05	<	<	-	<	-	<	<0.05	<0.05	<	0.05	-
Saturation pH (@ 20C)	N/A	7.50	7.41	7.64	7.64	7.32	7.45	-	7.31	7.37	7.32	7.67	7.5	7.5	-	7.20	-	7.28	7.20	7.23	7.22	N/A	-
Saturation pH (@ 4C)	N/A	7.80	7.66	7.89	7.89	7.57	7.69	-	7.55	7.62	7.57	7.92	7.75	7.75	-	7.40	-	7.53	7.45	7.47	7.47	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	240	300	230	210	310	280	290	290	300	300	220	260	260	205	2,320	-	210	220	210	220	30	-
Carbonaceous BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-
Dissolved Chloride (Cl)	mg/L	36	35	19	15	11	11	11	12	11	11	16	30	30	24	24	-	23	21	20	20	1	-
Colour	TCU	<	<	<	<5	<5	<	-	<	<	<5	<5	<	<	-	<	-	<	<5	<5	<	5.00	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-
Nitrate + Nitrite	mg/L	<	<	<	<	<	<	<0.05	<	<	<	<	<	<	<0.05	<	-	<	<	<	<	0.05	-
Nitrite (N)	mg/L	<	<	<	<	<	<	<0.015	<	<	<	<	<	<	<0.015	<	-	<	<	<	<	0.01	2.00
Nitrogen (Ammonia Nitrogen)	mg/L	0.10	<	<	<0.05	<0.05	<	0.02	<	<	<0.05	<0.05	<	<	<0.01	<	<	<	<0.05	<0.05	<	0.05	-
Total Organic Carbon (C)	mg/L	1.20	1.00	2.10	0.90	930.00	<	2.00	<	<5 (1)	<5 (1)	<0.5	1.4	1.5	2.00	0.50	0.90	1.50	1.30	1.00	0.88	0.50	-
Orthophosphate (P)	mg/L	<	<	<	<0.01	<	<	-	<	<	0.04	<	<	<	-	<	-	<	<0.01	<	<	0.01	-
pH	pH	8.00	8.03	8.11	8.02	8.12	8.26	8.02	8.00	7.99	7.93	8.22	8.33	8.35	7.50	7.70	-	7.81	7.74	7.90	8.12	N/A	-
Phenols-4AAP	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	26.00
Reactive Silica (SiO2)	mg/L	9.90	10.00	7.60	7.60	6.90	5.3	-	5.00	7.10	6.80	7.70	9.1	9.1	-	19.00	-	18.00	19.00	19.00	18.00	0.50	-
Total Suspended Solids (TSS)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Dissolved Sulphate (SO4)	mg/L	2	16	33	42	48	33	-	55	53	56	38	19	20	-	73	-	74	76	78	71	2	-
Sulphide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-
Turbidity	NTU	0.5	1.3	61.0	34.0	<1000	590	-	350.0	300.0	470.0	1.1	5.9	5.7	-	13.0	-	5.4	13.0	3.9	4.0	0.1	-
Conductivity	uS/cm	580	580	520	500	630	580	511	610	630	640	500	580	590	549	560	-	570	580	570	580	1	-
Total Oil & Grease	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-03= Field Duplicate of MW 93-1A
(1) = Elevated detection limit due to matrix interference

TABLE D6

HISTORICAL GROUNDWATER ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-2A							MW 10-1						MW 10-1A				DUP-A	RDL	Criteria*
		19-Aug-09	19-Aug-09 Lab Dup	16-Jul-10	16-Jul-10 Lab Dup	13-Dec-10	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	16-Jul-10 DUP-01	13-Dec-10 DUP-02	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	2-Sep-11		
Anion Sum	me/L	2.69	-	6.43	-	1.31	2.42	1.37	3.87	2.63	3.89	2.70	3.48	3.24	3.86	3.08	1.43	2.11	1.44	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	62.0	-	212.0	-	14.0	61.0	11.0	94.0	92.0	96.0	95.0	144.0	140	94.0	114.0	50.0	77.0	51.0	1.00	-
Calculated TDS	mg/L	184.0	-	351.0	-	87.0	145.0	96.0	215.0	147.0	217.0	149.0	185.0	174	215.0	171.0	95.0	122.0	95.0	1.00	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	<	-	1.00	-	<	<	<	<	<	<	<	<	1.1	<	<	<	<	<	1.00	-
Cation Sum	me/L	3.43	-	5.70	-	1.15	2.09	1.44	3.60	2.55	3.66	2.57	3.27	3.11	3.61	3.08	1.57	1.98	1.59	N/A	-
Hardness (CaCO3)	mg/L	120	-	240	-	31	73	34	100	110	100	110	150	140	100	140	61	84	61	1.00	-
Ion Balance (% Difference)	%	12.10	-	`	-	6.50	7.32	2.49	3.61	1.54	3.05	2.47	3.11	2.05	3.35	0.00	4.67	3.18	4.95	N/A	-
Langelier Index (@ 20C)	N/A	-1.51	-	0.48	-	-3.48	-1.21	-3.03	-0.23	-0.79	-0.31	-0.68	0.34	0.365	-0.36	-0.18	-1.18	-0.60	-1.11	N/A	-
Langelier Index (@ 4C)	N/A	-1.76	-	0.24	-	-3.73	-1.46	-3.28	-0.48	-1.05	-0.56	-0.93	0.09	0.115	-0.61	-0.43	-1.43	-0.85	-1.36	N/A	-
Nitrate (N)	mg/L	<	-	<	-	0.15	<0.05	<	<	0.24	<	0.25	<0.05	0.16	<	0.26	0.10	0.08	0.08	0.05	-
Saturation pH (@ 20C)	N/A	8.06	-	7.27	-	9.25	8.27	9.28	7.93	7.79	7.91	7.77	7.51	7.55	7.92	7.64	8.32	8.00	8.31	N/A	-
Saturation pH (@ 4C)	N/A	8.31	-	7.52	-	9.50	8.52	9.53	8.18	8.05	8.16	8.02	7.76	7.8	8.17	7.89	8.57	8.25	8.56	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	62	-	210	-	14	61	12	95	92	96	96	140	140	95	110	51	77	51	30	-
Carbonaceous BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-
Dissolved Chloride (Cl)	mg/L	21	68	23	-	14	16	17	56	12	56	12	6	3.8	56	14	3	4	3	1	-
Colour	TCU	6.00	21.00	<	-	79.00	120.00	41.00	10.00	9.00	6.00	13.00	9.00	5.6	7.00	5.00	22.00	7.70	18.00	5.00	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-
Nitrate + Nitrite	mg/L	<	5.00	<	-	<	<	<	<	<	<	<	0.90	0.16	<	<	0.11	0.08	0.08	0.05	-
Nitrite (N)	mg/L	<	<	<	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.01	2.00
Nitrogen (Ammonia Nitrogen)	mg/L	0.24	<	<	-	0.35	0.25	0.40	0.14	<0.05	0.14	<0.05	0.28	<	0.15	0.09	<	0.11	<	0.05	-
Total Organic Carbon (C)	mg/L	6.20	-	1.30	-	16.00	17.00	22.00	8 (1)	33.00	8 (1)	18.00	18.00	2.7	8 (1)	2.30	15.00	8.70	18.00	0.50	-
Orthophosphate (P)	mg/L	<	-	<	-	<0.01	<	<	<	<0.01	<	<0.01	<	<	<	<0.01	<	<	<	0.01	-
pH	pH	6.55	<	7.75	7.83	5.77	7.06	6.25	7.70	7.00	7.60	7.09	7.85	7.91	7.56	7.46	7.14	7.40	7.20	N/A	-
Phenols-4AAP	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	26.00
Reactive Silica (SiO2)	mg/L	12.00	-	18.00	-	6.40	11.00	5.70	7.00	6.20	7.00	6.00	8.00	7.4	7.10	7.60	10.00	10.00	10.00	0.50	-
Total Suspended Solids (TSS)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,000	-	9,400	2	-
Dissolved Sulphate (SO4)	mg/L	41	12	74	-	31	36	32	18	21	19	21	20	17	19	19	22	21	22	2	-
Sulphide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-
Turbidity	NTU	84.0	40.0	3.2	-	100.0	190.0	120.0	640.0	>1000	570.0	540.0	320.0	26	520.0	110.0	>1000	240.0	>1000	0.1	-
Conductivity	uS/cm	260	-	570	570	140	230	150	380	250	380	260	320	300	380	300	150	200	150	1	-
Total Oil & Grease	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
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- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-03= Field Duplicate of MW 93-1A
(1) = Elevated detection limit due to matrix interference

