



Supplemental Phase III Environmental Site Assessment

Generator Site Butter Pot Provincial Park, NL

NL Department of Environment and Conservation

1118 Topsail Road PO Box 8353 Station A St. John's NL A1B 3N7 Canada
11111591 | Report No 1 | March 2016

Executive Summary

GHD Limited (GHD) was retained by the Government of Newfoundland and Labrador Department of Environment and Conservation (ENVC) to complete a Supplemental Phase III Environmental Site Assessment (ESA) at the generator site located within Butter Pot Provincial Park, Newfoundland and Labrador (NL) (Site or Property). The Site Location Map is presented in Figure 1.

The objectives of the Supplemental Phase III ESA were to review previous environmental reports, identify data gaps, and conduct additional sampling to the extent that a Remedial Action Plan/Risk Management Plan (RAP/RMP) could be developed to bring the Site to closure. The Supplemental Phase III ESA was completed between December 15 and 18, 2015, and consisted of the excavation of six test pits (15-TP1 to 15-TP6), groundwater sampling from all accessible on-Site monitoring wells, and the installation and sampling of one soil vapour probe (SV1) in the area of the generator shed. Based on anticipated future land use, the property is classified by the 2012 (updated 2015) Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Level (RBSL) Table values as a commercial site with potable groundwater and coarse-grained soil. In addition, analytical data was also compared to Atlantic RBCA Tier I Ecological Screening Level (ESL) benchmarks.

A total of nine soil samples, including one field duplicate, were submitted to Maxxam for BTEX/mTPH analyses. The analytical results for all nine soil samples reported BTEX/mTPH concentrations below the Atlantic RBCA Tier I RBSL and ESL Table values for a commercial site with potable groundwater and coarse-grained soil.

Three groundwater samples, plus one field duplicate for MW-2, were submitted to Maxxam for BTEX/mTPH analyses. It is noted that MW-1 was not located due to regrading of the gravel parking area and; therefore, was not sampled. All samples reported BTEX/mTPH concentrations below the 2015 Tier I RBSL and ESLs for the Site characteristics. No free product or sheening was noted in the monitor wells during the sampling/gauging program.

It is estimated that approximately 800 tonnes (i.e., 265 m² x 1.5 m assumed thickness) of soil with concentrations above the 2015 Tier I RBSL Table values and Tier I ESLs for the Site characteristics is located within the area of the generator shed.

One soil vapour probe (SV1) was installed in the area of the highest historical petroleum hydrocarbon concentration (i.e. TP-4 located at the rear of the generator shed) to assess soil vapour conditions at the Site. The soil vapour probe was installed to sample soil vapour conditions for the assessment of human health risks associated with impacted soils on the Site and the risk of soil volatilization to indoor air for the adjacent commercial buildings. The soil vapour sample collected from SV1 was submitted to Maxxam for BTEX, and aromatic and aliphatic TPH sub fraction analyses. The analytical results of the soil vapour test were used to predict indoor air concentrations based on dilution factors and toxicity information provided in the Atlantic RBCA Version 2.0 User Guidance for Petroleum Impacted Sites in Atlantic Canada. The dilution factor is dependent on the distance from the vapour probe to the structure.

Given the soil vapour probes proximity to the surrounding buildings, and the fact that all buildings were constructed with wood floor and no concrete slab, a dilution factor of 1 was used for the

analysis. For comparison purposes and for resolutions to potential exceedances, a dilution factor of 50 for sub-slab was also used for the analysis.

Using no dilution factor, Benzene, Xylene, Aromatic C₈-C₁₀, and Aliphatic C₈-C₁₀ and C₁₂-C₁₆ hazard quotient levels were found to be above acceptable levels for a commercial building located in the immediate vicinity of the sampling location. In addition, the benzene risk was calculated to be 4.6×10^{-5} compared to an acceptable level of 1.0×10^{-5} . Using a dilution factor of 50 for sub-slab, soil vapour levels were determined to be within acceptable levels for a commercial building located in the immediate vicinity of the sampling location.

An evaluation of potential ecological receptors was completed using a Summary Table from Appendix 2 of the Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance dated July 2012 (updated January 2015). Ecological receptors (Provincial Park, forested habitats, Trailer Pond) were identified within 200 metres of the Site. The waters of Trailer Pond are located approximately 180 metres west of the Site. The results indicated further ecological assessment is not required.

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1. Introduction

GHD Limited (GHD) was retained by the Government of Newfoundland and Labrador Department of Environment and Conservation (ENVC) to complete a Supplemental Phase III Environmental Site Assessment (ESA) at the generator site located within Butter Pot Provincial Park (Park), Newfoundland and Labrador (NL) (Site or Property). The Site Location Map is presented in Figure 1.

Butter Pot Provincial Park is located approximately 36 km southwest of St. John's, NL along the Trans-Canada Highway (See Figure 1). The Park covers an area of 2,833 hectares and contains 175 campsites and related parking, picnic, and swimming areas that are used by the public for recreational purposes. The Site is located approximately 1.6 km southeast of the main campsite area, east of Trailer Pond, in the vicinity of the Park office (See Figure 2). The Site includes four buildings – a warm-up building, a workshop, a storage shed and a generator shed. The Site also includes one steel diesel fuel aboveground storage tank (AST), and one propane AST (see Figure 3).

The findings from environmental investigations and remediation programs undertaken at the Site by others since 2009 have identified petroleum hydrocarbon (PHC) impacts in the soil in the area surrounding the generator shed. The source of the PHC impacts are reportedly related to historic spills/releases of diesel fuel and/or waste oils.

The objectives of the Supplemental Phase III ESA were to review previous environmental reports, identify data gaps, and conduct additional sampling to the extent that a Remedial Action Plan/Risk Management Plan (RAP/RMP) could be developed to bring this Site to closure. The Supplemental Phase III ESA was completed between December 15 and 18, 2015, and consisted of the excavation of six test pits (15-TP1 to 15-TP6), groundwater sampling from four existing on-Site monitoring wells, and the installation and sampling of one soil vapour probe (SV1) in the area of the generator shed.

The Supplemental Phase III ESA report details the activities and findings of the soil, groundwater, and soil vapour sampling program.

2. Background

2.1 Spill History

Based on the ENVC Request for Proposal (RFP), in May 2009 a portable diesel generator was rented for use at the Park for the Victoria Day holiday weekend. The portable generator, supplied by United Rentals, was reportedly placed near the generator shed and was connected to the on-Site diesel fuel AST. On May 18, 2009, Park staff discovered a release of approximately 100 to 150 litres of diesel fuel from the generator onto the ground surface. Upon inspection, a crack in the generator fuel filter was identified as the source of the diesel fuel spill. Initial spill response measures reportedly included attempts by Park staff to absorb and contain the spilled diesel fuel using absorbents (i.e. paper, sawdust, spill kit absorbent) and hand excavation of the surface soil within the spill area.

Although no other reportable spills/releases at the Site were identified in the RFP, based on a review of previous environmental reports, and discussions with Park personnel, GHD understands that historic (i.e., pre 2009) PHC impacts in soil are present in the area of the generator shed and may be attributable to the past practice of handling and disposing of waste oil in this area of the Site.

2.2 Previous Environmental Reports

Several environmental investigations have been completed at the Site by other consultants, including a Phase II ESA, a Spill Remediation Program which included the removal, transportation and disposal of approximately 90 metric tonnes of PHC impacted soil related to the May 2009 spill, a Subsurface Assessment to evaluate the extent of PHC impacts related to other historical spill events, and most recently a Phase III ESA. The following provides a summary of the previous work completed at the Site.

2.2.1 Phase II ESA – March 2009

A Phase II ESA was conducted by ADI Limited (ADI) in March 2009 which involved the excavation of four test pits and associated soil sampling at locations of potential environmental concern, as determined by surface soil staining in areas adjacent to the existing diesel generator and AST (see test pit locations on Figure 3). Based on the soil analytical results, one or more benzene, toluene, ethylbenzene, and xylene (BTEX) components were detected in four of the seven soil samples analyzed at concentrations that exceeded the applicable criteria of the time. Modified total petroleum hydrocarbons (mTPH) were also detected in four of the seven soil samples analyzed at concentrations that exceeded applicable criteria. Based on the findings of the investigation, ADI recommended further assessment at the Site to further delineate the extent of PHC contamination in soils/groundwater and to develop a remedial action plan for the Site. Additional details are provided in the report entitled: “*Phase II Environmental Site Assessment, Diesel Generator Site – Butter Pot Provincial Park, Trans Canada Highway, NL*” by ADI Limited dated April 2009.

2.2.2 Spill Remediation – May 2009

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), was retained by Environmental Management Inc. (EMI), on behalf of United Rentals, in May 2009 to conduct a soil remediation program in response to the reported diesel generator spill in the area of the generator shed. During the inspection, an area of surface staining, measuring approximately 7 metres (m) long by 3 m wide, was observed on the north side of the generator shed, near the United Rentals generator. Strong PHC odours were noted within the general area of the spill. Surface staining was also observed to the south of the generator shed within a shallow trench and on the south exterior wall of the shed. According to the Park Manager, the shallow trench was excavated in the fall of 2008 for the purpose of installing electrical cables to the storage shed to the southeast. The surface staining in the trench was reportedly identified at that time and the electrical cable installation was not completed. The Park Manager indicated that the surface staining observed on the south side of the generator shed may have been the result of past practices of handling and dumping of waste oil from the Park generator in this area.

Based on the AMEC report, the Site remediation program included the excavation, removal, transportation and off-Site disposal of PHC impacted soil resulting from the May 2009 diesel fuel spill. PHC impacted soils were excavated from the diesel generator spill area down to bedrock at depths ranging from approximately 1.4 metres below ground surface (mbgs) to 2.0 mbgs on May

22, 2009 using a track-mounted excavator. Approximately 90 metric tonnes of PHC impacted soil was excavated and transported to Newfoundland Soiltec Inc. for treatment and disposal. Following the excavation and removal of PHC impacted soil from the Site, soil samples were collected from the excavation area. A total of nine soil samples were collected from the upper and lower portion of the walls and from the floor of the remedial excavation. One soil sample was also collected from the shallow trench on the south side of the generator shed.

Based on the reported quantity of diesel fuel that had been released from the United Rentals generator, and the findings from the preliminary (i.e., ADI 2009) Site inspection which revealed other areas of pre-existing surface staining on-Site (i.e. south side of generator shed), it was reportedly agreed that no further assessment and/or remediation was required by United Rentals. As a result, the remedial area was backfilled with clean imported fill. Review of the letter report indicates that no confirmatory soil samples were analyzed. Additional details are provided in the letter report entitled: "*Soil Remediation – Final Report, United Rentals Diesel Generator Spill, Butter Pot provincial Park, Trans Canada Highway, NL*" by AMEC, dated July 9, 2009.

2.2.3 Subsurface Assessment – September 2011

CBCL Limited (CBCL) conducted a Sub-Surface Soil Assessment in September 2011 to evaluate the extent of PHC impacts at the Site related to historical spill events. A summary of the conclusions and recommendations of the investigation is provided below:

- A total of 12 test pits (TP-1 to TP-12) were excavated in the vicinity of the generator shed and workshop building (See Figure 3). Test pits were terminated at depths ranging from 0.5 to 1.95 mbgs based on bedrock refusal.
- Groundwater was not encountered during test pit activities.
- Measured organic vapour concentrations in the soil samples collected from the test pits ranged from 0 ppm to 420 ppm.
- Two selected soil samples from each test pit were submitted for BTEX and modified TPH analysis.

Soil analytical results from the test pits revealed elevated BTEX concentrations in three of the 12 test pits (TP-3, TP-4 and TP-6) exceeding the applicable criteria of the time. Elevated modified TPH concentrations were also detected in four of the 12 test pits (TP-3, TP-4, TP-5 and TP-6) exceeding the applicable criteria of the time period. Elevated modified TPH concentrations ranged from 10,000 mg/kg in TP-4 and TP-5 to 54,000 mg/kg in TP-4. Based on the results of the investigation, CBCL recommended the following:

- Drill four monitoring wells to further assess and delineate petroleum impacts in groundwater and to determine if identified petroleum hydrocarbon impacts have impacted the groundwater.
- Conduct additional borehole activities to the southeast and southwest of the generator shed to delineate the identified hydrocarbon impacts vertically and horizontally.
- Collect potable water sample for laboratory analysis.

Additional details are provided in the report entitled: "*Subsurface Assessment, Butter Pot Provincial Park, Newfoundland and Labrador*" by CBCL Limited, dated November 2011.

2.2.4 Phase III ESA – January to June 2015

SNC-Lavalin Inc. (SLI) was retained by the ENVC to conduct a Phase III ESA to further assess the extent of PHC contamination at the Site. Field work included the excavation and sampling of nine test pits (TP1 to TP9), the installation and sampling of four monitoring wells (MW-1 to MW-4), and the collection of one potable water sample (TAP1). The soil, groundwater, and potable water samples were analyzed for BTEX/mTPH and Polycyclic Aromatic Hydrocarbons (PAHs). The field work was completed between January and June 2015. The results of the Phase III ESA include the following:

- A total of 15 soil samples, including one field duplicate, were submitted for petroleum hydrocarbon analysis and, with the exception of two soil samples, analytical results were below the applicable Tier I RBSL table values and Tier I ESL criteria for the Site characteristics. Soil samples TP1-Bottom (350 mg/kg) and TP2-Surface (570 mg/kg) reported F2 fraction concentrations above the applicable Tier I ESL of 260 mg/kg.
- Results of the PAH analysis for the soil sampling program at the Site indicated all 15 soil samples analyzed contained non-detectable PAH concentrations and; therefore, were below the applicable Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Commercial Guidelines for the Protection of Environmental and Human Health guidelines.
- Results of the groundwater sampling program revealed that all groundwater samples (MW-1 to MW-4) submitted for BTEX/mTPH and PAHs were reported as non-detect; and therefore, below the Tier I RBSL Table values for a commercial site, with potable groundwater and coarse-grained soil.
- Results of the potable water sampling program revealed that the sample submitted for BTEX/mTPH and PAHs were reported as non-detect; and, therefore below the applicable Health Canada Drinking Water Quality Guidelines.
- Based on the field program, horizontal and vertical delineation was achieved southeast and southwest of the generator shed. Based on this information it was estimated the area of petroleum hydrocarbon impacts was approximately 170 m² with an approximate volume of 250 m³. It was noted that delineation to the west/northwest had not been achieved.

Based on the results of the investigation, SLI recommended the following:

- Conduct additional sampling to delineate soil impacts to the northwest of the generator shed.
- Conduct an indoor air sampling program to assess current human health risks associated with inhalation exposure to potentially petroleum hydrocarbon impacted indoor/outdoor air within the four building structures located at the Site.
- Remove and replace the wooden walls of the generator shed stained with petroleum hydrocarbons.

Additional details are provided in the report entitled: "*Phase III Environmental Site Assessment, Butter Pot Provincial Park, Newfoundland and Labrador*" by SNC Lavalin Inc., dated September 2015.

Soil and groundwater analytical results from all previous environmental programs conducted at the Site are compared to the current Atlantic RBCA Tier I RBSL Table values and/or Tier I ESLs in Tables A1 and A2, respectively, which are presented in Appendix A. All relevant sample locations are shown on Figure 3.

2.3 Data Gap Analysis

Based on a review of the previous environmental reports provided by ENVC, GHD identified the following data gaps:

- There is a need to document subsurface conditions in the area/perimeter of the Workshop building.
- The extent of PHC impacts in soil to the northwest of the generator shed has not been fully delineated.
- There is a need to complete a soil vapour assessment program to determine if the known PHC impacted soil in the vicinity of the four on-Site buildings pose an actual risk to human health through the indoor air pathway.

