City of Saint John

Request for Proposal

2021-091001P

ENGINEERING SERVICES: SITE WORKS – FUNDY QUAY

Emailed proposals addressed to Monic MacVicar at monic.macvicar@saintjohn.ca and indicate in the subject line:

“PROPOSAL 2021-091001P
ENGINEERING SERVICES: SITE WORKS – FUNDY QUAY”

will be received until **4:00 p.m**. **Local Time.**, **Thursday, February 11th, 2021**, for Engineering Design and Construction Management Services for the above noted project, as per the Request for Proposal.

Proposals will NOT be opened publicly due to the on-going pandemic.

The lowest cost or any proposal not necessarily accepted.

Monic MacVicar, CCLP, CPPB
Procurement Specialist
Supply Chain Management

RFP No. 2021-091001P – Engineering Services: Site Works – Fundy Quay

Scope and requirement changes from RFP 2020-091004P, issued July 2020

The following is a brief summary of changes to the previous RFP issued by the City for a similar scope of work in July 2020. This section is intended as a summary and reference only. The changes to the RFP can be found throughout the document highlighted in red text.

1. Clarification requirement for Project Manager to have a P. Eng designation with APENGNB. See pg.2
2. Additional project description has been provided concerning the requirements for the removal of underground storage tanks on the site. See pg. 3
3. Updated information on seawall height has been provided. See pg. 4
4. Information has been provided on the budget for the soil remediation and infill projects. See pg. 4
5. Additional requirements for the phasing of construction has been included. See pg. 4
6. Project 3, the Platform to Raise the Site with a structure has been removed from the project scope.
7. Requirements in Part A, associated with Federal Funding approvals (consultation, vulnerability and GHG assessments) have been removed from the scope. See pg. 5-6
8. Requirement for video inspection of existing storm and sanitary sewers on the site included in Part A. See further details below. See page 6
9. Requirement for investigation and testing to support the removal of underground storage tanks included in Part A. See pg. 6.
10. Engineering development plan has been updated to also consider key schedule requirements and construction impacts on key stakeholders. Project 3 is no longer a consideration See pg. 7.
11. Concept design no longer includes the preparation of 2 options. Project 3 has been removed from this scope. See pg. 7
12. Proponents who are re-submitting an updated proposal are to provide a summary list of changes made to their original proposal submission. See page 17.
13. An additional $40,000 contingency is to be carried for this project. See pg. 16 & 18.

1. General

The City has prepared this document for Consulting Engineering firms wishing to provide their services to the City of Saint John. This request for proposals is to be used as a guide, in combination with good engineering judgment and standard engineering practices and is not intended to be a complete procedural document. It reflects basic standards the consultant is to adhere to when preparing a proposal or carrying out work for the City.

All Engineers working on this project for the City must be a current member, licensee or holder of a certificate of authorization with APEGNB. All Engineering companies working on this project for the City must have a current certificate of authorization with APEGNB. In addition to the requirements noted above, the Project Manager assigned for parts A, B, C, D, E, F, and G of this RFP must be a professional engineer, having obtained their P. Eng. Designation in New Brunswick.

The consultant shall in all matters act as a faithful advisor to the City. The consultant shall keep the City informed on all matters related to design, procurement and construction and all other important aspects forming part of the scope of work.

The consultant must aggressively and proactively manage the project in the best interest of the City of Saint John. ***The overall project is targeted for tender and construction in late summer of 2021.*** The consultant must allow for this in their proposal budget. The consultant will oversee and manage the entire project on behalf of the City of Saint John. The proposal shall clearly explain the anticipated structure of project management during each phase.

2. Project Description

In 2019, the City of Saint John entered into an agreement with Fundy Quay Developments Inc. for the ground lease and development of the property. Subsequent to this agreement, the City of Saint John has made application through the *Integrated Bi-Lateral Agreement for the Investment in Canada Infrastructure Program (ICIP),* for the purposes of obtaining funding support for both site infrastructure projects included in this RFP, which will deliver a development ready site and support municipal public space improvements in the area. The first component of this infrastructure work was the repair and vertical extension of the seawall, which was awarded in early 2020 and is currently under design. This next phase consists of site work for the purposes of delivering a development ready site for 2022.

***This Request for Proposal is conditional upon the City of Saint John obtaining funding through the *Integrated Bi-Lateral Agreement for the Investment in Canada Infrastructure Program (ICIP)* for this Project; specifically, the Fundy Quay Site, on or before the 31st day of March, 2021.**

Project 1 – Soil Remediation/Management

Contaminated surface and subsurface soils and groundwater, which present a potential risk to human health and the environment, have been identified at the Fundy Quay. A strategy for effective management of the contamination on site is therefore required in order to support ongoing site redevelopment. As remediation of all contamination is considered to be both impractical and cost prohibitive, a risk management approach is used in order to achieve the best possible site remediation while balancing fiscal responsibility.

A range of environmental management and treatment options will be evaluated in the preparation and implementation of a new remediation plan for the Fundy Quay. This could include a combination of on site treatment, off-site soil treatment, transporting some limited material to landfill where applicable, the covering of contaminants with fill material and vapor barrier, and other approaches. The nature of additional public infrastructure projects on site and the possible need to remove former coast guard underground storage tanks in several different locations may require the disturbance of existing soils in a number of locations. It is the City's understanding based on the materials provided in the appendix and recent building demolition projects on the site that several underground storage tanks exist and will need to be removed as part of the project.

In keeping with the intent of the Atlantic RBCA (Risk-Based Corrective Action) process, a risk management strategy for the development of Fundy Quay will include the use of a Waste Management Plan (WMP) to manage excavated contaminated soil as well as dewatering activities required during construction. Soil management may include such measures as off-site management or re-use onsite.

Additional assessment through further testing as determined by the proponent, will further characterize soil and groundwater that will be uncovered in future excavations as part of site redevelopment and could lead to WMP refinements.

On-site testing information will provide additional site-specific details for incorporation into an Environmental Protection Plan (EPP) and the development of Construction Monitoring Plan (CMP) which guide remediation activities on-site. The EPP will be based on best management practices providing environmental protection and will serve to mitigate potential environmental effects during construction. Contingency plans developed as part of the EPP will address environmental issues of non-compliance and unplanned events. Further, construction oversight and environmental monitoring and inspection completed as part of the CMP will ensure that developed procedures and mitigation measures are followed and effective.

Proposed remediation activities also include the maintenance of surface cover during the redevelopment of Fundy Quay and will restrict direct contact with contaminated materials. Suitable cover will be designed and maintained for contaminated soil over the lifecycle of the redevelopment project. This cover will act to mitigate the direct contact exposure pathway to contaminated soils, which may cause adverse human health effects to those in direct contact with the impacts. Surface cover is a requirement of the “conditional closure” issued by the New Brunswick Department of Environment and Local Government (NBDELG) for the Fundy Quay.

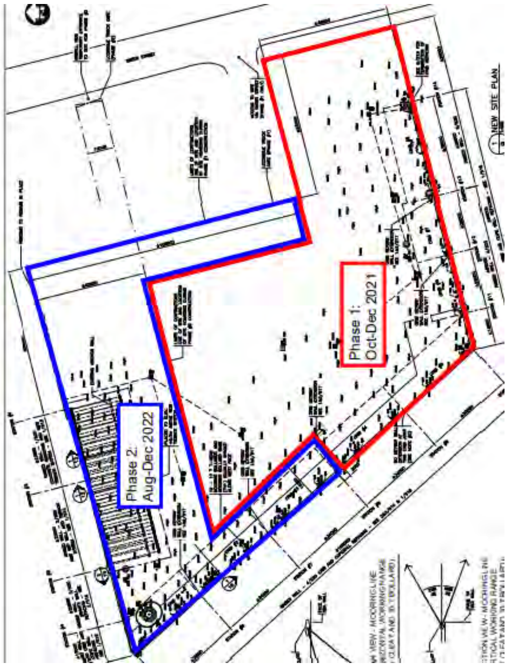
The preliminary budget for the soil remediation project is up to $4.1 Million, inclusive of design and engineering, capital construction and project contingency. It is the intention of the City of Saint John to identify opportunities to reduce this budget through the design and engineering process through the identification of design options that do not compromise the City’s obligations to the developer.

Project 2 –Site Re-grading

Re-grading the site in parallel with the sea wall extension to prevent flooding through bypassing of the sea wall or through sewer surcharging is a critical need to the future development of the site. Re-grading of the site is the second phase in an overall adaptive strategy to reduce flood vulnerabilities on the Fundy Quay site. The regraded site is expected to be in the magnitude of 1.3 - 2 metres above the current site elevation and will be determined using inputs from the design of the Fundy Quay seawall. The regraded property must be able to accommodate public space improvements proposed by the City and the development of future multi-storey buildings on pile foundations. The preparation of a materials waste plan and risk management strategy will help guide the regrading of the property. It is anticipated that the budget for design and construction of the site regrading component will be in the magnitude of $2M-2.5M.

Phasing of Projects 1 & 2

Both the construction of projects 1 and 2 will require coordination with the existing Seawall rehabilitation project occurring on Fundy Quay and must be phased according to the existing construction



schedule for the Seawall. Access to the site for construction will be phased according to the diagram below. Phase 1 will be made available for construction in early fall of 2021 while phase 2 may not become available until mid-2022.

3. Professional Services Required

The professional services required for these projects has been divided into seven distinct parts, as follows:

Part A: Background Information, Preliminary Investigation, Engineering Analysis, and Regulatory Approvals Process.

Part A is comprised of the activities required to provide an adequate understanding of site conditions to support the design process and to undertake the necessary analysis and approvals to allow the project to proceed. Please note that this project is no longer subject to a Federal Funding Agreement and therefore the requirements have been removed from the RFP.

The consultant shall carry out the following activities:

1. Review background documentation provided by the City of Saint John and Fundy Quay Developments Inc.
2. Consult with the Province of New Brunswick, Department of Fisheries and Oceans, the Impact Assessment Agency of Canada, Transport Canada, as well as Infrastructure Canada (IC) to comply with any environmental regulations and requirements associated with the work outlined in this call for proposals. The proponent shall conduct, coordinate and complete all the necessary tasks and process activities including all documentations and procedures to comply with all the federal and provincial environmental regulations. This task may involve coordination with key stakeholders and other impacted groups.
3. Determine the necessary additional site investigation required to support the engineering and design of projects 1,2 and 3. This could include further environmental testing, geotechnical investigation, structural analyses, and other investigation. It is the responsibility of the proponent to review the attached materials in assessing the scope of additional site investigations in their proposals.
4. Coordinate all the activities and tasks with the various subcontractors and other firms hired by the consultant firm as well as utility providers to complete the evaluation and design activities. This activity will identify any water, storm water and electrical and natural gas infrastructure required as part of projects 1, 2 and 3.
5. Coordinate and engage key stakeholders on all important information.
6. Provide a complete evaluation report identifying all the outcomes and necessary requirements to complete this refurbishment. The report will be presented to the City working committee for their review and approval.
7. Undertake the preparation and support the submission of an application to the Federation of Canadian Municipalities for funding to support soil remediation and management costs.
8. The consultant shall video all storm and sanitary sewers within the project boundaries, and 100m upstream and downstream as a minimum. Submit the DVD’s or storage drives and the written report. Review service cards and compare the service laterals to the information from

the DVD / storage drive. The consultant should include appropriate funds in their proposal to flush existing sewer lines if necessary in order to complete the video inspections.

   a. Survey field work shall include opening all chamber and manhole lids, and taking all necessary invert elevations, survey shots, measurements and photos as required to collect all pertinent information such as pipe material and diameter. Survey work should also include a full condition assessment on each structure.
   b. Investigate existing infrastructure by reviewing all digital and paper records available from the City or other utilities. Contact all buried infrastructure owners to confirm what is in the ground, and request field locates as required.
   c. Alert the City to conflicting information and contact the appropriate personnel to clarify the ambiguities.
   d. Submit full size plans, showing only the existing infrastructure including the known water and sewer service laterals and the location and nature of each deficiency noted in the report and from the consultant's review. All pipes to be clearly labeled with their size and material. The consultant shall include a letter summarizing their findings from their review and highlight any items that may impact this project. The consultant's letter should provide their condition assessments of each structure as well as recommendations on removals, repairs, replacements or realignments of existing infrastructure within the project limits (ie. Water, sanitary, and storm).

9. Complete the necessary desktop investigations of the available record information of the site detailing the locations of underground storage tanks. Based on the records, the consultant should confirm which tanks have been removed and which tanks remain buried onsite. The City would like all remaining tanks to be removed by the contractor under a separate contract. The consultant shall include in their proposal the necessary resources to investigate the underground tanks and prepare necessary drawings and contract specifications on how they are to be removed by the contractor. If required, the consultant shall also include the necessary time to work with and gain approvals from the relevant environmental agencies for the removal and disposal of the tanks.

Part B: Engineering Development Plan

The engineering development plan is intended to support the City in building a strategy for the design, coordination and staging of construction activities for the full suite of infrastructure and private construction projects contemplated for the Fundy Quay area. This plan will help to support the City of Saint John in its overall management of the Fundy Quay project portfolio and to inform its decision making and future procurement initiatives.

The engineering development plan should contemplate:

- The location, size, grade and footprint of projects planned for the Fundy Quay;
- The phasing and timing of construction for the various component of the project, for the purposes of laying out a coordinated program;
- High level cost impacts of critical decisions associated with the phasing of construction;
- Consideration of site servicing implications of the design and phasing of infrastructure construction;

- The management of risk as a result of the possibility of multiple contractors working on projects in this area;
- The City's objective of allowing the first phase of private construction to begin in 2022 & any requirements of Infrastructure Canada regarding timelines to complete this work; and
- Sensitive timelines associated with Federal Infrastructure Funding for Harbour Passage and Loyalist Plaza, which will require some components to be completed in 2021.

The projects to be considered in the engineering development plan include:

- The refurbishment and raising of the Fundy Quay seawall, which is already under design;
- The remediation and management of contaminated soils;
- The regrading of the Fundy Quay property to raise the elevation of the site;
- The redevelopment of public space at loyalist plaza & pedway connection from Market Square to the Fundy Quay;
- The extension of Harbor Passage around the perimeter of the Fundy Quay property;
- The connection of a proposed district energy system from Market Square to the Fundy Quay site; and
- The proposed site development plan of the developers, Fundy Quay Developments Inc. & critical timelines and requirements pertaining to the land transaction between the City and Fundy Quay Developments Inc. This information will be provided in a succinct format to the successful proponent.

Part C: Concept Design & Plans

The concept design process is intended to support the evaluation of cost options for soil remediation and the technical options for site regrading

The consultant shall carry out the following activities:

Provide a detailed concept design of the proposed measures and options for projects 1 & 2.

The concept design should provide a detailed cost estimation of the various options including the timeframe, work plan activities and milestones to complete the work, advantages and disadvantages for each option if required and any necessary drawings.

The consultant shall also provide the digital file of any designs or model(s) used and/or prepared for this project. The consultant shall provide digital files and at least 5 hard copies of the final design report and the preliminary design (printed in double sided format).