TABLE D7

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-1						MW 93-1A								DUP-03	MW 93-2						RDL	Criteria*
		19-Aug-09	19-Aug-09 Field Dup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	16-Jul-10 Lab Dup	13-Dec-10	2-Sep-11	2-Sep-11 Lab Dup	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12		
Aluminum (Al)	ug/L	100	120	37	17	73.7	73.7	42000	13,000	15	15	31	5.9	5.7	5.9	13.0	484	460	9	<	<	<	5.0	-
Antimony (Sb)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	16,000
Arsenic (As)	ug/L	<	<	<	<	<	<	36	7	<	<	<	<	<	<	<	3	2	2	2	1.2	1.2	1.0	480
Barium (Ba)	ug/L	130	150	88	70	77.9	77.9	426	240	79	75	73	68.6	67.6	68.6	107	131	180	170	160	171	171	1.0	23,000
Beryllium (Be)	ug/L	<	<	<	<	<1	<1	2	<	<	<	<	<	<	<	<	<0.1	<	<	<	<	<	1.0	53
Bismuth (Bi)	ug/L	<	<	<	<	<2	<2	-	<	<	<	<	<	<	<	<	<0.5	<	<	<	<	<	2.0	-
Boron (B)	ug/L	120	120	100	99	63	63	-	58	56	56	57	96	97	96	118	-	1100	980	1100	<	<	5.0	50,000
Cadmium (Cd)	ug/L	0.4	<	0.02	0.05	<	<	3	<	0.03	0.03	0.07	<	<	<	<	-	<	0.15	0.1	1160	1160	0.0	11
Calcium (Ca)	ug/L	-	-	26000	29000	43500	43500	-	-	40000	39000	45000	26300	25600	26300	33000	-	-	69000	80000	0.038	0.038	100	-
Chromium (Cr)	ug/L	<	<	<	<	<	<	54	39	<	<	<	<	<	<	<	1	<	<	<	77300	77300	1.0	2000/110[(1)]
Cobalt (Co)	ug/L	<	<	<	<	0.44	0.44	**110**	**170**	0.7	0.8	0.4	<	<0.4	<	<	1	<	<	0.4	<	<	0.4	100
Copper (Cu)	ug/L	6	3	<	<	<2	<2	**370**	**170**	2	3	<	<	<2	<	6.8	8	5	<	<	0.56	0.56	2.0	23
Iron (Fe)	ug/L	670	550	<	<	65	65	370	37000	<	<	<	<	<	<	55	1300	980	<	<	<	<	50	-
Lead (Pb)	ug/L	4.6	1	<	<	<	<	**45**	17	<	<	<	<	<	<	<	5	2	<	<	<	<	1	32
Magnesium (Mg)	ug/L	-	-	14000	12000	16400	16400	-	-	17000	17000	14000	12200	12100	12200	15400	-	-	16000	13000	15600	15600	100	-
Manganese (Mn)	ug/L	110	120	120	81	60	60	2620	1200	160	150	57	259	258	259	103	15300	1200	880	950	1120	1120	2.0	-
Molybdenum (Mo)	ug/L	6	6	20	18	16.3	16.3	20	11	15	15	14	19.2	18.8	19.2	10.7	2	<	<	<	<	<	2.0	7,300
Nickel (Ni)	ug/L	6	<	<	<	<	<	154	87	<	<	<	<	<	<	<	1	<	<	<	<	<	2.0	1,600
Phosphorus (P)	ug/L	-	-	<	<	-	-	-	-	<	<	130	-	-	-	<	-	-	<	150	-	-	100	-
Potassium (K)	ug/L	-	-	1900	2000	2680	2680	-	-	2500	2400	2700	1830	1840	1830	1730	-	-	1200	1400	1560	1560	100	-
Selenium (Se)	ug/L	<	<	<	<	<	<	<1	<	<	<	<	<	<	<	<	1	<	<	<	<	<	1.0	50
Silver (Ag)	ug/L	<	<	<	<	<	<	1	<	<	<	<	<	<	<	<	-	<	<	<	<	<	0.1	1
Sodium	ug/L	-	-	-	-	76,100	70,400	-	-	-	-	-	68,600	68,400	68,200	68,600	-	-	-	-	21,000	20,300	100.0	2,300,000
Strontium (Sr)	ug/L	250	260	230	220	263	263	-	300	300	290	280	192	190	192	249	-	230	240	230	210	210	2.0	-
Thallium (Tl)	ug/L	<	<	<	<	<	<	-	-	<	<	<	<	<0.1	<	<	-	<	<	<	<	<	0.1	400
Tin (Sn)	ug/L	<	<	<	<	<2	<2	-	<	<	<	<	<	<	<	<	-	<	<	<	<	<	2.0	-
Titanium (Ti)	ug/L	3	3	<	<	2.6	2.6	-	720	<	<	2	<	<	<	<	-	21	<	<	<	<	2.0	-
Uranium (U)	ug/L	0.2	0.2	0.3	0.2	3.06	3.06	-	6	2.9	2.8	2.8	0.4	0.42	0.4	0.21	-	0	0.3	0.2	0.24	0.24	0.1	-
Vanadium (V)	ug/L	<	<	<	<	<	<	155	28	<	<	<	<	<	<	<	2	<	<	<	<	<	2.0	200
Zinc (Zn)	ug/L	360	32	10	10	<	<	443	250	<	12	<	<	<	<	<	33	41	19	18	5	5	5.0	1,100

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

RDL = Reportable Detection Limit
0.0 = above criteria
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-03= Field Duplicate of MW 93-1A
(1) Criteria for Total Chromium = 2000 ug/L, Criteria for Chromium (VI) = 110 ug/L

TABLE D7

HISTORICAL GROUNDWATER ANALYTICAL DATA - METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	MW 93-2A					MW 10-1						MW 10-1A				DUP A (D of MW10-1)	RDL	Criteria*
		19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	16-Jul-10 DUP-01	13-Dec-10 DUP-02	2-Sep-11	30-Aug-12	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	2-Sep-11		
Aluminum (Al)	ug/L	630	<	150	86.6	86.6	200	38	160	36	41.8	41.8	100	11	74.5	74.5	68.3	5.0	-
Antimony (Sb)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	16,000
Arsenic (As)	ug/L	<	2	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	480
Barium (Ba)	ug/L	69	180	39	54.1	54.1	100	36	110	38	50.2	50.2	110	62	28.8	28.8	29.4	1.0	23,000
Beryllium (Be)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	53
Bismuth (Bi)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.0	-
Boron (B)	ug/L	440.0	1000	24	317	317	45	9	38	9	<	<	42	13	<	<	<	5.0	50,000
Cadmium (Cd)	ug/L	11	0.15	3.5	0.304	0.304	0.03	<	0.03	<	0.032	0.032	0.02	0.03	0.039	0.039	0.036	0.0	11
Calcium (Ca)	ug/L	-	69000	9000	20600	20600	31000	41000	32000	42000	51100	51100	31000	48000	20600	20600	20800	100	-
Chromium (Cr)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	2000/110[(1)]
Cobalt (Co)	ug/L	1	<	1.4	1.19	1.19	2.3	1.4	2.4	1.4	4.91	4.91	2.5	3.3	1.54	1.54	2.07	0.4	100
Copper (Cu)	ug/L	6	<	<	<	<	5	9	5	9	7.3	7.3	4	<	9.4	9.4	9.1	2.0	23
Iron (Fe)	ug/L	9900	<	1900	3000	3000	120	50	140	59	50	50	82	<	96	96	92	50	-
Lead (Pb)	ug/L	6.9	<	0.8	1.17	1.17	<	<	<	<	<	<	<	<	<	<	2.66	1	32
Magnesium (Mg)	ug/L		16000	2200	5220	5220	5800	2300	5900	2300	4540	4540	5900	3900	2190	2190	2150	100	-
Manganese (Mn)	ug/L	4300	890	4000	4190	4190	390	190	390	170	239	239	400	380	106	106	139	2.0	-
Molybdenum (Mo)	ug/L	<	<	<	<	<	16	3	16	3	2.5	2.5	14	5	8.5	8.5	6.1	2.0	7,300
Nickel (Ni)	ug/L	<	<	<	<	<	6	6	6	6	6.5	6.5	5	6	8.9	8.9	8.3	2.0	1,600
Phosphorus (P)	ug/L	-	<	<	-	-	<	150	<	<	-	-	<	<	-	-	-	100	-
Potassium (K)	ug/L	-	1200	980	1040	1040	6400	1100	6400	980	1360	1360	6400	1400	714	714	693	100	-
Selenium (Se)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1.0	50
Silver (Ag)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.1	1
Sodium	ug/L	-	-	-	11,000	9,100	-	-	-	-	6,570	7,020	-	-	4,670	5,750	4,600	100.0	2,300,000
Strontium (Sr)	ug/L	100	240	41	70.6	70.6	98	85	99	87	106	106	99	100	46.9	46.9	45.4	2.0	-
Thallium (Tl)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	0.1	400
Tin (Sn)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.0	-
Titanium (Ti)	ug/L	20	<	2	<	<	3	<	3	<	<	<	2	<	2.1	2.1	<	2.0	-
Uranium (U)	ug/L	0.3	0.3	<	<	<	0.4	<	0.4	<	0.43	0.43	0.4	0.3	<	<	<	0.1	-
Vanadium (V)	ug/L	4	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2.0	200
Zinc (Zn)	ug/L	**1700**	17	**1300**	**568**	568	5	11	6	11	9	9	5	10	8.9	8.9	10.1	5.0	1,100

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Ontario Ministry of the Environment (MOE) "Soil, Ground Water and Sediment Standrads for Use Under Part XV.1 of the Environmental Protection Act", March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
DUP-01 = Field Duplicate of MW 10-1, First Sampling Event
DUP-02 = Field Duplicate of MW 10-1, Second Sampling Event
DUP-03= Field Duplicate of MW 93-1A
(1) Criteria for Total Chromium = 2000 ug/L, Criteria for Chromium (VI) = 110 ug/L

TABLE D8

HISTORICAL SURFACE WATER ANALYTICAL DATA - BTEX/MTPH
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)				
						TPuH C_6-C_{10}	TExH C_{10}-C_{21}	TExH C_{21}-C_{32}	Modified TPH	Comments
SURFACE UP	2008 (AMEC)	<(0.2)	<(0.2)	<(0.2)	<(0.6)	<(0.05)[1]	<(0.05)[1]	<(0.05)[1]	<(0.15)[1]	-
	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	<	<	<	<	<	<	<	-
	Nov 07, 2012	<	<	<	<	<	<	<	<	-
SURACE DOWN	2008 (AMEC)	<(0.2)	<(0.2)	<(0.2)	<(0.6)	<(0.05)[1]	<(0.05)[1]	<(0.05)[1]	<(0.15)[1]	-
	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Sep 02, 2011	<	0.02	<	<	<	<	<	<	-
	Nov 07, 2012	<	<	<	<	<	<	<	<	-
RDL		0.001	0.001	0.001	0.002	0.01	0.05	0.1	0.1	-
2007 CCME Freshwater Aquatic Life Guidelines [2]		**4.00**	**2.00**	**0.39**	**-**	**-**	**-**	**-**	**-**	**Gasoline**
									-	**Diesel /#2 Fuel Oil**
									-	**#6 Oil**
1997 BC Guidelines for Protection of Aquatic Life [3]		**-**	**-**	**-**	**-**	**1.5**	**0.5**	**-**	**-**	**-**
									-	**-**
									-	**-**