3. Scope of Work

The approved scope of work for the Supplemental Phase III ESA included the following activities:

1. Excavation of six test pits (15-TP1 to 15-TP6) and the collection of soil samples to delineate known PHC impacts on the Site.
2. Collection of soil samples from select test pit locations for BTEX/mTPH analysis utilizing the Atlantic PIRI protocol.
3. Monitoring of four pre-existing monitoring wells (MW-1 to MW-4) for subsurface vapour concentrations, water levels and the presence or absence of free product.
4. Collection of groundwater samples from MW-1 to MW-4 for BTEX/mTPH analyses utilizing the Atlantic PIRI protocol.
5. Comparison of groundwater analytical results to the 2015 Tier I RBSLs for a commercial site with potable water and coarse grained soil and Tier I surface water screening benchmarks for the protection of freshwater and marine aquatic life.
6. Construction of one soil vapour probe (SV1) in the area of the highest historical PHC concentration (i.e. TP-4) located at the rear of the generator shed to assess soil vapour conditions at this location.
7. Collection of one soil vapour sample from the recently installed soil vapour probe for BTEX, and aromatic and aliphatic TPH sub fraction analyses.
8. Comparison of soil vapour analytical results to the applicable Reference Concentration (RfC) for TEX, a Risk Specific Concentration (RSC) for benzene, and a calculated indoor air site specific target level (SSTL) for TPH.
9. Inspection of the Site buildings to assist with the development of the Remedial Action /Risk Management Plans (RAP/RMP) for the Site.
10. Re-evaluation of the screening level ecological receptors checklist.

11. Preparation of a report that describes the field activities and the results of the Supplemental Phase III ESA.
12. Development of RAP/RMP options (to be completed under separate cover).

The following amendments to the approved scope of work were identified based on the initial Site visit:

- Only three of the four previously installed monitoring wells were located during the field program. MW-1 could not be located and; therefore, was not gauged or sampled.

4. Site Characteristics

4.1 Site Description

The Site is located at Butter Pot Provincial Park approximately 36 km southwest of St. John's, NL along the Trans-Canada Highway (See Figure 1). The Park covers an area of 2,833 hectares and has 175 campsites. Pit toilets and drinking water taps are located throughout the Park. The generator Site is located approximately 1.6 km southeast of the main campsites and is located east of Trailer Pond, in the vicinity of the Park office (See Figure 2).

The majority of the generator Site exterior area is covered with gravel with some areas of grass, moss and shrubs. The ground surface on-Site gently slopes downward to the northwest towards a gravel parking area. A large pond (Trailer Pond) is located approximately 180 m west of the Site. A small stream is located approximately 200 m southeast of the Site which flows in a northeasterly direction along the west side of the highway on/off ramp towards a small pond located northeast of the Park access road. There is a drinking water well near the Park office building which is located approximately 80 m south of the generator shed. The well provides potable water to Park staff and campground users. There is an underground plastic waterline located along a trail that is situated south of the generator shed which connects the well to the warm-up building.

There are four building structures within the Site area of the Park: a warm-up building, a workshop, a storage shed and a generator shed. These structures do not contain concrete basements or concrete slabs; however, the generator shed has a partial concrete slab beneath the generator. A steel diesel fuel AST is located adjacent to the east side of the generator shed which is stationed on a concrete pad. When in operation, the diesel generator, which is owned by the Park and stored inside the generator shed, is connected to the AST. A propane AST is also located to the southwest of the generator shed and underground lines supply the adjacent workshop building (see Figure 3).

The generator Site is bound to the north by forested land followed by the Park access road, to the east by forested land followed by the Trans-Canada Highway, to the south by forested land followed by the gravel access road to the Park office, and to the west by the gravel access road followed by forested land and the waters of Trailer Pond.

4.2 Geology

A review of the "Surficial Geology of Insular Newfoundland, Preliminary Version", issued by the Geological Survey Division of the Mines Branch of the Department of Natural Resources, Government of Newfoundland and Labrador (Map 90 08) indicates that the Site surficial geology consists of thin (less than 1.5 metres) discontinuous sheets of diamicton (poorly sorted sediment

containing a mixture of grain sizes from clay to boulders) overlying bedrock; patches of exposed bedrock, and thicker sediment cover common; matrices are generally dominated by sand with less than 20 percent silt and clay having maximum clast sizes of 1 to 2 metres in diameter, but clasts are mostly granules (0.2 to 0.4 cm diameter) and pebbles (0.4 to 6.4 cm diameter); relief and topography are variable, and bedrock controlled. A review of the “Geology of the Island of Newfoundland”, issued by the Geological Survey Division of the Mines Branch of the Department of Natural Resources, Government of Newfoundland and Labrador (Map 90-01) indicates that the bedrock in the vicinity of the Site consists of late proterozoic stratified rocks that consist of sandstone and shall turbidites, including minor unseparated tillite, olistostromes and volcanic rocks from the (Connecting Point and Conception groups) found in the Avalon Zone Units.

Surficial geology encountered at the Site during the Supplemental Phase III ESA work generally consisted of brown to grey sand and gravel fill overlying a thin layer of peat/organics, followed by rusty brown to grey sand and gravel till with occasional cobbles. Probable bedrock was encountered in two test pits (15-TP1 and 15-TP2) during the Supplemental Phase III ESA, at an approximate depth of 2.0 mbgs. Test pit logs containing stratigraphy and sample depths are presented in Appendix B. gravel parking area

4.3 Hydrogeology

Groundwater elevations measured on December 18, 2015 confirmed depths ranging from 3.566 to 4.450 mbgs at MW-4 and MW-2, respectively (see Table 2). It is noted MW-1 could not be located and; therefore, was not gauged. Free-phase product was not observed during the gauging or sampling program.

4.4 Topography and Surface Drainage

The elevation at the Site is approximately 200 metres above sea level (masl) based on local topographic mapping. Stormwater run-off from the Site is mainly directed by overland flow in a west/northwest direction.

Based on visual observations and topographic mapping for the Site area, surface drainage appears to flow both west and northwest throughout the Site.

5. Assessment Criteria

The Site is located with a Provincial Park and the land-use would be commercial. The subject Site and adjacent properties are serviced by a potable wells, the closest located 80 m south of the generator shed. Therefore, the Site is classified as a commercial property with potable groundwater and coarse-grained soil. The analytical results for the Supplemental Phase III ESA are compared to the 2012 (updated January 2015) Atlantic Risk Based Corrective Action (RBCA) Tier I Risk Based Screening Level (RBSL) Table values for a commercial site, with potable groundwater and coarse-grained soil. It is noted that the Tier I RBSLs were used as reference only as the current construction of the Site buildings do not meet the Tier I mandatory criteria of concrete slab-on-grade foundation.

Consistent with Version 3 of the Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada – User Guidance (July 2012, updated January 2015), analytical data was also compared to applicable Tier I Ecological Screening Level (ESL) benchmarks.

It is noted that analytical results for PAHs in soil from historical assessments were compared to the applicable CCME Soil Quality Guidelines (SQGs) for the Protection of Environmental and Human Health for a commercial site with potable groundwater and coarse-grained soil. Historical groundwater and/or potable water samples were also screened against the Ontario Ministry of the Environment – Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) and/or Health Canada – Guidelines for Canadian Drinking Water Quality (October 2014).

Soil vapour analytical results are compared to the Risk Specific Concentration (RSC) and reference concentrations (RfC) as detailed in the Guidance for Soil Vapour and Indoor Air Monitoring Assessments of the Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, July 2006 (with Errata July 2012). Appropriate dilution factors are applied to soil vapour results based on the distance from the source to the potential receptor.

6. Field Activities

All field procedures were conducted in accordance with the Atlantic RBCA (Risk Based Corrective Action) Version 3.0 User Guidance for Petroleum Impacted Sites in Atlantic Canada (updated January 2015) and generally accepted industry practices.

6.1 Test Pit Excavation

Under the supervision of GHD, Jim R. Eales Equipment Rentals Limited (JREL) excavated six test pits (15-TP1 to 15-TP6) on December 15, 2015 to document subsurface conditions in the area/perimeter of the work shop and to delineate the spatial extent of the PHC impacts in soil to the northwest of the generator shed. 15-TP1 and 15-TP2 were completed to the west and north of the work shop building. 15-TP3 to 15-TP5 were completed to the north of the generator shed, and 15-TP6 was completed the south of the work shop building (see Figure 3).

The test pits ranged in final depth from 1.5 to 2.0 mbgs. Groundwater was encountered in the test pits at depths ranging from 1.0 to 1.2 mbgs. Probable bedrock was encountered in two of the six test pits (15-TP1 and 15-TP2) at a depth of approximately 2.0 mbgs. The soil sampling locations are shown on Figure 3 and Site photographs are presented in Appendix C. Test pit logs containing stratigraphy and sample depths are presented in Appendix B.

6.2 Soil Sampling Program

Soil samples obtained from the test pit excavations were logged with special attention to visual and/or olfactory evidence of contamination. In general, one worst case soil sample, based on field screening results, and/or the first sample from above and below the apparent impacted zone, were submitted for laboratory analysis. The soil sampling locations are presented on the test pit logs (Appendix B).

The samples were collected using a clean trowel and nitrile gloves. The sampling device was washed with phosphate-free soap and tap water, and then rinsed with tap water, prior to collection of each soil sample. Each soil sample was immediately split and placed in containers supplied by the laboratory and stored in coolers with ice for possible analysis. The remainder of the sample was placed in a sealed clean plastic bag for field screening, which included determining textural description, physical evidence of impact (e.g., staining, free product, odour), and measurement of

the sample combustible headspace vapour concentration (soil vapour concentration). The soil samples were screened using a Gastector 1238ME (with methane elimination enabled) to determine relative concentrations of undifferentiated volatile organic vapours in the headspace of each representative soil sample.

Based on sample depth, odour, appearance, and depth of groundwater table, nine soil samples, including one field duplicate were selected from the test pits and forwarded to Maxxam in St. John's, NL, for BTEX/mTPH analyses.

6.3 Groundwater Sampling Program

Three of the four pre-existing monitor wells (MW-2 to MW-4) were monitored and sampled on December 18, 2015. It is noted that MW-1 could not be located, therefore, was not sampled. The monitoring included measurements of subsurface vapour concentrations, water levels, and the presence or absence of free product.

Immediately after removing the well cap, the maximum subsurface vapour concentrations in the wells were measured using the combustible gas detector that was operated in the methane elimination mode. This was done by inserting the collection tube of the instrument into the riser pipe and recording the peak instrument reading.

The depth to the water table and presence or absence of free product in the wells were determined with a Solinst electronic interface probe that was cleaned with a non toxic, biodegradable cleaner/degreaser, then rinsed with clean tap water, between monitoring wells.

If measurable free product is observed in any well, a groundwater sample is not collected from that well. However, groundwater samples are collected from wells if petroleum hydrocarbon sheen is observed.

Groundwater samples were collected using low flow purging techniques. The wells were low-flow purged with a peristaltic pump using silicon tubing and high density polyethylene (HDPE) tubing until field parameters were stable for three consecutive readings and representative groundwater was sampled. All sample bottles were supplied by the laboratory. The groundwater samples were placed in coolers with ice immediately after they were collected.

Three groundwater samples, plus a field duplicate, were submitted to Maxxam in St. John's, NL for BTEX/mTPH analysis.

6.4 Soil Vapour Installation and Sampling Program

On December 15, 2015, one soil vapour probe (SV1) was installed to facilitate the collection of soil vapour samples at the Site (see Figure 3). Crosbie Industrial Services (CIS) was retained by GHD to day-light the pre-selected soil vapour location at the rear of the generator shed for the assessment of human health risks associated with PHC impacted soils and the risk of soil volatilization to indoor air. The day-lighting activity included hydro excavating a 100 mm diameter hole using a trailer mounted hydro-vacuum to allow for the installation of the soil vapour probe. The soil vapour probe location was day-lighted to a depth of 1.1 mbgs. All waste materials generated during the day-lighting activities were transported to the CIS treatment facility in St. John's, NL for disposal.

The soil vapour probe consists of a perforated stainless steel well point connected to galvanized steel casing (25 mm diameter) with a Teflon sampling tube inside the probe casing. Silica sand was used to backfill around the well point and a hydrated bentonite seal was installed around the probe casing (above the sand pack) to prevent short circuiting during the soil vapour sampling event. The soil vapour probe was installed as outlined in the Guidance for Soil Vapour and Indoor Air Monitoring Assessments (Atlantic PIRI, 2006).

A soil vapour sample was collected from the recently installed soil vapour probe (SV1) on December 18, 2015. Prior to sampling, the sampling trains were checked for potential leaks. The first part of the leak test involved pressurizing the system and using soapy water to visually inspect all above ground connections. The second part of the leak test is completed using a helium shroud on the probe assembly during the purging process. Air is extracted from the probe to simulate sampling conditions (i.e., maintaining a vacuum of less than 10 inches of water) and helium levels in the air stream are measured using a Radio Detection MGD 2002 Multi Gas Leak Detector calibrated by the supplier. In order for the test to be successful, the helium levels in the air stream must be less than 10 percent of the ambient level in the shroud, as specified in Guidance for Soil Vapour and Indoor Air Monitoring Assessment. The helium level was 2 to 3 percent in SV1 during the leak test.

The soil vapour probe was purged a minimum of three well volumes using a low flow air pump to ensure that a representative sample is collected. The vacuum during purging and sampling was 5 to 6 inches of water in SV1.

The soil vapour samples were collected using a 1.4 litre Summa canister equipped with a flow regulator (flow rate of 0.07 litres per minute). The canister was supplied by the laboratory and the flow regulator was laboratory calibrated before sample collection.

The analytical results of the soil vapour test was used to predict indoor air concentrations based on dilution factors and toxicity information provided in the Atlantic RBCA Version 3.0 User Guidance for Petroleum Impacted Sites in Atlantic Canada. The dilution factor is dependent on the distance from the soil vapour probe to the structure. Given the adjacent structures do not meet the minimum assessment requirement (i.e. no concrete slab), for the purpose of the soil vapour evaluation, a dilution factor of 1 and 50 (sub-slab) were used for the analysis and to aid in the design of a RAP/RMP for the Site.

The soil vapour sample was collected from the soil vapour probe on December 18, 2015 and submitted to Maxxam in Mississauga, ON for BTEX/TPH analyses (Aliphatics and Aromatics).

6.5 Quality Assurance and Quality Control Sampling

A QA/QC program was implemented to reduce and quantify potential issues introduced during sample collection, handling, shipping and analysis. The program included, but was not limited to, using dedicated sampling equipment, using sample specific identification and labelling procedures, and using chain of custody records.

The soil QA/QC samples submitted to the laboratory included one field duplicate soil sample for BTEX and TPH analyses.

The groundwater QA/QC samples submitted to the laboratory included one field duplicate sample for BTEX and TPH analyses.

7. Analytical Data

Analytical data from the soil, groundwater, and soil vapour samples collected during the Supplemental Phase III ESA are summarized below.

7.1 Soil Sampling Protocol and Analytical Results

Soil samples were collected from all six test pits completed during the Supplemental Phase III ESA. Select soil samples (based on field PID/Gastech screening and visual/olfactory observations) were submitted to Maxxam for BTEX/TPH analyses.

A total of nine soil samples, including one field duplicate, were submitted to Maxxam for BTEX/mTPH analyses. The analytical results for all nine soil samples reported BTEX and mTPH concentrations below the Atlantic RBCA Tier I RBSL and ESL Table values for a commercial site with potable groundwater and coarse grained soil.

The analytical results are presented in Table 1 and Figure 4, and the laboratory certificates of analysis are included in Appendix D.

7.2 Groundwater Sampling Protocol and Analytical Results

Groundwater samples were collected from three monitor wells (MW-2 to MW-4) on December 18, 2015, and water levels ranged from depths of 3.566 mbgs (MW-4) to 4.450 mbgs (MW-2). MW-1 could not be located in the gravel parking area, therefore, was not sampled or gauged. No free product or sheening was noted in the monitor wells during the sampling/gauging program.

Three groundwater samples, plus one field duplicate of MW-2 (MW-0), were submitted to Maxxam in St. John's, NL for BTEX/mTPH analyses. All samples reported BTEX/mTPH concentrations below the Tier I RBSL Table values and Tier I ESLs for the Site characteristics.

Groundwater analytical results are presented in Table 2 and Figure 5, and the laboratory certificates of analysis are included in Appendix D.

7.3 Soil Vapour Sampling Protocol and Analytical Results

One soil vapour sampling event was conducted to assess current human health risks associated with inhalation exposure to potentially petroleum hydrocarbon impacted indoor air at the Site.