All reports and construction specifications must be signed and stamped by the consultant's engineer. All reports and construction specifications submitted to the City shall become the property of the City, which may be used and redistributed as the City sees fit.

After review and acceptance of the report by the Technical Review Team, the consultant may proceed with Part (D), Part (E), Part (F) and Part (G) as they pertain to the projects 1 & 2.

Part D: Consultation

The consultant shall carry out further consultation on the concept design options with other key stakeholders as determined by the City of Saint John. This will include:

- Fundy Quay Developments Inc.
- Saint John Water
- Saint John Energy
- Saint John Parking Commission
- Province of New Brunswick
- Design consultants for the following municipal projects:
  - Seawall refurbishment
  - Loyalist plaza redesign
  - Harbour Passage extension
  - District energy System

In addition to consulting critical municipal stakeholders, the consultant will support the City of Saint John in undertaking engagement on the overall Fundy Quay project. This will include a minimum of attendance at 1 digital town hall which may incorporate other facets of the development of the Fundy Quay.

Part E: Detailed Design & Tender Documents

The consultant team shall prepare all detailed design drawings, specifications, and tender documents for the site works and all the other items mentioned in the description of the works.

The consultant must look beyond the confines of the immediate project site, and determine what impacts the new works will have on the area as a whole, including storm water, and propose solutions to avoid possible problems.

The consultant must review all applicable plans, report(s) and data made available by the City. The consultant shall review the material in detail, as the consultant will be responsible for performing any further investigation, data gathering, etc., which may be necessary. The cost of such shall be detailed and included by the consultant in the proposal.

Detailed design shall be defined as the following:

- All items completed from the preliminary design requirements.
- Location of works is selected within 100mm.
- Detailed design calculations completed.
- A revised and detailed construction cost estimate.
- Complete the 100% design drawings and tender documents reviewed and approved by the City's Technical Review Team.
- Approvals and permits from all utilities and approval agencies.

Designs must also incorporate planning and sequencing of service disruptions (such as water main shutdowns), testing, disinfection and commissioning. The consultants will be required to lead the team of sub-consultants, contractors and City staff through these phases.

Work on any street must have traffic planning and organizing being led by the consultant. Traffic planning must be carried out by the consultant before tendering to give the City and contractor guidance as to the general scope of the detours, etc. The consultant may specify in the tender documents that the contractor is to submit traffic detour and work zone safety plans and drawings. The consultant must review submissions from the contractor and seek approval from the City. Traffic detour and work zone safety plans and drawings must be approved by the City before construction commences. The consultant may also have to co-ordinate timing of work with other agencies to avoid conflicting traffic detours.

The consultant shall co-ordinate the design drawings with all the underground utilities before the preparation of the tender documents in order to avoid conflicts with other utilities such as gas, electric, telephone, etc. Underground utility lines must be marked out and picked up during the topographic survey in Part A.

Before detailed designs and related documents are sent to the client for review, the consultant must have other engineers from their firm review them for errors to ensure only high quality work is released. The consultant must identify in the proposal the peer reviewers. The peer review engineers must send a memo to the City with the final drawings and specifications, stating the outcome of the review.

For each project, the consultant shall be responsible for applying for, and obtaining, all of the design approvals and permits necessary from all approval agencies, such as the New Brunswick Department of Environment and Local Government, New Brunswick Department of Natural Resources and Energy Development, Fisheries and Oceans Canada etc. These Approvals shall include, but not be limited to, Approval to Construct, Watercourse and Wetland Alteration permits, Highway Usage Permit (HUP); and Planning Advisory Committee (PAC) etc. The consultant must ensure that construction does not begin on the project until all approvals and permits have been received.

The City's Engineer must approve any variance from these requirements in writing before any construction tenders are called.

Part F: Tender Period Services, Materials Testing, & Inspection, Red Books and Record Drawings

Tender Schedule

Tender(s) are expected to be unfolded in the 2nd quarter of 2021.

Tender Period Services

Upon approval of the consultant's work, City staff will make copies and tender the project, however the consultant is to be available during the tender period to respond to questions (write addenda if required) and to perform the tender analysis. The consultant shall prepare a Tender Summary for each tender. It shall be a digital spreadsheet that compares the Engineer's estimate to all tendered items from all tenders submitted.

Materials Testing & Inspection

The contractor shall provide quality control testing for concrete, compaction of soils and for asphalt placement & testing. The consultant shall still provide random quality assurance tests to confirm that the contractor tests are in compliance. The consultant shall also make sure that the contractor is completing all his required testing. The consultant shall provide the Quality Assurance for the Portland cement concrete, granular material and the asphalt concrete. All costs for asphalt, concrete and soil quality assurance testing must be included in Part E of the consultant's proposal.

The consultant's minimum requirements for material testing and inspection are as follows:

Asphalt Inspection and Testing

- Full time inspection for asphalt placement by qualified personnel. The inspector assigned to this task shall have a minimum of 2 years direct related experience with asphalt inspection. The consultant shall identify in the proposal the qualified personnel they intend to utilize for this task including related experience. If the consultant does not have the qualified personnel directly on staff then the consultant must propose to utilize a sub-consultant that has the required expertise in asphalt inspection.
- Measurement of thickness, temperature, etc.
- Signing and collection of weight tickets as they arrive
  - Quality Assurance of asphalt in accordance with Division 27 of the General Specifications.

Concrete Inspection and Testing

- Slump, temperature, air test and compressive strength cylinders shall be considered a "set" of tests.
- Compressive strength testing at CSA standard A283 certified laboratory
- Check formwork and compaction of base gravels before each pour
- Check elevations, slopes and grades before every placement
- Quality Assurance by the consultant shall consist of random testing.
- Sampling and testing frequency of concrete:

The minimum frequency shall be **one set of tests for every 10** done by the contractor.

On smaller projects involving only a few loads of concrete, one complete set of tests shall be made.

a. Test Samples:
   i. The test samples shall consist of three (3) concrete cylinders. Compressive strength testing obtained at 7 and 28 days.
b. Reporting of field and laboratory testing:
   i. Field test results obtained shall be recorded on the Form – Concrete Testing Summary and shall be submitted to the City.
   ii. Compressive strength results shall be submitted to the City on the consultant's standard reporting form.

Granular Material supply and placement (soils and gravels) testing

- Confirming the contractor's test results onsite (QC by contractor)
- Ensuring proper frequency of compaction tests by contractor
- QA by consultant shall consist of random compaction testing using nuclear density equipment. The minimum frequency shall be one test for every 15 done by the contractor.

- Enforcement of established rolling pattern
- Approval of material before it arrives onsite (gradation and other properties)
- Checking grades, slopes, thicknesses during fine grading
- Witness and comment on proof rolling tests

Red Books

It is the responsibility of the consultant to obtain a copy of the "Standard Format for City of Saint John Red Book Notes" and to maintain a copy on file for all future projects. This format shall be followed by the consultant when preparing the notes for the project. The City of Saint John will provide Red Books for the consultant to fill out and return to City staff at the end of the project.

Record Drawings

The consultant shall submit a set of Record Drawings on plastic and in digital formats. The drawings and data shall be in accordance with the Drawing Standards noted below. The as-built drawings will show the actual in-place vertical and horizontal alignments. The finished works shall be re-surveyed by the consultant to establish exact locations and elevations, and the date the site was re-surveyed shall be noted on the signed and sealed Record Drawings. The final survey shall also include the pickup of structures (valves, manholes, etc.) that were not newly installed during the project, but are along the same section of street, easement or parcel. The consultant shall be responsible for obtaining the data and measurements used in the Record Drawings and shall not rely on the contractor to provide this information. The consultant shall note on each sheet of the Record Drawings the number of the Red Book where the project information was recorded. The Record Drawings shall also include the ground water table elevation and geotechnical information, and the names and models of all products used.

All new works specified and incorporated shall have as-built information recorded including electrical, mechanical, structural, etc. All sheets in the set of Record Drawings shall be signed and sealed, including those of sub-consultants.

The digital as-built data submitted to the City shall become the property of the City, which may be used and redistributed as the City sees fit.

DIGITAL DRAWING STANDARDS

PURPOSE

The development of Geographic Information Systems (GIS) and computer aided drawing (CAD) has facilitated the method to reduce the time and costs of development processing and land use map updates. Hence, a digital drawing submissions standard has been adopted by the City of Saint John to set the standard and facilitate the transfer process. The intent of this program is to take advantage of new technology, reduce the cost of digital conversion, maintain the mapping and facilitate the efficient transfer of data from private organizations to the City.

The standards and specifications contained within this document shall be used for digital drawing submissions to the City's Records Division for the purpose of development processing and GIS digital land use map updates.

DIGITAL FORMAT

1. The Consultant shall provide to the Engineer an As-Built record of the project which will include: all required documentation, CAD files and any associated digital files as described below in both ***printed*** and ***digital*** versions.

2. All CAD drawings shall be submitted in AutoCad (.DWG or .DXF) format with all line work complete. Each CAD project shall include all relevant resource files such as line & font resource files such as (.shx) resource files. The Consultant also shall provide the **drawings in PDF format**, with full color, on the CD. This shall be a direct conversion, not a scan.

3. The City of Saint John will provide drawing file names for the legend portion of the drawing.

4. Each CAD project shall be accompanied with an ASCII text file of all as-built structure locations as well as any existing underground structure within the limits of the project. This text file is to be used for importing as-built and unknown structure locations into the City's G.I.S. The text file shall meet the following conditions:

   - ✓ ASCII text file will include as-built structure locations such as catch basins, gate valves, manholes, air valves, outfalls, service boxes or any existing underground structure within the limits of the project.

   - ✓ ASCII text file shall <u>**only**</u> include all as-built structure locations as well as any existing structures within the limits of the project and shall not contain other coordinated points such as curb shots, utility poles, corners of buildings, etc. This ASCII text file is to be used for importing structure locations into the City's G.I.S.

   All coordinated points for the structures shall be delivered in a single comma-delimited ASCII text file. Each line of the file shall contain coordinate values (NAD83 CSRS Horizontal and HT2 Vertical) for a single point as follows:

   Pt Number,Northing,Easting,Elevation,Field Code (Numeric)

   ```
   1,7362284.223,2533177.653,15.207,3
   2,7362028.622,2533004.711,25.695,16
   3,7362009.446,2532991.590,25.935,4
   ```

The field code in the ASCII text file shall be City of Saint John field codes (i.e. Numeric Field Codes).

City of Saint John Field Codes			
3	CB EXIST CENTER	50	CATCHBASIN MANHOLE

4	CB EXIST EDGE	51	CATCH BASIN PYRD TOP
6	CULVERT	54	DRAIN TILE
14	FIRE HYDRANT	58	MH CP TELEGRAPH
16	GATE VALVE EXISTING	69	UTILITY HYDRO BOX
24	MANHOLE EXIST	70	UTILITY TEL BOX
25	HYDRO MANHOLE	71	UTILITY CABL BOX
26	TELEPHONE MANHOLE	79	NEW SANITARY MANHOLE
27	OTHER	80	NEW STORM MANHOLE
46	WATER TRACE	81	NEW CB EDGE
43	UTILITY BOX	82	NEW CB CENTER
44	SERVICE BOX	83	NEW FIRE HYDRANT
45	VAULT	1205	GATE VALVE NEW

DRAWING DOCUMENTATION

1. The horizontal and vertical datum utilized (NAD83 CSRS and HT2) shall be identified as NOTE 1 on all engineering drawings prepared for the City of Saint John.
2. All as-built drawings are to be marked on the title block in an obvious fashion with the text “Record Drawing” on the CAD files and manual copies of the drawings.
3. Each CAD project shall be accompanied with documentation to indicate CAD layers.
4. All required drawing documentation shall be summarized on a transmittal sheet submitted in both printed and digital versions. The transmittal sheet shall be placed on the same CD as the drawing files that the documentation refers to. The transmittal sheet shall include:

- ✓ Please find enclosed :
- ✓ Job Title
- ✓ Company/ Firm
- ✓ Contact Person
- ✓ Address
- ✓ Email Address
- ✓ Phone FAX
- ✓ List of attachments
- ✓ CD's (2 sets) Number of disks per set :
- ✓ As-built reproducibles (Hard Copies) 1 set

MEDIA

1. All electronic files shall be delivered on CD-ROM.

2. All submitted CD's shall be **typed and clearly labeled** with the project title, contract number, contractor, consultant name, date of submittal, and list of contents on CD.

3. As-built reproducibles shall be prepared on plastic (4 mil, mat 2 side film)

4. Plans are to be produced on an ISO **A1** paper size no larger than 600x900mm

OPERATION and MAINTENANCE MANUALS

The consultant shall provide the contractor with examples, both hard copy and CD's of what is expected in the form of Operation and Maintenance Manuals.

Two weeks prior to Substantial Completion of the work the consultant shall review, for completeness and accuracy, the contractors one hard copy and five CD's of the Operation and Maintenance Manual.

Receipt of acceptable Operation and Maintenance Manuals is a prerequisite for the granting of a Certificate of Substantial Completion.

Part G: Construction Management

The consultant must prepare all required documentation for construction management in a formal and standardized format acceptable to the City. The list of documents must include but is not limited to the following: change orders, addenda, progress payments, summary of extras, minutes of meetings, status reports, construction and consultant budget updates and forecasts, reports to the engineer, meeting agendas, reports on contractor performance, quality control test reports, deficiency lists, letters, memos and so on.

The consultant is responsible for the primary field layout, including marking out property lines for the contractors. This may require the services of a legal surveyor where property pins are not present. The consultant shall do the primary field layout at least once during each phase of the project. If the contractor does not preserve the layout stakes, the consultant may request a fee from the contractor to replace them. The consultant shall be responsible for the primary field layout, which consists of the layout of centerline, control points and structures. All other layout will be the responsibility of the contractor. The consultant shall give the contractor all the information and survey data points required to build the works utilizing the standard City of Saint John field codes from Digital Drawing Standards.

The consultant must co-ordinate, plan and notify all parties of all service shutdowns, testing, water main pressure testing & disinfection and system commissioning. The consultant will submit drawings or neat sketches that clearly communicate the proposed activity for the City's approval. The City will prepare all water service shutdown and street closure notices. The consultant must co-ordinate and plan traffic detours, and review proposed work zone safety plans received from the contractor. The City of Saint John staff will translate all routine and standardized public notices during construction.

The consultant must review and comment on all submissions and correspondence from the contractor, and provide recommendations to the City as to the best course of action.

The consultant must invite the WorkSafeNB safety inspector to the pre-construction meeting, giving the appropriate officer a minimum of one week's notice.

The consultant must report to NBDELG on any sewage overflows discharged to the environment. Consultants are responsible for preparing the detailed "bypass" reports required should sewage overflow occur, with discharge to the environment as a result of project activities.

The field inspector (or resident engineer) assigned to this project shall have significant (minimum 4 years) related experience with such construction activity. The field inspector shall have a local cellular phone for the duration of the project and the number is to be provided to the City prior to the start of construction.

The field inspector shall have a copy of the latest revision of the General Specifications, the contract drawings and specifications and the standard format for Red Book Notes, any applicable permits or approvals onsite, and be familiar with them. The principals of the consulting firm must educate and prepare the field inspectors before the start of construction. They must understand the tasks and responsibilities of the position.