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
1. Assumed transcript error by factor of 1,000 from Pinchin LeBlanc Environmental Table 2 from March 2010 OMM Report
2. 2007 CCME Freshwater Aquatic Life Guidelines
3. BC Ministry of Water, Land and Air Protection Guidelines for Protection of Aquatic Life

RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
DUP = Laboratory duplicate
0.0 = above criteria
<(#) = Parameter below AMEC laboratory detection limit

TPuH = Total Purgeable Hydrocarbons
TExH = Total Extractable Hydrocarbons
TPH = Total Petroleum Hydrocarbons
Modified TPH = mTPH = TExH + TPuH
TPH = mTPH + BTEX

G = Gasoline
FO = Fuel Oil
LO = Lube Oil
W = Weathered

TABLE D9

HISTORICAL SURFACE WATER ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP						SURFACE DOWN						RDL	Criteria*
		AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12		
1-Methylnaphthalene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.05	-
2-Methylnaphthalene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.05	-
Acenaphthene	ug/L	<0.04	<	<	<	<	<	<0.04	<	<	<	<	<	0.01	5.8
Acenaphthylene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	-
Acridine	ug/L	-	-	<	<	-	-	-	-	<	<	-	-	0.05	4.4
Anthracene	ug/L	<0.01	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	0.012
Benzo(a)anthracene	ug/L	<0.01	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	0.018
Benzo(a)pyrene	ug/L	<0.01	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	0.015
Benzo(b)fluoranthene	ug/L	<0.05	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	-
Benzo(g,h,i)perylene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	-
Benzo(j)fluoranthene	ug/L	-	-	-	-	<	<	-	-	-	-	<	<	0.01	
Benzo(k)fluoranthene	ug/L	<0.05	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	-
Chrysene	ug/L	<0.04	<	<	<	<	<	<0.04	<	<	<	<	<	0.01	-
Dibenz(a,h)anthracene	ug/L	-	<	<	<	<	<	NA	<	<	<	<	<	0.01	-
Fluoranthene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	0.04
Fluorene	ug/L	<0.03	<	<	<	<	<	<0.03	<	<	<	<	<	0.01	3.0
Indeno(1,2,3-cd)pyrene	ug/L	<0.05	<	<	<	<	<	<0.05	<	<	<	<	<	0.01	-
Naphthalene	ug/L	-	<	<	<	<	<	NA	<	<	<	<	<	0.2	1.1
Perylene	ug/L	-	<	0.01	<	<	<	NA	<	<	<	<	<	0.01	-
Phenanthrene	ug/L	<0.04	<	<	<	<	0.011	<0.04	0.01	<	<	<	0.012	0.01	0.4
Pyrene	ug/L	<0.01	<	<	<	<	<	<0.01	<	<	<	<	<	0.01	0.025
Quinoline	ug/L	-	-	<	<	-	-	-	-	<	<	-	-	0.05	3.4

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

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

TABLE D10

HISTORICAL SURFACE WATER ANALYTICAL DATA - PCBs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP						SURFACE DOWN						RDL	Criteria*
		AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12		
Total PCBs	ug/L	<0.04	0.11	<	<	<	<	<0.04	0.13	<	<	<	<	0.05	-

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
< = Parameter below detection limit
< (#) = Parameter below AMEC laboratory detection limit

TABLE D11

HISTORICAL SURFACE WATER ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP						SURFACE DOWN						RDL	Criteria*
		AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12		
Benzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	370
Bromodichloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Bromoform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Bromomethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	3	-
Carbon Tetrachloride	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	13.3
Chlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	1.3
Chloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	8	-
Chloroform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	1.8
Chloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	8	-
Dibromochloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,2-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	0.5	0.7
1,3-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	150
1,4-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	26
1,1-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	2	-
1,2-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	100
1,1-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	0.5	-
cis-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	2	-
trans-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	2	-
1,2-Dichloropropane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
cis-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	2	-
trans-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Ethylbenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	90
Methylene Chloride(Dichloromethane)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	3	98.1
o-Xylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
p+m-Xylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	2	-
Styrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	300
Tetrachloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	72
1,1,2,2-Tetrachloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Toluene	ug/L	<	<	<	<	2	<	<	<	<	<	<	<	1	111
Trichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	2.0
1,1,1-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1,2-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Trichlorofluoromethane (FREON 11)	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	8	21
Vinyl Chloride	ug/L	0.2	<	<	<	<	<	0.2	<	<	<	<	<	0.5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

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

TABLE D12

HISTORICAL SURFACE WATER ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP							SURFACE DOWN							RDL	Criteria*
		AMEC 2008	19/08/2009	16-Jul-10	13-Dec-10	13-Dec-10 Lab Dup	2-Sep-11	7-Nov-12	AMEC 2008	19/08/2009	16-Jul-10	16-Jul-10 Lab Dup	13-Dec-10	2-Sep-11	7-Nov-12		
Anion Sum	me/L	-	4.8	1.14	0.34	-	0.68	0.610	-	3.78	2.69	-	1.53	3.8	0.630	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	118	38	6	-	17	7.6	-	150	117	-	12	159	8.2	1	-
Calculated TDS	mg/L	53	267	62	23	-	63	38.0	145	205	140	-	122	204	39.0	1	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	<	<	<	-	<	<	-	3	<	-	<	<	<	1	-
Cation Sum	me/L	-	4.8	1.05	0.43	-	1.45	0.650	-	3.8	2.54	-	2.4	3.85	0.650	N/A	-
Hardness (CaCO3)	mg/L	21.5	100	41	10	-	29	14	138	170	110	-	70	170	14	1	-
Ion Balance (% Difference)	%	-	0.6	4.11	11.7	-	36.2	3.17	-	0.26	2.87	-	22.1	0.65	1.56	N/A	-
Langelier Index (@ 20C)	N/A	-	-0.4	-1.36	-3.49	-	-3.19	-2.97	-	0.996	-0.099	-	-2.64	0.248	-2.95	N/A	-
Langelier Index (@ 4C)	N/A	-	-0.7	-1.61	-3.74	-	3.44	-3.22	-	0.746	-0.35	-	-2.89	-0.002	-3.20	N/A	-
Nitrate (N)	mg/L	<	<	0.17	<	-	<	0.054	<	<	<	-	2	1.6	0.058	0.05	13
Saturation pH (@ 20C)	N/A	-	7.8	8.62	10.1	-	9.18	9.83	-	7.39	7.69	-	9.01	7.39	9.80	N/A	-
Saturation pH (@ 4C)	N/A	-	8.1	8.87	10.3	-	9.43	10.1	-	7.64	7.94	-	9.26	7.64	10.0	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	24	120	39	39	-	17	7.6	136	150	120	-	120	160	8.2	30	-
Carbonaceous BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-
Dissolved Chloride (Cl)	mg/L	8.9	79	5	6	-	7	12	3.6	4	1	-	23	8	12	1	-
Colour	TCU	-	44	38	49	-	140	67	-	23	39	-	120	32	78	5	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-
Nitrate + Nitrite	mg/L	-	<	0.17	<	-	<	0.054	-	<	<	-	2	1.6	0.058	0.05	-
Nitrite (N)	mg/L	<0.015	<	<	<	-	<	<	<0.015	<	<	-	<	<	<	0.01	0.06
Nitrogen (Ammonia Nitrogen)	mg/L	-	0.1	<	<	-	<	<	-	<	0.19	-	0.06	<	<	0.05	-
Total Organic Carbon (C)	mg/L	9.5	5.7	6	6.4	-	41	7.9	9.2	4.3	5.4	-	18	2.8	7.9	0.5	-
Orthophosphate (P)	mg/L	-	<	<	<	-	<	<	-	<	<	-	<	<	<	0.01	-
pH	pH	6.9	7.4	7.26	6.58	-	5.99	6.86	7.48	8.39	7.59	-	6.37	7.64	6.85	N/A	6.5 - 9
Phenols-4AAP	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-
Reactive Silica (SiO2)	mg/L	-	6.3	1.5	1.5	-	3.5	2.1	-	4	3.1	-	7.4	1.8	2.2	0.5	-
Total Suspended Solids (TSS)	mg/L	-	-	-	-	-	840	-	-	-	-	-	-	160	-	2	-
Dissolved Sulphate (SO4)	mg/L	-	8	11	3	-	-	5.7	-	29	15	-	24	-	5.8	2	-
Sulphide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-
Turbidity	NTU	-	2.9	3.8	2.2	2.1	30	0.72	-	5.2	39	37	140	5.6	0.88	0.1	-
Conductivity	uS/cm	87	470	110	43	-	72	66	275	290	240	-	170	340	67	1	-
Total Oil & Grease	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit **0.0** = above criteria
SW = Surface Water Sample
-= Not analysed/No criteria
< = Parameter below detection limit
< (#) = Parameter below AMEC laboratory detection limit