The analytical results of the soil vapour test were used to predict indoor air concentrations based on dilution factors and toxicity information provided in the Atlantic RBCA Version 2.0 User Guidance for Petroleum Impacted Sites in Atlantic Canada. The dilution factor is dependent on the distance from the soil vapour probe to the structure. Given the soil vapour probes proximity to the surrounding buildings, and the fact that the buildings were mostly constructed with wood floor and no concrete slabs, a dilution factor of 1 was used for the analysis (as a worst case scenario). For comparison purposes and for resolutions to potential exceedances, a dilution factor of 50 for sub-slab was also used for the analysis.

Using no dilution factor, Benzene, Xylene, Aromatic C₈-C₁₀, and Aliphatic C₈-C₁₀ and C₁₂-C₁₆ hazard quotient levels were found to be above acceptable levels for a commercial building located in the immediate vicinity of the sampling location. The hazard quotient calculated for the measured TPH

levels ranged from 1.0×10^{-2} to 1.4×10^{-1} for SV1, compared to an acceptable level of 0.5 to 1.0. The benzene risk was calculated to be 4.6×10^{-5} compared to an acceptable level of 1.0×10^{-5} .

Using a dilution factor of 50 for sub-slab, soil vapour levels were determined to be within acceptable levels for a commercial building (with concrete slab) located directly above the sampling location. Soil vapour analytical results and indoor air calculations for the sampling event are attached as Tables 3A (no dilution factor) and 3B (sub-slab dilution factor), as well as presented on Figure 6. Laboratory Certificates of Analysis are included in Appendix D.

7.4 Quality Assurance and Quality Control Results

A QA/QC program was implemented to reduce and quantify potential issues introduced during sample collection, handling, shipping and analysis. The program included, but was not limited to using dedicated sampling equipment, using sample specific identification and labeling procedures, and using chain of custody records.

The soil field QA/QC program consisted of one field duplicate sample that was collected and submitted for laboratory analysis of BTEX/mTPH. The groundwater field QA/QC program consisted of one field duplicate sample that was submitted for laboratory analysis of BTEX/mTPH.

For the field duplicate samples, evaluations of the QA/QC results were determined by calculating the relative percent difference (RPD) between the field duplicate and original sample results, and comparison of the RPD to designated alert limits.

$$RPD = \left| \left(\frac{x_1 - x_2}{\frac{x_1 + x_2}{2}} \right) \right| \times 100$$

Consistent with laboratory practices and to permit reliable calculations, an RPD is only calculated when the original and duplicate sample concentrations are at least 5 times the reportable detection limit (RDL). Based on the analytical results of the field duplicates and their parent samples, the RPDs were not calculable and; therefore, no field QA/QC issues were identified that call into question the reliability of the laboratory data reported.

The laboratory QA/QC program consisted of one or more of the following analysis (a) instrument and extraction surrogate recoveries for soil and/or groundwater samples that were analyzed, and (b) the analysis of method blank, laboratory duplicate, matrix spike and/or laboratory control samples for the sample analytical batches that were analyzed. The laboratory QA/QC results are presented in the certificates of analysis (Appendix D). As indicated, no laboratory QA/QC issues were identified.

In summary, no QA/QC issues were identified that would affect the overall results of the assessment findings.

7.5 Contaminant Distribution

Based on the Supplemental Phase III ESA, it is estimated that approximately 800 tonnes (i.e., $265 \text{ m}^2 \times 1.5 \text{ m}$ assumed thickness) of soil with concentrations above the 2015 Tier I RBSL Table values and Tier I ESLs for the Site characteristics is located within the area of the generator shed. The estimated extent of PHC impacts in soils is presented on Figure 7.

8. Tier I Ecological Receptors Assessment

An evaluation of potential ecological receptors was completed as part of the Supplemental Phase III ESA. A Tier I Check List for Ecological Receptors Assessment in Atlantic Canada was completed and is included in Appendix E. The purpose of the ecological receptor assessment was to gauge the potential for any on Site impact to pose an adverse risk to ecological receptors.

The Site is located in a commercial area with four Site buildings used to service the Provincial Park. The Site is predominately gravel covered with vegetation cover.

As identified by the ecological receptors assessment, both forested (forested area of 50 acres or more) and aquatic habitats (waters of Trailer Pond) are located within 200 metres of the Site. The forested area is located adjacent to Site and Trailer Pond is located approximately 180 metres west of the Site. Other sensitive ecological habitats were not identified within 200 metres of the Site. Groundwater flow at the Site is assumed to follow surface contours and be directed to the west/northwest towards Trailer Pond; therefore, groundwater discharging from the Site was considered to be a potentially complete exposure pathway.

In accordance with guidelines established by the Newfoundland and Labrador Department of Environment and Conservation under Version 3 of the July 2012 (updated January 2015) User Guidance Document for Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, a Summary Table with the Results of the Ecological Screening Protocol for Petroleum Impacted Sites is to be completed (Appendix E). Five generic ecological screening components must first be evaluated for the Site, which are described in further detail below with Site-specific commentary for each component. If an issue is identified in any one or more of the components noted below, additional ecological screening is required that includes identification of habitat and ecological receptors along with identification of exposure pathways for ecological receptors.

Site characterization data (as summarized in Table A1 of Appendix A) identified the presence of petroleum hydrocarbons in surface soil samples at a depth of less than 1.5 mbgs that was above the Tier I Soil ESLs for the Protection of Plants and Soil Invertebrates through Direct Soil Contact (Atlantic RBCA Table 1a). Five historical soil samples (TP3-02, TP4-02, TP4-03, TP1-Bottom and TP2-Surface) collected in the general area of the generator shed reported C₆-C₁₀ and/or C₁₀-C₁₆ carbon fractions above the Tier I Soil ESLs for coarse-grained soil. The soil sample locations are presented on Figure 3 and the analytical results are in Table A1 of Appendix A. However, given the location of these samples are in an area of the active generator shed and are predominantly covered with gravel access roads/parking areas, buildings, and/or concrete AST slabs, impacts to plant and soil invertebrates are not expected. In ecological risk assessments, the upper 0.6 metres of the soil horizon is commonly considered the ecologically active soil horizon. Soil greater than 0.6 metres depth is generally considered to be at a depth that eliminates the ecological receptor to soil contact pathway, specifically in areas that lack deep rooting plants such as trees and shrubs. Visible observations obtained during the assessment work indicated that vegetation in the area of the five historical samples noted above primarily consisted of gravel and grasses/forbs with no areas of stressed vegetation identified. As such, it is reasonable to assume that direct contact soil contact pathway for plants and invertebrates is not operable and therefore, hydrocarbon concentrations in this sample pose a low risk to ecological receptors.

The Tier I Soil ESLs for the Protection of Wildlife such as mammals, birds, and livestock through Soil and Food Ingestion (Atlantic RBCA Table 1b) is applicable to this Site as wildlife are present

that would ingest soil or food from the soil impact zone. All soil analytical results (see Table A1 of Appendix A) are below the applicable Tier I ESLs for the protection of wildlife.

Groundwater was encountered ranging in depths from approximately 3.566 mbgs (MW-4) to 4.450 mbgs (MW-2) in the monitor wells; however, groundwater was encountered in the test pits at depth ranging from 1.2 to 1.5 mbgs. Consequently, for conservative purposes, the groundwater samples were assumed to be collected from shallow Site groundwater at a depth of less than 3.0 mbgs and were compared to the Tier I Groundwater ESLs for Plants and Invertebrate Direct Contact with Shallow Groundwater (Atlantic RBCA Table 2). All groundwater samples collected reported values within the respective Tier I ESL criteria. The groundwater analytical results are presented on Figure 5 and in Table 2.

Groundwater was encountered within the soil impact zone, which required Site characterization in determining the presence of petroleum hydrocarbons in Site groundwater above Tier I Groundwater ESLs for the Protection of Freshwater and Marine Aquatic Life (Atlantic RBCA Tables 3a and 3b). As discussed above, a water body is present within 200 metres of the Site (i.e. the waters of Trailer Pond); therefore, Site characterization was applicable in determining the presence of petroleum hydrocarbons in nearby freshwater surface water above Tier I Surface Water ESLs for the Protection of Freshwater and Marine Aquatic Life. Groundwater analytical results from the on-Site monitor wells were compared to the respective criteria of Atlantic RBCA Table 3b using an adjusted distance to the receptor of 150 metres as a conservative measure. All groundwater samples collected reported values within the respective criteria. The groundwater analytical results are presented on Figure 5 and in Table 2.

Sediment was not present on Site; however, sediment is present west of the Site at the edge of the waters of Trailer Pond located approximately 180 metres west of the nearest monitor well at the Site. Given the groundwater and soil sample analytical results collected from the perimeter of the Site indicated non-detect concentrations of petroleum hydrocarbons, further evaluation of the adjacent sediment is not required for the Site.

Since adverse risk to ecological receptors has not been identified, the requirements of the Tier I Check List for Ecological Receptors Assessments have been met, and further ecological assessment is not required.

9. Conclusions

GHD Limited (GHD) was retained by the Government of Newfoundland and Labrador Department of Environment and Conservation (ENVC) to complete a Supplemental Phase III Environmental Site Assessment (ESA) at the generator site location within Butter Pot Provincial Park, Newfoundland and Labrador (NL) (Site or Property). The Site Location Map is presented in Figure 1.

The objectives of the Supplemental Phase III ESA were to review previous environmental reports, identify data gaps, and conduct additional sampling to the extent that a Remedial Action Plan/Risk Management Plan (RAP/RMP) could be developed to bring the Site to closure. The Supplemental Phase III ESA was completed between December 15 and 18, 2015, and consisted of the excavation of six test pits (15-TP1 to 15-TP6), groundwater sampling from all accessible on-Site monitoring wells, and the installation and sampling of one soil vapour probe (SV1) in the area of the generator shed. Based on anticipated future land use, the property is classified by the 2012 (updated 2015) Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Level (RBSL) Table

values as a commercial site with potable groundwater and coarse-grained soil. In addition, analytical data was also compared to Atlantic RBCA Tier I Ecological Screening Level (ESL) benchmarks.

A total of nine soil samples, including one field duplicate, were submitted to Maxxam for BTEX/mTPH analyses. The analytical results for all nine soil samples reported BTEX/mTPH concentrations below the Atlantic RBCA Tier I RBSL and ESL Table values for a commercial site with potable groundwater and coarse-grained soil.

Three groundwater samples, plus one field duplicate (for MW-2), were submitted to Maxxam for BTEX/mTPH analyses. It is noted that MW-1 was not located due to regrading of the gravel parking area and; therefore, was not sampled. All samples reported BTEX/mTPH concentrations below the 2015 Tier I RBSL and ESLs for the Site characteristics. No free product or sheening was noted in the monitor wells during the sampling/gauging program.

It is estimated that approximately 800 tonnes (i.e., 265 m² x 1.5 m assumed thickness) of soil with concentrations above the 2015 Tier I RBSL Table values and Tier I ESLs for the Site characteristics is located within the area of the generator shed.

One soil vapour probe (SV1) was installed in the area of the highest historical petroleum hydrocarbon concentration (i.e. TP-4 located at the rear of the generator shed) to assess soil vapour conditions at the Site. The soil vapour probe was installed to sample soil vapour conditions for the assessment of human health risks associated with impacted soils on the Site and the risk of soil volatilization to indoor air for the adjacent commercial buildings. The soil vapour sample collected from SV1 was submitted to Maxxam for BTEX, and aromatic and aliphatic TPH sub fraction analyses. The analytical results of the soil vapour test were used to predict indoor air concentrations based on dilution factors and toxicity information provided in the Atlantic RBCA Version 2.0 User Guidance for Petroleum Impacted Sites in Atlantic Canada. The dilution factor is dependent on the distance from the vapour probe to the structure.

Given the soil vapour probes proximity to the surrounding buildings, and the fact that all buildings were constructed with wood floor and no concrete slab, a dilution factor of 1 was used for the analysis. For comparison purposes and for resolutions to potential exceedances, a dilution factor of 50 for sub-slab was also used for the analysis.

Using no dilution factor, Benzene, Xylene, Aromatic C₈-C₁₀, and Aliphatic C₈-C₁₀ and C₁₂-C₁₆ hazard quotient levels were found to be above acceptable levels for a commercial building located in the immediate vicinity of the sampling location. In addition, the benzene risk was calculated to be 4.6 x 10⁻⁵ compared to an acceptable level of 1.0 x 10⁻⁵. Using a dilution factor of 50 for sub-slab, soil vapour levels were determined to be within acceptable levels for a commercial building located in the immediate vicinity of the sampling location.

An evaluation of potential ecological receptors was completed using a Summary Table from Appendix 2 of the Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance dated July 2012 (updated January 2015). Ecological receptors (Provincial Park, forested habitats, Trailer Pond) were identified within 200 metres of the Site. The waters of Trailer Pond are located approximately 180 metres west of the Site. The results indicated further ecological assessment is not required.

10. References

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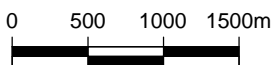
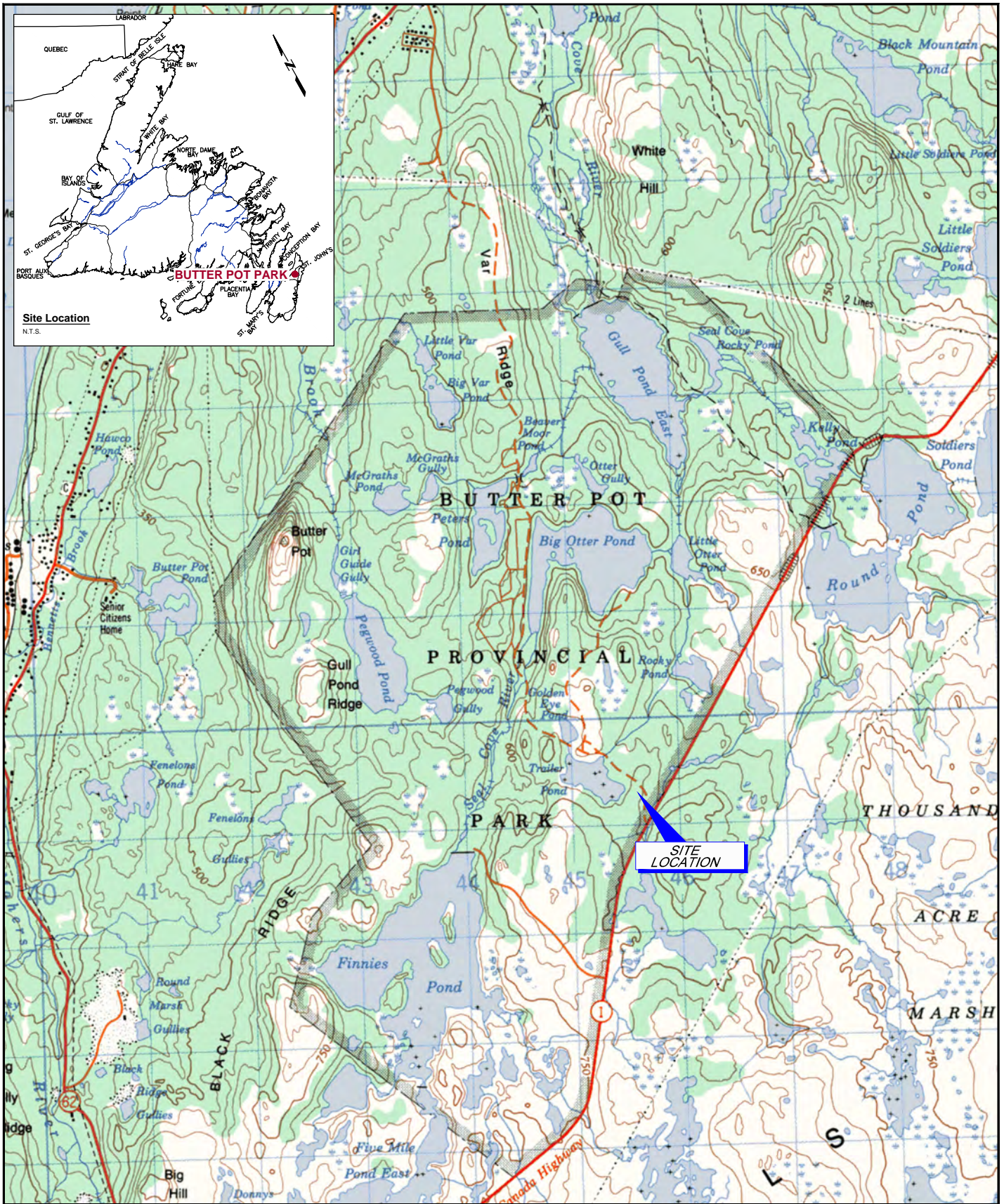
11. Closure

All of Which is Respectfully Submitted,

GHD Limited


James O'Neill, P.Eng.


