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April 10, 2014
File: 121411777.620

Attention: Christa Curnew
Department of Environment and Conservation
P.O. Box 8700
St. John's, NL
A1B 4Y6

Dear Mrs. Curnew,

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

At the request of the Newfoundland and Labrador Department of Environment and Conservation (NLDEC), Aivek-Stantec Limited Partnership (Stantec) carried out monitoring and supervised maintenance activities at the temporary biopile in Hopedale, Newfoundland and Labrador (NL) on behalf of the Newfoundland and Labrador Department of Education. The current work was completed to monitor the effectiveness of the remedial approach and to enhance the *ex-situ* natural attenuation of total petroleum hydrocarbons (TPH) in soil originating from the Old School Site in Hopedale in 2011 (Stantec Report No. 121411820, *Environmental Site Remediation, Old School Site, Hopedale, Labrador*, dated May 8, 2012). The following letter report documents the work carried out at the temporary biopile in 2012 and 2013.

SITE DESCRIPTION

The Inuit Community of Hopedale is located on the Labrador coast, 148 air miles north of Goose Bay, NL and has no outside road access. Coastal boat service is available to the community of approximately 600 people from mid-summer to late fall. The temporary biopile is located approximately 1 km north of the Inuit Community of Hopedale (see Drawing No. 121411777.620BP-EE-01 in Attachment A) and is bordered by the local landfill to the west, a cemetery to the east and undeveloped land to the northeast and south.

The ground surface surrounding the temporary biopile slopes slightly towards the northwest and is covered with grass, shrubs and some trees. A northeast flowing drainage ditch was diverted around the northeast edge of the biopile during construction. The drainage ditch flows through the local landfill and eventually empties into the waters of Black Head Tickle to the northeast. The site layout is shown on Drawing No. 121411777.620BP-EE-02 in Attachment A.

BACKGROUND

In October and November 2011, Stantec supervised the removal of TPH-impacted soil from the Old School Site in the Inuit Community of Hopedale, NL. A total of 5,322 tonnes of TPH-impacted soil with anticipated concentrations of TPH > 1,000 mg/kg was transported to the newly constructed containment cell (*i.e.*, the "temporary biopile") adjacent to the community's landfill

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

for temporary storage and enhanced natural attenuation. Soil consisted primarily of brown to grey silty sand. An additional 810 tonnes of TPH-impacted soil with concentrations of TPH < 1,000 mg/kg was transported to the local landfill for disposal. The new temporary biopile was constructed with black high density polyethylene (HDPE) liners that extend over sand perimeter berms. An old abandoned biopile was dismantled at this location prior to the construction of the new temporary biopile. Soil from two small stained areas in the old biopile was also placed into the new temporary biopile for further treatment.

In October and November, 2011, fertilizer/nutrients were added to the biopile during soil placement. A total of 3,625 kg of urea nitrogen fertilizer (46-0-0) (145 bags) and 350 kg of triple super phosphate fertilizer (0-46-0) (14 bags) were applied to the biopile. Five (5) representative soil samples were collected from the biopile material to document baseline petroleum hydrocarbon concentrations and soil characteristics (*i.e.*, microbial content, nutrient concentrations, soil texture, moisture content, pH, etc.) to determine requirements for soil augmentation. The results of soil sampling indicated that the biopile treatment was anticipated to be effective given the observed baseline soil conditions, however several follow-up activities would be required to ensure successful completion, including monitoring, addition of specified nutrients, irrigation and aeration. Details of the biopile construction, baseline soil sampling and 2011 maintenance activities are provided in Stantec Report No. 121411820, dated May 12, 2012.

Based on the results of baseline soil sampling and the previous environmental investigations conducted at the Old School Site, Stantec provided the following recommendations for the temporary biopile:

1. To ensure successful completion of the biopile, it is recommended that a spring tilling event including fertilizer amendment, irrigation and aeration be conducted in 2012. The spring tilling event should include the following:
    a. Conduct mechanical aeration of the biopile soils by tilling.
    b. Add 150 kg of monocalcium phosphate and 250 kg of potassium to biopile soils to complete the fertilizer amendment.
    c. Add 5,000 L of water to the biopile soils evenly and periodically during treatment as soil is tilled/aerated such that the target moisture content is maintained. Assess soil moisture content with tensiometers.
2. Collect representative soil samples from the biopile in the fall of 2012 for analysis of TPH/BTEX parameters to monitor the effectiveness of the biopile.
3. The biopile temporary approval to construct expires on June 30, 2012. An application seeking permit extension should be submitted to the NLDEC Pollution Prevention Division, as TPH concentrations in soil are not expected to reach the target concentration of 1,000 mg/kg by that time.

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

REGULATORY FRAMEWORK

As per the provincial *Guidelines for Construction and Operation of Facilities using Ex-Situ Bioremediation for the Treatment of Petroleum Contaminated Soil* (GD-PPD013 rev. 4, dated August 2008), "clean soils" are defined as those having concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) parameters below the Canadian Council of Ministers of the Environment (CCME) Canadian Soil Guidelines (CSQGs) for a commercial site and below 1,000 mg/kg for TPH. Landfill facilities in Newfoundland and Labrador typically accept "clean soils" for use as cover material; however, soil acceptance is ultimately at the discretion of the landfill operator. The latest update of the CCME CSQGs was obtained online at http://ceqg-rcqe.ccme.ca/.

2012 MAINTENANCE AND MONITORING ACTIVITIES

Description of Site Work

Site work conducted in 2012 consisted of two (2) rounds of soil sampling and biopile maintenance activities (addition of specified nutrients, mechanical aeration and irrigation). The initial round of soil sampling was conducted prior to soil mixing to determine if the target TPH concentration of 1,000 mg/kg had been achieved in all or a portion of the upper 1.0 m layer of soil. The second round of soil sampling was conducted in the fall to monitor the effectiveness of the remedial approach following one year of augmented natural attenuation.

During the initial round of soil sampling on July 14, 2012, soil samples were collected by Stantec personnel from six (6) test pits spaced evenly throughout the biopile. The July 2012 test pit locations are shown on Drawing No. 121411777.620BP-EE-02 in Attachment A. Soil samples were collected by bulk sample methods from test pits over continuous 0.5 m intervals, up to a depth of 1.0 m. Test pits were excavated using a Case 210 excavator owned and operated by RJG Construction Ltd. The soil samples were collected by Stantec personnel into glass jars with Teflon liners. Slight to strong petroleum hydrocarbon odours were detected on soil at each test pit location, with the exception of 12-BP-TP5. Field observations made at the time of sampling for each individual sample are summarized in Table B.1 in Attachment B. The soil samples were placed on ice in sample coolers and shipped to Maxxam Analytics Inc. in St. John's, NL for analysis of BTEX/TPH. Soil sampling results indicated that the top layer of soil could not be removed at that time.

Biopile maintenance activities, consisting of the addition of specified nutrients and mechanical aeration, were completed on July 20 and 21, 2012 under the supervision of Stantec personnel. A total of four (4) trenches aligned in a north-south orientation were excavated in parallel succession along the length of the biopile. Ten (10) 25 kg bags of potassium sulphate fertilizer (0-0-50, plus 17% sulfur) and eight (8) 25 kg bags of ammonium phosphate fertilizer were added to the impacted soils as follows:

- Trenches were excavated one-at-a-time using a Case 210 excavator owned and operated by RJG Construction Ltd. (Photo 1). Each trench measured approximately 1.0 m wide by 1.5 m deep and ran the entire length of the biopile. The excavated soil was temporarily stockpiled in

a windrow (*i.e.*, a build-up of material stored along the edge of the newly excavated area) adjacent to the trench from which it was excavated. Caution was taken not to damage the underlying liner during the advancement of each trench.

- Approximately ¼ of the potassium sulphate fertilizer and ¼ of the ammonium phosphate fertilizer were added evenly to each trench and windrow of excavated soil. The soil and fertilizer were thoroughly mixed together during backfilling.
- Once backfilling was completed, the excavator was used to level the entire biopile.

Photo 1 Mechanical aeration of biopile.

No water was added to the biopile during maintenance activities because the biopile had not been covered since soil placement in 2011. Therefore, water was added to the soil via snowmelt and rainfall.

The second round of soil sampling was carried out following composite soil sampling protocols outlined in NLDEC's standard Certificate of Authorization (COA) for soil treatment facilities. Sampling was carried out by Stantec personnel on October 20 and 21, 2012 and consisted of the collection of soil samples from fifteen (15) test pits. Test pits were excavated using a Case 210 excavator owned and operated by RJG Construction Ltd. NLDEC standard COAs for soil treatment facilities state that at a minimum, test pits shall be placed approximately 2 m inside the margins of the pile and every 12 m thereafter along the longitudinal axis of the pile. The October 2012 test pit locations are shown on Drawing No. 121411777.620BP-EE-03 in Attachment A. Soil samples were collected from the test pits by bulk sample methods over continuous 0.5 m intervals, to a maximum depth of 1.5 m. The test pits were not extended to the bottom of the biopile (approximately 2.0 m deep) in order to prevent damage to the bottom liner. The soil samples were collected into glass jars with Teflon liners. Slight to strong petroleum hydrocarbon odours were detected on various soil samples (12-BP-TP1A/B/C, 12-BP-TP2A/B, 12-BP-TP3A/B, 12-BP-TP4A, 12-BP-TP5B/C, 12-BP-TP6B/C, 12-BP-TP7A/B, 12-BP-TP8B, 12-BP-TP9A, 12-BP-TP11A/B, 12-BP-TP12A/B/C, 12-BP-TP13A, 12-BP-TP14A and 12-BP-TP13A). Sheening was observed on soil at sampling intervals 12-TP12A and 12-TP15A. Field observations made at the time of sampling are summarized in Table B.1 in Attachment B. The soil samples were placed in sample coolers with ice and shipped to Stantec's office in St. John's, NL for formation of composite samples.