TABLE D13

HISTORICAL SURFACE WATER ANALYTICAL DATA - METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	SURFACE UP						SURFACE DOWN						RDL	Criteria*
		AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12	AMEC 2008	19-Aug-09	16-Jul-10	13-Dec-10	2-Sep-11	7-Nov-12		
Aluminum (Al)	ug/L	484	18	**108**	**257**	**1,140**	**113**	**42,000**	69	**527**	**5,210**	**941**	**117**	5.0	100(1)
Antimony (Sb)	ug/L	<	<	<	<	-	<	<1	<	<	<	<1	<	1.0	-
Arsenic (As)	ug/L	3	<	<	<	2.50	<	**36**	<	1.1	3.3	2.5	<	1.0	5.0
Barium (Ba)	ug/L	131	26	22.3	9.4	132.0	8.9	426	82	102	289	179	8.6	1.0	-
Beryllium (Be)	ug/L	<0.1	<	<	<	<1	<	1.8	<	<	<	<1	<	1.0	-
Bismuth (Bi)	ug/L	<0.5	<	<	<	<2	<	<0.1	<	<	<	<2	<	2.0	-
Boron (B)	ug/L	-	14	9.4	6.9	<50	<	-	22	27.1	9	<50	<	5	-
Cadmium (Cd)	ug/L	**0.273**	<	**0.028**	**0.04**	**0.066**	<	**2.65**	<	**0.044**	**0.232**	**-**	<	0.017	0.015/0.036(2)
Calcium (Ca)	ug/L	-	-	12900	2960	8230	3,870	-	-	40100	18300	62300	3,890	100	-
Chromium (Cr)	ug/L	1	<	<	<	2.3	<	110	<	<	8	163	<	1	8.9/1.0(3)
Hexavalent Chromium (Cr^{6+})	ug/L						<						<	1	1.00
Cobalt (Co)	ug/L	1	<	<	<	1.9	<	307	<	0.9	6.69	1.98	<	0.4	-
Copper (Cu)	ug/L	8	<	<	<	5.3	<	370	<	**12.7**	**32.9**	**3**	<	2	2(4)
Iron (Fe)	ug/L	**1300**	**1300**	289	**722**	**16700**	**387**	**59000**	**380**	**1820**	**10900**	**4130**	**382**	50	300
Lead (Pb)	ug/L	5	<	<	<	0.5	<	45	<	1.48	**7.64**	**0.69**	<	0.5	1, 2(5)
Magnesium (Mg)	ug/L	-	-	2140	713	100	1,040	-	-	3320	5840	3830	1,050	100	-
Manganese (Mn)	ug/L	1260	230	97.9	142	2	41.2	2620	62	481	427	1760	38.0	2	-
Molybdenum (Mo)	ug/L	2	3.0	<	<	2	<	0.09	<	<	<	<2	<	2	73.00
Nickel (Ni)	ug/L	1	<	<	<	2	<	2	<	3	16.7	-	<	2	25, 65(6)
Phosphorus (P)	ug/L	-	-	<	<	-	<	-	-	120	852	-	<	100	-
Potassium (K)	ug/L	-	-	588	295	100	363	-	-	1080	4060	1030	400	100	-
Selenium (Se)	ug/L	1	<	<	<	1	<	<	<	<	<	<1	<	1	1.0
Silver (Ag)	ug/L	<0.1	<	<	<	0.1	<	0.5	<	<	<	<0.1	<	0.1	0.1
Sodium (Na)	ug/L	-	-	4720	3680	100	7,930	-	-	4300	11500	5820	7,880	100	-
Strontium (Sr)	ug/L	-	90	40.7	9.7	2	13.4	-	110	85.4	49.9	110	13.3	2	-
Thallium (Tl)	ug/L	-	<	<	<	0.1	<	-	<	<	<	<0.1	<	0.1	0.8
Tin (Sn)	ug/L	-	<	<	<	2	<	-	<	<	<	<2	<	2	-
Titanium (Ti)	ug/L	-	<	2.1	7.9	2	3.1	-	2.0	17.2	148	37.2	2.7	2	-
Uranium (U)	ug/L	-	0.2	<	<	0.1	<	-	0.9	0.38	0.38	0.35	<	0.1	-
Vanadium (V)	ug/L	<2	<	<	<	2	<	155	<	<	0.34	2.8	<	2	-
Zinc (Zn)	ug/L	33	<	9.2	10.7	5	<	**443**	<	25.2	**103**	**12.4**	<	5	30
Hardness (CaCO3)	mg/L	21.5	100	41	10	29	14.0	138	170	110	70	170	14.0	1	-
pH	pH	6.9	7.4	7.26	6.58	5.99	6.86	7.48	8.39	7.59	6.37	7.64	6.85	-	6.5 - 9

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).

RDL = Reportable Detection Limit
SW = Surface Water Sample
- = Not analysed/No criteria
< = Parameter below 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 = $10^{[0.86[\log(\text{hardness})]-3.2]}$

(3) Criteria for Chromium (III) = 8.9 ug/L, Criteria for Chromium (VI) = 1.0 ug/L

(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 D14

HISTORICAL LEACHATE ANALYTICAL DATA - BTEX/MTPH
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Sample Location	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Petroleum Hydrocarbons (TPH)				
						TPuH C_6-C_{10}	TExH C_{10}-C_{21}	TExH C_{21}-C_{32}	Modified TPH	Comments
PLCS	Aug 19, 2009	<	<	<	<	<	0.08	0.1	0.2	NR
	Aug 19, 2009[1]	<	<	<	<	<	0.11	0.1	<	NR
	Oct 13, 2009	<	<	<	<	<	0.2	0.1	0.3	WFO
	Jan 26, 2010	<	<	<	<	<	0.09	<	<	WFO
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Jul 16, 2010[1]	-	-	-	-	-	<	<	-	-
	Dec 13, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010[1]	<	<	<	<	<	-	-	-	-
	Sep 02, 2011	<	<	<	<	<	0.05	<	<	-
	Feb 07, 2012	<	<	<	<	<	0.05	<	<	-
	Aug 30, 2012	<	<	<	<	<	<	<	<	-
DUP-04	Aug 30, 2012	<	<	<	<	<	0.173	<	0.18	No resemblance to petroleum products in fuel oil range.
SLCS	2008 (AMEC)	<(0.2)	<(0.2)	<(0.2)	<(0.6)	<(0.05)[2]	<(0.05)[2]	<(0.05)[2]	<(0.15)[2]	-
	Aug 19, 2009	<	<	<	<	<	<	<	<	-
	Oct 13, 2009	<	<	<	<	<	0.14	<	0.1	WFO
	Jan 26, 2010	<	<	<	<	<	0.11	<	0.1	WFO
	Jan 26, 2010[3]	<	<	<	<	<	0.11	<	0.1	WFO
	Jul 16, 2010	<	<	<	<	<	<	<	<	-
	Dec 13, 2010	<	<	<	<	<	0.05	<	<	-
	Sep 02, 2011	<	<	<	<	<	0.05	<	<	-
	Feb 07, 2012	<	<	<	<	<	0.11	<	0.21	One product in fuel/ lube oil range
	Feb 07, 2012 (DUP)	<	<	<	<	<	0.11	<	0.11	One product in fuel/ lube oil range
	Aug 30, 2012	<	<	<	<	<	0.159	<	0.16	No resemblance to petroleum products in fuel oil range.
RDL		0.001	0.001	0.001	0.002	0.01	0.05	0.1	0.1	-
2007 CCME Freshwater Aquatic Life Guidelines [4]		**4.00**	**2.00**	**0.39**	**-**	**-**	**-**	**-**	**-**	**-**
									-	**-**
									-	**-**
Schedule A Water & Sewer Regulations*		-	-	-	-	-	-	-	**15**	-
2012 Tier I Surface Water ESL - Freshwater [5]		**2.10**	**0.77**	**0.32**	**0.33**	**-**	**-**	**-**	**1.5**	**Gasoline**
									0.1	**Diesel /#2 Fuel Oil**
									0.1	**#6 Oil**

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in St. John's, NL.
* Schedule A of Environmental Control Water and Sewer Regulations, 2003.

1. Lab Duplicate
2. Assumed transcript error by factor of 1,000 from Pinchin LeBlanc Environmental Table 2 from March 2010 OMM Report
3. Field Duplicate
4. 2007 CCME Freshwater Aquatic Life Guidelines
5. Atlantic Risk-Based Corrective Action (RBCA) Tier I Surface Water Ecological Screening Level (ESL) Table values for protection of freshwater and marine aquatic life.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04 = Field Duplicate of PLCS

RDL = Reportable Detection Limit
< = Parameter below detection limit
- = Not analysed
0.0 = above criteria

TPuH = Total Purgeable Hydrocarbons
TExH = Total Extractable Hydrocarbons
TPH = Total Petroleum Hydrocarbons
Modified TPH = mTPH = TExH + TPuH
TPH = mTPH + BTEX

G = Gasoline
FO = Fuel Oil
LO = Lube Oil
W = Weathered

TABLE D15

HISTORICAL LEACHATE ANALYTICAL DATA - PAHs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	PLCS									DUP-04	SLCS										RDL	Criteria*	
		19-Aug-09	13-Oct-09	25-Jan-10	25-Jan-10 Lab Dup	16-Jul-10	13-Dec-10	2-Sep-12	7-Feb-12	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	13-Oct-09	25-Jan-10	25-Jan-10 Field Dup	16-Jul-10	13-Dec-10	2-Sep-12	7-Feb-12	30-Aug-12		NL [1]	CCME [2]
1-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<	<	<	0.05	-	-
2-Methylnaphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.03	<	<	<	<	0.22	<	<	<	<	0.05	-	-
Acenaphthene	ug/L	<	0.01	0.01	0.02	<	<	<	0.011	0.041	0.01	<0.04	<	<	0.01	<	<	<	<	<	0.019	0.01	-	580
Acenaphthylene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<	<	0.018	0.01	-	-
Acridine	ug/L	-	-	-	-	<	<	<	<	-	<	-					<	<	<	<	-	0.05		
Anthracene	ug/L	<	0.05	0.06	0.06	<	0.04	<	<	<0.15 (1)	<0.040 (1)	<0.01	<	0.1	0.06	0.06	<	<	<	<	<0.20 (1)	0.01	-	1.2
Benzo(a)anthracene	ug/L	<	0.01	0.02	0.02	<	<	<	<	0.039	0.013	<0.01	<	0.06	0.02	0.03	<	<	<	<	0.064	0.01	-	1.8
Benzo(a)pyrene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.01	<	<	<	<	<	<	<	<	<	0.01	-	1.5
Benzo(b)fluoranthene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.05	<	<	<	<	<	<	<	<	<	0.01	-	-
Benzo(g,h,i)perylene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.03	<	<	<	<	<	<	<	<	<	0.01	-	-
Benzo(j)fluoranthene	ug/L																					0.01	-	-
Benzo(k)fluoranthene	ug/L	<	<	<	<	<	<	<	<	<	<	<0.05	<	<	<	<	<	<	<	<	<	0.01	-	-
Chrysene	ug/L	<	0.04	0.03	0.03	<	0.02	<	<	0.064	0.024	<0.04	<	0.09	0.04	0.04	<	0.01	<	0.013	0.10	0.01	-	-
Dibenz(a,h)anthracene	ug/L	<	<	<	<	<	<	<	<	<	<	-	<	<	<	<	<	<	<	<	<	0.01	-	-
Fluoranthene	ug/L	<	0.05	0.07	0.06	<	0.04	<	0.011	0.18	0.046	<0.03	<	0.26	0.11	0.11	0.01	<	<	0.018	0.37	0.01	-	4
Fluorene	ug/L	<	0.02	0.02	0.02	<	<	<		0.049	0.014	<0.03	<	0.02	<	<	<	<	<	<	0.031	0.01	-	300
Indeno(1,2,3-cd)pyrene	ug/L	<	<	<	<	<	<	<	0.017	<	<	<0.05	<	<	<	<	<	<	<	<	<	0.01	-	-
Naphthalene	ug/L	<	<	<	<	<	<	<	<	<	<	-	<	<	<	<	<	<	<	<	<	0.2	-	110
Perylene	ug/L	<	<	<	<	<	<	<	<	<	<	-	<	<	<	<	<	<	<	<	<	0.01	-	-
Phenanthrene	ug/L	<	0.17	0.23	0.2	<	0.07	<	0.034	<0.020 (1)	<0.060(1)	<0.04	<	0.4	0.13	0.07	0.02	0.01	<	0.012	<0.30 (1)	0.01	-	40
Pyrene	ug/L	<	0.36	0.32	0.29	<	0.17	0.2	0.046	0.85	0.01	<0.01	<	1.5	0.55	0.55	0.06	<	<	0.085	1.8	0.01	-	2.5
Quinoline	ug/L	<	-	-	-	<	<	-	-	-	-	-	-	-	-	-	<	<	-	-	-	0.05	-	-