The City of Saint John Construction Inspection Guidelines shall be used as a basis for the general requirements for inspecting the construction and installation of municipal infrastructure.

The field inspector shall take pre-construction photographs and shall also take construction photographs for the duration of the project utilizing a digital camera. Each photograph must have the date taken on it and the location labeled. A labeled CD containing the digital photographs in chronological order shall be provided to the City at the end of the project.

The consultant shall provide daily inspection 'Field Notes' to detail all work done on the construction site that day. Daily Field Reports in the consultant's standard format shall be completed every day and sent to the City's project engineer at least once a week. The inspector shall also fill out service cards for each building serviced to detail the water, sanitary and storm services that are installed during the project.

During construction, the consultant must provide the City with weekly e-mails (by Monday at 4:00pm) indicating those staff members who worked on the project the previous week, a brief description on their work as well as how many hours each person worked.

The field inspector shall be available to work overtime and on weekends (if the contractor is working), without extra charges to the City. The consultant will provide full time inspection and be on-site at all times, when the contractor is working. The inspector shall advise the client immediately when work on-site starts or stops unexpectedly and of all planned schedule changes and of all changes to the work that may result in extra costs to the City or standby charges.

The consultant shall review and approve the contractor's work including but not limited to all soil conditions, mechanical, electrical, architectural, pipework, excavation, grading, compaction, concrete work, asphalt paving and building finishes etc. In addition the consultant shall verify and provide detail on quantities of excavation and fill material, (measured by the inspector, not the contractor) as well as provide certification of work for progress payments.

4. Method Of Payment

Upon award of the contract the City will execute an agreement with the successful engineering firm for the work to be performed. Payment of fees shall be in accordance with the terms of the Request For Proposal at the rates submitted and accepted in the consultants proposal not to exceed the Recommended Minimum Hourly Rates as contained in The Association of Consulting Engineering Companies – New Brunswick fee guideline to a maximum of the upset fee for Parts A, B, C, D, E and F as required.

For Part G, payment of fees shall be based on actual time in hours plus reimbursable expenses subject to approval by the City.

The consultant shall invoice the City on a monthly basis for the work performed in accordance with the engineering services agreement. The consultant shall provide a status report with each invoice outlining in detail the scope of the work completed during that month. Payments will not be processed unless the invoice is signed by an authorized representative of the company, accompanied by a status report in the proper timed based format (hourly rate x hours worked).

Engineering fees are not based on a percentage of the construction costs; therefore the approved upset prices will not be changed due to the final construction costs being different from the current budget estimate. A change in the fees may be considered only if the scope of the engineering work is changed at the request of the City's Engineer.

Upset prices (including HST) will be included in the proposal for Part A, Part B, Part C, Part D, Part E and Part F of this project beyond which no additional payments will be considered unless first submitted by the consultant in writing and authorized in writing by the City.

The price submitted for Part G shall be in the format of a budget estimate based on the following estimated construction timeline for each project.

- Projects 1 & 2. = 24 weeks

In Part G, the consultant's budget should also assume a 55-hour work week for the inspection services as well as 24 hours of project management per week for the consultant's Engineer (with a P. Eng) overseeing the project plus reimbursable expenses. The consultant's Engineer (with a P. Eng) working on the project would be expected to provide the project management duties as they will be addressing construction issues that arise on a daily basis. Some of the project management time can also be allocated to the various project leads to visit the site during construction when additional guidance is required.

The final amount paid to the consultant for Part G shall be based on actual time in hours to complete Part G plus reimbursable expenses subject to approval by the City's Engineer.

The total price stated, for each project, must also include a $100,000 for unforeseen work total for projects 1 and 2.

No part of this contingency shall be expended without the written direction of the City's Engineer, and any part not so expended shall be deducted from the contingency allowance. Payments for engineering work performed in the preparation of as-built drawings will only be made upon receipt of completed drawings.

5. Termination of Contract

The City will reserve the right to terminate the contract with the Engineering Firm after completion of Part A or at any other time during the course of the work. In such an event, payment will be made only for the work completed up to the time of termination.

The City of Saint John does not, by virtue of any proposal request, commit to an award of this bid, nor does it commit to accepting the proposal submitted, but reserves the right to award this proposal in a manner deemed to be in the best interest of the City.

6. Content of Proposal

The consultant shall confirm a clear understanding of the work to be undertaken as described in the Scope of Work. The proposal must demonstrate that the consultant and its team have recent and significant experience with this type of work. When noting examples of experience gained on similar projects, the proposal must also note which current staff members worked on that project and what their role was. The proposal must specifically address all requirements of the work and any matters related to its successful implementation. The proposal must indicate what role each of the consultant's team will be carrying out for the project. The consultant may not substitute the project team members noted in the proposal without permission of the client. When proposing a schedule, the consultant must also indicate that their workload is such that they will have time to complete the project as promised. If the consultant is very busy, they should either decline the work or propose a longer schedule at the time of the RFP submission.

The proposal shall include the following sections:

A. *TECHNICAL PROPOSAL:*

- Table of Contents
- Work Plan and Schedule
- Project Team
- Experience with similar projects

If a proponent is resubmitting an updated proposal that was initially submitted in response to RFP 2020-091004P, the proponent is to include with their technical proposal a cover letter, providing a bullet point summary of any changes to the proposal. This should include any changes to scope or personnel assigned and should include references to page numbers where the details of the proposal changes have been included. Proposal changes can be included in either a supplementary appendix to the proposal outlining detailed changes or within the body of the proposal, highlighted in contrasting font colour (preferably red).

B. *FINANCIAL PROPOSAL:*

- Maximum or Upset Fee(s) for each of parts A, B, C, D, E, & F (for each project).
- Budget Estimate for Part G (for each project)

- All costs are to be subtotaled (including contingency allowance) with the 15% HST component identified separately and added to arrive at a total cost.
- Billing Rate Summary (hourly billing rates for all key personnel).
- The consultant must submit the cost breakdown in the following matrix format.

Sample format for financial proposal breakdown.

Project ID	Part A	Part B	Part C	Part D	Part E	Part F	Part G	Engineering Contingency	Subtotal (excluding HST)	HST (15%)	Total (including HST)
1								$70,000			
2								$30,000			

The financial proposal shall include separate prices (including reimbursable expenses) for each of Part A, Part B, Part C, Part D, Part E, & Part F for each project.

A further breakdown of Part G is required with the financial proposal to identify all staff participating in Part G; including hourly rates, hours and reimbursable expenses.

All sub-consultants such as geotechnical, legal survey, electrical, structural and others shall have their fees identified and included in the appropriate part of the proposal.

7. Evaluation Criteria

For the purposes of this proposal call, submissions will be evaluated on the following criteria:

- QUALITY AND COMPLETENESS – Has the proposal addressed all of the needs raised? Is the proposal presented in an organized and professional manner? (Criteria weight = 5 points)
- CONSULTANT'S EXPERIENCE – Has the proposal demonstrated a level of expertise with the requirements of this project? (Include references for projects of a similar nature.) (Criteria weight = 20 points)
- EXPERIENCE OF EMPLOYEES / SUB-CONSULTANTS – Has the proposal demonstrated a level of expertise for the employees of the company and sub-consultants listed? (Include resumes for staff and sub-contractors required) (Criteria weight = 35 points)
- METHODOLGY – Does the approach to the project outlined in the proposal address, in a realistic sense, attainable goals and is it in keeping with the City's expectations for the project? (Criteria weight = 75 points)
- VALUE ADDED – What additional information, technology, process or options has the consultant included in his proposal? Is there value added to the consultant's response for this additional information? (Criteria weight = 5 points)

- Schedule & Availability – Does the proposal meet the requirements of the City's schedule requirements? Are the necessary staff available to complete the work within this timeline? (Criteria weight = 10 points)
- COST – Cost will be a factor, however not the only factor to be considered. (Criteria weight = 50 points)

Consultants are advised that proposals will be evaluated solely on the basis of information submitted in accordance with the request for proposals. The City reserves the right, if deemed necessary, to short-list the proposals and to request an additional verbal presentation from each short-listed proponent. The Consultant may supplement their presentation with a summary in written format to clarify points raised during the process.

8. Insurance Requirements

The consulting engineering firm shall obtain and keep in force, during the full duration of this contract, an Errors and Omissions Liability policy with a minimum limit of two million dollars, and two million dollars per claim. The policy shall include a clause stating that thirty days' notice of cancellation of this policy will be given to the City of Saint John, by the insurers. Provide evidence of this policy.

The consultant must provide proof of current coverage from WorkSafeNB prior to the start of the work.

The consultant shall provide evidence of the following insurance coverage:

General Liability with minimum limits of two million dollars per occurrence. The policy shall include:

- operations of the consultants in connection with this project;
- products and completed operations coverage;
- contractual liability with respect to this project;
- the City of Saint John added as an additional named insured;
- a cross-liability clause;
- non-owned automobile;
- thirty days' notice of cancellation of this policy will be given to the City of Saint John, by the insurers;
- Standard automobile insurance for owned automobiles with at least the minimum limits allowed by law.

9. Formality Clause

In order for the City of Saint John to consider any proposal submission as a legally binding offer, on behalf of the consultant, it is necessary for the consultant to communicate this formality to the City in the form of an offer which contains the original signature of the individual or representative of the firm who is authorized to act on behalf of the consultant. In order to meet this requirement, all proposal submissions to the City of Saint John must be prefaced with a covering letter which contains an original signature of the individual authorized by the consultant to submit proposals on their behalf.

The covering letter must be on official company letterhead, be dated and be addressed to the attention of the City of Saint John representative specified in the request for proposal document. Additionally it must make reference in the body of the letter to the request for proposal number and project title, as well as to the fact that the enclosed documents constitute a formal proposal offer and finally, the letter must contain the original signature as indicated.

Failure to include the required covering letter as a preface with your proposal will be grounds for immediate rejection on the basis that it is not formal.

10. Standard Terms and Conditions

Advisory Notice(s)

Periodically, the City of Saint John is required to issue clarification notices to an RFP document in the form of Advisory Notices. Normally these notifications will not have a direct bearing on the cost of a project and will not influence bidding.

Proponents are responsible for obtaining all advisory notice(s) issued by the City. Advisory Notice(s) may be obtained from the City's website (www.saintjohn.ca) under the menu option "Tender and Proposals".

Proponents are instructed to sign the Advisory Notice and return it by email to monic.macvicar@saintjohn.ca prior to the closing date.

Failure to comply with the instructions on an Advisory Notice may result in rejection of the Proposal.

Addenda

Periodically, the City of Saint John is required to issue notification of changes or corrections to a Proposal document by way of addenda. Normally these notifications will have direct bearing on the cost of a project and will influence bidding. Therefore, it is important that the City have assurances that Proponents have in-fact received the notification(s).

Proponents are responsible for obtaining all addenda issued by the City. Addenda may be obtained from the City's website (www.saintjohn.ca) under the menu option "Tender and Proposals".

Proponents are required to sign and include the all addenda with their Proposal submission.

Failure to include a copy of all signed addenda with the Proposal submission may result in rejection of the Proposal regardless of whether or not the changes noted in the addendum are included in the Proposal submission.

Review of Proposals

The evaluation committee may invite proponents to meet with the review committee to make an oral/visual presentation in support of their proposal. The City will provide the meeting venue at its cost. The proponent shall bear its own costs related to such meeting.

Additional Information from Proponents

The City of Saint John reserves the right during evaluation of the Proposals to seek further information from any proponent and to utilize that information in evaluation and award without becoming obligated to seek further information from any other proponents.

Clarification of Bids

The City of Saint John reserves the right in its sole discretion to clarify any Proposal after the close of the RFP process without becoming obligated to clarify any other Proposal.

Negotiation

The City reserves the right in its sole discretion to negotiate the final terms and conditions of the engagement contract with the most probable candidate for award prior to award of the engagement.

Inconsistency between Paper and Electronic Form

If there is any inconsistency between the paper form of a document issued by or on behalf of the City to proponents and the digital, electronic or other computer readable form, the paper form of the document prevails.

Acceptance, Revocation and Rejection of Proposals

The proposal constitutes an offer which shall remain open and irrevocable until 90 days after the date of the proposal opening.

Reserved Rights

The City reserves the right to:

a) Reject an unbalanced Proposal. For the purpose of this section, an unbalanced Proposal is a Proposal containing a unit price which deviates substantially from, or does not fairly represent, reasonable and proper compensation for the unit of work bid or one that contains prices which appear to be so unbalanced as to adversely affect the interests of the City. The City reserves the right to use Proposals submitted in response to other like or similar Requests for Proposals as a guideline in determining if a proposal is unbalanced.

b) Amend or modify the scope of a project, and/or cancel or suspend the RFP process at any time for any reason.or modify the scope of a project, and/or cancel or suspend the Bid Solicitation at any time for any reason.

c) Require proponents to provide additional information after the Closing Date for the RFP process to support or clarify their Proposals.

d) Not accept any or all Proposals.

e) Not accept a Proposal from a Proponent who is involved in litigation, arbitration or any other similar proceeding against the City.

f) Reject any or all Proposals without any obligation, compensation or reimbursement to any Proponent or any of its team members.

g) Reject any or all Proposals in the event that the City does not receipt formal written approval of its application for funding on or before the 31st day of March, 2021; said application being dated the 27th day of June, 2019 and submitted under the Integrated Bilateral Agreement for the Investing in Canada Infrastructure Program (ICIP).

h) Withdraw an RFP process and cancel or suspend the RFP process.

i) Extend, from time to time, any date, any time period or deadline provided in an RFP process (including, without limitation, the RFP process Closing Date), upon written notice to all Proponents.

j) Assess and reject a bid on the basis of
    i. information provided by references;
    ii. the Proponent's past performance on previous contracts;
    iii. information provided by a Proponent pursuant to the City exercising its clarification rights under the RFP process;
    iv. the Proponent's experience with performing the type and scope of work specified including the Proponent's experience;
    v. other relevant information that arises during an RFP process.

k) Waive formalities and accept Proposals which substantially comply with the requirements of the RFP process.

l) Verify with any Proponent or with a third party any information set out in a Proposal.

m) Disqualify any Proponent whose Proposal contains misrepresentations or any other inaccurate or misleading information.

n) Disqualify any Proponent who has engaged in conduct prohibited by the RFP documents.

o) Make changes including substantial changes to the RFP documents provided that those changes are issued by way of an addendum in the manner set out in the RFP documents.

p) Select any Proponent other than the Proponent whose Proposal reflects the lowest cost to the City.

q) Cancel an RFP process at any stage.

r) Cancel an RFP process at any stage and issue a new RFP for the same or similar deliverable.

s) Accept any Proposal in whole or in part.

And these reserved rights are in addition to any other express rights or any other rights which may be implied in the circumstances and the City shall not be liable for any expenses, costs, losses or any direct or indirect damages incurred or suffered by any Proponent or any third party resulting from the City exercising any of its express or implied rights under an RFP process.