To obtain average petroleum hydrocarbon concentrations within each horizon of the biopile, soil samples from the same depths were combined to form composite samples following the confirmatory sampling protocol provided in NLDEC's standard COA for soil treatment facilities. Two (2) composite samples from the 0.0 to 0.5 m horizon (12-BP-COMP-A1 and 12-BP-COMP-A2), two (2) composite samples from the 0.5 to 1.0 m horizon (12-BP-COMP-B1 and 12-BP-COMP-B2)

and two (2) composite samples from the 1.0 to 1.5 m horizon (12-BP-COMP-C1 and 12-BP-COMP-C2) were submitted to Maxxam Analytics in St. John's, NL for analysis of TPH/BTEX. Table 1 provides a summary of individual soil samples collected from the test pits and composite samples formed from individual samples.

Table 1 Summary of Composite Samples – October 2012

Test Pit	Composite Samples		
	Horizon A: 0.0 - 0.5 mgbs	Horizon B: 0.5 - 1.0 mgbs	Horizon C: 1.0 - 1.5 mgbs
12-BP-TP1	12-BP-COMP-A1 12-BP-COMP-A2	12-BP-COMP-B1 12-BP-COMP-B2	12-BP-COMP-C1 12-BP-COMP-C2
12-BP-TP2			
12-BP-TP3			
12-BP-TP4			
12-BP-TP5			
12-BP-TP6			
12-BP-TP7			
12-BP-TP8			
12-BP-TP9			
12-BP-TP10			
12-BP-TP11			
12-BP-TP12			
12-BP-TP13			-*
12-BP-TP14			-*
12-BP-TP15			-*

Note: mbgs = meters below ground surface
* No horizon C samples collected from 12-BP-TP13 to 12-BP-TP15 because pile was shallower at these locations

The temporary biopile was covered with 40 mil black HDPE liners on October 22, 2012. The liners were overlapped and placed such that they extended over the exterior perimeter berms. Clean sand was placed on top of the liners to secure them in place (as shown in Photo 2).

Photo 2 Biopile cover.

An application seeking biopile permit extension was submitted to the NLDEC Pollution Prevention Division on June 22, 2012. The department issued a temporary approval to operate the temporary biopile/ containment cell in Hopedale on July 11, 2012 (File No. 831.007.001). A copy of the temporary approval letter is included in Attachment C. The temporary approval expires on September 30, 2014.

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

Analytical Results

Results of the laboratory analysis of soil samples for petroleum hydrocarbons (BTEX/TPH) are presented in Table D.1 in Attachment D. The corresponding analytical reports from Maxxam Analytics are presented in Attachment E.

July 2012

Petroleum hydrocarbon analysis was conducted on six (6) soil samples collected from 0.0 to 0.5 m below ground surface (mbgs) (12-BP-TP1A to 12-BP-TP6A) and six (6) soil samples collected from 0.5 to 1.0 mbgs (12-BP-TP1B to 12-BP-TP6B) in July 2012.

TPH was detected in all twelve (12) soil samples at concentrations ranging from 87 mg/kg to 8,400 mg/kg. The Maxxam Analytics analytical reports indicated that petroleum hydrocarbon products impacting the soil samples resembled the fuel oil or weathered fuel oil fractions. The detected concentrations of TPH in seven (7) of the soil samples (12-BP-TP1A/B, 12-BP-TP2B, 12-BP-TP3A/B and 12-BP-TP4A/B) were greater than the typical landfill acceptance limit of 1,000 mg/kg.

Ethylbenzene was detected in sample 12-BP-TP1A and xylenes were detected in samples 12-BP-TP1A and 12-BP-TP3B. The detected concentrations of ethylbenzene and xylenes were below the CCME CSQGs for a commercial site. BTEX parameters were not detected in the remaining soil samples analyzed.

October 2012

Petroleum hydrocarbon analysis was conducted on two (2) composite soil samples collected from 0.0 to 0.5 mbgs (12-BP-COMP A1 and 12-BP-COMP A2), two (2) composite soil samples collected from 0.5 to 1.0 mbgs (12-BP-COMP B1 and 12-BP-COMP B2) and two (2) composite soil samples collected from 1.0 to 1.5 mbgs (12-BP-COMP C1 and 12-BP-COMP C2) in October 2012.

TPH was detected in all six (6) soil samples at concentrations ranging from 1,400 mg/kg to 2,300 mg/kg. The Maxxam Analytics analytical reports indicated that petroleum hydrocarbon products impacting the soil samples resembled the fuel oil fraction. The detected concentrations of TPH in all six (6) of the soil samples (12-BP-COMP A1/2, 12-BP-COMP B1/2 and 12-BP-COMP C1/2) were greater than the typical landfill acceptance limit of 1,000 mg/kg.

Toluene was detected in sample 12-BP-COMP B2 (0.058 mg/kg), ethylbenzene was detected in sample 12-BP-COMP B1 (0.036 mg/kg) and xylenes were detected in samples 12-BP-COMP B1 (0.15 mg/kg) and 12-BP-COMP C1 (0.062 mg/kg). The detected concentrations of ethylbenzene and xylenes were below the CCME CSQGs for a commercial site of 10,000 mg/kg and 110 mg/kg, respectively. BTEX parameters were not detected in the remaining soil samples analyzed.

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

Discussion

Biopile maintenance activities, consisting of the addition of nutrients, mechanical aeration and irrigation were conducted in 2012. Based on the 2012 concentrations of TPH and nutrient levels previously recorded, it was deemed that sufficient nutrients had been added to the biopile. The moisture content values provided in the Maxxam Analytics report for the October 2012 sampling event (11 to 15%) indicated that the target moisture content of approximately 12% had been achieved and that sufficient water had been added to the biopile.

Due to the cold temperatures of the northern community of Hopedale, petroleum hydrocarbon degradation likely only occurred over a period of approximately 4 months during the first year of enhanced bioattenuation. As such, it was anticipated that soil treatment would be complete sometime between October 2013 and October 2014, given the previous estimate of 8 to 12 months of degradation time under ideal conditions. It was recommended that the biopile be re-sampled in 2013 and that mechanical tilling/aeration of biopile soils be conducted at that time. NLDEC retained Stantec and RJG to conduct this additional work in 2013.

2013 MAINTENANCE AND MONITORING ACTIVITIES

Description of Site Work

On August 18, 2013, Stantec conducted confirmatory soil sampling at the temporary biopile to monitor the effectiveness of the remedial approach. When Stantec arrived onsite, two (2) sections of the HDPE cover had been cut out and stolen (Photo 3). The remaining sections of the HDPE cover were manually folded back to expose the soil for sampling.

Photo 3 Damaged cover during August 2013 sampling.

Soil sampling was carried out following composite soil sampling protocols outlined in NLDEC's standard Certificate of Authorization (COA) for soil treatment facilities. Soil samples were collected by Stantec personnel from 15 test pits spaced evenly throughout the temporary biopile in accordance with NLDEC standard COAs for soil treatment facilities. The test pit locations are shown on Drawing No. 121411777.620BP-EE-04 in Attachment A. Test pits were excavated using a Case 210 excavator owned and operated by RJG Construction Ltd.

Soil samples were collected from the test pits by bulk sample methods over continuous 0.5 m intervals, to a maximum depth of 1.5 m. The test pits were not extended to the bottom of the biopile (approximately 2.0 m deep) in order to prevent damage to the bottom liner. Soil samples

were collected by bulk sample methods from test pits over continuous 0.5 m intervals, up to a depth of 1.5 m. Duplicate soil samples were collected at each sample location. The soil samples were visually examined in the field for any evidence of petroleum hydrocarbon impacts. There was no evidence of free liquid phase petroleum hydrocarbons on soil in any of the test pits.

The samples were collected into clean glass jars that were placed on ice in sample coolers and returned to Stantec's temporary storage area in Hopedale for soil vapour testing. Head space soil vapour concentrations were measured in the duplicate sample jars on August 19, 2013 using a MiniRAE 2000 photo ionization detector (PID). The PID readings are presented in Table B.1 in Attachment B along with other field observations. Soil vapour concentrations recorded in the August 2013 samples ranged from 0.0 to 106 ppm. Soil vapour concentrations were not recorded in the 2012 samples. Soil vapour concentrations vary with both fuel type and age, and it should be noted that the readings are intended to provide only a qualitative indication of volatile hydrocarbon levels and are not directly equivalent to soil analytical results. Soil vapour concentrations that exceed 50 ppm may indicate the presence of hydrocarbon or volatile organic compound (VOC) impacts in soil. Slight petroleum hydrocarbon odours were detected in soil samples 13-BP-TP1B, 13-BP-TP2A, 13-BP-TP5B, 13-TP-BP6A/B, 13-TP-BP9B, 13-TP-BP10A/B/C, 13-BP-TP11B, 13-BP-TP14B/C and 13-BP-TP15A/B/C.

To obtain average petroleum hydrocarbon concentrations within each horizon of the biopile, soil samples from the same depths were combined to form composite samples following the confirmatory sampling protocol provided in NLDEC's standard COA for soil treatment facilities. Two (2) composite samples from the 0.0 to 0.5 m horizon (13-BP-COMP-A1 and 13-BP-COMP-A2), two (2) composite samples from the 0.5 to 1.0 m horizon (13-BP-COMP-B1 and 13-BP-COMP-B2) and two (2) composite samples from the 1.0 to 1.5 m horizon (13-BP-COMP-C1 and 13-BP-COMP-C2) were submitted to Maxxam Analytics in St. John's, NL for analysis of TPH/BTEX.

Table 2 provides a summary of individual soil samples collected from the test pits and composite samples formed from individual samples.