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
NL = Environmental Control Water and Sewer Regulations, 2003, under the Water Resources Act, Newfoundland and Labrador Regulation 65/03.
CCME = Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007 - Update 7.1).
PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04= Field Duplicate of PLCS
(1) = Elevated PAH RDL(s) due to matrix / co-extractive interference.
RDL = Reportable Detection Limit — **0.0** = above NL criteria
SW = Surface Water Sample — 0.0 = above CCME criteria for surface water
- = Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit

TABLE D16

HISTORICAL LEACHATE ANALYTICAL DATA - PCBs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	PLCS								DUP-04	SLCS									RDL	Criteria*
		19-Aug-09	13-Oct-09	26-Jan-10	16-Jul-10	13-Dec-10	2-Sep-11	7-Feb-12	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	13-Oct-09	26-Jan-10	16-Jul-10	13-Dec-10	2-Sep-11	7-Feb-12	30-Aug-12		
Total PCBs	ug/L	0.16	<	<	<	<	<	<	<	<	<0.04	<	<	<	<	<	<	<	<	0.05	-

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.

* Environmental Control Water and Sewer Regulations, 2003, under the Water Resources Act, Newfoundland and Labrador Regulation 65/03.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04= Field Duplicate of PLCS
RDL = Reportable Detection Limit
SW = Surface Water Sample

< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit
0.0 = above criteria

TABLE D17

HISTORICAL LEACHATE ANALYTICAL DATA - VOCs
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	PLCS								DUP-04	SLCS										RDL	Criteria*
		19-Aug-09	13-Oct-09	26-Jan-10	16-Jul-10	13-Dec-10	2-Sep-11	7-Feb-12	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	13-Oct-09	26-Jan-10	26-Jan-10 Field Dup	16-Jul-10	13-Dec-10	2-Sep-11	7-Feb-12	30-Aug-12		
Benzene	ug/L	<	<	<	<	<	<	<	<	<		<	<	<	<	<	<	<	<	<	1	-
Bromodichloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Bromoform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Bromomethane	ug/L	<	<	<	<	<	<	<(4)	<	<	<	<	<	<	<	<	<	<(4)	<(4)	<	3	-
Carbon Tetrachloride	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Chlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Chloroethane	ug/L	<	<	<	<	<	<	<(10)	<	<	<	<	<	<	<	<	<	<(10)	<(10)	<	8	-
Chloroform	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Chloromethane	ug/L	<	<	<	<	<	<	<(10)	<	<	<	<	<	<	<	<	<	<(10)	<(10)	<	8	-
Dibromochloromethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,2-Dichlorobenzene	ug/L	<	<	<	<	<	<	<(0.7)	<	<	<	<	<	<	<	<	<	<(0.7)	<(0.7)	<	0.5	-
1,3-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,4-Dichlorobenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	2	-
1,2-Dichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1-Dichloroethylene	ug/L	<	<	<	<	<	<	<(0.7)	<	<	<	<	<	<	<	<	<	<(0.7)	<(0.7)	<	0.5	-
cis-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<(3)	<	<	<	<	<	<	<	<	<	<(3)	<(3)	<	2	-
trans-1,2-Dichloroethylene	ug/L	<	<	<	<	<	<	<(3)	<	<	<	<	<	<	<	<	<	<(3)	<(3)	<	2	-
1,2-Dichloropropane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
cis-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<(3)	<	<	<	<	<	<	<	<	<	<(3)	<(3)	<	2	-
trans-1,3-Dichloropropene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Ethylbenzene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Methylene Chloride(Dichloromethane)	ug/L	<	<	<	<	<	<	<(4)	<	<	<	<	<	<	<	<	<	<(4)	<(4)	<	3	-
o-Xylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
p+m-Xylene	ug/L	<	<	<	<	<	<	<(3)	<	<	<	<	<	<	<	<	<	<(3)	<(3)	<	2	-
Styrene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Tetrachloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1,2,2-Tetrachloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Toluene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Trichloroethylene	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1,1-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
1,1,2-Trichloroethane	ug/L	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	1	-
Trichlorofluoromethane (FREON 11)	ug/L	<	<	<	<	<	<	<(10)	<	<	<	<	<	<	<	<	<	<(10)	<(10)	<	8	-
Vinyl Chloride	ug/L	<	<	<	<	<	<	<(0.7)	<	<	<	<	<	<	<	<	<	<(0.7)	<(0.7)	<	0.5	-

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.

* Environmental Control Water and Sewer Regulations, 2003, under the Water Resources Act, Newfoundland and Labrador Regulation 65/03.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04= Field Duplicate of PLCS
RDL = Reportable Detection Limit

- = Not analysed/No criteria
< = Parameter below detection limit
0.0 = above criteria

TABLE D18

HISTORICAL LEACHATE ANALYTICAL DATA - GENERAL CHEMISTRY
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units	PLCS							DUP-04	SLCS											RDL	Criteria*
		19-Aug-09	13-Oct-09	26-Jan-10	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-12	30-Aug-12	AMEC 2008	19-Aug-09	13-Oct-09	26-Jan-10	26-Jan-10 Field Dup	26-Jan-10 Lab Dup	16-Jul-10	16-Jul-10 Lab-Dup	13-Dec-10	2-Sep-11	30-Aug-12		
Anion Sum	me/L	2.30	12.20	12.20	4.86	10.10	4.21	12.5	9.53	-	10.80	13.70	13.60	13.40	-	8.68	-	10.90	6.93	12.3	N/A	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	90	482	453	176	400	167	520	390	-	428	542	532	509	-	315	-	420	267	500	1	-
Calculated TDS	mg/L	133	640	662	263	546	239	624	564	780	598	737	728	716	-	460	-	574	383	647	1	1,000
Carb. Alkalinity (calc. as CaCO3)	mg/L	<	<	<	1	1	1	2.6	2.3	-	<	<	<	<	-	1	-	2	2	2.2	1	-
Cation Sum	me/L	2.30	11.60	11.90	4.47	10.10	4.06	10.7	12.3	-	10.70	13.90	12.90	13.10	-	7.81	-	10.40	6.6	12.0	N/A	-
Hardness (CaCO3)	mg/L	71	510	540	190	190	140	470	530	658	410	580	560	570	-	320	-	320	240	500	1	-
Ion Balance (% Difference)	%	0.40	2.40	1.30	4.18	0.00	1.81	7.94	12.9	-	0.50	0.70	3.70	1.10	-	5.28	-	2.44	2.44	1.07	N/A	-
Langelier Index (@ 20C)	N/A	-0.10	0.60	0.60	0.42	0.86	0.366	1.10	1.11	-	0.60	0.40	0.50	0.60	-	0.67	-	0.99	0.749	1.04	N/A	-
Langelier Index (@ 4C)	N/A	-0.40	0.30	0.30	0.17	0.61	0.116	0.856	0.864	-	0.40	0.20	0.30	0.30	-	0.42	-	0.74	0.5	0.787	N/A	-
Nitrate (N)	mg/L	0.30	<	0.10	0.35	0.28	0.32	0.061	0.41	<0.05	0.10	<	<	<	-	0.35	-	0.10	0.48	0.067	0.05	10
Saturation pH (@ 20C)	N/A	8.00	6.60	6.60	7.40	6.74	7.51	6.63	6.69	-	6.80	6.60	6.60	6.60	-	7.00	-	6.73	7.17	6.63	N/A	-
Saturation pH (@ 4C)	N/A	8.30	6.90	6.90	7.65	6.98	7.76	6.87	6.94	-	7.00	6.80	6.80	6.80	-	7.25	-	6.98	7.42	6.87	N/A	-
Total Alkalinity (Total as CaCO3)	mg/L	91	480	450	180	400	170	530	390	587	430	540	530	510	520	320	-	420	270	510	30.00	-
Carbonaceous BOD	mg/L	-	-	-	<	<	-	-	-	-	-	-	-	-	-	<	<	<	-	-	5.00	20
Dissolved Chloride (Cl)	mg/L	8	40	33	11	29	11	39	31	67	40	54	48	48	47	32	-	43	29	44	1	-
Colour	TCU	31	35	20	15	17	18	10	10	-	17	19	15	15	16	12	-	56	10	12	5	-
Strong Acid Dissoc. Cyanide (CN)	mg/L	-	-	-	<	<	-	<0.0020	-	-	-	-	-	-	-	<	-	<	-	<0.0020	0.002	25
Nitrate + Nitrite	mg/L	0.30	<	0.10	0.37	0.28	0.32	0.061	0.41	-	0.10	<	<	<	-	0.37	-	0.10	0.48	0.067	0.05	-
Nitrite (N)	mg/L	<	<	<	0.03	<	ND	<0.010	<	<0.015	<	<	<	<	-	0.02	-	<	ND	<0.010	0.01	-
Nitrogen (Ammonia Nitrogen)	mg/L	<	0.30	0.40	<	0.10	ND	0.53	0.45	0.43	0.40	0.50	0.50	0.50	-	0.12	0.12	0.26	ND	0.50	0.05	2
Total Organic Carbon (C)	mg/L	4.7	25.0	16.0	6.4	11.0	5.1	16 (1)	20 (5)	25.7	16.0	24.0	19.0	19.0	-	12.0	-	13.0	ND	20 (1)	0.5	-
Orthophosphate (P)	mg/L	<	<	<	<	<	ND	<0.010	<	-	<	<	<	<	-	<	-	<	ND	<0.010	0.01	-
pH	pH	7.90	7.20	7.20	7.82	7.59	7.88	7.73	7.8	6.80	7.40	7.00	7.10	7.10	-	7.67	-	7.72	7.92	7.66	N/A	5.5 - 9.0
Phenols-4AAP	mg/L	-	-	-	0.01	0.003	0.003	0.012	-	-	-	-	-	-	-	0.003	-	<0.01*	0.004	0.014	0.001	0.10
Reactive Silica (SiO2)	mg/L	4.30	16.00	16.00	8.40	13.00	12	17	14	-	19.00	17.00	17.00	18.00	18.00	14.00	-	14.00	19	15	0.5	-
Total Suspended Solids (TSS)	mg/L	-	2	6	11	17	5	9.8	-	**69**	-	**34**	18	16	-	5	-	**33**	**5**	24	2.0	30
Dissolved Sulphate (SO4)	mg/L	11	66	110	47	61	25	43	36	-	54	64	90	88	88	69	-	60	34	44	2.0	-
Sulphide	mg/L	-	-	-	<	<	ND	<0.020	-	-	-	-	-	-	-	<	-	<	ND	0.060	0.02	0.50
Turbidity	NTU	0.4	62.0	6.8	1.6	16.0	0.7	160	12	-	140.0	200.0	77.0	65.0	59.0	6.6	-	17.0	0.9	280	0.1	-
Conductivity	uS/cm	220	1000	1000	440	840	400	1000	820	1250	980	990	1200	1100	-	750	-	900	620	1100	1	-
Total Oil & Grease	mg/L	-	-	-	<	<	-	-	-	-	-	-	-	-	-	<	-	<	-	-	5.00	-
Coliform-Fecal	#/100mL	-	-	-	0	0	-	-	-	-	-	-	-	-	-	0	-	- [1]	-	-	-	1,000/100 mL
Coliform-Total	#/100mL	-	-	-	>80	>80	-	-	-	-	-	-	-	-	-	>80	-	- [1]	-	-	-	5,000/100 mL