Limitation of Liability and Waiver

In every RFP process, the City shall draft the documents such that each Proponent, by submitting a Proposal, agrees that:

a) Neither the City nor any of its employees, agents, advisers or representatives will be liable, under any circumstances, for any claims arising out of an RFP process including but not limited to costs of preparation of the Proposal, loss of profits, loss of opportunity or any other claim.

b) The Proponent waives any claim for any compensation of any kind whatsoever including claims for costs of preparation of the Proposal, loss of profit or loss of opportunity by reason of the City's decision to not accept the Proposal submitted by the Proponent, to award a contract to any other Proponent or to cancel the RFP process, and the Proponent shall be deemed to have agreed to waive such right or claim.

Proposal Debrief

Immediately following the City's acceptance of a Proposal submitted, Supply Chain Management shall send a written notification of award to all unsuccessful proponents disclosing the name of the successful proponent and providing a brief explanation rationalizing the City's selection:

i. For all Requests for Proposals valued at Fifty Thousand Dollars **($50,000.00) or less**, the written notification of award will be the only form of debriefing offered by the City;

ii. In the case of Requests for Proposals valued **in excess** of Fifty Thousand Dollars **($50,000.00)**, Supply Chain Management may, in addition to the notification of award and upon written request from any proponent, provide a more detailed oral debriefing either by phone or in person, as required by the proponent. During this debriefing, Supply Chain Management may disclose information such as the total price of the successful proponent and may discuss an overview of the process as well as the strengths and weaknesses of the requesting proponent's proposal.

iii. The written request referred to paragraph (ii) shall be submitted to the Office of the Purchasing Agent no later than fifteen (15) business days after the notification of award is issued.

iv. The acceptance of the successful Proposal shall not be discussed during a debriefing.

11. Submittals

When preparing the Agreement for Engineering Services, the consultant is required to submit a "Business Corporation Act Certificate" to the engineer.

12. Inquiries

All inquiries regarding this request for proposals shall be submitted in writing via email, by 4:00 p.m. Local Time on **Wednesday, February 3rd, 2021**, only to the attention of:

Monic MacVicar, CCLP, CPPB
Procurement Specialist
Supply Chain Management
Email: monic.macvicar@saintjohn.ca

Responses to inquiries will be in writing and distributed by email to all Consultants registered as having received the Terms of Reference as of the date the response is prepared. The source of the question will not be identified in the response. Verbal information shall not be binding upon the City. Inquiries after the above deadline will not receive a response.

13. Attachments

Over the past 15 years, there have been several studies and assessments conducted on the Fundy Quay property to develop a remediation action plan, and to assess the geotechnical conditions of the property. The following is a list of relevant documents appended to this RFP:

Appendix 1: Geotechnical Investigation by Conquest Engineering 2006

Appendix 2: Geotechnical & Environmental Summary by Stantec 2010

Appendix 3: Site Closure Report by Stantec 2015

Appendix 4: Remediation Summary Plan by Stantec 2015

Appendix 5: Remediation Plan-Fundy Quay Redevelopment by Stantec 2016

Appendix 6: Waste Characterization Program for Waste Management Plan by Stantec 2017

Appendix 7: Climate Change Vulnerability Assessment by Dillon Consulting 2020

14. Other Relevant Documents

City of Saint John Construction Inspection Guidelines

Details of the preliminary plans for future development will be shared with the successful proponent following the awarding of the project

15. Submission of Proposals

In light of the current Covid-19 situation, the submission instructions for this RFP are as follows:

Public openings of all Tenders and Proposals have been cancelled until further notice. The summary of Proposal submissions may be viewed on the City's website under "City Services" and then under the top link "Tenders and Proposals" 24 hours after the closing date and time.

A. Proposals Shall Be Submitted at the Prescribed Location

1) Proposals shall be submitted via email to: monic.macvicar@saintjohn.ca

B. Proposals Should Be Submitted in Prescribed Manner

1) Proponents should submit two signed electronic documents in PDF format, complete with all mandatory forms, as follows:
    a. RFP No. 2021-091001P – Engineering Services: Site Works – Fundy Quay – Technical Proposal
    b. RFP No. 2021-091001P – Engineering Services: Site Works – Fundy Quay – Financial Proposal

C. Proposals Shall Be Submitted on Time

1) Proposals shall be submitted in accordance with the above on or before the Submission Deadline. Proposals submitted after the Submission Deadline will be rejected.

Appendix 1: Geotechnical Investigation by Conquest Engineering 2006

REPORT TO

The Hardman Group Limited
1226 Hollis Street
Halifax, Nova Scotia
B3J 1T6

ON

GEOTECHNICAL INVESTIGATION – PHASE 1
PROPOSED MULTI-PHASE DEVELOPMENT
SAINT JOHN COAST GUARD TERMINAL SITE
SAINT JOHN, N. B.

Prepared by:

CONQUEST ENGINEERING LTD.
575 Crown Street
Saint John, N. B.
E2L 5E9

PROJECT NO. 130-001

April 11, 2006

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Section **Page No.**

1.0 INTRODUCTION

Acting at the request of The Hardman Group Limited, Conquest Engineering Ltd. has undertaken a geotechnical investigation for a proposed multi-phase development at the site of the present Coast Guard Terminal in Saint John, New Brunswick. The primary focus of this geotechnical report is Phase 1 of the development of which initial plans include a 130 room hotel structure, a 36-unit condominium tower and a pedestrian tunnel/link to Market Square to the north. Additional investigation points (boreholes) were put down throughout the remainder of the development area, however, it is anticipated that more detailed investigation of the conditions will be required as further phases of the development proceed.

The field work was undertaken in concert with our environment sub-consultant, Dillon Consulting Ltd., and their report on the environmental aspects of the site will be submitted separately when the results of analytical testing of samples become available.

The purpose of this geotechnical investigation was to obtain information on the underlying soil and bedrock conditions necessary for input to the design of the foundations for proposed buildings of the development. This report has been prepared specifically and solely for the project described herein and it contains all of our findings.

2.0 SITE and GEOLOGY

The site of the proposed development is located on the Saint John waterfront and encompasses the present Coast Guard Terminal, a parking lot on the corner of Water Street and Peters Wharf (street) owned by the City of Saint John and a corridor at the east end of Market Slip extending from Market Square to the Coast Guard Terminal property. The investigated corridor between Market Square and the Coast Guard site is presently occupied by beach volleyball courts and an access road adjacent to Market Square known as North Market Wharf.

The general arrangement of the proposed and existing structures is shown on the attached Borehole Location Plan (Figure 1 – Appendix C). The elevation of the wharf deck at the Coast Guard site is 32.0 feet +/- (LWOST Datum) whereas the entrance to the parking lot at Peters Wharf (street) is some 4 feet lower (elevation 28 feet LWOST). The ground surface elevation of the corridor varies from elevation 29 feet at the existing volleyball courts to 35 feet at North Market Wharf.

Prior to the investigation we were able to obtain a copy of the 1957 design drawings of the Coast Guard Terminal site. From our review we learned that the wharf facility is comprised of concrete caissons along the west and south boundaries and with a concrete gravity wall and steel sheet pile wall making up the north boundary at Market Slip. Prior to construction the areas designated for concrete caissons were dredged of all former wharf structures and overburden down to bedrock. A mattress of rockfill was then placed over the bedrock and the caissons installed. The area behind the caissons was not dredged and the remains of the former slips and timber cribworks are buried at the site. Behind the concrete caissons a detail on the drawings show that “man-sized rockfill” was placed at a 1:1 slope to elevation +17 feet LWOST datum at the joints between adjacent caissons.

Our geotechnical investigation has shown that the principal overburden strata are random fills (mostly granular) overlying native silty, clayey sand followed by bedrock. In some instances the fills were noted to extend directly to the bedrock surface. Bedrock is classified as black shale of the Kings Square Formation (Saint John Group – Early Cambrian to Ordovician Era). It will be important for potential pile-driving contractors to note that the remains of the wooden timber cribworks and large boulders were frequently encountered during the course of this investigation.

3.0 FIELD PROCEDURES

The field drilling, which consisted of fourteen (14) boreholes, was carried out during the period of March 22 to April 5, 2006. It was originally proposed to drill 15 boreholes, however, one was eliminated within the Coast Guard site due to underground utility conflicts. The location of all boreholes is shown on the appended Borehole Location Plan (Figure 1).

A Conquest Engineering Ltd. engineer supervised the drilling and sample collection activities and logged the subsurface conditions encountered. The boreholes were advanced through overburden soils using HW sized casing and the soil samples were collected at frequent intervals using a 2-inch outside diameter split-spoon sampler. Bedrock was cored at selected locations using an HQ sized diamond core barrel. Detailed logs of the soils and bedrock encountered are given on the Borehole Records appended.

All soil samples recovered were stored in moisture tight containers and returned with the rock core to our Saint John laboratory for further classification and testing as required. Samples remaining after testing will be stored for a period of six (6) months from the date of issue of this report. After this time the samples will be discarded unless we receive instructions to retain them longer.

The location and ground surface elevation of each borehole were established in the field by our personnel. Elevations given on the Borehole Records are referenced to LWOST datum and the Coast Guard wharf deck was used as a benchmark at 32.0 feet.

4.0 SOIL AND BEDROCK PROFILE

The strata encountered are described in detail below and on the Borehole Records appended. For an explanation of the descriptions used reference should be made to the *Symbols and Terms used on Borehole and Test Pit Records* included in Appendix A.

4.1 Link to Market Square - Boreholes 1 thru 3 inclusive

FILL

The fill materials encountered at these locations consisted primarily of very loose to dense brown to grey sand with gravel, trace of silt and cobbles. Borehole 1 was terminated at a depth of 12 feet on what is believed to be armour stone placed during the development of Market Square. The borehole was relocated approximately 5 feet to the west, re-drilled and again encountered refusal to further advancement at a depth of 11 feet. Each of the 3 boreholes drilled in this area were terminated within the fill materials at depths varying from 11 feet at Borehole 1 to 20 feet at Boreholes 2 and 3.

4.2 Existing Parking Lot – Peters Wharf and Water Street – Boreholes 4 and 5

FILL

The fill materials encountered at Boreholes 4 and 5 consisted primarily of very loose to compact brown to black sand with silt and gravel. Wood and rubble, such as pieces of red brick, were encountered throughout the fill zone which extended to bedrock at each location. The thickness of the fill was determined to be 27 feet at Borehole 4 and 18.6 feet at Borehole 5.

BEDROCK

Although bedrock was not proven through diamond core drilling at these locations fragments of black shale bedrock were retrieved from the tip of the hollow-stem auger when refusal to advancement was encountered. Through inference we consider that Boreholes 4 and 5 were terminated on the bedrock surface at depths of 27 feet and 18.6 feet respectively.

4.3 Existing Coast Guard Terminal – Boreholes 6 thru 14 inclusive

FILL

Throughout the Coast Guard Terminal the entire area is covered with asphalt. From discussions with Coast Guard personnel concrete aprons were cast around the existing buildings and now underlie the asphalt. The slabs of concrete are discernible at the surface by regularly-spaced joints in the asphalt.

The principal fill materials encountered underlying the Coast Guard site consist of grey to brown sand with gravel and traces of silt. Frequently zones of wood and large armour stone were intersected in addition to rubble such as pieces of brick. At Boreholes 12, 13 and 14 the sand and gravel fill was underlain by a zone of very loose to compact black silt with organics, brick and wood.

SILTY CLAYEY SAND WITH GRAVEL - TILL

Overlying the bedrock at Boreholes 6, 7, 8, 9, 11 and 13 a stratum of compact to dense grey to brown silty, clayey sand with gravel till was encountered. This stratum, which is considered to be native to the site, varied in thickness from 3 feet at Borehole 11 to 21 feet at Borehole 8. A boulder was encountered within this till at Borehole 11 at a depth of 43 feet.

BEDROCK

Bedrock underlying the site is black shale of the Kings Square Formation (Saint John Group). The core recovered indicates a Rock Quality Designation varying from vary severely fractured (RQD = 0%) to sound (RQD = 83%). It was noted that the bedrock RQD increases with depth into the bedrock mass.

Discontinuities within the rock mass varied from extremely close to moderate and fracture orientation ranged from horizontal to vertical with most of the fractures oriented at 60^o to 70^o from the horizontal.

The following Table 1 summarizes the depth to bedrock at Boreholes 6 thru 14 of the Coast Guard Terminal site.

TABLE 1
SUMMARY OF BEDROCK DEPTHS – COAST GUARD TERMINAL SITE

BOREHOLE NO.	DEPTH BELOW EXISTING WHARF DECK – (FT.)
6	34
7	64
8	57
9	63
10	40
11	45
12	39.5
13	41
14	43

5.0 GROUNDWATER CONDITIONS

In the area of the planned link to Market Square and throughout the Coast Guard Terminal site it should be expected that the prevailing groundwater table will be influenced by the tidal cycles in the adjacent Saint John harbour. In the area of the City of Saint John parking lot the groundwater level was intersected at a depth of 8 feet in each of the 2 boreholes drilled in that area. We would not anticipate that the groundwater table in this area would be direct influenced by tidal cycles. Fluctuations, however, should be expected from seasonal trends and specific storm events.

6.0 DISCUSSION AND RECOMMENDATIONS

The development concepts conveyed at the time of this investigation were understood to be somewhat preliminary in detail. Phase 1 of the development plans include multi-story hotel and condominium structures in addition to a pedestrian link to Market Square from the north side of the Coast Guard Terminal site. With multi-story buildings column loads are expected to be high.

We further understand that an underground parking garage is planned for the hotel/condo tower. For the pedestrian link it is envisioned that it will exit Market Square from the atrium level, drop below the street level at North Market Wharf and enter the proposed hotel either at the parking garage level or at the main floor level. In addition to the development of buildings, Phase 1 also includes plans for new streets and access roads.

Based on our understanding of the scope of the project and on the geotechnical information obtained during this investigation, we have analysed and reviewed options for building foundations and have provided our comments and recommendations herein. In addition we have provided design and construction considerations for the pedestrian link, parking garage and roadways. Comments on the existing sheet pile wall and concrete caissons have also been provided.

6.1 Building Foundations – Phase 1 Buildings – Hotel and Condominium Tower

With large diameter boulders and remains of old timber cribworks underlying the site the successful installation of driven piles such steel “H” or pipe piles is highly improbable and not without significant risk to the integrity of the piles and their load-carrying capacity. Furthermore the anticipated high column loads will require the installation of high-capacity foundation units. It is for these reasons that we strongly recommend that the building foundations consist of high capacity drilled piers (caissons) in rock. Such a system was installed for the Market Square development some 25 years ago and is specifically suited for such conditions. The piers are constructed by the driving of a cylindrical shaft to the bedrock surface. A socket 3 times the diameter of the shaft is then drilled into the rock, the socket cleaned, a reinforcing steel cage installed and the shaft filled with concrete.

The basis of design is that, when loaded, the pier transfers the load to the rock either through bond between the concrete and rock of the wall of the socket, or through the base as end-bearing. Based on our knowledge of the underlying rock conditions and considering that the bond or shaft resistance is much more dependent on construction techniques, we recommend that the design be based on the end-bearing capacity of the piers. For embedment we recommend a socket depth to diameter ratio of 3, which is consistent with the design for the caissons at Market Square. Based on our examination of the bedrock core we recommend that the upper 2 feet of bedrock be disregarded in the socket length calculations.