Jennifer Gabriel, B.Sc.

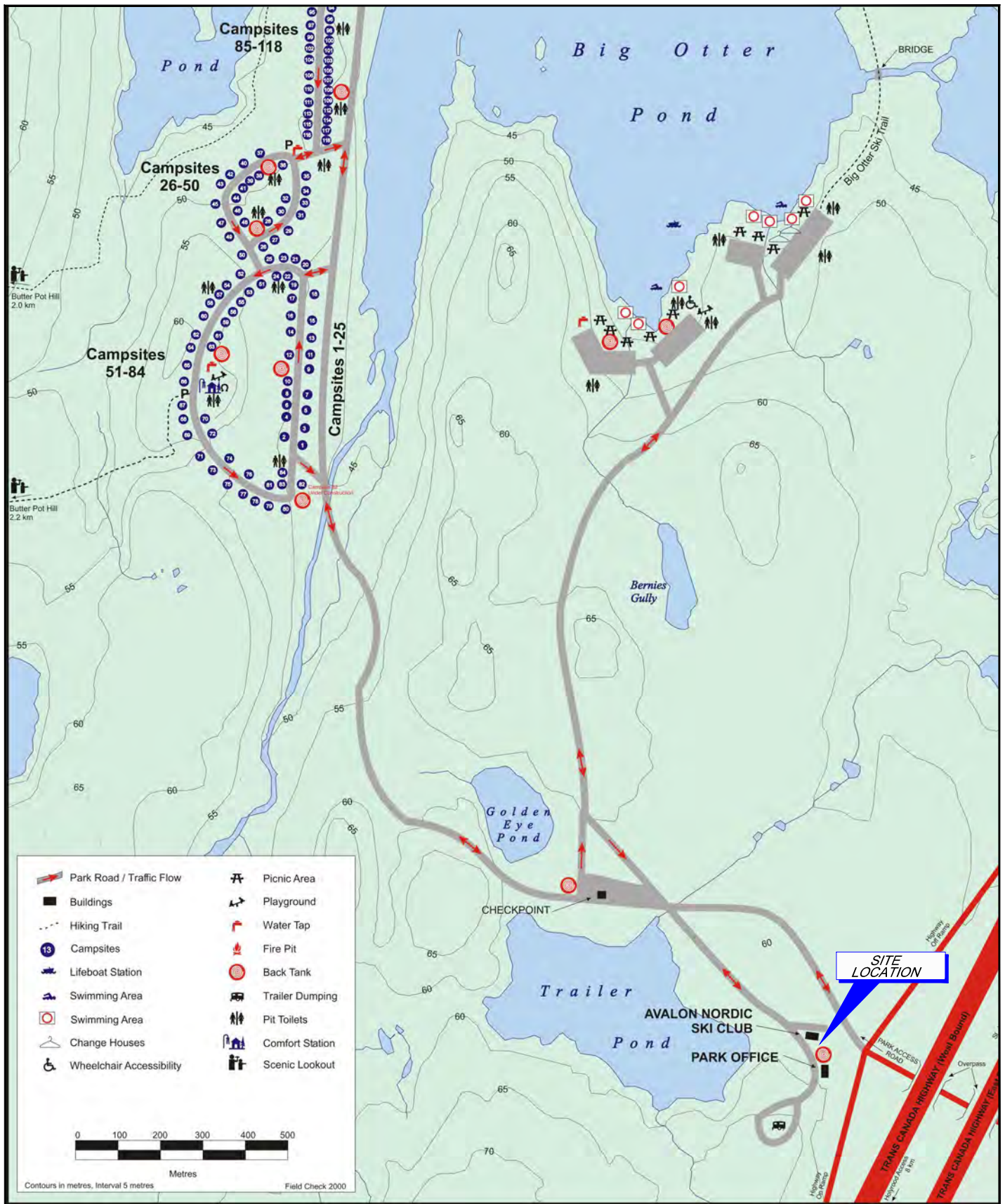


NEWFOUNDLAND AND LABRADOR PARKS
 AND NATURAL AREA DIVISION
 BUTTER POT PROVINCIAL PARK
 SUPPLEMENTAL PHASE III ESA

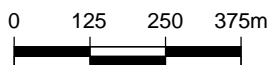
SITE LOCATION MAP

11111591
 Apr 22, 2016

FIGURE 1



Source: <http://www.env.gov.nl.ca/env/parks/maps/butterpot.pdf>

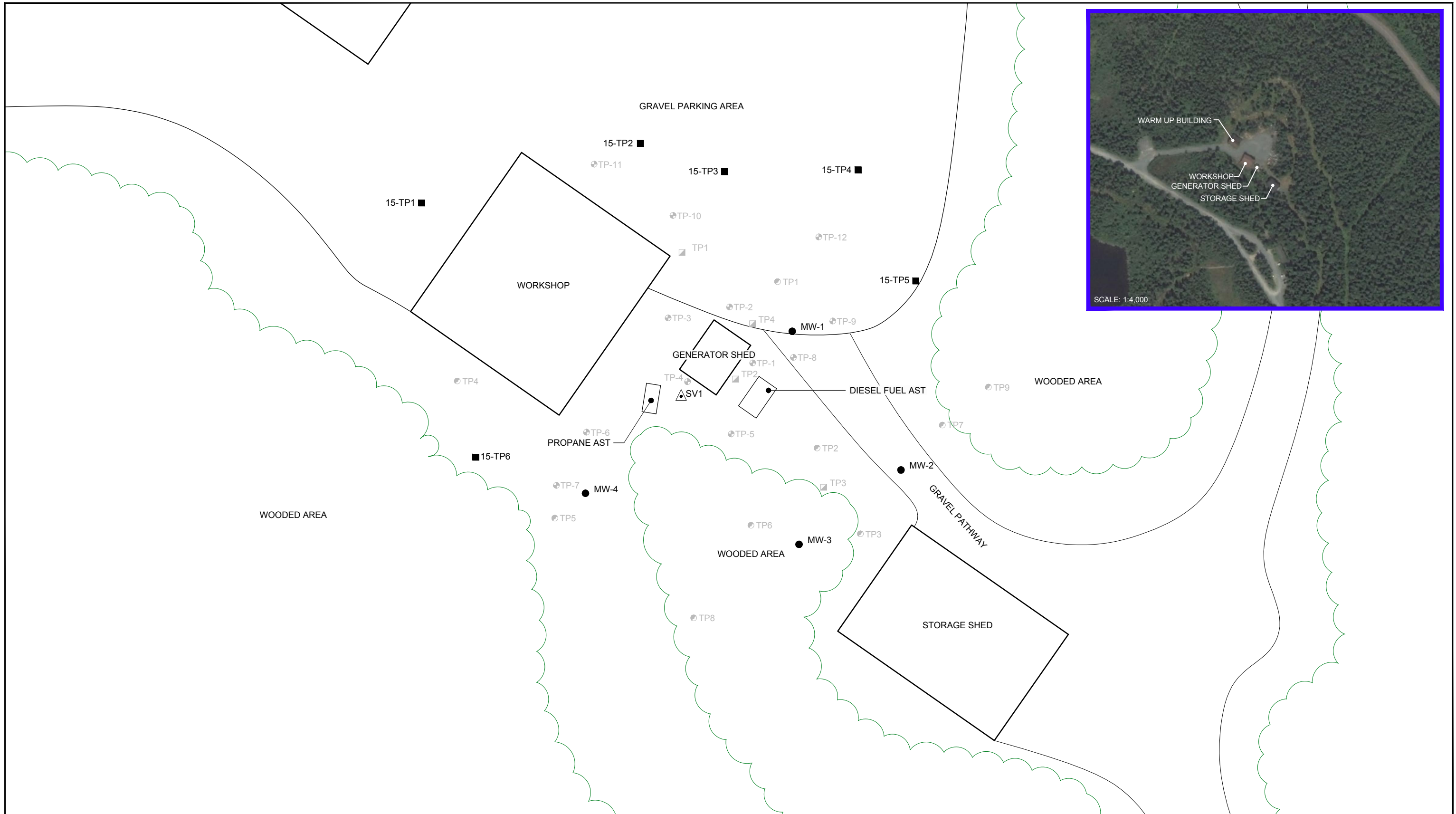


NEWFOUNDLAND AND LABRADOR PARKS
AND NATURAL AREA DIVISION
BUTTER POT PROVINCIAL PARK
SUPPLEMENTAL PHASE III ESA

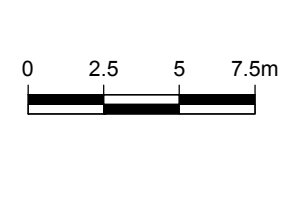
GENERAL SITE LOCATION PLAN

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FIGURE 2



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LEGEND:

- TP ■ TEST PIT LOCATION (GHD 2015)
- SV ▲ SOIL VAPOUR WELL LOCATION (GHD 2015)
- MW ● MONITOR WELL LOCATION (SLI, 2015)
- TP ● HISTORICAL TEST PIT LOCATION (SLI, 2015)
- TP ● HISTORICAL TEST PIT LOCATION (CBCL, 2011)
- TP ▣ HISTORICAL TEST PIT LOCATION (ADI, 2009)

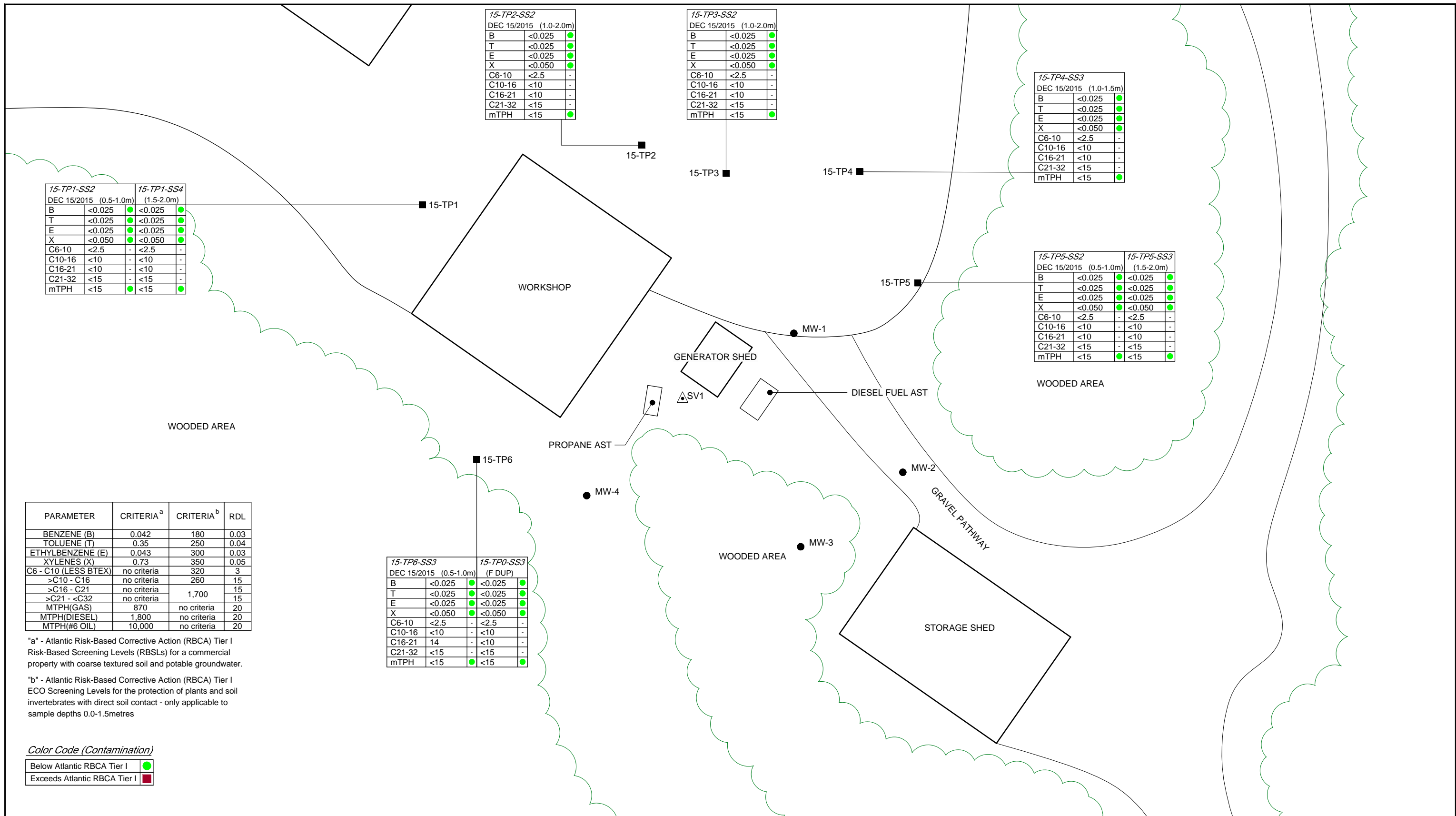


NEWFOUNDLAND AND LABRADOR PARKS AND NATURAL AREA DIVISION
 BUTTER POT PROVINCIAL PARK
 SUPPLEMENTAL PHASE III ESA

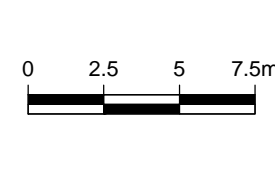
SITE PLAN WITH SAMPLE LOCATIONS

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FIGURE 3



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LEGEND:

- TP ■ TEST PIT LOCATION (GHD 2015)
- SV ▲ SOIL VAPOUR WELL LOCATION (GHD 2015)
- MW ● MONITOR WELL LOCATION (SLI, 2015)