Notes:
Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
Coliform analysis completed by Newfoundland and Labrador Government Services in Grand Falls-Windsor, NL
* Environmental Control Water and Sewer Regulations, 2003, under the Water Resources Act, Newfoundland and Labrador Regulation 65/03.
PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04= Field Duplicate of PLCS
RDL = Reportable Detection Limit **0.0** = above criteria
-= Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit

TABLE D19

HISTORICAL LEACHATE ANALYTICAL DATA - TOTAL METALS
2012/13 MONITORING AND MAINTENANCE PROGRAM
COME BY CHANCE SECURE LANDFILL
COME BY CHANCE, NL

Parameter	Units								DUP-04	SLCS									RDL	Criteria*
		19-Aug-09	13-Oct-09	26-Jan-10	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-11	30-Aug-11	AMEC 2008	19-Aug-09	13-Oct-09	26-Jan-10	26-Jan-10 Field Dup	16-Jul-10	13-Dec-10	2-Sep-11	30-Aug-11		
Aluminum (Al)	ug/L	35	<	<	36.8	<	41	14.2	22.2	42	<	100	<	<	23.1	<	23.7	16.3	5	-
Antimony (Sb)	ug/L	<	<	<	<	<	-	<	<	<1	<	<	<	<	<	<	-	<	1	-
Arsenic (As)	ug/L	<	<	<	<	<	-	<	1.0	2	<	<	<	<	<	<	-	1.1	1	500
Barium (Ba)	ug/L	7.0	73	71	13.3	51	11	72.7	85.7	69.8	38	93	68	68	18.9	40	5.3	78.2	1	5,000
Beryllium (Be)	ug/L	<	<	<	<	<	-	<	<	<0.1	<	<	<	<	<	<	-	<	1	-
Bismuth (Bi)	ug/L	<	<	<	<	<	-	<	<	1.1	<	<	<	<	<	<	-	<	2	-
Boron (B)	ug/L	170	7,400	3,400	1,170	2,230	650	1,500	1,890	-	2,800	3,100	2,300	2,400	1,970	1,870	1350	2,500	5	5,000
Cadmium (Cd)	ug/L	<	<	<	<	<	-	<	<	1.3	<	<	<	<	<	<	-	<	0.017	50
Calcium (Ca)	ug/L	-	-	-	58,400	138,000	46,100	140,000	159,000	-	-	-	-	-	90,900	135,000	69700	147,000	100	-
Total Chromium (Cr)	ug/L	<	<	<	<	<	-	<	<	1	<	<	<	<	<	<	63.2	<	1	1,000
Chromium VI	mg/L	-	-	-	<	<	-	-	<	-	-	-	-	-	<	<	-	-	0.001	0.05
Cobalt (Co)	ug/L	<	<	<	<	<	-	<	<	<1	<	<	<	<	0.49	<	-	1.04	0.4	-
Copper (Cu)	ug/L	4.0	<	<	2.50	<	2	<	<	1	<	<	<	<	<	<	-	<	2	300
Iron (Fe)	ug/L	77	4,900	4,000	1,790	3,150	342	5,470	**14,300**	**29,900**	6,800	**19,000**	8,500	8,300	1,320	2,240	-	15,100	50	10,000
Lead (Pb)	ug/L	<	<	<	<	<	-	<	<	6	<	<	<	<	<	<	-	<	5	200
Magnesium (Mg)	ug/L	-	-	-	10,700	24,300	7,070	28,800	32,900	-	-	-	-	-	23,500	27,400	16900	33,200	100	-
Manganese (Mn)	ug/L	7.0	9,100	8,800	1,130	6,240	369	7,270	8,770	11,000	5,400	10,000	8,900	9,000	3,270	5,120	241	8,250	2	-
Mercury (Hg)	ug/L	-	-	<	<	<	-	-	<	-	-	-	<	<	<	<	-	-	0.013	5
Molybdenum (Mo)	ug/L	<	<	<	<	<	-	<	<	2	<	<	<	<	<	<	-	7.20	2	-
Nickel (Ni)	ug/L	<	<	<	<	<	-	<	<	1	<	<	<	<	<	<	-	2.40	2	500
Phosphorus (P)	ug/L	-	-	-	<	<	-	<	<	-	-	-	-	-	<	<	-	<	100	0.5
Potassium (K)	ug/L	-	-	-	7,270	6,530	21,000	5,840	5,800	-	-	-	-	-	<	7,750	28400	8,870.00	100	-
Selenium (Se)	ug/L	<	<	<	<	<	-	<	<	1	<	<	<	<	<	<	-	<	1	10
Silver (Ag)	ug/L	-	-	-	<	<	-	<	<	-	-	-	-	-	<	<	-	<	0.1	50
Sodium (Na)	ug/L	<	<	<	9,880	22,500	14,300	21,100	23,700	0.6	<	<	<	<	21,300	25,500	23100	26,600	100	-
Strontium (Sr)	ug/L	52	360	350	156	289	104	318	362	-	280	440	380	390	282	324	183	369	2	-
Thallium (Tl)	ug/L	<	<	<	<	<	-	<	<	-	<	<	<	<	<	<	-	<	0.1	-
Tin (Sn)	ug/L	<	<	<	<	<	-	<	<	-	<	<	<	<	<	<	-	<	2	-
Titanium (Ti)	ug/L	<	<	<	<	<	-	<	2.00	-	<	<	<	<	<	<	-	<	2	-
Uranium (U)	ug/L	0.1	<	<	0.25	<	0	0.79	0.94	-	0.8	1	2	2	1.11	1	0.71	5.05	1	-
Vanadium (V)	ug/L	<	<	<	<	<	-	<	<	4	<	<	<	<	<	<	-	<	2	-
Zinc (Zn)	ug/L	<	67.0	<	8.10	<	14	<	6.50	7	<	<	<	<	5.20	<	32.2	8.30	50	500

Notes:

Analysis completed by Maxxam Analytics Inc. laboratory in Bedford, NS.
* Environmental Control Water and Sewer Regulations, 2003, under the Water Resources Act, Newfoundland and Labrador Regulation 65/03.

PLCS = Primary Leachate Collection System
SLCS = Secondary Leachate Collection System
DUP-04= Field Duplicate of PLCS
RDL = Reportable Detection Limit **0.0** = above criteria
-= Not analysed/No criteria
< = Parameter below detection limit
<(#) = Parameter below AMEC laboratory detection limit

APPENDIX E

HELP MODEL RESULTS

CONESTOGA-ROVERS & ASSOCIATES

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MEMORANDUM

TO:	Brian Luffman, P.Eng.	REF. NO.:	056680-02
FROM:	David Barton, M.Eng., P.Eng., P.E./mg/1	DATE:	June 11, 2013
RE:	**HELP Model Results – Secure Landfill, Come by Chance, Newfoundland and Labrador**		

INTRODUCTION

The Hydrologic Evaluation of Landfill Performance (HELP) model Version 3.07 (Schroeder, et al., 1994a and 1994b) has been used to evaluate the top and side slopes of the final cover system at the Secure Landfill located in Come by Chance, Newfoundland and Labrador (NL). The evaluations are referred to as "Secure Landfill, Come by Chance, NL – Top Slope" and "Secure Landfill, Come by Chance, NL – Side Slope". Both evaluations have been completed using a combination of Site-specific and default climate data.

The following text discusses the HELP model, model input parameters, surface cover parameters, results, and references.