We have provided the following capacities for 36, 30 and 24 inch diameter caissons.

36 inch diameter	480 tons
30 inch diameter	330 tons
24 inch diameter	215 tons

Piers designed according to the above requirements will have total and differential settlements primarily a function of their elastic compression under load.

Although we have recommended that the design loads be established from the base capacity, it is recommended that both the base and shaft of the socket be determined to be clean and sound before they are accepted. Field construction review is essential for such foundations and should be performed by qualified geotechnical personnel.

6.2 Building Foundations – Existing Parking Lot – Peters Wharf and Water Street

Based on the findings of the preliminary boreholes put down in this area (Boreholes 4 and 5) a foundation scheme of end-bearing steel H-piles could be utilized, depending on anticipated loads from building columns. It should be noted that in Borehole 4 intermittent layers of wood were encountered from a depth of 14 to 21 feet and this zone of wood would lead to significant difficulty in the driving of closed-end pipe piles. It is for this reason that we have not considered pipe pile for this site.

For steel H-piles we have provide the following capacities based on a factor of safety of 3. It is assumed that the final grade of the site will be coincident with the present grade and therefore negative shin friction forces will not apply.

HP 10 x 57 (HP 250 x 85)	150 kips (75 tons)
HP 12 x 74 (HP 310 x 110)	200 kips (100 tons)

We can provide allowable capacities for other pile sizes if requested.

For installation considerations we recommend the following:

- Piles should be installed utilizing appropriate driving energy (approximately 2,000 foot-pounds per square inch of pile cross-sectional area) and driven to refusal on bedrock utilizing a minimum refusal criteria of 10 blows per inch for the last 3 inches of pile penetration.
- Frost protection should be provided for the pile caps with a minimum of 4 feet of soil cover over the underside of the pile cap.
- Full-time geotechnical review of the pile installation is recommended.
- We further recommend that the design capacity of the piles driven for the project be confirmed in the field by dynamic testing using a Pile Driving Analyser (PDA).
- Pile contractors should be aware that a significant amount of wood was encountered in one of the boreholes and the potential exists that boulders may also be present within the underlying fill. Accordingly, adjustments to the pile driving operation (such as driving additional piles) may have to be taken if obstructions are encountered.

If high capacity piles are required at this site due to specific building configurations and load requirements then the recommendations in Section 6.1 would apply. When details of a proposed building(s) for the site become known we recommend that the present geotechnical information and our recommendations herein be reviewed for appropriateness and, if deemed necessary additional boreholes drilled to supplement the current data.

6.3 Pedestrian Link to Market Square

The plans at this stage of the development are preliminary and the design details have not been finalized. It is assumed, for the purposes of this report, that the underside of the pedestrian tunnel will be some 8-10 feet below the present grade of North Market Wharf.

For design and construction considerations we offer the following preliminary recommendations which we suggest should be reviewed when the details become more finalized:

- The ground surface elevation at Boreholes 2 and 3 is of the order of elevation 29.4 feet LWOST datum. Normal high water would be within a few feet of this elevation and obviously the buoyant forces and waterproofing of the structure will have to considered for in the design.
- From a construction standpoint work will have to be carried out during periods of low water. At the foundation level we recommend that an 18 inch thick layer of rockfill (8 inch minus – see attached gradation specification) be placed immediately below the tunnel slab level. Prior to placement of the rockfill the excavated surface should be proof-rolled with a heavy vibratory compactor. The rockfill should then be placed and compacted in place using a vibratory compactor and during periods of low water. With construction of the tunnel as anticipated the resulting settlement should be negligible as the installation of the tunnel creates a negative effective stress condition at the foundation level.
- If, at the Market Square end of the tunnel, an above-ground structure with conventional foundations is proposed, which would provide access to pedestrians to an upper level, then we would recommend the following approach for foundations at this location:
    - Over-excavate to a depth of 4 feet below the foundation level, proof roll the excavated base with a large vibratory compactor and replace the excavated material with 8 inch minus rockfill placed and compacted as detailed previously.
    - Foundations established on the compacted rockfill may be designed based on an allowable bearing pressure of 2,000 pounds per square foot. For such a scheme the potential for differential settlement exists at the transition between the tunnel and the elevator/stairway structure. Further geotechnical and structural input will be required on this issue when the plans and details become finalized.

6.4 Parking Garage for Hotel and Condominium Tower

Design and construction considerations for the establishment of an underground parking garage beneath the hotel and condominium structures will have to account for the potential for water infiltration. We understand that the Market Square parking garage was established at elevation 5.0 meters +/- (Geodetic datum). This equates to elevation 30.1 feet +/- LWOST datum. With the wharf deck level at the Coast Guard Terminal site at elevation 32 feet, the bottom level of any proposed parking garage will likely be well below normal high water (approximately elevation 28 feet). Storm surge and future rising sea levels should also be taken into consideration when establishing a parking garage design grade.

Based on the present grades we suggest that the parking garage will have to be designed as a water-tight structure which will likely dictate that the lowest floor level be a structural concrete floor slab.

We can provide further geotechnical input to this as required.

6.5 Road Construction

For roadway design and construction the municipal standards of the City of Saint John "Division 24 – Roadway Construction" should be followed, which include:

1. A minimum of 450 mm of sub base gravel and 150 mm of base gravel below the underside of asphalt.
2. Asphalt should include a minimum of 50 mm of Type B – base asphalt and 40 mm of Type D – seal asphalt.

6.6 Other Consideration

1. **Existing Steel Sheet Pile Wall –** The existing steel sheet pile wall along Market Slip is reportedly in poor condition and requires extensive repair or replacement. From review of the 1957 design drawings this sheet pile wall is anchored back by steel tie rods at a spacing of 5 feet which are tied to a pile-supported concrete wall located some 50 feet back from the face of the slip. If the tie-backs are considered for extended service, either with a repaired sheet pile wall or a new wall, we recommended their condition be assessed, including the connection to the buried concrete wall.

2. **Existing Concrete Cribs** – We understand consideration is being given to the installation of a new sheet pile wall around the entire perimeter of the Coast Guard Terminal wharf, which would act as a new barrier to the environmental exposure of the Saint John harbour. The existing concrete cribs and copewall are reportedly experiencing deterioration of the concrete face and, in places, reinforcing steel is now exposed. In the absence of a new sheet pile barrier wall it should be anticipated that regular repairs and maintenance will be required to offset the concrete deteriorating from the aggressive environment.

3. **Future Phases of Development –** The primary focus of this geotechnical report was to provide geotechnical input to the design and construction of Phase 1 buildings. As future phases of the development proceed it may be necessary to provide further geotechnical input as the details are developed. This may require additional borings and investigation of underlying conditions.

7.0 CLOSING

The recommendations given in this report are in accordance with our present understanding of the project. If our understandings of the project and/or assumptions stated in this report are incorrect, we request that we be contacted and permitted to review our recommendations.

It should be noted that the recommendations provided are based on the geotechnical data gathered from a limited number of small diameter boreholes. It is therefore possible that subsurface conditions across the site will vary. Should any conditions at the site be encountered which differ from those at the test locations, we require that we be notified immediately in order to access the additional information and its effects on the planned design and proposed construction.

Construction review by qualified geotechnical personnel is strongly recommended to ensure that the installation and construction of foundation components is in accordance with our recommendations. Furthermore, modifications to our recommendations may have to be made if variable conditions are encountered.

We trust this report meets with your present requirements. Please feel free to contact us if you have any questions or if we can be of further assistance to you on this development.

Respectfully submitted,
CONQUEST ENGINEERING LTD.

G. Ross Whitcomb, P. Eng.
Senior Engineer/Principal

APPENDIX A

SYMBOLS & TERMS USED ON BOREHOLE AND TEST PIT RECORDS

BOREHOLE RECORDS

SYMBOLS AND TERMS USED ON
BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil - mixture of soil and humus capable of supporting good vegetative growth
Peat - fibrous aggregate of visible and invisible fragments of decayed organic matter
Till - unstratified glacial deposit which may range from clay to boulders
Fill - any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated - having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured - having cracks, and hence a blocky structure
Varved - composed of regular alternating layers of silt and clay
Stratified - composed of alternating successions of different soil types, e.g. silt and sand
Layer - >75 mm
Seam - 2 mm to 75 mm
Parting - < 2 mm
Well Graded - having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded - predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	Greater than 20%

The standard terminology to describe cohesionless soils includes the compactness (formerly “relative density”), as determined by laboratory test or by the Standard Penetration Test ‘N’ – value.

Relative Density	‘N’ Value	Compactness %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value
	Kips/sq.ft.	KPa	
Very Soft	< 0.25	< 12.5	< 2
Soft	0.25 – 0.5	12.5 – 25	2 – 4
Firm	0.5 – 1.0	25 – 50	4 – 8
Stiff	1.0 – 2.0	50 – 100	8 – 15
Very Stiff	2.0 – 4.0	100 – 200	15 – 30
Hard	> 4.0	> 200	> 30

ROCK DESCRIPTION

Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size (45 mm) core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90 – 100	Excellent, intact, very sound
75 – 90	Good, massive, moderately jointed or sound
50 – 75	Fair, blocky and seamy, fractured
25 – 50	Poor, shattered and very seamy or blocky, severely fractured
0 – 25	Very poor, crushed, very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000 – 6000	*Very Thick*	*Very Wide*
600 – 2000	*Thick*	*Wide*
200 – 600	*Medium*	*Moderate*
60 – 200	*Thin*	*Close*
20 – 60	*Very Thin*	*Very Close*
< 20	*Laminated*	*Extremely Close*
< 6	*Thinly Laminated*	

Strength Classification	Uniaxial Compressive Strength (MPa)
Very Weak	1 – 25
Weak	25 – 50
Strong	50 – 100
Very Strong	100 – 250
Extremely Strong	> 250

Terminology describing weathering:

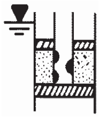
Slight - Weathering limited to the surface of major discontinuities. Typically iron stained.
Moderate - Weathering extends throughout rock mass. Rock is not friable.
High - Weathering extends throughout rock mass. Rock is friable.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:

WATER LEVEL MEASUREMENT

Borehole or
Standpipe



Piezometer

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the standard Penetration Test)
ST	Shelby tube or thin wall tube
PS	Piston sample
DC	Dynamic Cone Penetration
SV	Field Shear Vane
AS	Auger Sample
BS	Bulk Sample
WS	Wash Sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits

N- VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the number of blows are reported over sampler penetration in millimeters (e.g. 50/75).

OTHER TESTS

Symbols in this column indicate that the following laboratory tests have been carried out and the results are presented separately.

S	Sieve analysis
G_s	Specific gravity of soil particles
k	Permeability
	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; Test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

H	Hydrometer analysis
γ	Unit weight
C	Consolidation
CD	Consolidation drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct shear
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Records equals I_p (50); the index corrected to a reference diameter of 50 mm)

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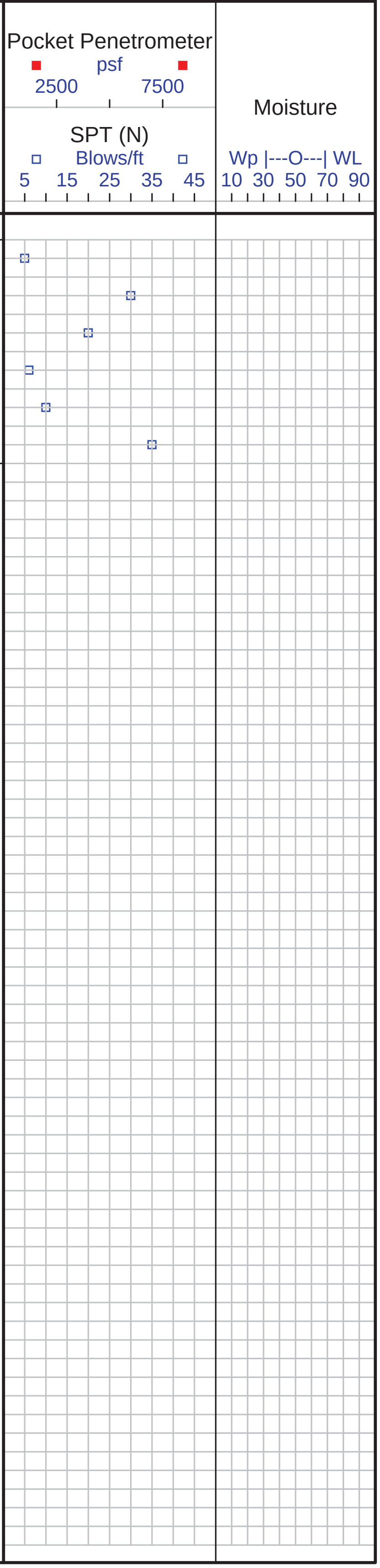
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 01
Page 1 of 1
Date Drilled: April 5, 2006
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
0								34.9
		SS	1	5	8	▨	Loose to dense brown sand with gravel, trace of silt and occasional cobbles: FILL	
		SS	2	30	0	▨		
		SS	3	20	8	▨		
		SS	4	6	10	▨		
		SS	5	10	8	▨		
		SS	6	35	3	▨		
12							End of Borehole BH-01 Practical refusal to further penetration of auger Possible armour stone at 12 ft Relocated BH-01 5 ft west - Refusal at 11 ft	22.9



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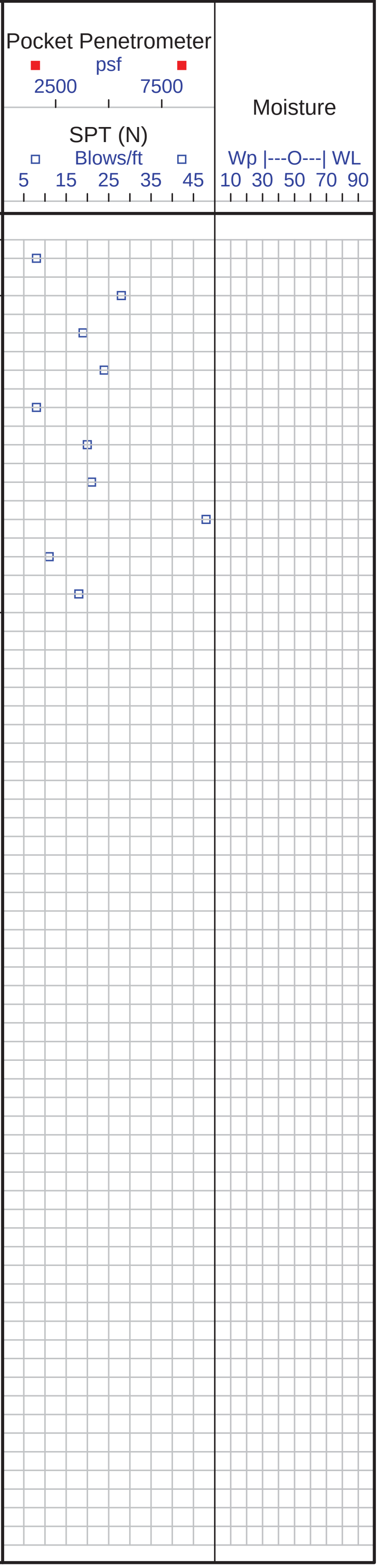
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 02
Page 1 of 1
Date Drilled: April 3, 2006
Datum: LWOST