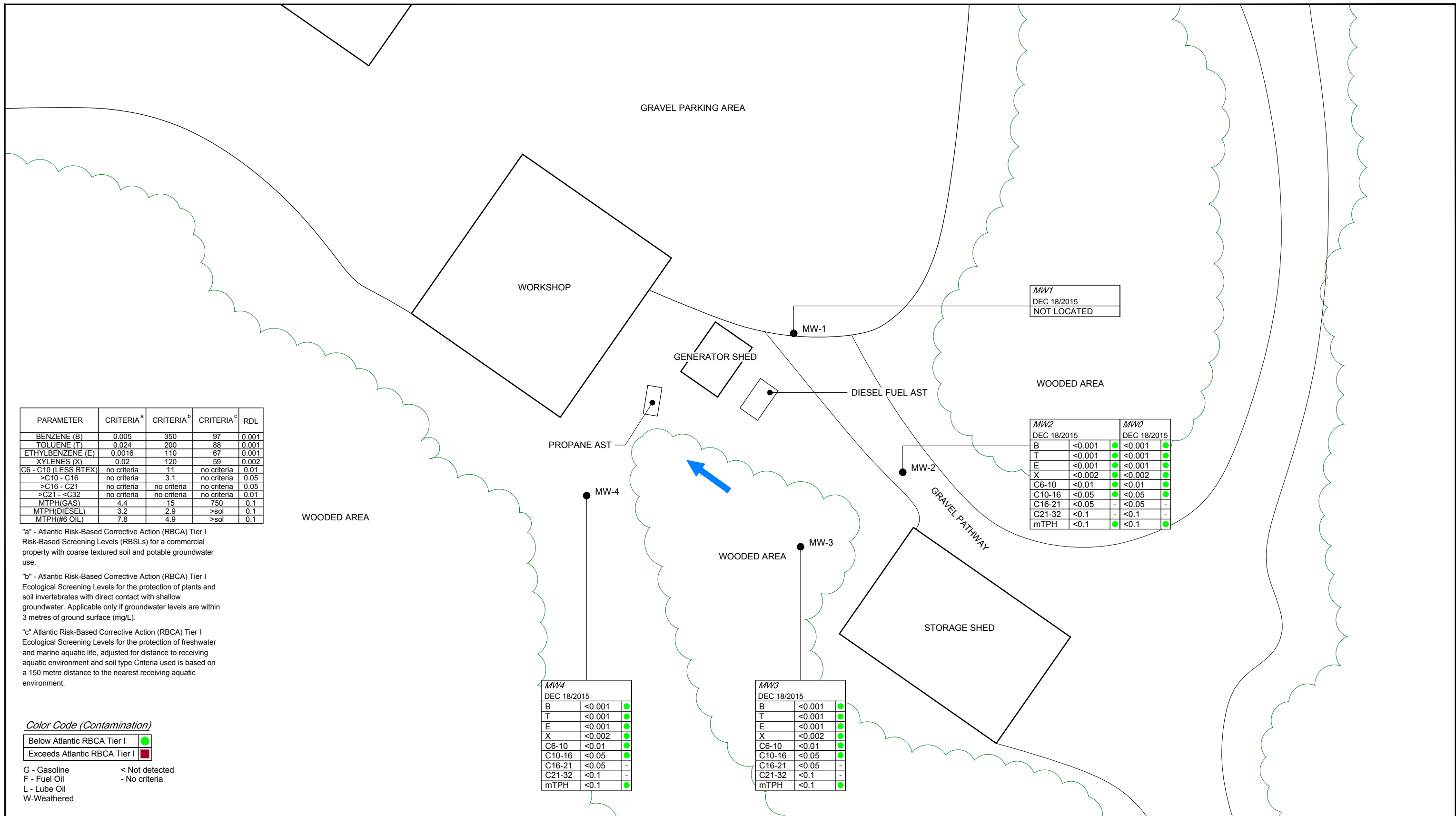


NEWFOUNDLAND AND LABRADOR PARKS AND NATURAL AREA DIVISION
 BUTTER POT PROVINCIAL PARK
 SUPPLEMENTAL PHASE III ESA

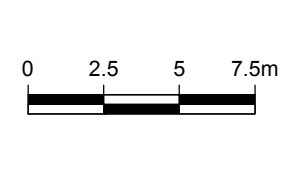
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SITE PLAN WITH SOIL ANALYTICAL RESULTS

FIGURE 4



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LEGEND:
MW ● MONITOR WELL LOCATION (SLI, 2015)
→ GROUNDWATER FLOW DIRECTION (ASSUMED)

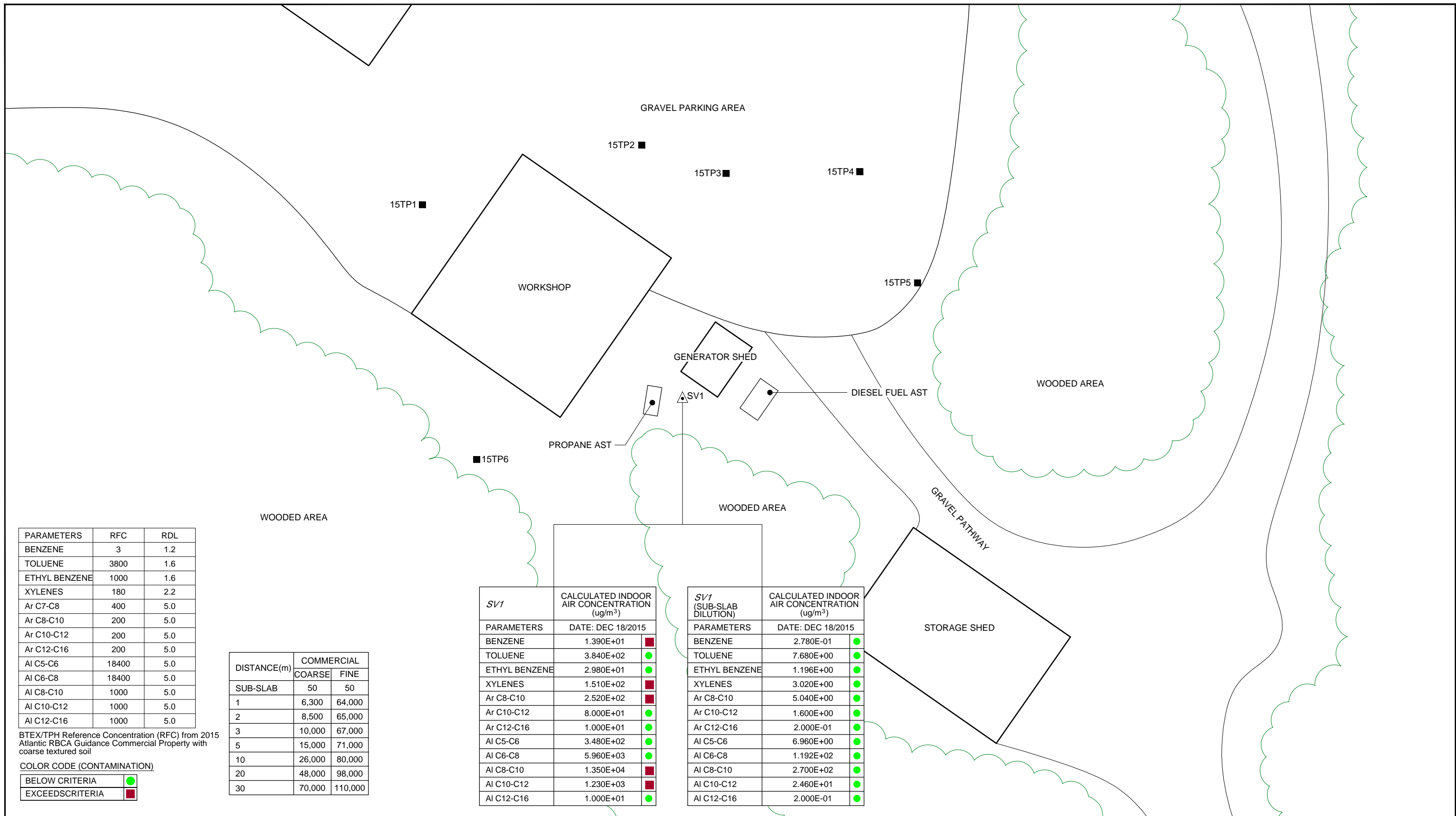


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BUTTER POT PROVINCIAL PARK
SUPPLEMENTAL PHASE III ESA

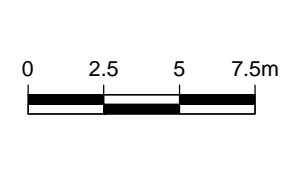
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Aug 17, 2016

SITE PLAN WITH GROUNDWATER ANALYTICAL RESULTS

FIGURE 5



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LEGEND:
 TP ■ TEST PIT LOCATION (GHD 2015)
 SV ▲ SOIL VAPOUR WELL LOCATION (GHD 2015)

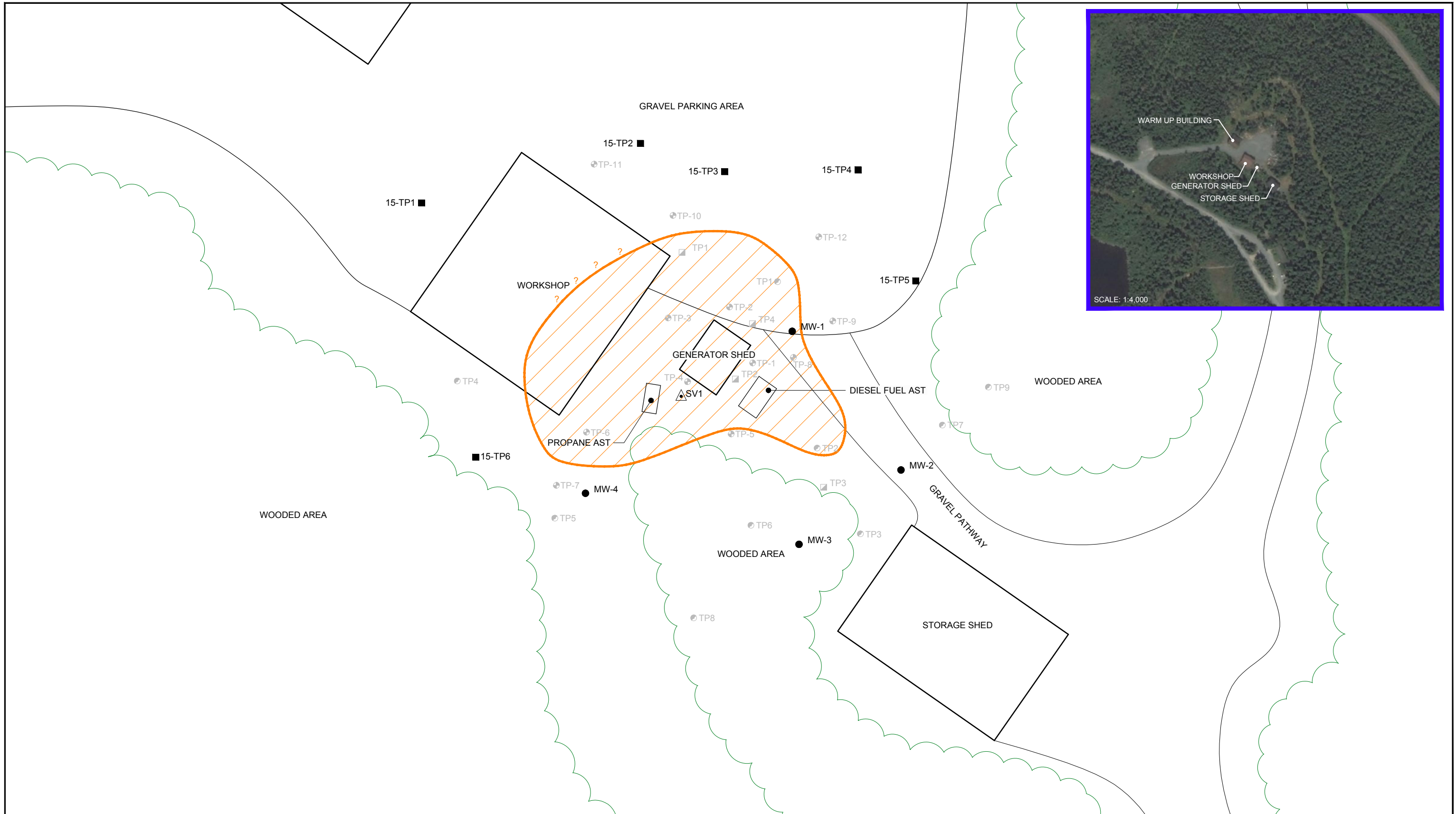


NEWFOUNDLAND AND LABRADOR PARKS AND NATURAL AREA DIVISION
 BUTTER POT PROVINCIAL PARK
 SUPPLEMENTAL PHASE III ESA

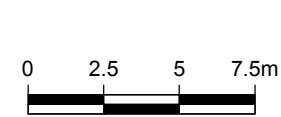
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 Apr 22, 2016

SITE PLAN WITH SOIL VAPOUR ANALYTICAL RESULTS

FIGURE 6



Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date AUG 2012 , Accessed: 2016



LEGEND:

- TP ■ TEST PIT LOCATION (GHD 2015)
- SV ▲ SOIL VAPOUR WELL LOCATION (GHD 2015)
- MW ● MONITOR WELL LOCATION (SLI, 2015)
- TP ● HISTORICAL TEST PIT LOCATION (SLI, 2015)
- TP ● HISTORICAL TEST PIT LOCATION (CBCL, 2011)
- TP ▣ HISTORICAL TEST PIT LOCATION (ADI, 2009)

AREA OF TIER I IMPACT



NEWFOUNDLAND AND LABRADOR PARKS AND NATURAL AREA DIVISION
 BUTTER POT PROVINCIAL PARK
 SUPPLEMENTAL PHASE III ESA

ESTIMATED AREA OF IMPACT

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 Aug 17, 2016

FIGURE 7

**Table 1: Soil Analytical Results - BTEX/TPH
Supplemental Phase III ESA
Butter Pot Provincial Park, Newfoundland and Labrador**

Location	Depth (m)	Date	BTEX Concentration (mg/kg)				TPH Concentration (mg/kg)				
			Benzene	Toluene	Ethyl Benzene	Xylenes	C6-C10	C10-C16	C16-C21	C21-C32	Modified TPH
15-TP1-SS2	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP1-SS2 Lab-Dup	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	-	-	-	-
15-TP1-SS4	1.5-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP2-SS2	1.0-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP3-SS2	1.0-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP4-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP5-SS2	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP5-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP6-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	14	<15	<15
15-TP0-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
2012 Tier I RBSL values - Commercial, Potable			0.042	0.35	0.043	0.73	--	--	--	--	870 / 1,800 / 10,000
2012 Tier I ESL values - Commercial			180	250	300	350	320	260	1,700	-	
2012 Tier I ESL values - Protection of Wildlife Commercial			18	980	640	2,600	1,100	9,800	16,000	-	

Note:

--- No established criteria or not analyzed

0.00	Concentration above Atlantic RBCA Tier I RBSL Table values - Commercial, Potable, Coarse-grained
------	--

0.00	Concentration above Atlantic RBCA Tier I ESL Table values (0 to 1.5 mbgs)
------	---

0.00	Concentration above Atlantic RBCA Tier I ESL Table values for protection of wildlife
------	--

(1) Based on laboratory reporting gasoline fraction

(2) Based on laboratory reporting diesel fraction

(3) Based on laboratory reporting #6 oil fraction

15-TP0-SS3 is field duplicate of 15-TP6-SS3

**Table 2: Groundwater Analytical Results - BTEX/TPH
Supplemental Phase III ESA
Butter Pot Provincial Park, Newfoundland and Labrador**

Location	Date	Groundwater Depth (mbgs)	BTEX Concentration (mg/L)				TPH Concentration (mg/L)				
			Benzene	Toluene	Ethyl Benzene	Xylenes	C6-C10	C10-C16	C16-C21	C21-C32	Modified TPH
MW1	18-Dec-15	-	Not Located								
MW2	18-Dec-15	4.45	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15*	4.45	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
MW3	18-Dec-15	4.43	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
MW4	18-Dec-15	3.57	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
2012 Tier I RBSL Commercial, Potable values			0.005	0.024	0.0016	0.02	--	--	--	--	4.4 / 3.2 / 7.8
2012 Tier I ESL Commercial, Coarse-grained values - Shallow groundwater			350	200	110	120	11	3.1	na	na	na
2012 Tier I ESL, Coarse-grained values - Aquatic Life (150 m)			97	88	67	59	--	--	--	--	750 / >sol / >sol

Note:

--- No established criteria or not analyzed

0.00 Concentration above Atlantic RBCA Tier I RBSLs - Commercial, Potable, Coarse-grained**0.00** Concentration above Atlantic RBCA Tier I ESLs with Groundwater < 3.0 mbgs**0.00** Concentration above Atlantic RBCA Tier I ESLs adjusted to 150 metres from receptor

(1) Based on laboratory reporting gasoline fraction

(2) Based on laboratory reporting diesel fraction

(3) Based on laboratory reporting #6 oil fraction

* Indicates Field duplicate

TABLE 3A
SOIL VAPOUR PETROLEUM HYDROCARBON RESULTS - TPH FRACTIONATION
Butter Pot Park, Newfoundland and Labrador
Sampling Date: December 18, 2015

SV1-AS1

Parameters	Soil Vapour Hydrocarbon Level (µg/m ³)	Dilution Factor	Calculated Indoor Air Concentration (A) µg/m ³	RfC (B) µg/m ³	Hazard Quotient (HQ=A/B)	OK if HQ< Target Hazard Quotient = 1	SSTL Calculation	
							Mass Fractions (MF)	MF/RfC
Benzene	13.9	1	1.390E+01	3.0	4.6E+00	HQ<1 - OK		
Toluene	384	1	3.840E+02	3800	1.0E-01	HQ<0.5 - OK		
Ethyl Benzene	59.8	1	5.980E+01	1000	6.0E-02	HQ<0.5 - OK		
Xylenes	151	1	1.510E+02	180	8.4E-01	HQ<0.5 - OK		
Total Petroleum Hydrocarbon Fractions (TPH)								
Ar C8-C10	252	1	2.520E+02	200	1.3E+00	HQ<1 - OK	0.012	0.0000589
Ar C10-C12	80	1	8.000E+01	200	4.0E-01	HQ<1 - OK	0.004	0.0000187
Ar C12-C16	10	1	1.000E+01	200	5.0E-02	HQ<1 - OK	0.000	0.0000023
Al C5-C6	348	1	3.480E+02	18400	1.9E-02	HQ<1 - OK	0.016	0.0000009
Al C6-C8	5960	1	5.960E+03	18400	3.2E-01	HQ<1 - OK	0.279	0.0000151
Al C8-C10	13500	1	1.350E+04	1000	1.4E+01	HQ<1 - OK	0.631	0.0006311
Al C10-C12	1230	1	1.230E+03	1000	1.2E+00	HQ<1 - OK	0.058	0.0000575
Al C12-C16	10	1	1.000E+01	1000	1.0E-02	HQ<1 - OK	0.0005	0.0000005
Total (minus TEX)	21390.0		2.139E+04		1.7E+01	If <1, OK		0.001

Calc SSTL	1273.8	
TPH/SSTL	1.7E+01	If <1, OK

Benzene Risk	Target Risk
4.6E-05	1.0E-05

Notes:

Commercial

Used Dilution Factor from Atlantic RBCA User Guidance as presented in table below

BTEX/TPH Reference Concentration (RFC) from 2012 Atlantic RBCA Guidance

Toluene, Ethyl Benzene and Xylenes are excluded from the TPH carbon ranges, as they are evaluated separately

As per Atlantic RBCA User Guidance, SSTLs are calculated using the mass fraction for each individual sample. Thus, SSTLs for the same sampling location can vary from sample to sample.