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

Table 2 Summary of Composite Samples – August 2013

Test Pit	Horizon A (0.0 – 0.5 mbgs)	Horizon B (0.5 –1.0 mbgs)	Horizon C (1.0 – 1.5 mbgs)
	Composite Sample	Composite Sample	Composite Sample
13-BP-TP1	13-BP-COMP-A1 13-BP-COMP-A2	13-BP-COMP-B1 13-BP-COMP-B2	-*
13-BP-TP2			-*
13-BP-TP3			-*
13-BP-TP4			-*
13-BP-TP5			-*
13-BP-TP6			-*
13-BP-TP7			13-BP-COMP-C1 13-BP-COMP-C2
13-BP-TP8			
13-BP-TP9			-*
13-BP-TP10			13-BP-COMP-C1 13-BP-COMP-C2
13-BP-TP11			
13-BP-TP12			
13-BP-TP13			
13-BP-TP14			
13-BP-TP15			

Note: mbgs = meters below ground surface
* No horizon C samples collected from 13-BP-TP1 to 13-BP-TP6 or 13-BP-TP9 because pile was shallower at these locations

Biopile maintenance, consisting of mechanical aeration, was completed on August 30, 2013. Mechanical aeration was achieved by excavating four (4) trenches aligned in parallel succession along the length of the biopile. Trenches were excavated one-at-a-time using a Case 210 excavator owned and operated by RJG Construction Ltd. Each trench measured approximately 1.0 m wide by 1.5 m deep and ran the entire length of the biopile. The excavated soil was temporarily stockpiled in a windrow (*i.e.*, a build-up of material stored along the edge of the newly excavated area) adjacent to the trench from which it was excavated. Caution was taken not to damage the underlying liner during the advancement of each trench. Soil was then replaced back into the trenches and the biopile was levelled and recovered. The damaged sections of liner were replaced with new 40 mil black HDPE liners. Clean sand was placed on top of the liners to secure them in place.

Four (4) of the drums and the oily pads that were temporarily stored in the corner of the biopile were placed in overpacks and were transported to New Alta for treatment and disposal. The fifth drum was empty and was crushed and transported to the Hopedale landfill for disposal.

Analytical Results

Results of the laboratory analysis of soil samples for petroleum hydrocarbons (BTEX/TPH) are presented in Table D.1 in Attachment D. The corresponding analytical reports from Maxxam Analytics are presented in Attachment E.

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

August 2013

Petroleum hydrocarbon analysis was conducted on two (2) composite soil samples collected from 0.0 to 0.5 mbgs (13-BP-COMP A1 and 13-BP-COMP A2), two (2) composite soil samples collected from 0.5 to 1.0 mbgs (13-BP-COMP B1 and 13-BP-COMP B2) and two (2) composite soil samples collected from 1.0 to 1.5 mbgs (13-BP-COMP C1 and 13-BP-COMP C2) in August 2013. Laboratory analysis was also completed on one (1) laboratory duplicate sample (13-BP-COMP-A1 Lab-Dup).

TPH was detected in all six (6) soil samples at concentrations ranging from 460 mg/kg to 900 mg/kg. The Maxxam Analytics analytical reports indicated that petroleum hydrocarbon products impacting the soil samples resembled the weathered fuel oil fraction. The detected concentrations of TPH in all six (6) of the soil samples (12-BP-COMP A1/2, 12-BP-COMP B1/2 and 12-BP-COMP C1/2) were below than the typical landfill acceptance limit of 1,000 mg/kg.

BTEX parameters were not detected in the soil samples analyzed.

Discussion

Biopile monitoring and maintenance (mechanical aeration) were completed in 2013. The 2013 sampling results indicate that after 22 months of enhanced bioremediation, concentrations of TPH in soil in the temporary biopile were reduced to a level below the typical landfill acceptance limit of 1,000 mg/kg. A summary of TPH concentrations measured in biopile soil since soil placement in 2011 is provided in Table 3.

Table 3 Summary of TPH Concentrations (mg/kg) in Biopile Soil

	TPH Concentration (mg/kg)			
	November 2011	**July 2012**	**October 2012**	**August 2013**
Number of Samples	5 grab samples	12 grab samples (A and B depths only)	6 composite samples	6 composite samples
Minimum	180	87	1,400	460
Maximum	1,700	8,400	2,300	900
Average	964	2,436	1,750	603

RECOMMENDATIONS

Based on the findings of the 2012 and 2013 monitoring programs, Stantec provides the following recommendations:

- Transport the soil from the biopile containment cell to the Hopedale landfill for use as cover material (pending approval from the landfill operator). It is recommended that this task be completed prior to September 30, 2014; otherwise, an application seeking biopile permit extension will need to be submitted to the NLDEC Pollution Prevention Division.

It shall be noted that if the Inuit Community Government of Hopedale wishes to use the soil for any alternate end use, additional treatment and sampling of the soil will be required.

- Once soil is removed from the temporary biopile containment cell, any damage to the bottom liner should be documented, photographed and repaired. The containment cell can then be used by NLDEC to receive additional TPH-impacted soil from the Former U.S. Military Site in Hopedale (i.e., future remediation work to be completed by NLDEC). A biopile permit will be required for future storage and treatment of soil in the temporary biopile.
- Once the containment cell is no longer required, it should be dismantled and the area should be backfilled or levelled to match the surrounding grade.

CLOSURE

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact

Reference: Temporary Biopile Monitoring and Maintenance, Hopedale, NL

location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

This report was prepared by Anna Roy, B.Sc.E., MIT and reviewed by Jim Slade, P.Eng., P.Geo.

Regards,

STANTEC CONSULTING LTD.

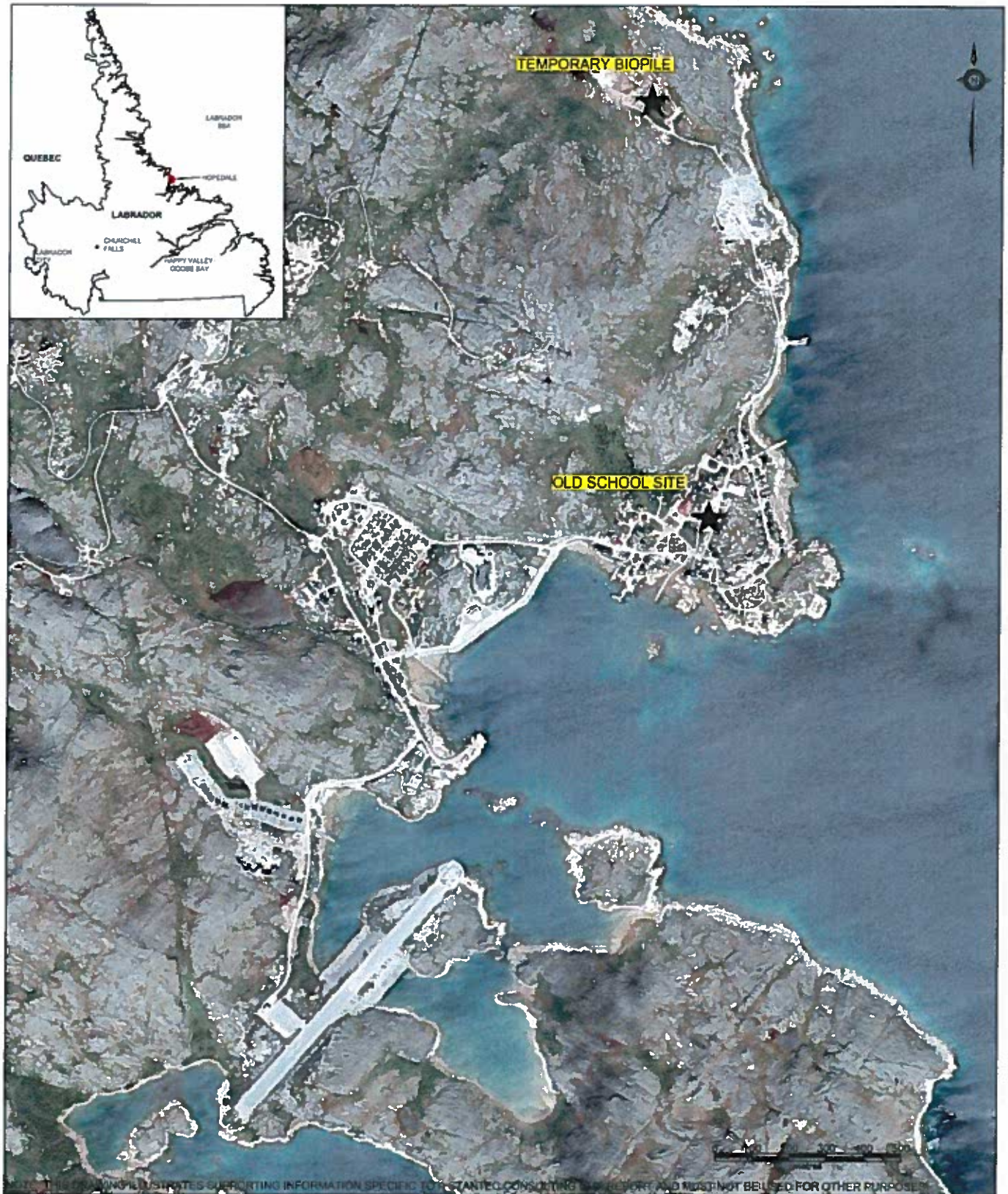
Anna Roy, B.Sc.E., MIT
Environmental Engineer

Jim Slade, P.Eng., P.Geo.
Team Leader – Environmental Remediation

Attachments:
Attachment A: Drawings
Attachment B: Field Observations
Attachment C: Permit
Attachment D: Laboratory Analytical Summary Tables
Attachment E: Maxxam Analytics Reports

ATTACHMENT A

Drawings



CLIENT: NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION	SCALE: 1:14,000	DATE: MAR. 28, 2014	REV No: 0
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DRAWING TITLE: SITE LOCATION PLAN	DRAWING No: 121411777.620-EE-01	CAD FILE: 121411777_620-EE-05.DWG	Stantec