Depth (ft): ft 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70
Depth (m): 0 2 4 6 8 10 12 14 16 18 20

Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
							29.4
	SS	1	8	16	☒	Loose brown sand with trace of silt and gravel: FILL	26.4
	SS	2	28	19	☒	Loose to dense brown to grey sand with gravel and trace of silt and occasional cobbles: FILL	
	SS	3	19	13	☒		
	SS	4	24	15	☒		
	SS	5	8	13	☒		
	SS	6	20	17	☒		
	SS	7	21	15	☒		
	SS	8	48	18	☒		
	SS	9	11	7	☒		
	SS	10	18	14	☒		9.4
						End of Borehole BH-02 at 20 ft	



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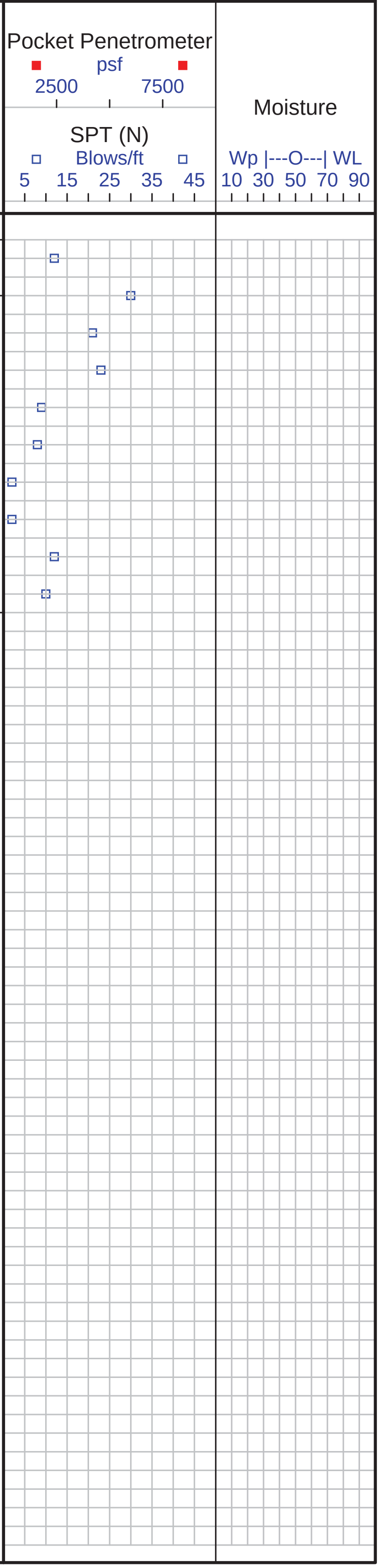
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 03
Page 1 of 1
Date Drilled: April 4, 2006
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
0		SS	1	12	17	▨	Loose to compact brown sand with trace of silt and gravel: FILL	29.4
		SS	2	28	10	▨	Very loose to compact brown to grey sand with gravel, trace of silt and occasional cobbles: FILL	26.4
		SS	3	21	16	▨		
		SS	4	23	15	▨		
		SS	5	9	11	▨		
		SS	6	8	13	▨		
		SS	7	2	4	▨		
		SS	8	2	0	▨		
		SS	9	12	13	▨		
		SS	10	10	6	▨		9.4
20							End of Borehole BH-03 at 20 ft	



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BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: 8 ft on April 5, 2006

BH - 04
Page 1 of 1
Date Drilled: April 5, 2006
Datum: LWOST

Depth (ft): ft 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70
m 0 2 4 6 8 10 12 14 16 18 20

Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)
	SS	1	13	15
	SS	2	10	4
	SS	3	8	9
▼	SS	4	8	4
	SS	5	3	8
	SS	6	2	17
	SS	7	1	9
	SS	8	5	2
	SS	9	13	7
	SS	10	16	10

SOIL DESCRIPTION — Elevation (ft)

30.9

Very loose to compact brown to black sand with silt and gravel: FILL

- red bricks at 6 ft and 15 ft

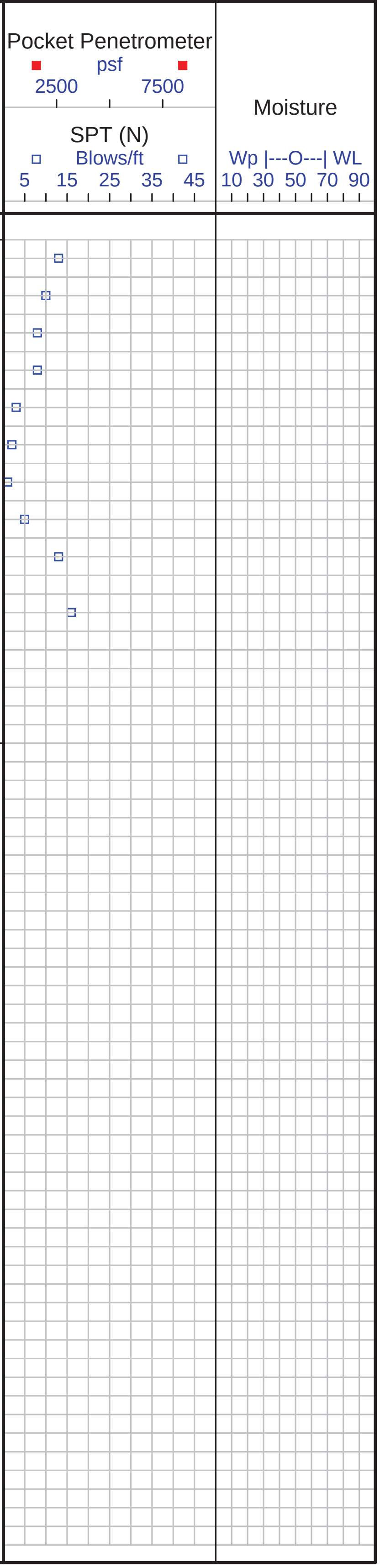
- some clay from 10 ft to 14 ft

- zones of wood from 14 to 21 ft

- black shale bedrock fragments at tip of auger

3.9

End of Borehole BH-04
Practical refusal to further penetration of auger
Probable bedrock at 27 ft



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BOREHOLE RECORD

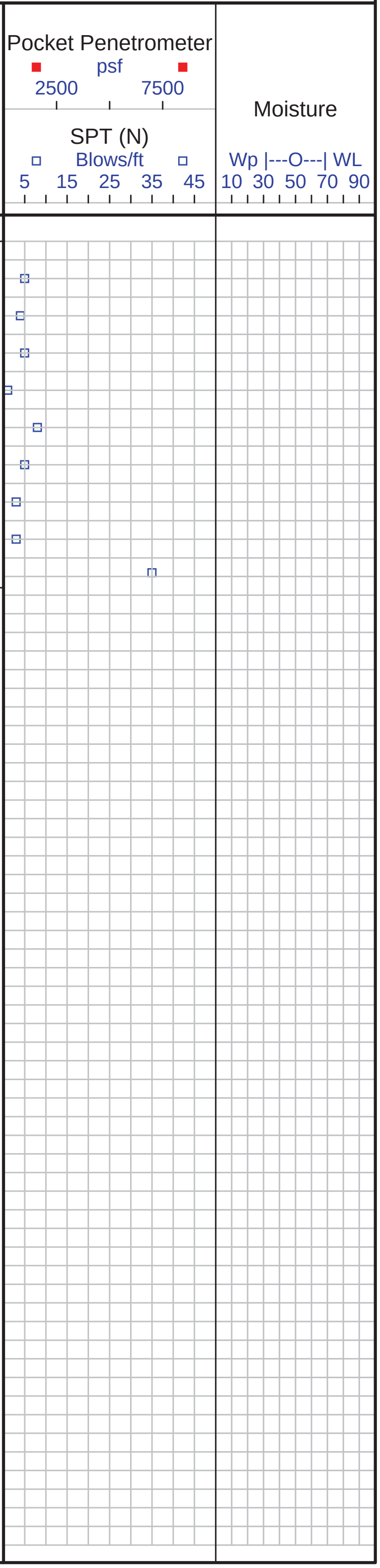
Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: 8 ft on March 31, 2006

BH - 05
Page 1 of 1
Date Drilled: March 31, 2006
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
0								30.6
2		SS	1	5	9	▨	Very loose to loose brown to black sand with silt and gravel: FILL	
4		SS	2	4	4	▨	- presence of woods and red bricks throughout	
6		SS	3	5	8	▨		
8	▼	SS	4	1	15	▨		
10		SS	5	8	7	▨		
12		SS	6	5	6	▨		
14		SS	7	3	4	▨		
16		SS	8	3	2	▨		
18		SS	9	35	10	▨	- black shale bedrock fragments at tip of split spoon	12.0

End of Borehole BH-05
Practical refusal to further penetration of auger
Probable bedrock at 18.6 ft

Depth scale: ft 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70; m 0 2 4 6 8 10 12 14 16 18 20



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BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 06
Page 1 of 1
Date Drilled: March 30, 2006
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
0							Very loose to dense grey to brown sand with gravel and trace of silt: FILL	31.2
2		SS	1	35	13			
4		SS	2	13	13			
6		SS	3	5	7			
8		SS	4	8	8		- brick fragments at 8 ft	
10		SS	5	3	4		- zones of wood from 10 ft to 19 ft	
12		SS	6	6	4			
14		SS	7	5	18			
18		SS	8	5	6			
20		SS	9	15	8			
22		SS	-	6	0			
27							Compact dark grey to brown silty clayey SAND with gravel: TILL	4.2
31		SS	10	17	10			
34							Very severely fractured to fractured black SHALE with occasional quartz seams, horizontal to vertical fractures and extremely close to close discontinuities	-2.8
35		RC	11	0%	100%			
38		RC	12	40%	67%			
43		RC	13	72%	100%			
45							End of Borehole BH-06 at 45 ft	-13.8

ft m
0 0
2
4
6 2
8
10
12 4
14
16
18 6
20
22
24
26 8
28
30
32 10
34
36
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52 16
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58 18
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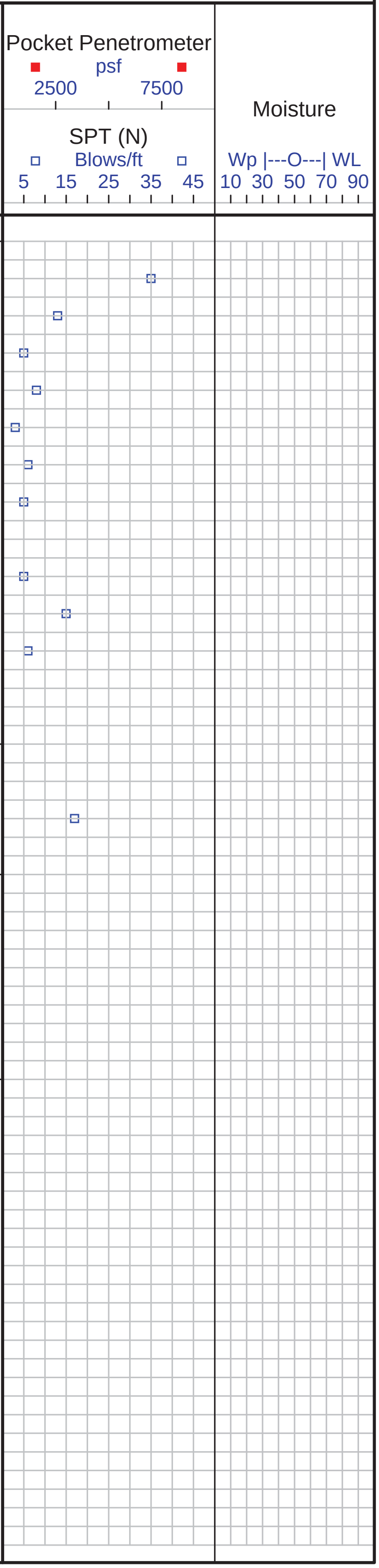
66 20
68
70



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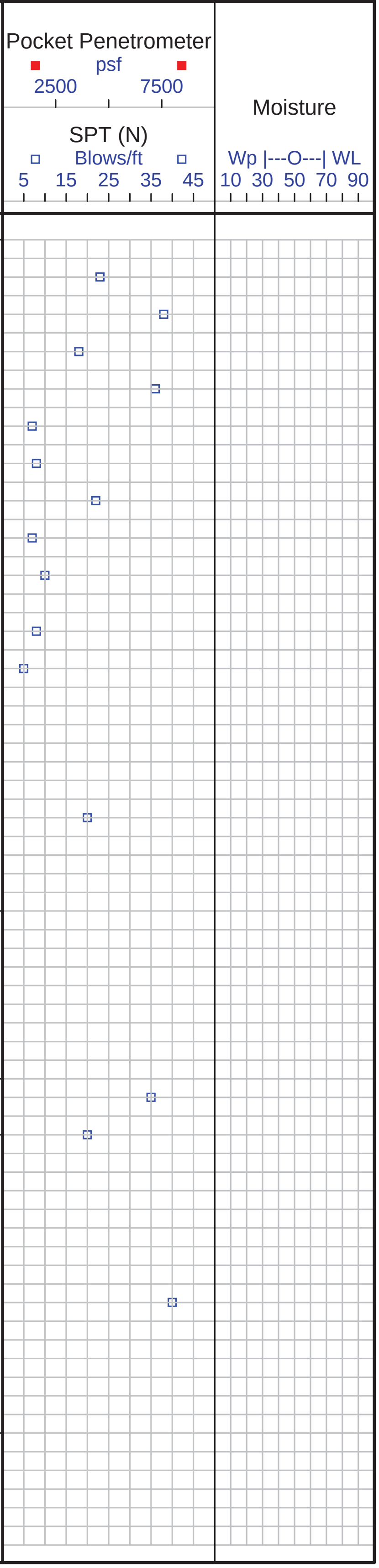
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 07
Page 1 of 1
Date Drilled: March 30, 2006
Datum: LWOST

Sample Type	Sample Number	N Value or RQD %	Recovery (in)
SS	1	23	9
SS	2	38	13
SS	3	18	6
SS	4	36	7
SS	5	7	5
SS	6	8	4
SS	7	22	6
SS	8	7	5
SS	-	10	0
SS	9	8	2
SS	-	5	0
SS	10	20	6
SS	11	35	8
SS	12	20	18
SS	13	40	4

Elevation (ft)	SOIL DESCRIPTION
31.2	Loose to dense grey to brown sand with gravel and trace of silt: FILL
-4.8	ARMOUR STONE from 36 ft to 45 ft
-13.8	Compact to dense brown silty sand with gravel and frequent wood layers: FILL
-16.8	Compact to dense dark grey to brown silty clayey SAND with gravel: TILL
-32.8	End of Borehole BH-07 Practical refusal to further penetration of casing Probable bedrock at 64 ft



Conquest Engineering Ltd.