Non-detectable results are entered as half the reportable detection limit (RDL)

Aromatic C7-C8 range soil vapour results are excluded from the above TPH calculations, as this range is made up entirely of Toluene and Toluene is evaluated separately.

Input
Exceeds criteria

Distance (m)	Residential		Commercial	
	Coarse	Fine	Coarse	Fine
Sub-Slab	50	50	50	50
1	2,500	31,000	6,300	64,000
2	4,000	33,000	8,500	65,000
3	5,500	34,000	10,000	67,000
5	8,500	36,000	15,000	71,000
10	15,000	42,000	26,000	80,000
20	30,000	54,000	48,000	98,000
30	45,000	66,000	70,000	110,000

TABLE 3B
SOIL VAPOUR PETROLEUM HYDROCARBON RESULTS - TPH FRACTIONATION
Butter Pot Park, Newfoundland and Labrador
Sampling Date: December 18, 2015

SV1-AS1 (Using Sub-Slab Dilution Factor)

Parameters	Soil Vapour Hydrocarbon Level (µg/m³)	Dilution Factor	Calculated Indoor Air Concentration (A) µg/m³	RfC (B) µg/m³	Hazard Quotient (HQ=A/B)	OK if HQ< Target Hazard Quotient = 1	SSTL Calculation	
							Mass Fractions (MF)	MF/RfC
Benzene	13.9	50	2.780E-01	3.0	9.3E-02	HQ<1 - OK		
Toluene	384	50	7.680E+00	3800	2.0E-03	HQ<0.5 - OK		
Ethyl Benzene	59.8	50	1.196E+00	1000	1.2E-03	HQ<0.5 - OK		
Xylenes	151	50	3.020E+00	180	1.7E-02	HQ<0.5 - OK		
Total Petroleum Hydrocarbon Fractions (TPH)								
Ar C8-C10	252	50	5.040E+00	200	2.5E-02	HQ<1 - OK	0.012	0.0000589
Ar C10-C12	80	50	1.600E+00	200	8.0E-03	HQ<1 - OK	0.004	0.0000187
Ar C12-C16	10	50	2.000E-01	200	1.0E-03	HQ<1 - OK	0.0005	0.0000023
Al C5-C6	348	50	6.960E+00	18400	3.8E-04	HQ<1 - OK	0.016	0.0000009
Al C6-C8	5960	50	1.192E+02	18400	6.5E-03	HQ<1 - OK	0.279	0.0000151
Al C8-C10	13500	50	2.700E+02	1000	2.7E-01	HQ<1 - OK	0.631	0.0006311
Al C10-C12	1230	50	2.460E+01	1000	2.5E-02	HQ<1 - OK	0.058	0.0000575
Al C12-C16	10	50	2.000E-01	1000	2.0E-04	HQ<1 - OK	0.0005	0.0000005
Total (minus TEX)	21390.0		4.278E+02		3.4E-01	If <1, OK		0.001

Calc SSTL	1273.8
TPH/SSTL	3.4E-01

If <1, OK

Benzene Risk	Target Risk
9.2E-07	1.0E-05

Notes: Commercial
Used Dilution Factor from Atlantic RBCA User Guidance as presented in table below
BTEX/TPH Reference Concentration (RFC) from 2012 Atlantic RBCA Guidance
Toluene, Ethyl Benzene and Xylenes are excluded from the TPH carbon ranges, as they are evaluated separately
As per Atlantic RBCA User Guidance, SSTLs are calculated using the mass fraction for each individual sample. Thus, SSTLs for the same sampling location can vary from sample to sample.
Non-detectable results are entered as half the reportable detection limit (RDL)
Aromatic C7-C8 range soil vapour results are excluded from the above TPH calculations, as this range is made up entirely of Toluene and Toluene is evaluated separately.

Input
Exceeds criteria

Distance (m)	Residential		Commercial	
	Coarse	Fine	Coarse	Fine
Sub-Slab	50	50	50	50
1	2,500	31,000	6,300	64,000
2	4,000	33,000	8,500	65,000
3	5,500	34,000	10,000	67,000
5	8,500	36,000	15,000	71,000
10	15,000	42,000	26,000	80,000
20	30,000	54,000	48,000	98,000
30	45,000	66,000	70,000	110,000

Appendices

Appendix A

Historical Analytical Results

**Table A1: Historical Soil Analytical Results - BTEX/TPH
Supplemental Phase III ESA
Butter Pot Provincial Park, Newfoundland and Labrador**

Location	Depth (m)	Date	BTEX Concentration (mg/kg)				TPH Concentration (mg/kg)				
			Benzene	Toluene	Ethyl Benzene	Xylenes	C6-C10	C10-C16	C16-C21	C21-C32	Modified TPH
ADI Limited - Phase II Environmental Site Assessment (2009)											
TP1-SA2	0.5-1.0	19-Mar-09	<0.03	<0.03	0.6	3.2	260	6900	800	7900	
TP1-SA5	2.0-2.8	19-Mar-09	<0.03	<0.03	0.12	0.71	190	3600	430	4200	
TP2-SA1	0.0-0.5	19-Mar-09	<0.03	7.3	1.5	11	140	28000	23000	51000	
TP2-SA3	1.0-1.5	19-Mar-09	<0.03	0.04	0.12	1.1	130	1300	350	1800	
TP3-SA4	2.0-2.5	19-Mar-09	<0.03	<0.03	<0.03	<0.05	<3	<15	<15	<20	
QA/QC-S1 (TP3-SA4)	2.0-2.5	19-Mar-09	<0.03	<0.03	<0.03	<0.05	<3	<15	<15	<20	
TP4-SA4	2.0-2.4	19-Mar-09	<0.03	<0.03	<0.03	<0.05	<3	<15	<15	<20	
CBCL Limited - Subsurface Assessment (2011)											
TP1-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	0.26	250	3800	1100	5200	
TP1-03	1.0-1.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	7	260	86	360	
TP2-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	59	24	83	
TP2-03	1.0-1.45	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP3-02	0.3-1.0	15-Sep-11	<0.03	1	1.4	12	570	38000	3800	43000	
TP3-03	1.0-1.8	15-Sep-11	<0.03	<0.03	<0.03	0.13	160	3600	480	4200	
TP4-02	0.3-0.8	15-Sep-11	<0.03	7.9	3	19	490	48000	5400	54000	
TP4-03	0.8-1.15	15-Sep-11	<0.03	0.27	1	5.4	630	8900	940	10000	
TP5-01	0-0.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	7400	3100	10000	
TP5-02	0.3-0.5	15-Sep-11	<0.03	<0.03	<0.03	<0.05	20	1020	190	1200	
TP6-01	0-0.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	307	68	370	
TP6-02	0.3-1.1	15-Sep-11	<0.03	<0.03	0.4	1.3	330	4300	400	5000	
TP7-01	0-0.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	640	210	840	
TP7-02	0.3-0.7	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	480	110	600	
TP8-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	18	<20	
TP8-03	1.0-1.85	15-Sep-11	<0.03	<0.03	<0.03	<0.05	5	12	<10	<20	
TP9-01	0-0.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP9-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP10-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	115	89	200	
TP10-03	1.0-1.55	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	41	<10	41	
TP11-01	0-0.3	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP11-02	0.3-1.05	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP12-02	0.3-1.0	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
TP12-03	1.0-1.95	15-Sep-11	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<20	
SNC Lavalin - Phase III ESA (2015)											
TP1-SURFACE	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP1-BOTTOM	1.5	19-Jan-15	<0.03	<0.03	<0.03	<0.05	3.3	350	220	60	640
TP2-SURFACE	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	570	640	270	1500
TP2-BOTTOM	1.6	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	120	160	86	370
TP3-SURFACE	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	64	64
TP3-BOTTOM	1.9	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP4-SURFACE	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	27	36	63
TP4-BOTTOM	1.8	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP5-SURFACE	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	17	53	70
TP5-BOTTOM	1	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP10-SURFACE (Dup of TP1-SURFACE)	0.0-0.15	19-Jan-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP6-SURFACE	0.0-0.15	27-May-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	31	31
TP6-BOTTOM	1.5	27-May-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20
TP7-SURFACE	0.0-0.15	27-May-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	71	71
TP7-BOTTOM	1.9	27-May-15	<0.03	<0.03	<0.03	<0.05	<3	<10	<10	<15	<20

**Table A1: Historical Soil Analytical Results - BTEX/TPH
Supplemental Phase III ESA
Butter Pot Provincial Park, Newfoundland and Labrador**

Location	Depth (m)	Date	BTEX Concentration (mg/kg)				TPH Concentration (mg/kg)				
			Benzene	Toluene	Ethyl Benzene	Xylenes	C6-C10	C10-C16	C16-C21	C21-C32	Modified TPH
GHD Limited - Supplemental Phase III ESA (2015)											
15-TP1-SS2	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP1-SS2 Lab-Dup	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	-	-	-	-
15-TP1-SS4	1.5-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP2-SS2	1.0-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP3-SS2	1.0-2.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP4-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP5-SS2	0.5-1.0	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP5-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
15-TP6-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	14	<15	<15
15-TP0-SS3	1.0-1.5	15-Dec-15	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15
2012 Tier I RBSL values - Commercial, Non-Potable			0.042	0.35	0.043	0.73	--	--	--	--	870 / 1,800 / 10,000
2012 Tier I ESL values - Commercial			180	250	300	350	320	260	1,700		-
2012 Tier I ESL values - Protection of Wildlife Commercial			18	980	640	2,600	1,100	9,800	16,000		-

Note:

- No established criteria or not analyzed
- 0.00** Concentration above Atlantic RBCA Tier I RBSL Table values - Commercial, Potable, Coarse-grained
- 0.00** Concentration above Atlantic RBCA Tier I ESL Table values (0 to 1.5 mbgs)
- 0.00** Concentration above Atlantic RBCA Tier I ESL Table values for protection of wildlife

(1) Based on laboratory reporting gasoline fraction
(2) Based on laboratory reporting diesel fraction
(3) Based on laboratory reporting #6 oil fraction

15-TP0-SS3 is field duplicate of 15-TP6-SS3

**Table A2: Historical Groundwater Analytical Results - BTEX/TPH
Supplemental Phase III ESA
Butter Pot Provincial Park, Newfoundland and Labrador**

Location	Date	Groundwater Depth (mbgs)	BTEX Concentration (mg/L)				TPH Concentration (mg/L)				
			Benzene	Toluene	Ethyl Benzene	Xylenes	C6-C10	C10-C16	C16-C21	C21-C32	Modified TPH
MW1	9-Jun-15	5.97	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15	-	Not Located								
MW2	9-Jun-15	4.48	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15	4.45	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15*	4.45	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
MW3	9-Jun-15	3.34	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15	4.43	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
MW4	9-Jun-15	3.56	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
	18-Dec-15	3.57	<0.001	<0.001	<0.001	<0.002	<0.01	<0.05	<0.05	<0.1	<0.1
2012 Tier I RBSL Commercial, Potable values			0.005	0.024	0.0016	0.02	--	--	--	--	4.4 / 3.2 / 7.8
2012 Tier I ESL Commercial, Coarse-grained values - Shallow groundwater			350	200	110	120	11	3.1	na	na	na
2012 Tier I ESL, Coarse-grained values - Aquatic Life (150 m)			97	88	67	59	--	--	--	--	750 / >sol / >sol

Note:

- No established criteria or not analyzed
- 0.00** Concentration above Atlantic RBCA Tier I RBSLs - Commercial, Potable, Coarse-grained
- 0.00** Concentration above Atlantic RBCA Tier I ESLs with Groundwater < 3.0 mbgs
- 0.00** Concentration above Atlantic RBCA Tier I ESLs adjusted to 150 metres from receptor
- (1) Based on laboratory reporting gasoline fraction
- (2) Based on laboratory reporting diesel fraction
- (3) Based on laboratory reporting #6 oil fraction
- * Indicates Field duplicate

Appendix B

Test Pit Logs

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 2.0 metres

UTM Northing: N/A

Depth to Water Strike: 1.2 metres

Logged By: Robert Perry

Depth to Bedrock: 2.0 metres



Test Pit: TP1

Page: 1 of 1

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			FILL Sand and gravel fill, brown and grey, loose, dry, no hydrocarbon odour.	0.0	SS1	<5		
			PEAT Brown and black, with some organics, sand, and gravel, compact, dry to moist, no hydrocarbon odour.		SS2	35	BTEX/TPH	
1.0			SAND AND GRAVEL Rusty brown, with some cobbles, till, compact, dry to moist, no hydrocarbon odour.	-1.0				
			Brown and grey, with some cobbles, till, compact, moist to wet at 1.2 mbgs, no hydrocarbon odour.		SS3	<5		
					SS4	<5	BTEX/TPH	
2.0			Test pit terminated on possible bedrock at 2.0 mbgs.	-2.0				
3.0				-3.0				

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 2.0 metres

UTM Northing: N/A

Depth to Water Strike: 1.0 metres

Logged By: Robert Perry

Depth to Bedrock: 2.0 metres



Test Pit: TP2

Page: 1 of 1

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			FILL Sand and gravel fill, brown and grey, loose, dry, no hydrocarbon odour.	0.0				
1.0			PEAT Brown and black, with some organics, sand, and gravel, compact, moist to wet, no hydrocarbon odour.	-1.0	SS1	<5		
2.0			SAND AND GRAVEL Rusty brown transitioning to brownish grey, with some cobbles, till, compact, wet, no hydrocarbon odour.		SS2	30	BTEX/TPH	
2.0			Test pit terminated on possible bedrock at 2.0 mbgs.	-2.0				
3.0				-3.0				

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 2.0 metres

UTM Northing: N/A

Depth to Water Strike: 1.0 metres

Logged By: Robert Perry

Depth to Bedrock: 2.0 metres



Test Pit: TP3

Page: 1 of 1

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			FILL Sand and gravel fill, brown and grey, loose, dry, no hydrocarbon odour.	0.0				
1.0			PEAT Brown and black, with some organics, sand, and gravel, compact, moist to wet, no hydrocarbon odour.	-1.0	SS1	75		
2.0			SAND AND GRAVEL Rusty brown transitioning to brownish grey, till, compact, wet, no hydrocarbon odour.		SS2	<5	BTEX/TPH	
2.0			Test pit terminated on possible bedrock at 2.0 mbgs.	-2.0				
3.0				-3.0				

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 1.5 metres

UTM Northing: N/A

Depth to Water Strike: 1.0 metres

Logged By: Robert Perry

Depth to Bedrock: Not Encountered



Test Pit: TP4

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			FILL Sand and gravel fill, brown and grey, loose, dry, no hydrocarbon odour.	0.0	SS1	75		
			PEAT Brown and black, loose, dry to moist, no hydrocarbon odour.		SS2	15		
1.0			SAND AND GRAVEL Rusty brown, with some cobbles, till, loose to compact, moist, no hydrocarbon odour.	-1.0	SS3	<5	BTEX/TPH	
			Grey, with some cobbles, till, compact, wet, no hydrocarbon odour.					
2.0				-2.0				
3.0				-3.0				

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 1.5 metres

UTM Northing: N/A

Depth to Water Strike: 1.0 metres

Logged By: Robert Perry

Depth to Bedrock: Not Encountered



Test Pit: TP5

Page: 1 of 1

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			FILL Sand and gravel fill, brown and grey, loose, dry, no hydrocarbon odour.	0.0	SS1	<5		
			PEAT Brown and black, loose, dry to wet, no hydrocarbon odour.					
			SAND AND GRAVEL Rusty brown, with some cobbles, till, compact, moist to wet, no hydrocarbon odour.		SS2	20	BTEX/TPH	
1.0			Grey, with some cobbles, till, compact, wet, no hydrocarbon odour.	-1.0	SS3	<5	BTEX/TPH	
2.0				-2.0				
3.0				-3.0				

Client: NL Dept. of Enviro. & Cons.