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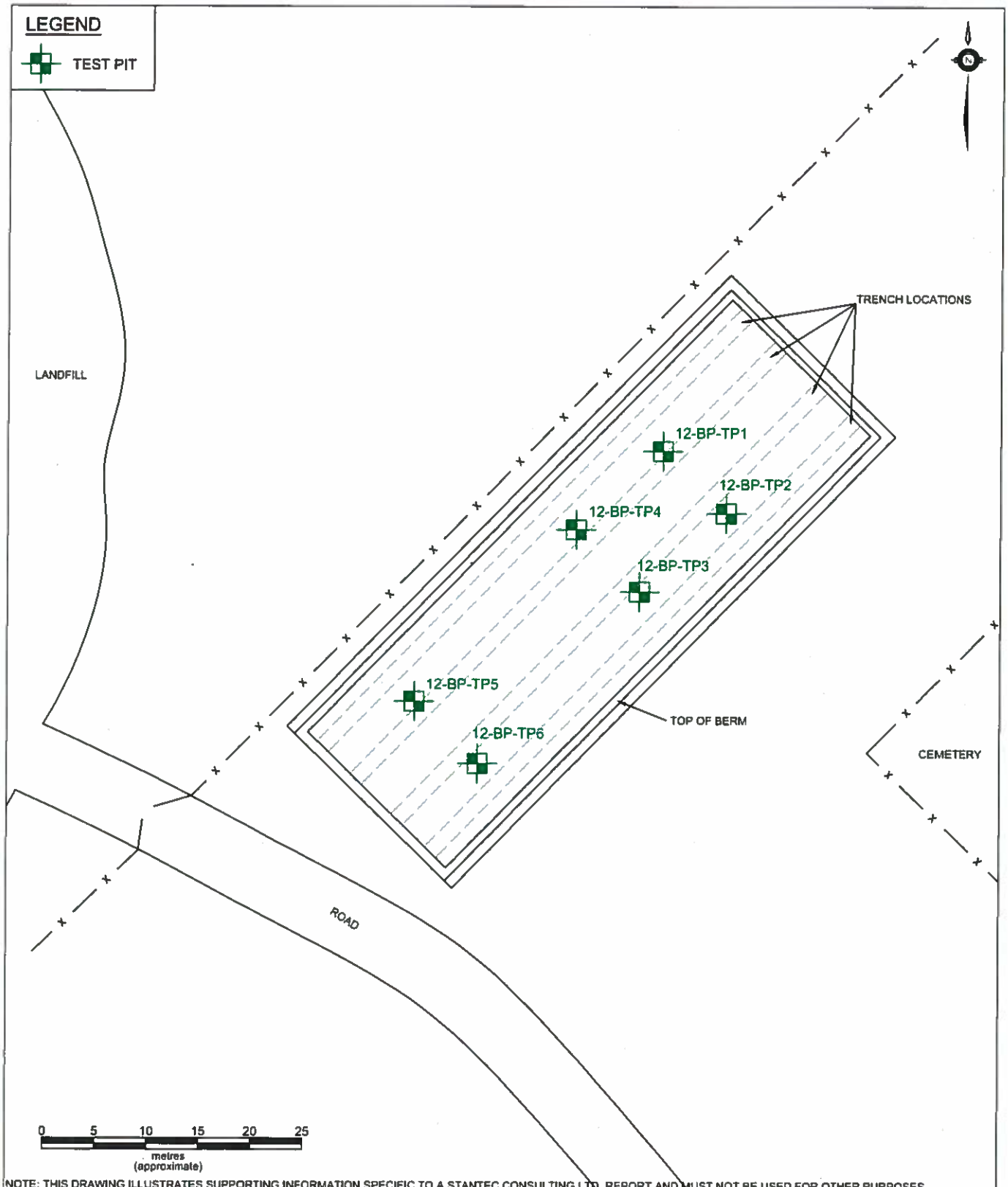
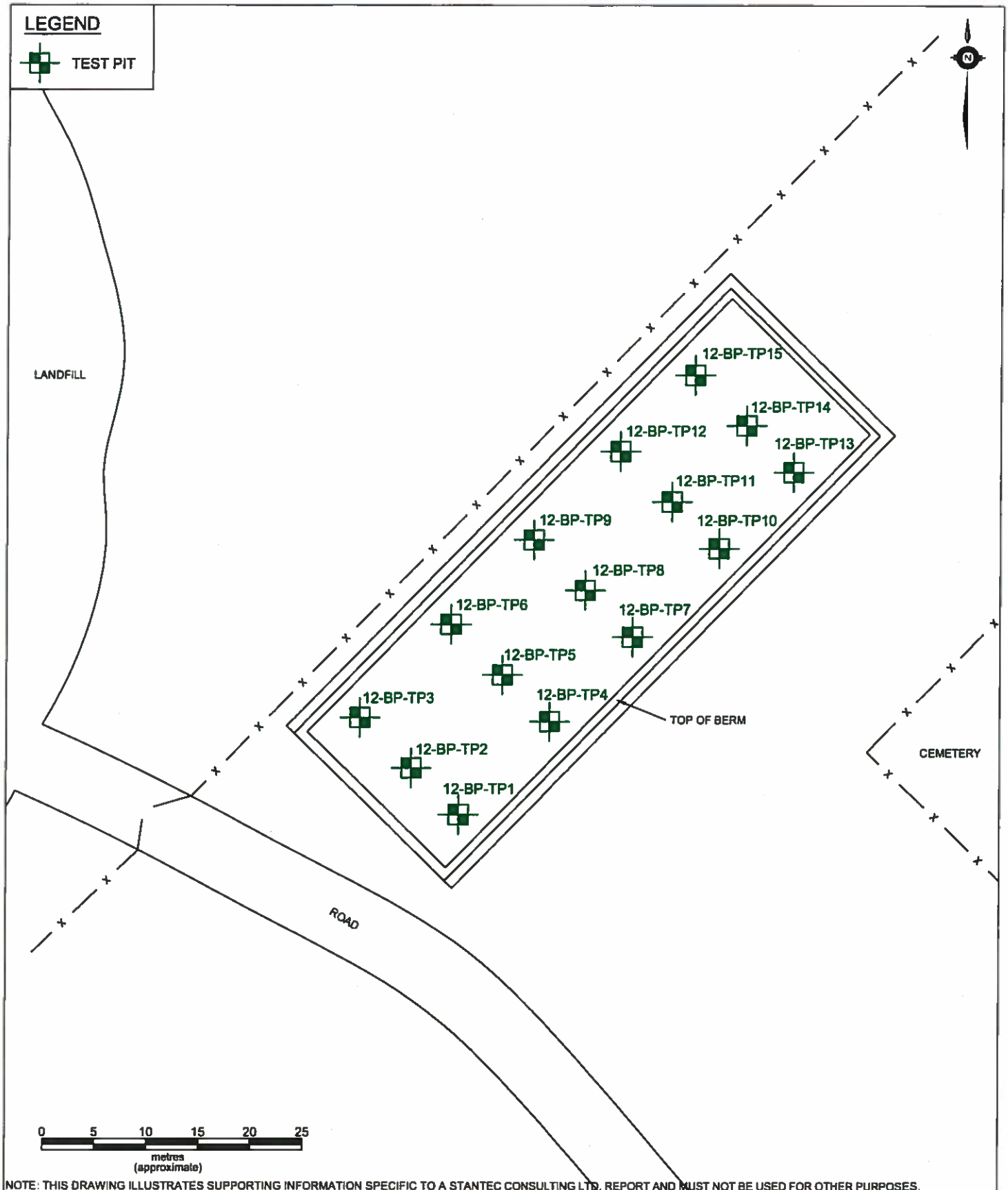


NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT: NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION	SCALE: 1:500 (approx.)	DATE: MAR. 28, 2014	REV. No. 0
	DRAWN BY: N.M.	EDITED BY: S.N.	CHECKED BY:
PROJECT TITLE: TEMPORARY BIOPILE MONITORING AND MAINTENANCE, HOPEDALE, NL	DRAWING No: 121411777.620-EE-02	CAD FILE: 121411777_620-EE-02.DWG	
DRAWING TITLE: TEST PIT LOCATION PLAN - JULY 2012	Stantec		

28MAR14 9:05AM



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT: NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION	SCALE: 1:500 (approx.)	DATE: JAN. 28, 2014	REV. No. 0
	DRAWN BY: N.M.	EDITED BY: -	CHECKED BY: AR
PROJECT TITLE: TEMPORARY BIOPILE MONITORING AND MAINTENANCE, HOPEDALE, NL	DRAWING No: 121411777.620-EE-03	CAD FILE: 121411777_620-EE-03.DWG	
DRAWING TITLE: TEST PIT LOCATION PLAN - OCTOBER 2012	Stantec		

28JAN14 12:00PM

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT: NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT AND CONSERVATION	SCALE: 1:500 (approx.)	DATE: MAR. 28, 2014	REV. No. 0
	DRAWN BY: N.M.	EDITED BY: S.N.	CHECKED BY: AR
PROJECT TITLE: TEMPORARY BIOPILE MONITORING AND MAINTENANCE, HOPEDALE, NL	DRAWING No: 121411777.620-EE-04	CAD FILE: 121411777_620-EE-04.DWG	
DRAWING TITLE: TEST PIT LOCATION PLAN - AUGUST 2013	Stantec		

28MAR14 9:15AM

ATTACHMENT B

Field Observations

Table B.1 - Field Observations
Temporary Biopile Monitoring and Maintenance - 2012 and 2013
Hopedale, NL
Stantec Project No. 121411777.620