BOREHOLE RECORD

Project Name: Coast Guard Terminal Development

Project No.: 130-001

Client: The Hardman Group Limited

Location: Saint John, NB

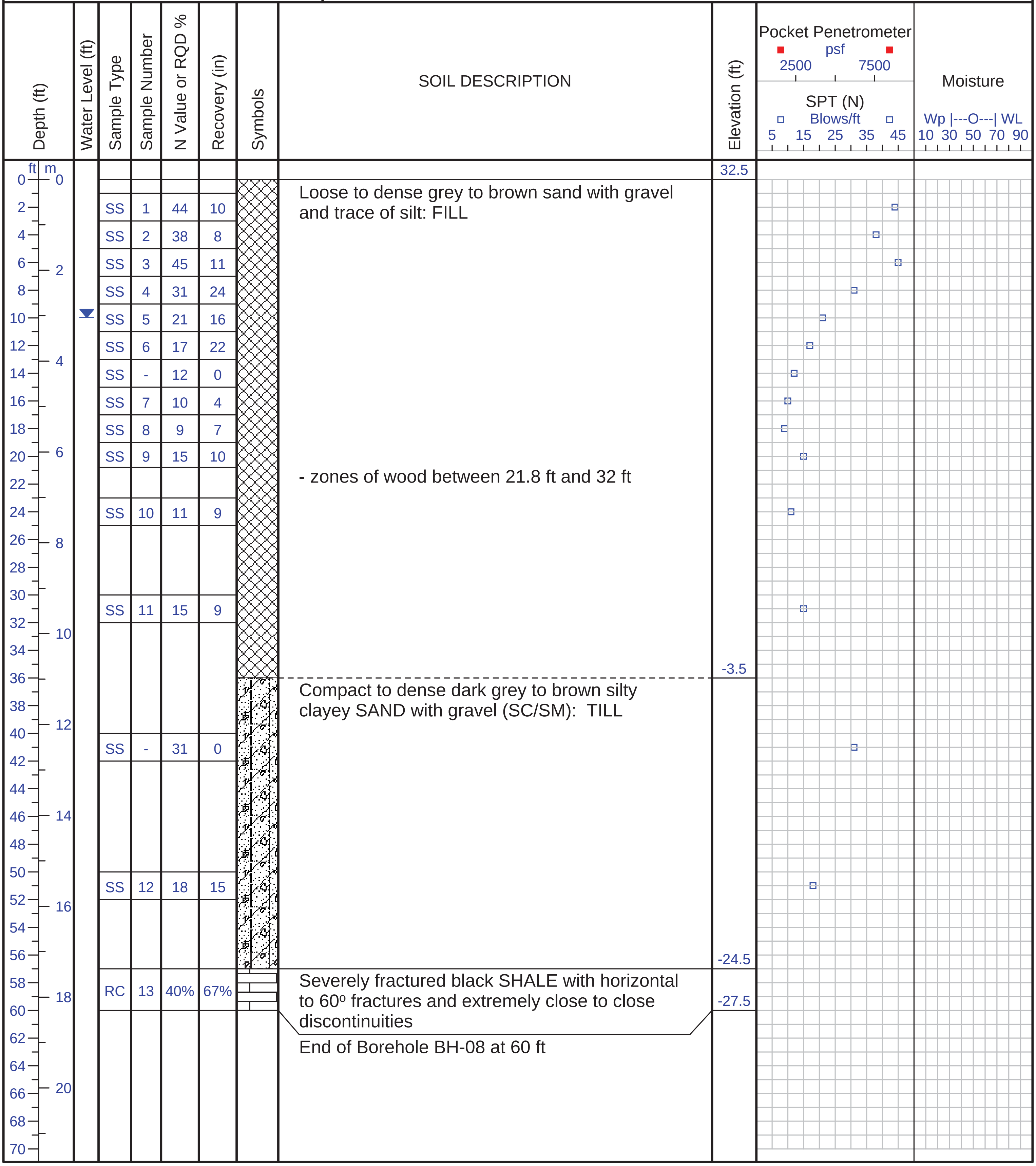
Water Level: 10 ft on March 29, 2006

BH - 08

Page 1 of 1

Date Drilled: March 29, 2006

Datum: LWOST



Sample Type	Sample Number	N Value or RQD %	Recovery (in)
SS	1	44	10
SS	2	38	8
SS	3	45	11
SS	4	31	24
SS	5	21	16
SS	6	17	22
SS	-	12	0
SS	7	10	4
SS	8	9	7
SS	9	15	10
SS	10	11	9
SS	11	15	9
SS	-	31	0
SS	12	18	15
RC	13	40%	67%

SOIL DESCRIPTION	Elevation (ft)
Loose to dense grey to brown sand with gravel and trace of silt: FILL - zones of wood between 21.8 ft and 32 ft	32.5
Compact to dense dark grey to brown silty clayey SAND with gravel (SC/SM): TILL	-3.5
Severely fractured black SHALE with horizontal to 60º fractures and extremely close to close discontinuities	-24.5
End of Borehole BH-08 at 60 ft	-27.5

BOREHOLE RECORD

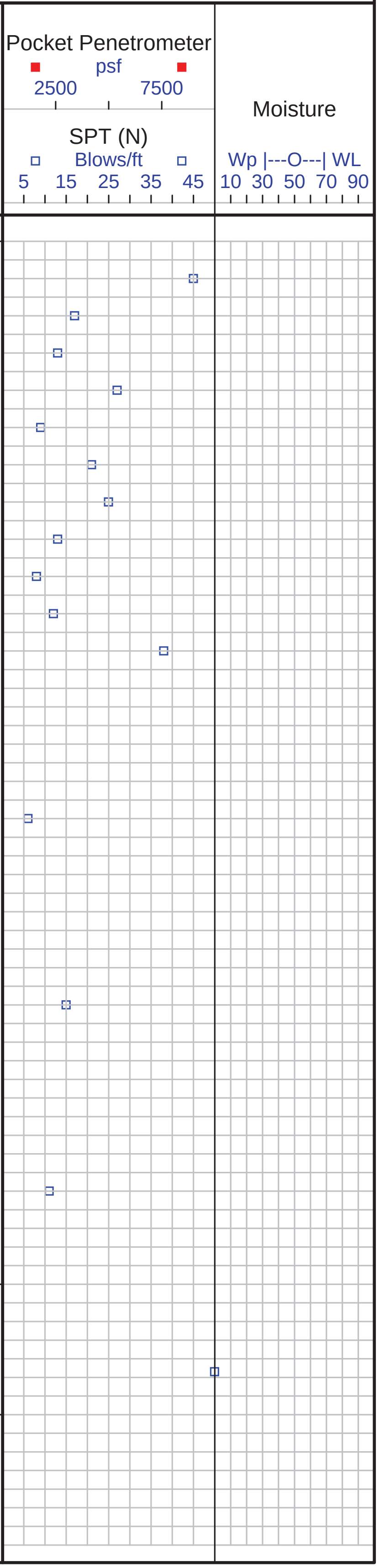
Conquest Engineering Ltd.

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: 12 ft on March 28, 2006

BH - 09
Page 1 of 1
Date Drilled: March 28, 2006
Datum: LWOST

Sample Type	Sample Number	N Value or RQD %	Recovery (in)
SS	1	45	11
SS	2	17	8
SS	3	13	10
SS	4	27	10
SS	5	9	8
SS	6	21	10
SS	7	25	24
SS	-	13	0
SS	8	8	7
SS	9	12	14
SS	10	38	9
SS	11	6	8
SS	-	15	2
SS	12	11	8
SS	13	50+	8

Depth (ft)	SOIL DESCRIPTION	Elevation (ft)
0	Loose to dense brown sand with gravel and trace of silt: FILL	31.9
56	Compact to dense dark grey to brown silty clayey SAND with gravel (SC/SM): TILL	-24.1
63	End of Borehole BH-09 Probable bedrock at a depth of 63 ft	-31.1



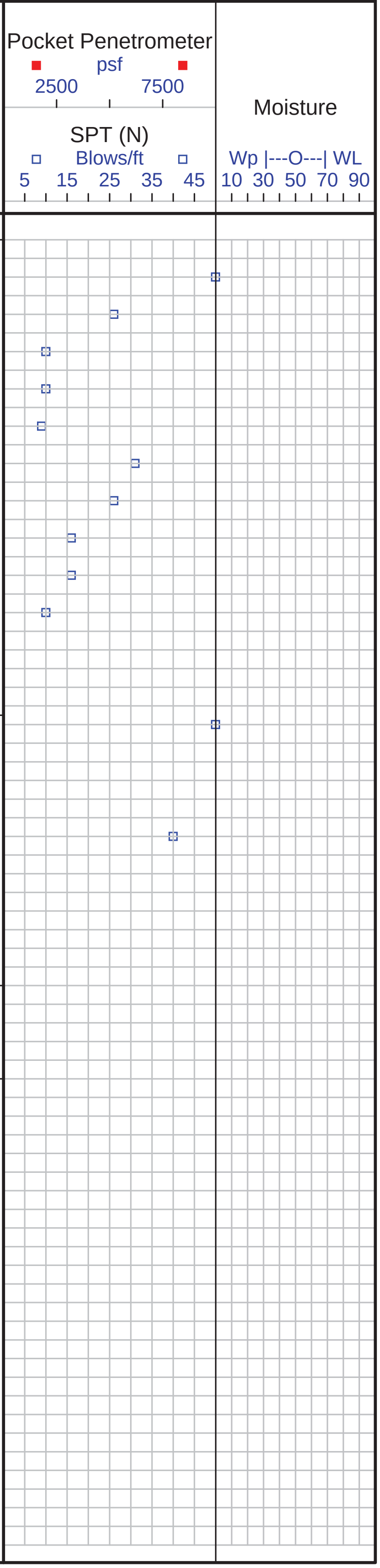
Conquest Engineering Ltd.

BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 10
Page 1 of 1
Date Drilled: March 23/24, 06
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
0							Loose to dense brown sand with gravel and trace of silt: FILL	32.0
2		SS	1	50	20			
4		SS	2	26	14			
6		SS	3	10	8			
8		SS	4	10	5			
10		SS	5	9	10			
12		SS	6	31	15			
14		SS	7	26	13			
16		SS	8	16	6			
18		SS	9	16	13		- brick fragments at 18 ft	
20		SS	10	10	4			
25.5							WOOD from 25.5 ft to 38.5 ft	6.5
26		SS	11	50+	4			
29							- occasional voids	
32		SS	12	40	19			
38.5							- Boulder at 38'-6"	
40							Severely fractured black SHALE with horizontal to 60º fractures and extremely close to close discontinuities	-8.0
42		RC	13	40%	70%			
45							End of Borehole BH-10 at 45 ft	-13.0



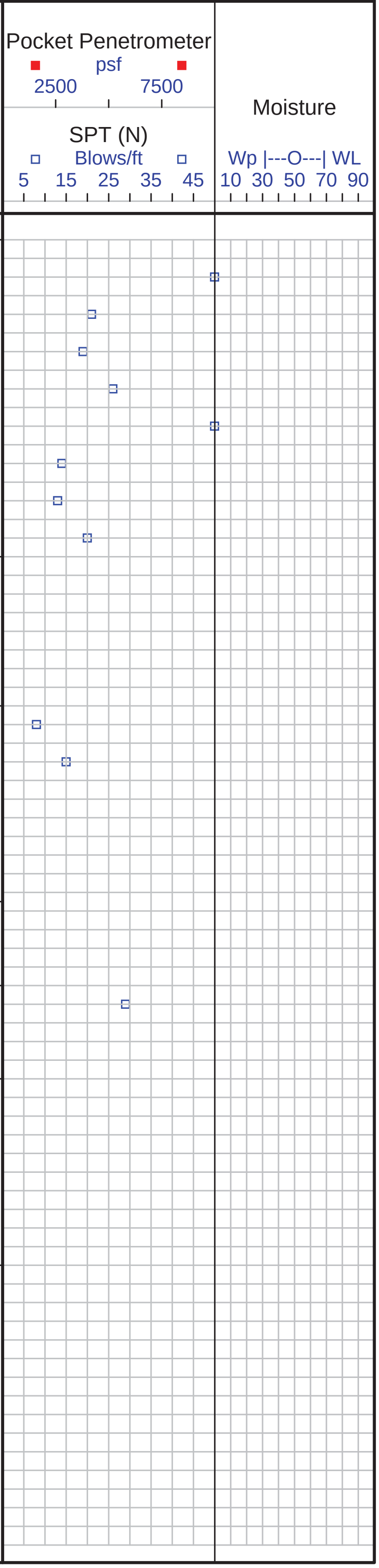
Conquest Engineering Ltd.

BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 11
Page 1 of 1
Date Drilled: March 25, 2006
Datum: LWOST

Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	SOIL DESCRIPTION	Elevation (ft)
						31.6
	SS	1	56	11	Loose to dense grey to brown sand with gravel and trace of silt: FILL	
	SS	2	21	16		
	SS	3	19	6		
	SS	4	26	8		
	SS	5	55	4		
	SS	6	14	4		
	SS	7	13	4		
	SS	8	20	2		14.6
					ARMOUR STONE from 17 ft to 25 ft	6.6
	SS	9	8	5	Loose to compact grey to brown sand with gravel and trace of silt: FILL	
	SS	10	15	10		-3.9
					WOOD from 35.5 ft to 40 ft	-8.4
	SS	11	29	9	Compact to dense dark grey to brown silty clayey SAND with gravel (SC/SM): TILL - boulder at 43 ft	-13.4
	RC	12	19%	63%	Very severely fractured to fractured black SHALE with occasional quartz seams, horizontal to 70º fractures and extremely close to close discontinuities	
	RC	13	28%	89%		
	RC	14	63%	100%		-23.4
					End of Borehole BH-11 at 55 ft	



Conquest Engineering Ltd.