Excavator Contractor: Jim Eales

Project No: 11111591

Excavator Model: Vi055 Yanmar

Civic Address: Butter Pot Provincial Park

Date Started: Dec. 15, 2015

City & Province: NL

Date Finished: Dec. 15, 2015

PID Number: N/A

GL Elevation: N/A

UTM Easting: N/A

Final Depth: 1.5 metres

UTM Northing: N/A

Depth to Water Strike: 1.0 metres

Logged By: Robert Perry

Depth to Bedrock: Not Encountered



Test Pit: TP6

Depth (m)	Lithology	USCS Classification	Description	Elevation (mamsl)	Sample ID	Headspace (ppm/% LEL)	Analysis	Photo
0.0			PEAT Brown and black, with some organics, sand, gravel and cobbles, loose, dry to moist, no hydrocarbon odour.	0.0				
			SAND AND GRAVEL Rusty brown, with some cobbles, till, compact, moist, no hydrocarbon odour.		SS1	15		
1.0			Grey and brown with some cobbles, till, compact, wet, no hydrocarbon odour.	-1.0	SS2	75		
					SS3	<5	BTEX/TPH	
2.0				-2.0				
3.0				-3.0				

Appendix C

Site Photographs



Photo 1 – View, looking southwest towards the workshop, note the Hydrovac truck and excavator (completing TP1) in the background.



Photo 2 – View, looking southwest towards the workshop, generator shed and storage shed.



Site Photographs



Photo 3 – View, looking northwest towards the generator shed and workshop.



Photo 4 – View, looking northwest along the gravel pathway in front of the storage shed.



Site Photographs



Photo 5 – View, looking southwest at side of generator shed, note the diesel fuel AST and the propane AST.



Photo 6 – View, looking east behind workshop, note loose fuel drum storage.



Site Photographs



Photo 7 – View, behind storage shed, note loose fuel drum storage.



Photo 8 – View, test pit TP1, east of workshop.



Site Photographs



Photo 9 – View, test pit TP2, north of workshop.



Photo 10 – View, test pit TP4, northeast of generator shed.



Site Photographs



Photo 11 – View, test pit TP5, northeast of generator shed.



Photo 12 – View, test pit TP6, southwest of workshop.



Site Photographs

Appendix D

Laboratory Certificates of Analysis

Your Project #: 11111591
Site Location: BUTTERPOT PARK, NL
Your C.O.C. #: B154462

Attention: Jamie O'Neill

GHD Limited
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2015/12/24
Report #: R3827264
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5P8612
Received: 2015/12/16, 10:00

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date		Laboratory Method	Reference
		Extracted	Analyzed		
TEH in Soil (PIRI) (1, 2)	2	2015/12/22	2015/12/23	ATL SOP 00197	Atl. RBCA v3 m
TEH in Soil (PIRI) (2)	7	2015/12/22	2015/12/24	ATL SOP 00197	Atl. RBCA v3 m
Moisture	9	N/A	2015/12/18	ATL SOP-00196	OMOE Handbook 1983 m
VPH in Soil (PIRI)	1	2015/12/17	2015/12/18	ATL SOP 00199	Atl. RBCA v3 m
VPH in Soil (PIRI)	5	2015/12/22	2015/12/23	ATL SOP 00199	Atl. RBCA v3 m
VPH in Soil (PIRI)	3	2015/12/23	2015/12/24	ATL SOP 00199	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	9	N/A	2015/12/24	N/A	Atl. RBCA v3 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

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

Encryption Key  Paula Chaplin
24 Dec 2015 13:28:59 -03:30

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

=====
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.

RBCA HYDROCARBONS IN SOIL (SOIL)

Maxxam ID		BNN717	BNN717		BNN718	BNN719	BNN720	BNN721		
Sampling Date		2015/12/15	2015/12/15		2015/12/15	2015/12/15	2015/12/15	2015/12/15		
COC Number		B154462	B154462		B154462	B154462	B154462	B154462		
	UNITS	15-TP1-SS2	15-TP1-SS2 Lab-Dup	QC Batch	15-TP1-SS4	15-TP2-SS2	15-TP3-SS2	15-TP4-SS3	RDL	QC Batch

Inorganics

Moisture	%	11	9.6	4317880	8.4	9.3	7.5	9.8	1.0	4317880
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Petroleum Hydrocarbons

Benzene	mg/kg	<0.025	<0.025	4318173	<0.025	<0.025	<0.025	<0.025	0.025	4323746
Toluene	mg/kg	<0.025	<0.025	4318173	<0.025	<0.025	<0.025	<0.025	0.025	4323746
Ethylbenzene	mg/kg	<0.025	<0.025	4318173	<0.025	<0.025	<0.025	<0.025	0.025	4323746
Total Xylenes	mg/kg	<0.050	<0.050	4318173	<0.050	<0.050	<0.050	<0.050	0.050	4323746
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	4318173	<2.5	<2.5	<2.5	<2.5	2.5	4323746
>C10-C16 Hydrocarbons	mg/kg	<10		4323826	<10	<10	<10	<10	10	4323826
>C16-C21 Hydrocarbons	mg/kg	<10		4323826	<10	<10	<10	<10	10	4323826
>C21-<C32 Hydrocarbons	mg/kg	<15		4323826	<15	<15	<15	<15	15	4323826
Modified TPH (Tier1)	mg/kg	<15		4315450	<15	<15	<15	<15	15	4315450
Reached Baseline at C32	mg/kg	Yes		4323826	Yes	Yes	Yes	Yes	N/A	4323826

Surrogate Recovery (%)

Isobutylbenzene - Extractable	%	92		4323826	90	91	91	91		4323826
n-Dotriacontane - Extractable	%	95		4323826	92	95	93	92		4323826
Isobutylbenzene - Volatile	%	101	92	4318173	99	97	94	95		4323746

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

RBCA HYDROCARBONS IN SOIL (SOIL)

Maxxam ID		BNN722		BNN723		BNN724	BNN725		
Sampling Date		2015/12/15		2015/12/15		2015/12/15	2015/12/15		
COC Number		B154462		B154462		B154462	B154462		
	UNITS	15-TP5-SS2	QC Batch	15-TP5-SS3	QC Batch	15-TP6-SS3	15-TP0-SS3	RDL	QC Batch
Inorganics									
Moisture	%	19	4317880	9.4	4317880	10	10	1.0	4317880
Petroleum Hydrocarbons									
Benzene	mg/kg	<0.025	4323746	<0.025	4325541	<0.025	<0.025	0.025	4325541
Toluene	mg/kg	<0.025	4323746	<0.025	4325541	<0.025	<0.025	0.025	4325541
Ethylbenzene	mg/kg	<0.025	4323746	<0.025	4325541	<0.025	<0.025	0.025	4325541
Total Xylenes	mg/kg	<0.050	4323746	<0.050	4325541	<0.050	<0.050	0.050	4325541
C6 - C10 (less BTEX)	mg/kg	<2.5	4323746	<2.5	4325541	<2.5	<2.5	2.5	4325541
>C10-C16 Hydrocarbons	mg/kg	<10	4323826	<10	4323826	<10	<10	10	4323830
>C16-C21 Hydrocarbons	mg/kg	<10	4323826	<10	4323826	14	<10	10	4323830
>C21-<C32 Hydrocarbons	mg/kg	<15	4323826	<15	4323826	<15	<15	15	4323830
Modified TPH (Tier1)	mg/kg	<15	4315450	<15	4315450	<15	<15	15	4315450
Reached Baseline at C32	mg/kg	Yes	4323826	Yes	4323826	Yes	Yes	N/A	4323830
Hydrocarbon Resemblance	mg/kg					COMMENT (1)		N/A	4323830
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	90	4323826	90	4323826	92	94		4323830
n-Dotriacontane - Extractable	%	94	4323826	94	4323826	99	99		4323830
Isobutylbenzene - Volatile	%	99	4323746	103	4325541	98	99		4325541
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) One product in fuel oil range.									

GENERAL COMMENTS

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

Package 1	8.8°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4318173	Isobutylbenzene - Volatile	2015/12/18			97	60 - 130	92	%		
4323746	Isobutylbenzene - Volatile	2015/12/23			93	60 - 130	90	%		
4323826	Isobutylbenzene - Extractable	2015/12/24	99	30 - 130	97	30 - 130	99	%		
4323826	n-Dotriacontane - Extractable	2015/12/24	110	30 - 130	107	30 - 130	100	%		
4323830	Isobutylbenzene - Extractable	2015/12/23	97 (3)	30 - 130	97	30 - 130	97	%		
4323830	n-Dotriacontane - Extractable	2015/12/23	109	30 - 130	115	30 - 130	100	%		
4325541	Isobutylbenzene - Volatile	2015/12/24			97	60 - 130	93	%		
4317880	Moisture	2015/12/18							12 (1)	25
4318173	Benzene	2015/12/18			75	60 - 140	<0.025	mg/kg	NC (1)	50
4318173	C6 - C10 (less BTEX)	2015/12/18					<2.5	mg/kg	NC (1)	50
4318173	Ethylbenzene	2015/12/18			75	60 - 140	<0.025	mg/kg	NC (1)	50
4318173	Toluene	2015/12/18			73	60 - 140	<0.025	mg/kg	NC (1)	50
4318173	Total Xylenes	2015/12/18			80	60 - 140	<0.050	mg/kg	NC (1)	50
4323746	Benzene	2015/12/23			81	N/A	<0.025	mg/kg		
4323746	C6 - C10 (less BTEX)	2015/12/23					<2.5	mg/kg		
4323746	Ethylbenzene	2015/12/23			79	N/A	<0.025	mg/kg		
4323746	Toluene	2015/12/23			78	N/A	<0.025	mg/kg		
4323746	Total Xylenes	2015/12/23			88	N/A	<0.050	mg/kg		
4323826	>C10-C16 Hydrocarbons	2015/12/24	93	30 - 130	94	30 - 130	<10	mg/kg	NC (2)	50
4323826	>C16-C21 Hydrocarbons	2015/12/24	101	30 - 130	105	30 - 130	<10	mg/kg	NC (2)	50
4323826	>C21-<C32 Hydrocarbons	2015/12/24	94	30 - 130	85	30 - 130	<15	mg/kg	NC (2)	50
4323830	>C10-C16 Hydrocarbons	2015/12/23	NC	30 - 130	95	30 - 130	<10	mg/kg	6.4 (2)	50
4323830	>C16-C21 Hydrocarbons	2015/12/23	NC	30 - 130	102	30 - 130	<10	mg/kg	9.0 (2)	50
4323830	>C21-<C32 Hydrocarbons	2015/12/23	NC	30 - 130	91	30 - 130	<15	mg/kg	1.1 (2)	50
4325541	Benzene	2015/12/24			84	N/A	<0.025	mg/kg	NC (2)	50
4325541	C6 - C10 (less BTEX)	2015/12/24					<2.5	mg/kg	NC (2)	50
4325541	Ethylbenzene	2015/12/24			83	N/A	<0.025	mg/kg	NC (2)	50
4325541	Toluene	2015/12/24			82	N/A	<0.025	mg/kg	8.3 (2)	50

QUALITY ASSURANCE REPORT(CONT'D)

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4325541	Total Xylenes	2015/12/24			89	N/A	<0.050	mg/kg	11 (2)	50

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

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

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

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

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

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

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

(1) Duplicate Parent ID [BNN717-01]

(2) Duplicate Parent ID

(3) If the original sample concentration is greater than 2X the matrix spike level, the matrix spike does not need to be repeated.

VALIDATION SIGNATURE PAGE

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



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.

Your Project #: 11111591
Site Location: BUTTER POT PARK
Your C.O.C. #: B154419

Attention: Jamie O'Neill

GHD Limited
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2016/01/04
Report #: R3839485
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5Q2934
Received: 2015/12/22, 10:50

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date		Laboratory Method	Reference
		Extracted	Analyzed		
TEH in Water (PIRI)	3	2015/12/29	2015/12/31	ATL SOP 00198	Atl. RBCA v3 m
TEH in Water (PIRI)	1	2015/12/30	2016/01/04	ATL SOP 00198	Atl. RBCA v3 m
VPH in Water (PIRI) (1)	4	N/A	2015/12/25	ATL SOP 00118	Atl. RBCA v3 m
ModTPH (T1) Calc. for Water	3	N/A	2015/12/31	N/A	Atl. RBCA v3 m
ModTPH (T1) Calc. for Water	1	N/A	2016/01/04	N/A	Atl. RBCA v3 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam Bedford

Encryption Key



Robert Whelan

04 Jan 2016 16:58:49 -03:30

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

=====

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.

RBCA HYDROCARBONS IN WATER (WATER)

Maxxam ID		BOL185	BOL186	BOL187		BOL188		
Sampling Date		2015/12/18	2015/12/18	2015/12/18		2015/12/18		
COC Number		B154419	B154419	B154419		B154419		
	UNITS	MW2	MW3	MW4	QC Batch	MW0	RDL	QC Batch
Petroleum Hydrocarbons								
Benzene	mg/L	<0.0010	<0.0010	<0.0010	4325514	<0.0010	0.0010	4325514
Toluene	mg/L	<0.0010	<0.0010	<0.0010	4325514	<0.0010	0.0010	4325514
Ethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	4325514	<0.0010	0.0010	4325514
Total Xylenes	mg/L	<0.0020	<0.0020	<0.0020	4325514	<0.0020	0.0020	4325514
C6 - C10 (less BTEX)	mg/L	<0.010	<0.010	<0.010	4325514	<0.010	0.010	4325514
>C10-C16 Hydrocarbons	mg/L	<0.050	<0.050	<0.050	4328966	<0.050	0.050	4330305
>C16-C21 Hydrocarbons	mg/L	<0.050	<0.050	<0.050	4328966	<0.050	0.050	4330305
>C21-<C32 Hydrocarbons	mg/L	<0.10	<0.10	<0.10	4328966	<0.10	0.10	4330305
Modified TPH (Tier1)	mg/L	<0.10	<0.10	<0.10	4323334	<0.10	0.10	4323334
Reached Baseline at C32	mg/L	Yes	Yes	Yes	4328966	Yes	N/A	4330305
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	101	102	110	4328966	105		4330305
n-Dotriacontane - Extractable	%	101	100	107 (1)	4328966	108		4330305
Isobutylbenzene - Volatile	%	99	99	99	4325514	100		4325514
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) TEH sample contained sediment.								