Sample ID	Sample Depth (mbgs)	PID Reading (ppm)	Hydrocarbon odour	Apparent Moisture content	Notes
July 2012 Sampling Event					
12-BP-TP1A	0.0 - 0.5	-	2	M	-
12-BP-TP1B	0.5 - 1.0	-	1	M	-
12-BP-TP2A	0.0 - 0.5	-	2	M	-
12-BP-TP2B	0.5 - 1.0	-	0	M	-
12-BP-TP3A	0.0 - 0.5	-	2	M	-
12-BP-TP3B	0.5 - 1.0	-	3	M	-
12-BP-TP4A	0.0 - 0.5	-	2	M	-
12-BP-TP4B	0.5 - 1.0	-	0	M	-
12-BP-TP5A	0.0 - 0.5	-	0	M	-
12-BP-TP5B	0.5 - 1.0	-	0	M	-
12-BP-TP6A	0.0 - 0.5	-	1	M	-
12-BP-TP6B	0.5 - 1.0	-	1	M	-
October 2012 Sampling Event					
12-BP-TP1A	0.0 - 0.5	-	1	D	-
12-BP-TP1B	0.5 - 1.0	-	3	M	-
12-BP-TP1C	1.0 - 1.5	-	2	S	-
12-BP-TP2A	0.0 - 0.5	-	1	D	-
12-BP-TP2B	0.5 - 1.0	-	1	D	-
12-BP-TP2C	1.0 - 1.5	-	0	S	-
12-BP-TP3A	0.0 - 0.5	-	1	D	-
12-BP-TP3B	0.5 - 1.0	-	1	D	-
12-BP-TP3C	1.0 - 1.5	-	0	S	-
12-BP-TP4A	0.0 - 0.5	-	2	D	-
12-BP-TP4B	0.5 - 1.0	-	0	S	-
12-BP-TP4C	1.0 - 1.5	-	0	S	-
12-BP-TP5A	0.0 - 0.5	-	0	D	-
12-BP-TP5B	0.5 - 1.0	-	1	S	-
12-BP-TP5C	1.0 - 1.5	-	2	S	-
12-BP-TP6A	0.0 - 0.5	-	0	D	-
12-BP-TP6B	0.5 - 1.0	-	3	M	-
12-BP-TP6C	1.0 - 1.5	-	1	S	-
12-BP-TP7A	0.0 - 0.5	-	1	D	-
12-BP-TP7B	0.5 - 1.0	-	1	D	-
12-BP-TP7C	1.0 - 1.5	-	0	S	-
12-BP-TP8A	0.0 - 0.5	-	0	D	-
12-BP-TP8B	0.5 - 1.0	-	1	M	-
12-BP-TP8C	1.0 - 1.3	-	0	M	-
12-BP-TP9A	0.0 - 0.5	-	1	D	-
12-BP-TP9B	0.5 - 1.0	-	0	M	-
12-BP-TP9C	1.0 - 1.5	-	0	S	-
12-BP-TP10A	0.0 - 0.5	-	0	D	-
12-BP-TP10B	0.5 - 1.0	-	0	M	-
12-BP-TP10C	1.0 - 1.5	-	0	S	-
12-BP-TP11A	0.0 - 0.5	-	1	M	-
12-BP-TP11B	0.5 - 1.0	-	1	M	-
12-BP-TP11C	1.0 - 1.5	-	0	S	-
12-BP-TP12A	0.0 - 0.5	-	3	M	Sheen
12-BP-TP12B	0.5 - 1.0	-	3	M	-
12-BP-TP12C	1.0 - 1.5	-	1	M	-

Notes:
mbgs = meters below ground surface
PID = photo ionization detector
Hydrocarbon odour: 0 = no odour, 1 = slight odour, 2 = moderate odour, 3 = strong odour
Apparent moisture content: D = dry, M = moist, S = saturated

Table B.1 - Field Observations
Temporary Biopile Monitoring and Maintenance - 2012 and 2013
Hopedale, NL
Stantec Project No. 121411777.620

Sample ID	Sample Depth (mbgs)	PID Reading (ppm)	Hydrocarbon odour	Apparent Moisture content	Notes
October 2012 Sampling Event (...continued)					
12-BP-TP13A	0.0 - 0.5	-	0	S	-
12-BP-TP13B	0.5 - 1.0	-	0	S	-
12-BP-TP14A	0.0 - 0.5	-	1	S	-
12-BP-TP14B	0.5 - 1.0	-	0	S	-
12-BP-TP15A	0.0 - 0.5	-	1	S	Sheen
12-BP-TP15B	0.5 - 1.0	-	0	S	-
August 2013 Sampling Event					
13-BP-TP1A	0.0 - 0.5	5	0	M	-
13-BP-TP1B	0.5 - 1.0	73.2	1	S	-
13-BP-TP2A	0.0 - 0.5	99.4	1	M	-
13-BP-TP2B	0.5 - 1.0	8.6	0	S	-
13-BP-TP3A	0.0 - 0.5	13.5	0	M	-
13-BP-TP3B	0.5 - 1.0	19	0	S	-
13-BP-TP4A	0.0 - 0.5	0	0	M	-
13-BP-TP4B	0.5 - 1.0	31.7	0	S	-
13-BP-TP5A	0.0 - 0.5	0	0	D	-
13-BP-TP5B	0.5 - 1.0	52.4	1	S	-
13-BP-TP6A	0.0 - 0.5	50.8	1	M	-
13-BP-TP6B	0.5 - 1.0	57.9	1	S	-
13-BP-TP7A	0.0 - 0.5	19.7	0	D	-
13-BP-TP7B	0.5 - 1.0	18.5	0	D	-
13-BP-TP7C	1.0 - 1.5	16	0	S	-
13-BP-TP8A	0.0 - 0.5	0	0	D	-
13-BP-TP8B	0.5 - 1.0	18.5	0	D	-
13-BP-TP8C	1.0 - 1.5	25.5	0	S	-
13-BP-TP9A	0.0 - 0.5	5.3	0	D	-
13-BP-TP9B	0.5 - 1.0	42.3	1	S	-
13-BP-TP9C	1.0 - 1.5	-	-	-	-
13-BP-TP10A	0.0 - 0.5	76.4	1	D	-
13-BP-TP10B	0.5 - 1.0	70	1	D	-
13-BP-TP10C	1.0 - 1.5	68.2	1	S	-
13-BP-TP11A	0.0 - 0.5	0	0	D	-
13-BP-TP11B	0.5 - 1.0	51.7	1	S	-
13-BP-TP11C	1.0 - 1.5	106	0	S	-
13-BP-TP12A	0.0 - 0.5	20.5	0	D	-
13-BP-TP12B	0.5 - 1.0	17.6	0	D	-
13-BP-TP12C	1.0 - 1.5	44.2	0	S	-
13-BP-TP13A	0.0 - 0.5	45.6	0	D	-
13-BP-TP13B	0.5 - 1.0	0	0	M	-
13-BP-TP13C	1.0 - 1.5	29	0	W	-
13-BP-TP14A	0.0 - 0.5	0	0	D	-
13-BP-TP14B	0.5 - 1.0	38.1	1	D	-
13-BP-TP14C	1.0 - 1.5	28.7	1	D	-
13-BP-TP15A	0.0 - 0.5	44.6	1	D	-
13-BP-TP15B	0.5 - 1.0	80	1	D	-
13-BP-TP15C	1.0 - 1.5	17.6	1	D	-

Notes:
mbgs = meters below ground surface
PID = photo ionization detector
Hydrocarbon odour: 0 = no odour, 1 = slight odour, 2 = moderate odour, 3 = strong odour
Apparent moisture content: D = dry, M = moist, S = saturated

ATTACHMENT C

Permit

12141177 320-C

JUL 13 2012

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Environment and Conservation
Pollution Prevention Division

File No. 831.007.001

July 11, 2012

Mr. Sean Casey
Government of Newfoundland and Labrador
Department of Education
P.O. Box 8700
St. John's, NL
A1B 4J6

Dear Mr. Casey:

Re: Application to Operate the Temporary Biopile/Containment Cell for Petroleum Contaminated Soil in Hopedale, NL

This is in reference to a request from your consultant (Stantec Consulting Ltd.) to operate the temporary biopile/containment cell for petroleum contaminated soil (PCS) at Hopedale in Labrador as per the outline in the tender document – Remediation of Contaminated Materials, Section 02066 (August, 2011), Construction follow-up documentation, Decommisioning and Land Reclamation Plan and Application for Approval to operate the Temporary Biopile (July, 2012).

The Department of Environment and Conservation has reviewed the documents and hereby approves your application to operate the temporary biopile/containment cell subject to the following conditions:

a.) This temporary approval expires on **September 30, 2014**

b.) The proponent shall operate the temporary PCS treatment facility according to the Guidelines for Construction and Operation of Facilities Using Ex-Situ Bioremediation for the Treatment of Petroleum Contaminated Soil: GD-PPD-013 rev.4. (http://www.env.gov.nl.ca/env/env_protection/waste/guidancedocs/ex_situ_bioremediation.pdf)

c.) All surface run-on from surrounding land shall be diverted away from the temporary biopile/containment cell.

d.) The approval holder shall not release any effluent /runoff/wastewater from the temporary biopile/containment cell into the surrounding watershed unless authorized by the Director.

e.) Any liquid effluent releases from the temporary biopile/ containment cell into the environment shall not exceed the limits for the parameters specified in the table bellow:

Parameters	Sample type	Limit value
pH	Grab	5.5 – 9.0 pH units
TPH	Grab	15 mg/L
Oil and Grease	Visual	No visible sheen
Ammonia nitrogen	Grab	2.0 mg/L
Benzene	Grab	370 µg/L
Toluene	Grab	2 µg/L
Ethylbenzene	Grab	90 µg/L
Xylene	Grab	180 µg/L

f.) Collection and analysis of samples shall be conducted by a contracted commercial laboratory as per the Accredited and Certified Laboratory Policy PD: PP2001-01-02. (http://www.env.gov.nl.ca/env/publications/env_protection/policy_directive_pd_pp.pdf)

g.) Prior to removal of soil from the site, post-treatment compliance sampling shall be conducted followed by laboratory analysis to confirm the following:

- BTEX concentrations are below the industrial limits for soil in the latest edition of the CEQG; and
- TPH concentration is equal to or less than 1000 mg/kg (ppm).

h.) Treated soils shall be disposed of at approved waste disposal sites with the permission of the owner/operator. Reuse of treated soil at any other location is not permitted unless otherwise approved by the Department.

i.) The Director has the authority to require any additional testing when :
- pollutants might be released into the surrounding environment without being detected; and
- an adverse environmental effect may occur;

If you have any questions or comments please contact Roman Krska at (709) 729-4124.

Sincerely yours,

Derrick Maddocks, P. Eng,
Director

Cc: File
Manager of Operations (SNL, Happy Valley-Goose Bay)
Jim Slade (Stantec Consulting Ltd.)