HELP MODEL

The HELP model was developed specifically to simulate the hydrologic components related to landfill operations. Therefore, the HELP model is well suited for estimating the infiltration rate through the existing final cover system for this Site. The following description of the HELP model, taken directly from Schroeder, *et al.*,(1994a), provides an overview of both the landfill design parameters and hydrologic processes that can be simulated by the model:

"The Hydrologic Evaluation of Landfill Performance (HELP) computer program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills. The model accepts weather, soil and design data and uses solution techniques that account for the effects of surface storage, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical drainage, and leakage through soil, geomembrane or composite liners. Landfill systems including various combinations of vegetation, cover soils, waste cells, lateral drain layers, low permeability barrier soils, and synthetic geomembrane liners may be modeled. The program was developed to conduct water balance analyses of landfills, cover systems, and solid waste disposal and containment facilities. As such, the model facilitates rapid estimation of the amounts of runoff, evapotranspiration, drainage, leachate collection, and liner leakage that may be expected to result from the operation of a wide variety of landfill designs. The primary purpose of the model is to assist in the comparison of design alternatives as judged by their water balances. The model, applicable to open, partially closed, and fully closed sites, is a tool for both designers and permit writers."

The United States Army Corps of Engineers, under endorsement from the United States Environmental Protection Agency (USEPA), developed the HELP model.

MODEL INPUT PARAMETERS

The HELP model requires two generalized groups of input parameters:

- Climate Data
- Soil and Design Data

Climate Data

The HELP model permits manual input of Site-specific climate data or the use of historical climate data as provided by the HELP model defaults for select geographical locations. For the purpose of this evaluation, CRA has used relative humidity data for St. John's, NL, and growing season [i.e., day 171 (Julian Date) through today 274], windspeed, precipitation, and temperature data for Arnold's Cove, NL, as available through Environment Canada's Canadian Climate Normals 1971 – 2000 (Climate Normals and Averages).

HELP model guidance was used to establish reasonable evaporative depths (20 centimetres based on the design details for the Site) and a maximum leaf area index (assumed to be 2.0 for a fair stand of grass).

Default HELP model climate data for Portland, Maine, was used for solar radiation (with an adjustment for latitude to that of the Site) and model coefficients to develop synthetically generated precipitation, temperature, and solar radiation data over a 100 year time frame.

Soil and Design Data

The HELP model allows for either manual input of soil and design data or the use of default soil and design data as provided by the HELP model. The required soil and design data input parameters include soil layer type [i.e., (i) vertical percolation layer; (ii) lateral drainage layer; (iii) barrier soil liner; and (iv) flexible membrane liner], soil layer thickness and texture number, and the length and slope of the lateral drainage layer.

Values that best represent the proposed soil layer type, thickness, length, and slope of the lateral drainage layer were used as input to the HELP model. Where possible, CRA selected HELP model soil layer texture numbers to best reflect the existing final cover system and associated material, including the use of default soil and design data as provided in the HELP model for the soil porosity, field capacity, wilting point, and hydraulic conductivity.

The selected soil layer type, associated texture number, and saturated hydraulic conductivity are as follows:

- Vertical percolation layer (i.e., topsoil layer): HELP Material Texture Number 4; Unified Soil Classification System (USCS) Group Symbol SM (silty sands, sand-silt mixtures, > 12 percent fines); Saturated Hydraulic Conductivity 1.7×10^{-3} centimeters per sec (cm/sec)
- Lateral drainage layer (i.e., Granular Class "A"): HELP Material Texture Number 2; USCS Group Symbol SW (well graded sands, gravelly sands, < 5 percent fines); Saturated Hydraulic Conductivity 5.8×10^{-3} cm/sec
- Barrier soil liner (i.e., glacial till): HELP Material Texture Number 26; USCS Group Symbol CL (inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays); Saturated Hydraulic Conductivity 1.9×10^{-6} cm/sec

- Flexible Membrane Liner (FML) (i.e., 1.5 millimetre textured HDPE geomembrane): HELP Material Texture Number 35; (High Density Polyethylene [HDPE]); Saturated Hydraulic Conductivity 2.0×10^{-13} cm/sec
- Vertical percolation layer (i.e., municipal solid waste): HELP Material Texture Number 18; Unified Soil Classification System (USCS) Group Symbol SM (municipal waste); Saturated Hydraulic Conductivity 1.0×10^{-3} centimeters per sec (cm/sec)

CRA assumed a pinhole density of two holes per hectare (considered by the model to be "typical") and installation defects of eight holes per hectare (considered by the model to be "Fair" installation quality).

A summary of soil and design data for existing final cover system is presented in Table 1.

SURFACE COVER PARAMETERS

The following surface cover parameters were used in the analysis:

- Ground Cover: "Fair Stand of Grass"
- Maximum Leaf Area Index: 2.0 for "Fair Stand of Grass"
- Evaporative Zone Depth: 20 centimetres representing the topsoil layer

A United States Department of Agriculture (USDA) Soil Conservation Service (SCS) runoff curve number of 64.4 and 67.7 for the top slope and side slope, respectively, was computed from a default soil database using HELP Material Texture Number 4, USCS Group Symbol SM (silty sands, sand-silt mixtures, > 12 percent fines). A fair stand of grass, a top slope of 2 percent, a side slope of 25 percent on the slope of the landfill, and a slope length of 11.5 metres and 10.5 metres for the top slope and side slope, respectively, were also assumed to calculate the runoff number.

The HELP model default porosity (0.437), field capacity (0.105), wilting point (0.047), and hydraulic conductivity (1.7 x 10-3 cm/sec) for Texture Number 4 were also used.

RESULTS

The HELP model computed a synthetically generated average annual precipitation of 1,315.6 millimetres, similar to the actual average annual precipitation of 1,319.0 millimetres for Arnold's Cove, NL (1,269.9 millimetres for Come by Chance, NL), as reported by Environment Canada's Canadian Climate Normals 1971 – 2000 (Climate Normals and Averages).

The average annual infiltration percolation / leakage through the final cover system at the Site are estimated to be:

- Top Slope: 3.4 millimetres per hectare per year
- Side Slope: 1.9 millimetres per hectare per year

A summary of the HELP model inputs and results is provided in Table 1. Copies of the HELP model output for each of the top slope and side slope are presented in Attachment A.

REFERENCES

Schroeder, P.R. et al., 1994a. The Hydrologic Evaluation of Landfill Performance (HELP) Model: User's Guide for Version 3; EPA/600/R-94/168a; USEPA, Washington, DC

Schroeder, P.R. et al., 1994b. The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation for Version 3 EPA/600/R-94/168b; USEPA, Washington, DC

TABLE 1

SUMMARY OF HELP MODEL INPUTS AND RESULTS

SECURE LANDFILL

COME BY CHANCE, NL

	Top	*Slope*
Layer 1 - Vertical Percolation		
Material Texture Number	4	4
Effective Saturated Hydraulic Conductivity (cm/s)	1.7×10^{-3}	1.7×10^{-3}
Thickness (centimetres)	20	20
Layer 2 - Lateral Drainage		
Material Texture Number	2	2
Effective Saturated Hydraulic Conductivity (cm/s)	5.8×10^{-3}	5.8×10^{-3}
Thickness (centimetres)	20	20
Layer 3 - Barrier Soil		
Material Texture Number	60	60
Effective Saturated Hydraulic Conductivity (cm/s)	1.9×10^{-6}	1.9×10^{-6}
Thickness (centimetres)	60	60
Layer 4 - Flexible Memrbrane		
Material Texture Number	35	35
Effective Saturated Hydraulic Conductivity (cm/s)	2.0×10^{-13}	2.0×10^{-13}
Thickness (centimetres)	0.15	0.15
Layer 5 - Vertical Percolation		
Material Texture Number	18	18
Effective Saturated Hydraulic Conductivity (cm/s)	1.0×10^{-3}	1.0×10^{-3}
Thickness (centimetres)	30	30
Slope	2%	25%
SCS Curve Number	64.4	67.7
Evaporative Depth Zone (centimetres)	20	20
Annual Averages (millimetres)		
Precipitation	1315.63	1315.63
Runoff	400.12	394.56
Evapotranspiration	438.08	437.80
Lateral Drainage Collected from Layer 2	474.32	481.34
Percolation/Leakage Through Layer 4	3.42	1.87
Average Head on Top of Layer 3	64.17	5.86
Percolation/Leakage Through Layer 5	3.47	1.92
Change in Water Storage	-0.36	0.02

ATTACHMENT A

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**                                                                              **
**                                                                              **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                    **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                              **
**                                                                              **
**********************************************************************************
**********************************************************************************

PRECIPITATION DATA FILE:    C:\HELP\data\056680\SECURE.D4
TEMPERATURE DATA FILE:      C:\HELP\data\056680\SECURE.D7
SOLAR RADIATION DATA FILE:  C:\HELP\data\056680\SECURE.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\data\056680\SECURE.D11
SOIL AND DESIGN DATA FILE:  c:\help\data\056680\SECURE-1.D10
OUTPUT DATA FILE:           C:\HELP\data\056680\SECURE-1.OUT

TIME:  12:38     DATE:   6/11/2013

**********************************************************************************

     TITLE:  SECURE LANDFILL, COME BY CHANCE, NL - TOP SLOPE

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                                  LAYER  1
                                  --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     20.00   CM
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3600 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 2

THICKNESS	=	20.00	CM
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.0620	VOL/VOL
WILTING POINT	=	0.0240	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2510	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.579999993000E-02	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	11.5	METERS

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 26

THICKNESS	=	60.00	CM
POROSITY	=	0.4450	VOL/VOL
FIELD CAPACITY	=	0.3930	VOL/VOL
WILTING POINT	=	0.2770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000003000E-05	CM/SEC

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.15	CM
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	2.00	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	8.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	30.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.1799 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 11. METERS.