GENERAL COMMENTS

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

Package 1	5.7°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4325514	Isobutylbenzene - Volatile	2015/12/25	100	70 - 130	98	70 - 130	104	%		
4328966	Isobutylbenzene - Extractable	2015/12/31	80	30 - 130	102	30 - 130	92	%		
4328966	n-Dotriacontane - Extractable	2015/12/31	92	30 - 130	108	30 - 130	91	%		
4330305	Isobutylbenzene - Extractable	2016/01/04	102 (2)	30 - 130	107	30 - 130	100	%		
4330305	n-Dotriacontane - Extractable	2016/01/04	102 (2)	30 - 130	105	30 - 130	101	%		
4325514	Benzene	2015/12/25	104	70 - 130	105	70 - 130	<0.0010	mg/L	NC (1)	40
4325514	C6 - C10 (less BTEX)	2015/12/25					<0.010	mg/L	NC (1)	40
4325514	Ethylbenzene	2015/12/25	106	70 - 130	106	70 - 130	<0.0010	mg/L	NC (1)	40
4325514	Toluene	2015/12/25	105	70 - 130	106	70 - 130	<0.0010	mg/L	NC (1)	40
4325514	Total Xylenes	2015/12/25	106	70 - 130	105	70 - 130	<0.0020	mg/L	NC (1)	40
4328966	>C10-C16 Hydrocarbons	2015/12/31	NC	70 - 130	84	70 - 130	<0.050	mg/L	NC (1)	40
4328966	>C16-C21 Hydrocarbons	2015/12/31	91	70 - 130	94	70 - 130	<0.050	mg/L	NC (1)	40
4328966	>C21-<C32 Hydrocarbons	2015/12/31	99	70 - 130	101	70 - 130	<0.10	mg/L	NC (1)	40
4330305	>C10-C16 Hydrocarbons	2016/01/04	73 (2)	70 - 130	76	70 - 130	<0.050	mg/L	NC (1)	40
4330305	>C16-C21 Hydrocarbons	2016/01/04	84 (2)	70 - 130	88	70 - 130	<0.050	mg/L	NC (1)	40
4330305	>C21-<C32 Hydrocarbons	2016/01/04	86 (2)	70 - 130	93	70 - 130	<0.10	mg/L	NC (1)	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 sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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

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

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

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

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [BOL188-01]

VALIDATION SIGNATURE PAGE

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



Rosemarie MacDonald, Scientific Specialist (Organics)



Rob Whelan, Laboratory 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.

This column for lab use only:

Client Code **10275**
 Maxxam Job # **BSQ2934**

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			5.0	5.5	5.5	

INVOICE INFORMATION:
 Company Name: **GHD**
 Contact Name: **Jamie O'Neill**
 Address: **1118 Topsail Road**
St. John's, NL Postal Code **A1B3M7**
 Email: **Joneill@GHD.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 # **To Follow**
 Project # / Phase # **1111591**
 Project Name / Site Location **Butter Pot Park**
 Quote **GHD'SO"**
 Site # **N/A**
 Task Order # **N/A**
 Sampled by **R.M.P.**

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

Integrity YES NO
 Integrity / Checklist by **A**
 Labelled by **A** Location / Bin # _____

Guideline Requirements / Detection Limits / Special Instructions
Please c.c. dani@GHD.com

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

Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Total Digest (Default Method) for well water, surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Available Digest Method	Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Selenium (low level) Rec'd for CCME Residential, Parkslands, Agricultural	Hot Water soluble Boron (required for CCME Agricultural)	RBCH Hydrocarbons (BTEX, C8-C12)	Hydrocarbons Soil (Potable), NS Fuel Oil Soil Policy Low Level BTEX, C8-C12	MB Potable Water BTEX, VPH, Low level TEH.	TPH Fractionation	PAH's	PAH's with Acridine, Quinoline
Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Metals Water	Metals Soil	Hydrocarbons											

1	MW 2	Water	Dec. 18/15	5x 40ml 2x 250ml								X					
2	MW 3	Water	Dec. 19/15	3x 40ml 2x 250ml								X					
3	MW 4	Water	Dec. 19/15	3x 40ml 2x 250ml								X					
4	MW 0	Water	Dec. 18/15	3x 40ml 2x 250ml								X					
5																	
6																	
7																	
8																	
9																	
10																	

RELINQUISHED BY: (Signature/Print) **Robert Perry** Date **Dec. 22/15** Time _____
 RECEIVED BY: (Signature/Print) **A. Wignen** Date **2015/12/22** Time **10:50**



Your P.O. #: TO FOLLOW
Your Project #: 11111591
Site Location: BUTTER POT PARK
Your C.O.C. #: 14374, 14373

Attention: Jamie O'Neill

GHD Limited
Mount Pearl/St. John's
PO Box 8353 Stn A
1118 Topsail Rd
St. John's, NL
A1B 3N7

Report Date: 2016/01/06
Report #: R3841033
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5Q3067
Received: 2015/12/22, 10:45

Sample Matrix: AIR
Samples Received: 1

Analyses	Date		Laboratory Method	Reference
	Quantity	Extracted		
BTEX Fractionation in Air (TO-15mod)	1	N/A	2015/12/24 BRL SOP-00304	EPA TO-15 m
Canister Pressure (TO-15)	1	N/A	2015/12/24 BRL SOP-00304	EPA TO-15 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Encryption Key *Cristina Bacchus* Cristina Bacchus
Project Manager
06 Jan 2016 10:37:07 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cristina Bacchus, Project Manager
Email: CBacchus@maxxam.ca
Phone# (905) 817-5700

=====
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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RESULTS OF ANALYSES OF AIR

Maxxam ID		BOL744	
Sampling Date		2015/12/18	
COC Number		14373	
	UNITS	SV1-AS1/#2577	QC Batch
Pressure on Receipt	psig	(-1.3)	4332934
QC Batch = Quality Control Batch			

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		BOL744		
Sampling Date		2015/12/18		
COC Number		14373		
	UNITS	SV1-AS1/#2577	RDL	QC Batch
Benzene	ug/m3	13.9	4.8	4333011
Toluene	ug/m3	384	6.4	4333011
Ethylbenzene	ug/m3	59.8	6.4	4333011
Total Xylenes	ug/m3	151	8.8	4333011
Aliphatic >C5-C6	ug/m3	348	20	4333011
Aliphatic >C6-C8	ug/m3	5960	20	4333011
Aliphatic >C8-C10	ug/m3	13500	20	4333011
Aliphatic >C10-C12	ug/m3	1230	20	4333011
Aliphatic >C12-C16	ug/m3	<20	20	4333011
Aromatic >C7-C8 (TEX Excluded)	ug/m3	<20	20	4333011
Aromatic >C8-C10	ug/m3	252	20	4333011
Aromatic >C10-C12	ug/m3	80	20	4333011
Aromatic >C12-C16	ug/m3	<20	20	4333011
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	76		4333011
Bromochloromethane	%	79		4333011
D5-Chlorobenzene	%	80		4333011
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

GENERAL COMMENTS

Sample BOL744-01 : Sample was analyzed at a 4X dilution. The DL's were adjusted accordingly.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4333011	DVO	Spiked Blank	1,4-Difluorobenzene	2015/12/24		100	%	60 - 140	
			Bromochloromethane	2015/12/24		102	%	60 - 140	
			D5-Chlorobenzene	2015/12/24		95	%	60 - 140	
			Benzene	2015/12/24		96	%	70 - 130	
			Toluene	2015/12/24		97	%	70 - 130	
			Ethylbenzene	2015/12/24		99	%	70 - 130	
			Total Xylenes	2015/12/24		100	%	70 - 130	
4333011	DVO	Method Blank	1,4-Difluorobenzene	2015/12/24		111	%	60 - 140	
			Bromochloromethane	2015/12/24		108	%	60 - 140	
			D5-Chlorobenzene	2015/12/24		102	%	60 - 140	
			Benzene	2015/12/24	<1.2		ug/m3		
			Toluene	2015/12/24	<1.6		ug/m3		
			Ethylbenzene	2015/12/24	<1.6		ug/m3		
			Total Xylenes	2015/12/24	<2.2		ug/m3		
			Aliphatic >C5-C6	2015/12/24	<5.0		ug/m3		
			Aliphatic >C6-C8	2015/12/24	<5.0		ug/m3		
			Aliphatic >C8-C10	2015/12/24	<5.0		ug/m3		
			Aliphatic >C10-C12	2015/12/24	<5.0		ug/m3		
			Aliphatic >C12-C16	2015/12/24	<5.0		ug/m3		
			Aromatic >C7-C8 (TEX Excluded)	2015/12/24	<5.0		ug/m3		
			Aromatic >C8-C10	2015/12/24	<5.0		ug/m3		
Aromatic >C10-C12	2015/12/24	<5.0		ug/m3					
Aromatic >C12-C16	2015/12/24	<5.0		ug/m3					
4333011	DVO	RPD	Aliphatic >C5-C6	2015/12/24	NC		%	25	
			Aliphatic >C6-C8	2015/12/24	NC		%	25	
			Aliphatic >C8-C10	2015/12/24	NC		%	25	
			Aliphatic >C10-C12	2015/12/24	NC		%	25	
			Aliphatic >C12-C16	2015/12/24	19		%	25	
			Aromatic >C7-C8 (TEX Excluded)	2015/12/24	NC		%	25	
			Aromatic >C8-C10	2015/12/24	NC		%	25	
			Aromatic >C10-C12	2015/12/24	NC		%	25	
Aromatic >C12-C16	2015/12/24	NC		%	25				

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

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

Appendix E

Summary Table – Results of Ecological Screening Protocol for Petroleum Impacted Sites

SUMMARY TABLE – RESULTS OF ECOLOGICAL SCREENING PROTOCOL FOR PETROLEUM IMPACTED SITES

Instructions to Practitioners: This table is intended to summarize the results of the Ecological Screening Protocol and must be completed in consultation with guidance provided in the protocol. Users should include this completed table in their Environmental Assessment or Closure Report. Details and explanations are to be provided in the body of the Report.

Ecological Screening Component	Yes or No	Report name and location of details and explanations
Part I – Identification of petroleum hydrocarbons in media		
<p>1. Do site characterization data indicate the presence of PHC in site <u>surface soil</u> (depth < 1.5 m) above the appropriate screening levels in Tables 1a and 1b?</p>	<p>Yes</p>	<p><u>Historical Soil Analytical Tables – Table A1 of Appendix A (Supplemental Phase III ESA Report)</u> Site characterization data identified the presence of petroleum hydrocarbons in surface soil samples at a depth of less than 1.5 mbgs that was above the Tier I Soil ESLs for the Protection of Plants and Soil Invertebrates through Direct Soil Contact (Atlantic RBCA Table 1a). Five historical soil samples (TP3-02, TP4-02, TP4-03, TP1-Bottom and TP2-Surface) collected in the general area of the generator shed reported C10–C16 and/or C10 C16 carbon fractions above the Tier I Soil ESLs for coarse grained soil. However, given the location of these samples are in an area of the active generator shed and are predominantly covered with gravel access roads/parking areas, buildings, and/or concrete AST slabs, impacts to plant and soil invertebrates are not expected. In ecological risk assessments, the upper 0.6 metres of the soil horizon is commonly considered the ecologically active soil horizon. Soil greater than 0.6 metres depth is generally considered to be at a depth that eliminates the ecological receptor to soil contact pathway, specifically in areas that lack deep rooting plants such as trees and shrubs. Visible observations obtained during the assessment work indicated that vegetation in the area of the five historical samples noted above primarily consisted of gravel and grasses/forbs with no areas of</p>

Ecological Screening Component	Yes or No	Report name and location of details and explanations
		stressed vegetation identified. As such, it is reasonable to assume that direct contact soil contact pathway for plants and invertebrates is not operable and therefore, hydrocarbon concentrations in this sample pose a low risk to ecological receptors.
2. Do site characterization data indicate the presence of PHC in shallow site <u>groundwater</u> (depth < 3.0 m) above appropriate ecological screening levels that were derived for the protection of terrestrial plants and soil invertebrates in contact with site groundwater in Table 2?	No	Historical Groundwater Analytical Tables – <u>Table A2 of Appendix A (Supplemental Phase III ESA Report)</u> h All Site Groundwater results are within the applicable Tier I ESLs.
3. Do existing site characterization data indicate the presence of PHC in site <u>groundwater</u> above appropriate ecological screening levels derived for the protection of aquatic receptors in Table 3a/3b?	No	All Site Groundwater results are within the applicable Tier I ESLs.
4. Do site characterization data indicate the presence of PHC in the site <u>surface water</u> above the appropriate screening levels in Table 3?	No	Given the groundwater and soil sample analytical results collected from the perimeter of the Site indicated non-detect concentrations of petroleum hydrocarbons, further evaluation of the adjacent surface water is not required for the Site.
5. Does site characterization indicate the presence of PHC in on-site or adjacent <u>sediments</u> above the appropriate screening levels in Table 4?	No	Given the groundwater/soil sample analytical results collected from the perimeter of the Site indicated non-detect concentrations of petroleum hydrocarbons, further evaluation of the adjacent sediment is not required for the Site.
IF ALL ANSWERS IN PART I ARE “NO” THEN NO FURTHER ACTION IS REQUIRED		
Part II – Identification of habitat and ecological receptors		
1. Are the following habitat types or conditions present on the site or proximate to the site within a minimum of 200 metres? <ul style="list-style-type: none"> • wetland habitats • aquatic habitats • forested habitats • grassland habitats • provincial/national parks or ecological reserves • known rare, threatened or endangered species • other known critical or sensitive habitat • other local or regional receptor or habitat concerns 	Yes	Site is located within Butter Pot Provincial Park and both forested and aquatic habitats are located within 200 metres of the Site.

Ecological Screening Component	Yes or No	Report name and location of details and explanations
2a. Are there visible indications of stressed vegetation on the site?	No	See response to Part 1, Q1.
2b. Is there evidence that the site vegetation community differs from what would be expected?	No	See response to Part 1, Q1.
2c. Are there indications that the site soil cannot support a soil invertebrate community?	No	See response to Part 1, Q1.
3. Is there evidence that terrestrial plants in the habitats above are likely to be in root contact with site groundwater above screening levels?	No	All Site Groundwater results are within the applicable Tier I ESLs.
4. Would wildlife receptors be expected to forage on or near the contaminated areas of the site?	No	All soil analytical results (see Table A1 of Appendix A) are below the applicable Tier I ESLs for the protection of wildlife
Part III – Identification of exposure pathways for ecological receptors		
1a. Is it reasonable to conclude that site hydrocarbons in surface soil with concentrations exceeding applicable screening levels, will come into contact with terrestrial plants and invertebrates in a suitable habitat?	No	See response to Part 1, Q1.
1b. Is it reasonable to conclude that site hydrocarbons in surface soil with concentrations exceeding applicable screening levels, will come into contact with mammalian, avian or herptile terrestrial receptors within an agricultural land use in suitable habitat?	No	See response to Part 1, Q1.
2. Is it reasonable to conclude that dissolved hydrocarbons in site groundwater with concentrations exceeding applicable screening levels will come into contact with plants or soil invertebrates in a suitable habitat?	No	All Site Groundwater results are within the applicable Tier I ESLs.
3. Is it reasonable to conclude that dissolved hydrocarbons in the site groundwater with concentrations exceeding applicable screening levels will come into contact with aquatic receptors or aquatic receptor habitat?	No	All Site Groundwater results are within the applicable Tier I ESLs.
4. Is it reasonable to conclude that site petroleum hydrocarbon contamination could impact aquatic receptors or aquatic habitat in surface water bodies via the following: a. surface run-off (e.g. Erosion, windblown contaminants) b. groundwater flow c. preferential overland flow pathways (e.g. drainage ditch, slope, swale) d. preferential subsurface flow pathways (e.g. culvert, trench, sewer line, pipelines, swales) such that aqueous media concentrations would potentially exceed surface water and/or sediment quality screening levels?	No	Given the groundwater and soil sample analytical results collected from the perimeter of the Site indicated non-detect concentrations of petroleum hydrocarbons, further evaluation of the adjacent sediment is not required for the Site.
Are there site specific conditions present, which were not considered in any section above that should require further ecological assessment?	No	
IF ALL ANSWERS IN PART III ARE “NO” THEN NO FURTHER ACTION IS REQUIRED		