ATTACHMENT D

Laboratory Analytical Summary Tables

Table D.1 Results of Laboratory Analysis of Petroleum Hydrocarbons in Soil
Temporary Biopile Monitoring and Maintenance - 2012 and 2013
Hopedale, NL
Stantec Project No. 121411777.620

Sample ID	Sample Date	Sample Depth (mbgs)	Benzene	Toluene	Ethyl-benzene	Xylenes	C_6-C_{10} (Gas Range)	C_{10}-C_{16} (Fuel Range)	C_{16}-C_{21} (Fuel Range)	C_{21}-C_{32} (Lube Range)	Modified TPH - Tier I[2]	Chromatogram reached baseline at C_{32}[3]	Resemblance
		Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-
		RDL (2011)	0.03	0.03	0.03	0.05	3	10	10	15	20	-	-
		RDL (2012-2013)	0.025	0.025	0.025	0.05	2.5	10	10	15	15		
		Landfill acceptance criteria[1]	2.5	10,000	10,000	110	-	-	-	-	1,000	-	-
2011 Sampling													
11-BIOPILE-BS1	6-Nov-11	grab	nd	nd	nd	nd	14	570	91	nd	670	Yes	WFO
11-BIOPILE-BS2	6-Nov-11	grab	nd	nd	nd	nd	9	1,300	210	38	**1,500**	Yes	FO
11-BIOPILE-BS3	6-Nov-11	grab	nd	nd	nd	nd	48	610	89	23	770	Yes	FO
11-BIOPILE-BS4	6-Nov-11	grab	nd	nd	nd	nd	64	1,400	220	41	**1,700**	Yes	FO
11-BIOPILE-BS5	16-Nov-11	grab	nd	nd	nd	nd	6	140	30	nd	180	Yes	FO
2012 Sampling													
12-BP-TP1A	14-Jul-12	0.0 - 0.5	nd	nd	0.047	0.15	270	2,600	260	47	**3,200**	Yes	FO
12-BP-TP1B	14-Jul-12	0.5 - 1.0	nd	nd	nd	nd	260	3,400	340	58	**4,000**	Yes	FO
12-BP-TP2A	14-Jul-12	0.0 - 0.5	nd	nd	nd	nd	22	710	66	nd	800	Yes	FO
12-BP-TP2B	14-Jul-12	0.5 - 1.0	nd	nd	nd	nd	49	860	120	nd	**1,000**	Yes	FO
12-BP-TP3A	14-Jul-12	0.0 - 0.5	nd	nd	nd	nd	910	6,800	650	84	**8,400**	Yes	FO
12-BP-TP3B	14-Jul-12	0.5 - 1.0	nd	nd	nd	0.16	560	4,100	420	81	**5,200**	Yes	FO
12-BP-TP4A	14-Jul-12	0.0 - 0.5	nd	nd	nd	nd	120	2,300	240	37	**2,700**	Yes	FO
12-BP-TP4B	14-Jul-12	0.5 - 1.0	nd	nd	nd	nd	100	1,400	150	nd	**1,700**	Yes	FO
12-BP-TP5A	14-Jul-12	0.0 - 0.5	nd	nd	nd	nd	21	620	83	22	740	Yes	FO
12-BP-TP5B	14-Jul-12	0.5 - 1.0	nd	nd	nd	nd	30	600	120	nd	750	Yes	WFO
12-BP-TP6A	14-Jul-12	0.0 - 0.5	nd	nd	nd	nd	22	560	60	17	660	Yes	FO
12-BP-TP6B	14-Jul-12	0.5 - 1.0	nd	nd	nd	nd	5	82	nd	nd	87	Yes	WFO
12-BP-COMP A1	21-Oct-12	0.0 - 0.5 (composite)	nd	nd	nd	nd	63	1,500	190	51	**1,800**	Yes	FO
12-BP-COMP A2	21-Oct-12	0.0 - 0.5 (composite)	nd	nd	nd	nd	110	1,100	150	46	**1,400**	Yes	FO
12-BP-COMP B1	21-Oct-12	0.5 - 1.0 (composite)	nd	nd	0.036	0.15	230	1,800	220	45	**2,300**	Yes	FO
12-BP-COMP B2	21-Oct-12	0.5 - 1.0 (composite)	nd	0.058	nd	nd	73	1,200	160	42	**1,400**	Yes	FO
12-BP-COMP C1	21-Oct-12	1.0 - 1.5 (composite)	nd	nd	nd	0.062	120	1,400	170	30	**1,700**	Yes	FO
12-BP-COMP C2	21-Oct-12	1.0 - 1.5 (composite)	nd	nd	nd	nd	140	1,500	200	53	**1,900**	Yes	FO

Notes:

1 Typical landfill acceptance criteria. BTEX acceptance criteria based on Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines (CSQGs) for an Industrial Site (2012) with coarse grained soil and non-potable groundwater
2 Modified TPH = Total petroleum hydrocarbons excluding total BTEX
3 If baseline was not reached at C_{32}, sample may contain carbon fractions >C_{32}
" - " No applicable guideline or does not apply
nd Not detected above standard RDL
RDL Reportable Detection Limit for routine analysis
mbgs Metres below ground surface
Bold / Shaded Concentration exceeds typical landfill acceptance criteria

Resemblence
FO Fuel oil fraction WFO Weathered fuel oil fraction

Table D.1 Results of Laboratory Analysis of Petroleum Hydrocarbons in Soil
Temporary Biopile Monitoring and Maintenance - 2012 and 2013
Hopedale, NL
Stantec Project No. 121411777.620

Sample ID	Sample Date	Sample Depth (mbgs)	Benzene	Toluene	Ethyl-benzene	Xylenes	C_6-C_{10} (Gas Range)	C_{10}-C_{16} (Fuel Range)	C_{16}-C_{21} (Fuel Range)	C_{21}-C_{32} (Lube Range)	Modified TPH - Tier I[2]	Chromatogram reached baseline at C_{32}[3]	Resemblance
		Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-
		RDL (2011)	0.03	0.03	0.03	0.05	3	10	10	15	20	-	-
		RDL (2012-2013)	0.025	0.025	0.025	0.05	2.5	10	10	15	15		
		Landfill acceptance criteria[1]	2.5	10,000	10,000	110	-	-	-	-	1,000	-	-
13-BP-COMP-A1	18-Aug-13	0.0 - 0.5 (composite)	nd	nd	nd	nd	15	420	77	26	540	Yes	WFO
13-BP-COMP-A1 Lab-Dup	18-Aug-13	0.0 - 0.5 (composite)	nd	nd	nd	nd	16	420	77	23	-	Yes	-
13-BP-COMP-A2	18-Aug-13	0.0 - 0.5 (composite)	nd	nd	nd	nd	12	370	71	25	480	Yes	WFO
13-BP-COMP-B1	18-Aug-13	0.5 - 1.0 (composite)	nd	nd	nd	nd	43	720	110	30	900	Yes	WFO
13-BP-COMP-B2	18-Aug-13	0.5 - 1.0 (composite)	nd	nd	nd	nd	32	560	83	25	700	Yes	WFO
13-BP-COMP-C1	18-Aug-13	1.0 - 1.5 (composite)	nd	nd	nd	nd	17	440	67	20	540	Yes	WFO
13-BP-COMP-C2	18-Aug-13	1.0 - 1.5 (composite)	nd	nd	nd	nd	20	370	57	21	460	Yes	WFO

Notes:

1 Typical landfill acceptance criteria. BTEX acceptance criteria based on Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines (CSQGs) for an Industrial Site (2012) with coarse grained soil and non-potable groundwater
2 Modified TPH = Total petroleum hydrocarbons excluding total BTEX
3 If baseline was not reached at C_{32}, sample may contain carbon fractions >C_{32}
" - " No applicable guideline or does not apply
nd Not detected above standard RDL
RDL Reportable Detection Limit for routine analysis
mbgs Metres below ground surface
Bold / Shaded Concentration exceeds typical landfill acceptance criteria

Resemblence
WFO Weathered fuel oil fraction

ATTACHMENT E

Maxxam Analytical Reports

Your P.O. #: 16400NR
Your Project #: 1214-11777.320
Site Location: HOPEDALE-BIOPILE
Your C.O.C. #: ES619312

Attention: Anna Roy
Stantec Consulting Ltd
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/11/05

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2G7691
Received: 2012/10/26, 15:32

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI) (1,2)	4	2012/10/31	2012/11/01	ATL SOP-00197	Based on Atl. PIRI
TEH in Soil (PIRI) (1,2)	2	2012/11/01	2012/11/02	ATL SOP-00197	Based on Atl. PIRI
Moisture	6	N/A	2012/10/30	ATL SOP-00196	MOE Handbook 1983
VPH in Soil (PIRI) (1)	4	2012/10/31	2012/10/31	ATL SOP 00199	Based on Atl. PIRI
VPH in Soil (PIRI) (1)	2	2012/11/01	2012/11/01	ATL SOP 00199	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	4	2012/10/26	2012/11/01		Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	2	2012/10/26	2012/11/02		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.

(1) Reported on a dry weight basis.
(2) Soils are reported on a dry weight basis unless otherwise specified.

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

==========

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 #: B2G7691
Report Date: 2012/11/05

Stantec Consulting Ltd
Client Project #: 1214-11777.320
Site Location: HOPEDALE-BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

RESULTS OF ANALYSES OF SOIL

Maxxam ID		PJ4466	PJ4468	PJ4469	PJ4470	PJ4471	PJ4472		
Sampling Date		2012/10/20	2012/10/20	2012/10/20	2012/10/20	2012/10/20	2012/10/20		
Received Temperature (°C)		7.8	7.8	7.8	7.8	7.8	7.8		
	Units	**12-BP-COMP A1**	**12-BP-COMP A2**	**12-BP-COMP B1**	**12-BP-COMP B2**	**12-BP-COMP C1**	**12-BP-COMP C2**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	11	14	14	12	12	15	1	3018893

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		PJ4466	PJ4468	PJ4469	PJ4470		PJ4471	PJ4472		
Sampling Date		2012/10/20	2012/10/20	2012/10/20	2012/10/20		2012/10/20	2012/10/20		
Received Temperature (°C)		7.8	7.8	7.8	7.8		7.8	7.8		
	Units	**12-BP-COMP A1**	**12-BP-COMP A2**	**12-BP-COMP B1**	**12-BP-COMP B2**	**QC Batch**	**12-BP-COMP C1**	**12-BP-COMP C2**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	3020626	<0.025	<0.025	0.025	3022003
Toluene	mg/kg	<0.025	<0.025	<0.025	0.058	3020626	<0.025	<0.025	0.025	3022003
Ethylbenzene	mg/kg	<0.025	<0.025	0.036	<0.025	3020626	<0.025	<0.025	0.025	3022003
Xylene (Total)	mg/kg	<0.050	<0.050	0.15	<0.050	3020626	0.062	<0.050	0.050	3022003
C6 - C10 (less BTEX)	mg/kg	63	110	230	73	3020626	120	140	2.5	3022003
>C10-C16 Hydrocarbons	mg/kg	1500	1100	1800	1200	3020636	1400	1500	10	3021999
>C16-C21 Hydrocarbons	mg/kg	190	150	220	160	3020636	170	200	10	3021999
>C21-<C32 Hydrocarbons	mg/kg	51	46	45	42	3020636	30	53	15	3021999
Modified TPH (Tier1)	mg/kg	1800	1400	2300	1400	3015326	1700	1900	15	3015326
Reached Baseline at C32	mg/kg	YES	YES	YES	YES	3020636	YES	YES	N/A	3021999
Hydrocarbon Resemblance	mg/kg	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	3020636	SEECOMMENT(1)	SEECOMMENT(1)	N/A	3021999
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	121	115	124	117	3020636	119	120		3021999
Isobutylbenzene - Volatile	%	149(2)	160(2)	162(2)	138	3020626	126	142(2)		3022003
n-Dotriacontane - Extractable	%	110	112	117	113	3020636	113	114		3021999

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Fuel oil fraction.
(2) - Isobutylbenzene recovery not within acceptance limits due to matrix/co-extractive interference.