SCS RUNOFF CURVE NUMBER	=	64.40	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	20.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	7.199	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.740	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.940	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	44.316	CM
TOTAL INITIAL WATER	=	44.316	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ARNOLD'S COVE NL

STATION LATITUDE	=	47.81	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	171	
END OF GROWING SEASON (JULIAN DATE)	=	274	
EVAPORATIVE ZONE DEPTH	=	20.0	CM
AVERAGE ANNUAL WIND SPEED	=	21.00	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	80.50	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	80.10	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	79.70	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	82.10	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
120.7	107.2	100.6	86.0	92.7	126.2
95.2	103.2	109.2	138.0	128.6	111.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-4.4	-5.1	-2.0	2.3	5.9	9.5
13.8	15.3	12.6	7.9	3.4	-1.5

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE
AND STATION LATITUDE = 47.81 DEGREES

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AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	112.97	109.48	95.30	90.22	94.38	137.99
	94.17	106.86	107.91	125.32	124.78	116.26
STD. DEVIATIONS	49.20	51.05	44.93	39.72	38.54	61.58
	49.90	44.00	52.93	73.74	58.66	51.68
RUNOFF						
TOTALS	28.436	40.726	143.532	141.604	22.053	0.980
	0.074	0.107	0.953	3.038	4.050	14.571
STD. DEVIATIONS	42.555	56.601	93.008	111.573	43.551	4.072
	0.516	0.574	5.946	16.025	20.636	29.785
EVAPOTRANSPIRATION						
TOTALS	11.158	9.017	9.207	18.295	58.130	74.526
	66.037	70.472	52.267	35.282	21.064	12.625
STD. DEVIATIONS	1.898	1.561	2.648	13.535	18.770	19.061
	24.538	20.128	14.828	9.314	4.406	3.961
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	19.4577	4.0444	1.1723	12.3759	48.0531	48.7442
	47.5351	34.6260	43.0692	65.1568	85.1084	64.9798
STD. DEVIATIONS	14.6183	2.9885	2.5173	19.4331	18.3095	30.2469
	29.6510	21.7515	29.0945	41.3039	44.4860	34.0840

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.2938	0.2561	0.2539	0.1472	0.2731	0.3052
	0.3135	0.3049	0.3011	0.3241	0.3273	0.3247
STD. DEVIATIONS	0.0108	0.0083	0.0609	0.0992	0.0700	0.0190
	0.0194	0.0153	0.0186	0.0252	0.0264	0.0214

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.3387	0.3130	0.3131	0.1707	0.2533	0.2906
	0.3040	0.3122	0.2958	0.2946	0.2759	0.3035
STD. DEVIATIONS	0.0542	0.0422	0.0831	0.1136	0.0764	0.0304
	0.0290	0.0244	0.0234	0.0275	0.0266	0.0199

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	3.4680	0.8228	0.2109	2.0230	7.9309	8.1837
	7.7728	5.9022	7.2516	10.0678	13.1436	10.2241
STD. DEVIATIONS	2.3717	0.6106	0.4083	3.0878	2.7026	4.2695
	4.2403	3.3382	4.1800	5.4781	5.9182	4.6480

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	MM		CU. METERS	PERCENT
PRECIPITATION	1315.63	(175.952)	13156.3	100.00
RUNOFF	400.123	(115.5778)	4001.23	30.413
EVAPOTRANSPIRATION	438.081	(49.3480)	4380.81	33.298
LATERAL DRAINAGE COLLECTED FROM LAYER 2	474.32285	(112.03805)	4743.229	36.05286
PERCOLATION/LEAKAGE THROUGH LAYER 4	3.42481	(0.16781)	34.248	0.26032
AVERAGE HEAD ON TOP OF LAYER 3	64.168	(12.934)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	3.46528	(0.38563)	34.653	0.26339
CHANGE IN WATER STORAGE	-0.359	(2.3972)	-3.59	-0.027

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 100

	(MM)	(CU. METERS)
PRECIPITATION	132.10	1321.000
RUNOFF	167.901	1679.0057
DRAINAGE COLLECTED FROM LAYER 2	11.21282	112.12825
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.014939	0.14939
AVERAGE HEAD ON TOP OF LAYER 3	399.995	
MAXIMUM HEAD ON TOP OF LAYER 3	469.628	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	8.2 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.028591	0.28591
SNOW WATER	450.58	4505.7515

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4370
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0470

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(CM)	(VOL/VOL)
1	7.2787	0.3639
2	1.6729	0.0836
3	26.7000	0.4450
4	0.0000	0.0000
5	4.9934	0.1664
SNOW WATER	0.079	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                    **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                    USAE WATERWAYS EXPERIMENT STATION                         **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                              **
**                                                                              **
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PRECIPITATION DATA FILE:    C:\HELP\data\056680\SECURE.D4
TEMPERATURE DATA FILE:      C:\HELP\data\056680\SECURE.D7
SOLAR RADIATION DATA FILE:  C:\HELP\data\056680\SECURE.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\data\056680\SECURE.D11
SOIL AND DESIGN DATA FILE:  c:\help\data\056680\SECURE-2.D10
OUTPUT DATA FILE:           C:\HELP\data\056680\SECURE-2.OUT

TIME:  12:38     DATE:   6/11/2013

**********************************************************************************

     TITLE:  SECURE LANDFILL, COME BY CHANCE, NL - SIDE SLOPE

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                                  LAYER  1
                                  --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     20.00   CM
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3358 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 2

THICKNESS	=	20.00	CM
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.0620	VOL/VOL
WILTING POINT	=	0.0240	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0620	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.579999993000E-02	CM/SEC
SLOPE	=	25.00	PERCENT
DRAINAGE LENGTH	=	10.5	METERS

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 26

THICKNESS	=	60.00	CM
POROSITY	=	0.4450	VOL/VOL
FIELD CAPACITY	=	0.3930	VOL/VOL
WILTING POINT	=	0.2770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000003000E-05	CM/SEC

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.15	CM
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	2.00	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	8.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	30.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.1805 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 10. METERS.

SCS RUNOFF CURVE NUMBER	=	67.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	20.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	6.715	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.740	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.940	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	40.069	CM
TOTAL INITIAL WATER	=	40.069	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ARNOLD'S COVE NL

STATION LATITUDE	=	47.81	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	171	
END OF GROWING SEASON (JULIAN DATE)	=	274	
EVAPORATIVE ZONE DEPTH	=	20.0	CM
AVERAGE ANNUAL WIND SPEED	=	21.00	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	80.50	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	80.10	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	79.70	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	82.10	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (MM)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
120.7	107.2	100.6	86.0	92.7	126.2
95.2	103.2	109.2	138.0	128.6	111.5

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES CELSIUS)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-4.4	-5.1	-2.0	2.3	5.9	9.5
13.8	15.3	12.6	7.9	3.4	-1.5

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE
AND STATION LATITUDE = 47.81 DEGREES

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AVERAGE MONTHLY VALUES (MM) FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	112.97	109.48	95.30	90.22	94.38	137.99
	94.17	106.86	107.91	125.32	124.78	116.26
STD. DEVIATIONS	49.20	51.05	44.93	39.72	38.54	61.58
	49.90	44.00	52.93	73.74	58.66	51.68
RUNOFF						
TOTALS	28.245	40.595	143.303	141.414	22.093	0.844
	0.077	0.204	0.508	1.069	2.124	14.082
STD. DEVIATIONS	42.551	56.634	92.990	111.328	43.569	3.150
	0.372	0.950	1.801	3.014	17.421	29.215
EVAPOTRANSPIRATION						
TOTALS	11.158	9.017	9.197	18.330	58.087	74.570
	65.898	70.406	52.213	35.248	21.054	12.624
STD. DEVIATIONS	1.898	1.561	2.611	13.575	18.718	19.050
	24.566	20.099	14.824	9.274	4.411	3.960
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	1.9324	0.0000	0.6152	30.4938	55.0465	55.2305
	36.8575	34.8326	50.2042	77.0059	94.0546	45.0656
STD. DEVIATIONS	8.1109	0.0000	6.1525	33.6847	30.0939	41.4396
	35.5610	28.7232	40.7396	62.2800	56.6691	42.7756

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0213	0.0000	0.0009	0.0453	0.2104	0.2299
	0.2135	0.2139	0.2189	0.2436	0.2632	0.2079
STD. DEVIATIONS	0.0427	0.0000	0.0091	0.0661	0.0610	0.0516
	0.0602	0.0526	0.0514	0.0612	0.0316	0.0778

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0233	0.0000	0.0008	0.0427	0.2210	0.2440
	0.2333	0.2371	0.2314	0.2384	0.2442	0.2006
STD. DEVIATIONS	0.0426	0.0000	0.0083	0.0627	0.0902	0.0669
	0.0536	0.0542	0.0495	0.0556	0.0361	0.0730

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0278	0.0000	0.0088	0.4526	0.7907	0.8198
	0.5298	0.5003	0.7452	1.1080	1.3964	0.6481
STD. DEVIATIONS	0.1165	0.0000	0.0884	0.5000	0.4323	0.6151
	0.5121	0.4126	0.6047	0.9040	0.8424	0.6172

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 100

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.63 (175.952)	13156.3	100.00
RUNOFF	394.558 (114.4752)	3945.58	29.990
EVAPOTRANSPIRATION	437.803 (49.2129)	4378.03	33.277
LATERAL DRAINAGE COLLECTED FROM LAYER 2	481.33899 (124.13295)	4813.390	36.58615
PERCOLATION/LEAKAGE THROUGH LAYER 4	1.86880 (0.17280)	18.688	0.14205
AVERAGE HEAD ON TOP OF LAYER 3	5.856 (1.510)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	1.91695 (0.35287)	19.169	0.14571
CHANGE IN WATER STORAGE	0.016 (2.4687)	0.16	0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 100

	(MM)	(CU. METERS)
PRECIPITATION	132.10	1321.000
RUNOFF	167.901	1679.0068
DRAINAGE COLLECTED FROM LAYER 2	50.49998	504.99985
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.013014	0.13014
AVERAGE HEAD ON TOP OF LAYER 3	272.586	
MAXIMUM HEAD ON TOP OF LAYER 3	422.223	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	2.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.035406	0.35406
SNOW WATER	450.58	4505.7515

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4346
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0470

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 100

LAYER	(CM)	(VOL/VOL)
1	7.2788	0.3639
2	1.2400	0.0620
3	26.7000	0.4450
4	0.0000	0.0000
5	4.9321	0.1644
SNOW WATER	0.079	

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