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Maxxam Job #: B2G7691
Report Date: 2012/11/05

Stantec Consulting Ltd
Client Project #: 1214-11777.320
Site Location: HOPEDALE-BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

GENERAL COMMENTS

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Maxxam Job #: B2G7691
Report Date: 2012/11/05

Stantec Consulting Ltd
Client Project #: 1214-11777.320
Site Location: HOPEDALE-BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

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
3018893	Moisture	2012/10/30							13.3	25
3020626	Isobutylbenzene - Volatile	2012/10/31			104	60 - 140	109	%		
3020626	Benzene	2012/10/31			84	60 - 140	<0.025	mg/kg	NC	50
3020626	Toluene	2012/10/31			86	60 - 140	<0.025	mg/kg	NC	50
3020626	Ethylbenzene	2012/10/31			87	60 - 140	<0.025	mg/kg	NC	50
3020626	Xylene (Total)	2012/10/31			88	60 - 140	<0.050	mg/kg	NC	50
3020626	C6 - C10 (less BTEX)	2012/10/31					<2.5	mg/kg	NC	50
3020636	Isobutylbenzene - Extractable	2012/11/01	96	30 - 130	102	30 - 130	100	%		
3020636	n-Dotriacontane - Extractable	2012/11/01	102	30 - 130	109	30 - 130	100	%		
3020636	>C10-C16 Hydrocarbons	2012/11/01	102	N/A	99	N/A	<10	mg/kg	NC	50
3020636	>C16-C21 Hydrocarbons	2012/11/01	104	N/A	103	N/A	<10	mg/kg	NC	50
3020636	>C21-<C32 Hydrocarbons	2012/11/01	104	30 - 130	115	30 - 130	<15	mg/kg	NC	50
3021999	Isobutylbenzene - Extractable	2012/11/02	TBA	30 - 130	105	30 - 130	98	%		
3021999	n-Dotriacontane - Extractable	2012/11/02	TBA	30 - 130	117	30 - 130	101	%		
3021999	>C10-C16 Hydrocarbons	1899/12/30	TBA	30 - 130	106	30 - 130	<10	mg/kg	TBA	50
3021999	>C16-C21 Hydrocarbons	1899/12/30	TBA	30 - 130	113	30 - 130	<10	mg/kg	TBA	50
3021999	>C21-<C32 Hydrocarbons	1899/12/30	TBA	30 - 130	123	30 - 130	<15	mg/kg	TBA	50
3022003	Isobutylbenzene - Volatile	2012/11/01			117	60 - 140	114	%		
3022003	Benzene	2012/11/01			87	60 - 140	<0.025	mg/kg	NC	50
3022003	Toluene	2012/11/01			87	60 - 140	<0.025	mg/kg	NC	50
3022003	Ethylbenzene	2012/11/01			87	60 - 140	<0.025	mg/kg	NC	50
3022003	Xylene (Total)	2012/11/01			89	60 - 140	<0.050	mg/kg	NC	50
3022003	C6 - C10 (less BTEX)	2012/11/01					<2.5	mg/kg	10.1	50

N/A = Not Applicable
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.
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 #: B2G7691

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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Your P.O. #: 16400NR
Your Project #: 1214-11777.220
Site Location: BIOPILE
Your C.O.C. #: ES570112

Attention: James Slade
Stantec Consulting Ltd
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/07/18

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2A6498
Received: 2012/07/17, 9:30

Sample Matrix: Soil
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI) (1,2)	12	2012/07/17	2012/07/18	ATL SOP-00197	Based on Atl. PIRI
Moisture	12	N/A	2012/07/17	ATL SOP-00196	MOE Handbook 1983
VPH in Soil (PIRI) (1)	12	2012/07/17	2012/07/17	ATL SOP 00199	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	12	2012/07/17	2012/07/18		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.

(1) Reported on a dry weight basis.
(2) Soils are reported on a dry weight basis unless otherwise specified.

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 #: B2A6498
Report Date: 2012/07/18

Stantec Consulting Ltd
Client Project #: 1214-11777.220
Site Location: BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

RESULTS OF ANALYSES OF SOIL

Maxxam ID		OD8841	OD8842	OD8843	OD8844	OD8845	OD8846		
Sampling Date		2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14		
Received Temperature (°C)		18.4	18.4	18.4	18.4	18.4	18.4		
	Units	**12-BP-TP1A**	**12-BP-TP1B**	**12-BP-TP2A**	**12-BP-TP2B**	**12-BP-TP3A**	**12-BP-TP3B**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	14	12	9	14	4	8	1	2910039

Maxxam ID		OD8847	OD8848	OD8849	OD8850	OD8851	OD8852		
Sampling Date		2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14		
Received Temperature (°C)		18.4	18.4	18.4	18.4	18.4	18.4		
	Units	**12-BP-TP4A**	**12-BP-TP4B**	**12-BP-TP5A**	**12-BP-TP5B**	**12-BP-TP6A**	**12-BP-TP6B**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	9	10	9	9	8	10	1	2910039

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2A6498
Report Date: 2012/07/18

Stantec Consulting Ltd
Client Project #: 1214-11777.220
Site Location: BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		OD8841	OD8842	OD8843	OD8844	OD8845	OD8846	OD8847		
Sampling Date		2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14		
Received Temperature (°C)		18.4	18.4	18.4	18.4	18.4	18.4	18.4		
	Units	**12-BP-TP1A**	**12-BP-TP1B**	**12-BP-TP2A**	**12-BP-TP2B**	**12-BP-TP3A**	**12-BP-TP3B**	**12-BP-TP4A**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Ethylbenzene	mg/kg	0.047	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Xylene (Total)	mg/kg	0.15	<0.050	<0.050	<0.050	<0.050	0.16	<0.050	0.050	2910567
C6 - C10 (less BTEX)	mg/kg	270	260	22	49	910	560	120	2.5	2910567
>C10-C16 Hydrocarbons	mg/kg	2600	3400	710	860	6800	4100	2300	10	2910565
>C16-C21 Hydrocarbons	mg/kg	260	340	66	120	650	420	240	10	2910565
>C21-<C32 Hydrocarbons	mg/kg	47	58	<15	<15	84	81	37	15	2910565
Modified TPH (Tier1)	mg/kg	3200	4000	800	1000	8400	5200	2700	15	2910032
Reached Baseline at C32	mg/kg	YES	YES	YES	YES	YES	YES	YES	N/A	2910565
Hydrocarbon Resemblance	mg/kg	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	N/A	2910565
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	132(2)	116	110	109	158(2)	127	132(2)		2910565
Isobutylbenzene - Volatile	%	138	181(3)	150(3)	157(3)	94	102	189(3)		2910567
n-Dotriacontane - Extractable	%	132(4)	133(4)	117	118	139(4)	137(4)	137(4)		2910565

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Fuel oil fraction.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(3) - Isobutylbenzene recovery not within acceptance limits due to matrix/co-extractive interference.
(4) - Isobutylbenzene/n-Dotriacontane recovery(ies) not within acceptance limits due to matrix/co-extractive interference.

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Maxxam Job #: B2A6498
Report Date: 2012/07/18

Stantec Consulting Ltd
Client Project #: 1214-11777.220
Site Location: BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		OD8848	OD8849	OD8850	OD8851	OD8852		
Sampling Date		2012/07/14	2012/07/14	2012/07/14	2012/07/14	2012/07/14		
Received Temperature (°C)		18.4	18.4	18.4	18.4	18.4		
	Units	**12-BP-TP4B**	**12-BP-TP5A**	**12-BP-TP5B**	**12-BP-TP6A**	**12-BP-TP6B**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	2910567
Xylene (Total)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	2910567
C6 - C10 (less BTEX)	mg/kg	100	21	30	22	4.8	2.5	2910567
>C10-C16 Hydrocarbons	mg/kg	1400	620	600	560	82	10	2910565
>C16-C21 Hydrocarbons	mg/kg	150	83	120	60	<10	10	2910565
>C21-<C32 Hydrocarbons	mg/kg	<15	22	<15	17	<15	15	2910565
Modified TPH (Tier1)	mg/kg	1700	740	750	660	87	15	2910032
Reached Baseline at C32	mg/kg	YES	YES	YES	YES	YES	N/A	2910565
Hydrocarbon Resemblance	mg/kg	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(2)	SEECOMMENT(1)	SEECOMMENT(2)	N/A	2910565
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	123	109	105	105	101		2910565
Isobutylbenzene - Volatile	%	157(3)	144(3)	158(3)	141(3)	124		2910567
n-Dotriacontane - Extractable	%	122	115	114	118	109		2910565

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Fuel oil fraction.
(2) - Weathered fuel oil fraction.
(3) - Isobutylbenzene recovery not within acceptance limits due to matrix/co-extractive interference.

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Maxxam Job #: B2A6498
Report Date: 2012/07/18

Stantec Consulting Ltd
Client Project #: 1214-11777.220
Site Location: BIOPILE
Your P.O. #: 16400NR
Sampler Initials: RMP

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
2910039	Moisture	2012/07/17							13.6	25
2910565	Isobutylbenzene - Extractable	2012/07/18	94	30 - 130	104	30 - 130	102	%		
2910565	n-Dotriacontane - Extractable	2012/07/18	118	30 - 130	122	30 - 130	106	%		
2910565	>C10-C16 Hydrocarbons	2012/07/18	NC	30 - 130	86	30 - 130	<10	mg/kg	15.8	50
2910565	>C16-C21 Hydrocarbons	2012/07/18	88	30 - 130	92	30 - 130	<10	mg/kg	14.6	50
2910565	>C21-<C32 Hydrocarbons	2012/07/18	95	30 - 130	99	30 - 130	<15	mg/kg	1.6	50
2910567	Isobutylbenzene - Volatile	2012/07/17			122	60 - 140	118	%		
2910567	Benzene	2012/07/17			93	60 - 140	<0.025	mg/kg	NC	50
2910567	Toluene	2012/07/17			95	60 - 140	<0.025	mg/kg	NC	50
2910567	Ethylbenzene	2012/07/17			93	60 - 140	<0.025	mg/kg	NC	50
2910567	Xylene (Total)	2012/07/17			95	60 - 140	<0.050	mg/kg	26.5	50
2910567	C6 - C10 (less BTEX)	2012/07/17					<2.5	mg/kg	21.6	50

N/A = Not Applicable
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.
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.

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Validation Signature Page

Maxxam Job #: B2A6498

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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Success Through Science®

Your P.O. #: 16300R-20
Your Project #: 121411777.620
Site Location: HOPEDALE
Your C.O.C. #: ES765713

Attention: Anna Roy
Stantec Consulting Ltd
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2013/08/28

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3D8325
Received: 2013/08/21, 12:16

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI) (1,2)	1	2013/08/23	2013/08/26	ATL SOP-00197	Based on Atl. PIRI
TEH in Soil (PIRI) (1,2)	5	2013/08/26	2013/08/27	ATL SOP-00197	Based on Atl. PIRI
Moisture	5	N/A	2013/08/23	ATL SOP-00196	MOE Handbook 1983
Moisture	1	N/A	2013/08/26	ATL SOP-00196	MOE Handbook 1983
VPH in Soil (PIRI) (1)	1	2013/08/23	2013/08/26	ATL SOP 00199	Based on Atl. PIRI
VPH in Soil (PIRI) (1)	5	2013/08/26	2013/08/27	ATL SOP 00199	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil (3)	1	N/A	2013/08/26	N/A	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil (3)	5	N/A	2013/08/27	N/A	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.

(1) Reported on a dry weight basis.
(2) Soils are reported on a dry weight basis unless otherwise specified.
(3) New RDLs in effect due to release of NS Contaminated Sites Regulations. Reduced RDL based on MDL study performance. Low level analytical run checks being implemented.

Encryption Key

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

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

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Total cover pages: 1

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Maxxam Job #: B3D8325
Report Date: 2013/08/28

Stantec Consulting Ltd
Client Project #: 121411777.620
Site Location: HOPEDALE
Your P.O. #: 16300R-20
Sampler Initials: JRS

RESULTS OF ANALYSES OF SOIL

Maxxam ID		SS8444	SS8444	SS8445	SS8446		
Sampling Date		2013/08/18	2013/08/18	2013/08/18	2013/08/18		
Received Temperature (°C)		6.5	6.5	6.5	6.5		
	Units	**13-BP-COMP-A1**	**13-BP-COMP-A1 Lab-Dup**	**13-BP-COMP-A2**	**13-BP-COMP-B1**	**RDL**	**QC Batch**
Inorganics							
Moisture	%	11	11	10	12	1	3325106

Maxxam ID		SS8447	SS8448		SS8449	SS8449		
Sampling Date		2013/08/18	2013/08/18		2013/08/18	2013/08/18		
Received Temperature (°C)		6.5	6.5		6.5	6.5		
	Units	**13-BP-COMP-B2**	**13-BP-COMP-C1**	**QC Batch**	**13-BP-COMP-C2**	**13-BP-COMP-C2 Lab-Dup**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	12	14	3325106	13	13	1	3325556

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3D8325
Report Date: 2013/08/28

Stantec Consulting Ltd
Client Project #: 121411777.620
Site Location: HOPEDALE
Your P.O. #: 16300R-20
Sampler Initials: JRS

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		SS8444	SS8444		SS8445		
Sampling Date		2013/08/18	2013/08/18		2013/08/18		
Received Temperature (°C)		6.5	6.5		6.5		
	Units	**13-BP-COMP-A1**	**13-BP-COMP-A1 Lab-Dup**	**QC Batch**	**13-BP-COMP-A2**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/kg	<0.025	<0.025	3325600	<0.025	0.025	3327603
Toluene	mg/kg	<0.025	<0.025	3325600	<0.025	0.025	3327603
Ethylbenzene	mg/kg	<0.025	<0.025	3325600	<0.025	0.025	3327603
Xylene (Total)	mg/kg	<0.050	<0.050	3325600	<0.050	0.050	3327603
C6 - C10 (less BTEX)	mg/kg	15	16	3325600	12	2.5	3327603
>C10-C16 Hydrocarbons	mg/kg	420	420	3325571	370	10	3327636
>C16-C21 Hydrocarbons	mg/kg	77	77	3325571	71	10	3327636
>C21-<C32 Hydrocarbons	mg/kg	26	23	3325571	25	15	3327636
Modified TPH (Tier1)	mg/kg	540		3321840	480	15	3321840
Reached Baseline at C32	mg/kg	YES	YES	3325571	YES	N/A	3327636
Hydrocarbon Resemblance	mg/kg	SEECOMMENT(1)		3325571	SEECOMMENT(1)	N/A	3327636
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	108	107	3325571	104		3327636
Isobutylbenzene - Volatile	%	121	134	3325600	113		3327603
n-Dotriacontane - Extractable	%	105	104	3325571	101		3327636

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Weathered fuel oil fraction.

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Maxxam Job #: B3D8325
Report Date: 2013/08/28

Stantec Consulting Ltd
Client Project #: 121411777.620
Site Location: HOPEDALE
Your P.O. #: 16300R-20
Sampler Initials: JRS

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		SS8446	SS8447	SS8448	SS8449		
Sampling Date		2013/08/18	2013/08/18	2013/08/18	2013/08/18		
Received Temperature (°C)		6.5	6.5	6.5	6.5		
	Units	**13-BP-COMP-B1**	**13-BP-COMP-B2**	**13-BP-COMP-C1**	**13-BP-COMP-C2**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3327603
Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3327603
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3327603
Xylene (Total)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	3327603
C6 - C10 (less BTEX)	mg/kg	43	32	17	20	2.5	3327603
>C10-C16 Hydrocarbons	mg/kg	720	560	440	370	10	3327636
>C16-C21 Hydrocarbons	mg/kg	110	83	67	57	10	3327636
>C21-<C32 Hydrocarbons	mg/kg	30	25	20	21	15	3327636
Modified TPH (Tier1)	mg/kg	900	700	540	460	15	3321840
Reached Baseline at C32	mg/kg	YES	YES	YES	YES	N/A	3327636
Hydrocarbon Resemblance	mg/kg	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	SEECOMMENT(1)	N/A	3327636
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	115	111	110	108		3327636
Isobutylbenzene - Volatile	%	108	108	114	120		3327603
n-Dotriacontane - Extractable	%	110	102	102	102		3327636

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Weathered fuel oil fraction.

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Stantec Consulting Ltd
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GENERAL COMMENTS

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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
3325106	Moisture	2013/08/23							0	25
3325556	Moisture	2013/08/26							3.1	25
3325571	Isobutylbenzene - Extractable	2013/08/26	107	30 - 130	97	30 - 130	99	%		
3325571	n-Dotriacontane - Extractable	2013/08/26	108	30 - 130	107	30 - 130	101	%		
3325571	>C10-C16 Hydrocarbons	2013/08/26	NC	30 - 130	93	30 - 130	<10	mg/kg	1.1	50
3325571	>C16-C21 Hydrocarbons	2013/08/26	104	30 - 130	101	30 - 130	<10	mg/kg	0.3	50
3325571	>C21-<C32 Hydrocarbons	2013/08/26	84	30 - 130	76	30 - 130	<15	mg/kg	NC	50
3325600	Isobutylbenzene - Volatile	2013/08/26			112	60 - 140	92	%		
3325600	Benzene	2013/08/26			104	60 - 140	<0.025	mg/kg	NC	50
3325600	Toluene	2013/08/26			98	60 - 140	<0.025	mg/kg	NC	50
3325600	Ethylbenzene	2013/08/26			95	60 - 140	<0.025	mg/kg	NC	50
3325600	Xylene (Total)	2013/08/26			102	60 - 140	<0.050	mg/kg	NC	50
3325600	C6 - C10 (less BTEX)	2013/08/26					<2.5	mg/kg	4.5	50
3327603	Isobutylbenzene - Volatile	2013/08/27			102	60 - 140	111	%		
3327603	Benzene	2013/08/27			89	60 - 140	<0.025	mg/kg	NC	50
3327603	Toluene	2013/08/27			80	60 - 140	<0.025	mg/kg	NC	50
3327603	Ethylbenzene	2013/08/27			73	60 - 140	<0.025	mg/kg	NC	50
3327603	Xylene (Total)	2013/08/27			83	60 - 140	<0.050	mg/kg	NC	50
3327603	C6 - C10 (less BTEX)	2013/08/27					<2.5	mg/kg	NC	50
3327636	Isobutylbenzene - Extractable	2013/08/27	93	30 - 130	89	30 - 130	95	%		
3327636	n-Dotriacontane - Extractable	2013/08/27	70	30 - 130	99	30 - 130	96	%		
3327636	>C10-C16 Hydrocarbons	2013/08/27	92	30 - 130	91	30 - 130	<10	mg/kg	NC	50
3327636	>C16-C21 Hydrocarbons	2013/08/27	95	30 - 130	98	30 - 130	<10	mg/kg	NC	50
3327636	>C21-<C32 Hydrocarbons	2013/08/27	NC	30 - 130	93	30 - 130	<15	mg/kg	12.5	50

N/A = Not Applicable
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.
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.

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Validation Signature Page

Maxxam Job #: B3D8325

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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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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