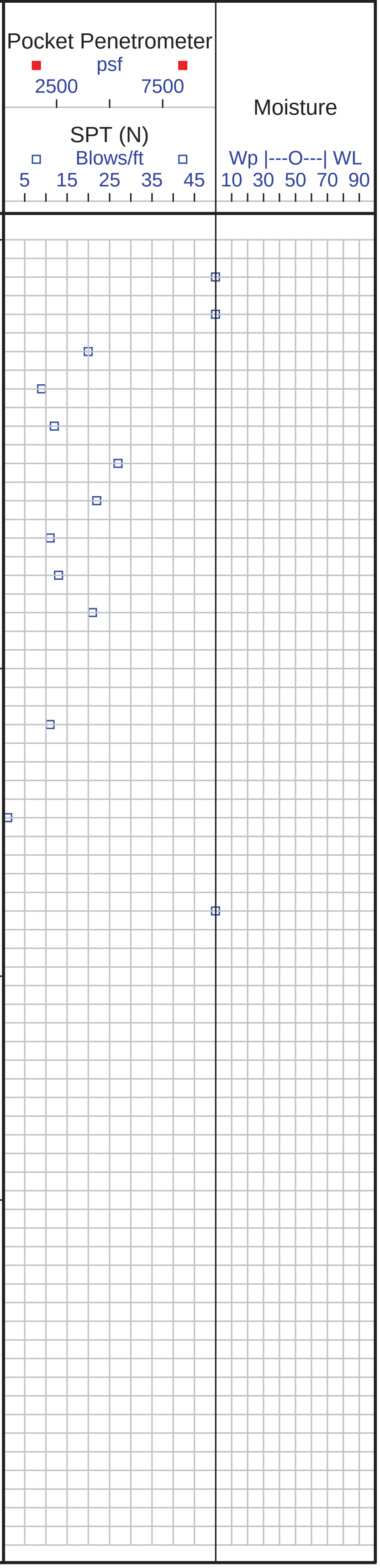
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 12
Page 1 of 1
Date Drilled: March 22, 2006
Datum: LWOST

Depth (ft): ft 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70
m 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)	Symbols	SOIL DESCRIPTION	Elevation (ft)
							32.1
	SS	1	50+	7	▨	Loose to very dense brown sand with gravel and trace of silt: FILL	
	SS	2	52	17	▨		
	SS	3	20	6	▨		
	SS	4	9	9	▨		
	SS	5	12	8	▨		
	SS	6	27	2	▨		
	SS	7	22	20	▨		
	SS	8	11	6	▨	- cobbles at 16 ft	
	SS	9	13	9	▨	- brick fragments at 19 ft	
	SS	10	21	19	▨		
					▨		9.1
					▨	Very loose to compact brown to black silt with organics, trace of brick and occasional zones of wood: FILL	
	SS	11	11	13	▨		
	SS	12	1	2	▨		
	SS	13	50+	5	▨	- boulder at 36 ft	
					▨		-7.4
	RC	14	83%	100%	▤	Fractured to sound black SHALE with occasional quartz seams, horizontal to 60º fractures and extremely close to close discontinuities	
	RC	15	78%	100%	▤		
	RC	16	70%	91%	▤		
	RC	17	83%	96%	▤		-19.4
						End of Borehole BH-12 at 51.5 ft	



Conquest
Engineering
Ltd.

BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

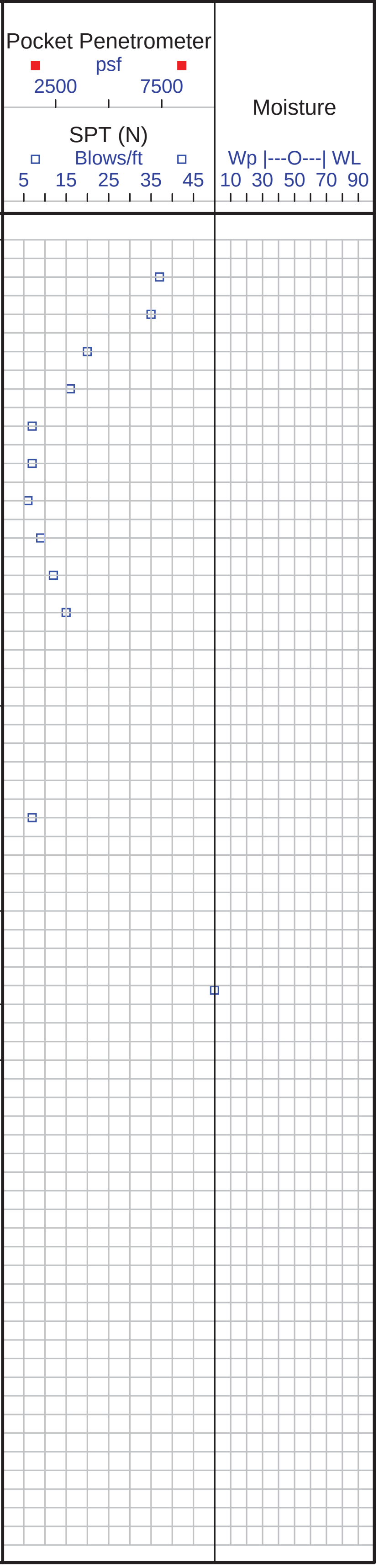
BH - 13
Page 1 of 1
Date Drilled: March 26, 2006
Datum: LWOST

Sample Type	Sample Number	N Value or RQD %	Recovery (in)
SS	1	37	4
SS	2	35	13
SS	3	20	12
SS	4	16	13
SS	5	7	10
SS	6	7	6
SS	7	6	7
SS	8	9	10
SS	9	12	19
SS	10	15	4
SS	11	7	20
SS	12	50+	10
RC	13	0%	67%

SOIL DESCRIPTION	Elevation (ft)
	32.0
Loose to dense brown sand with gravel and trace of silt: FILL	7.0
Loose brown to black silt with organics and trace of brick and some wood: FILL	-4.0
Compact to dense dark grey to brown silty clayey SAND with gravel (SC/SM): TILL	-9.0
Very severely fractured black SHALE with horizontal to vertical fractures and extremely close to very close discontinuities	-12.0

End of Borehole BH-13 at 44 ft

Depth (ft) 0–70; m 0–20



Conquest Engineering Ltd.

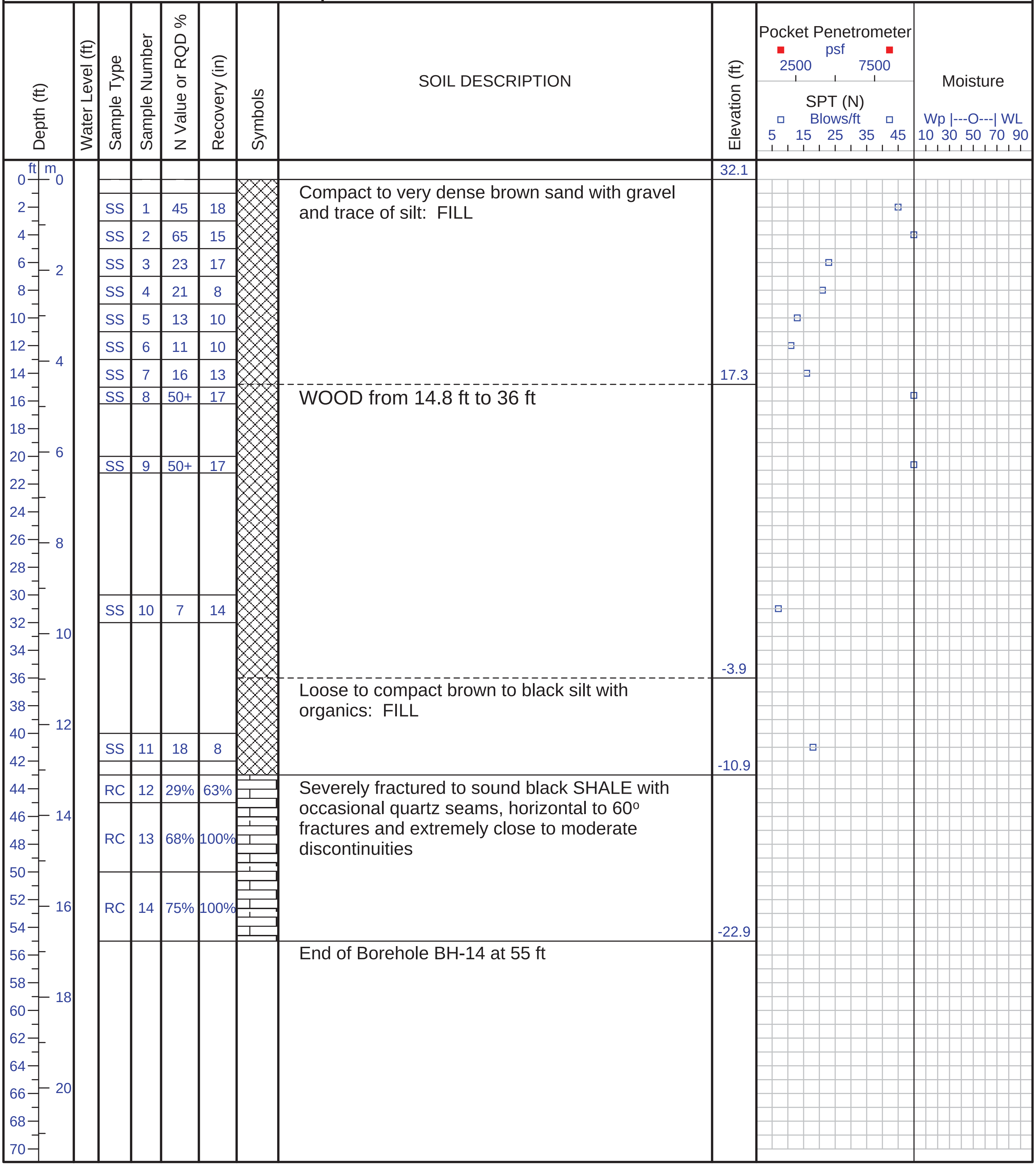
BOREHOLE RECORD

Project Name: Coast Guard Terminal Development
Project No.: 130-001
Client: The Hardman Group Limited
Location: Saint John, NB
Water Level: Tidal

BH - 14
Page 1 of 1
Date Drilled: March 27, 2006
Datum: LWOST

Depth (ft)	Water Level (ft)	Sample Type	Sample Number	N Value or RQD %	Recovery (in)
		SS	1	45	18
		SS	2	65	15
		SS	3	23	17
		SS	4	21	8
		SS	5	13	10
		SS	6	11	10
		SS	7	16	13
		SS	8	50+	17
		SS	9	50+	17
		SS	10	7	14
		SS	11	18	8
		RC	12	29%	63%
		RC	13	68%	100%
		RC	14	75%	100%

Symbols	SOIL DESCRIPTION	Elevation (ft)
		32.1
▨	Compact to very dense brown sand with gravel and trace of silt: FILL	
		17.3
▨	WOOD from 14.8 ft to 36 ft	
		-3.9
▨	Loose to compact brown to black silt with organics: FILL	
		-10.9
	Severely fractured to sound black SHALE with occasional quartz seams, horizontal to 60º fractures and extremely close to moderate discontinuities	
		-22.9
	End of Borehole BH-14 at 55 ft	



APPENDIX B

SPECIFICATION FOR 8 INCH MINUS ROCKFILL

CONQUEST
ENGINEERING
LTD.

SPECIFICATION FOR ROCKFILL – 200mm (8 inch) minus

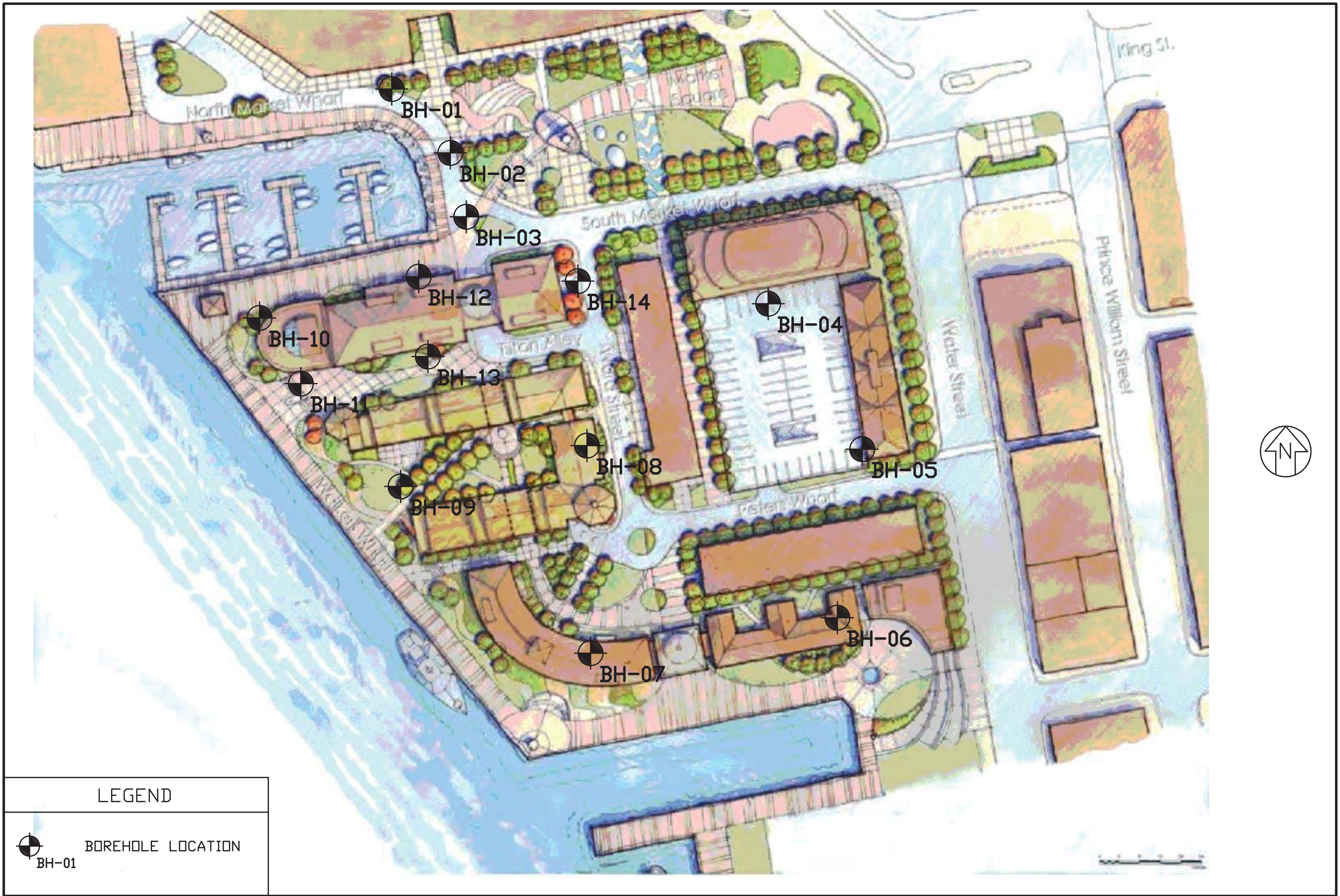
Sieve Size	Percent Passing
200mm (8")	100
150mm (6")	60-90
75mm (3")	40-55
10mm (3/8)	0-5

NOTE

Rockfill shall be hard, durable, sound, quarried rock, free from splits, seams, or defects likely to impair its soundness during handling or by the actions of water, and free from silt, clay, organic or other deleterious materials. Rockfill shall be well-graded. Rockfill shall be suitably graded such as to minimize segregation during end dumping.

APPENDIX C

BOREHOLE LOCATION PLAN – FIGURE 1



BOREHOLE LOCATION PLAN
COAST GUARD TERMINAL DEVELOPMENT
SAINT JOHN, NB

CONQUEST ENGINEERING Ltd.
575 CROWN STREET
SAINT JOHN, NEW BRUNSWICK, CANADA
E2L 5E9

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DATE: 2006-04-10

SCALE: NTS

PROJECT No.: 130-001

FIGURE: 1

Appendix 2: Geotechnical & Environmental Summary by Stantec 2010

Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4
Tel: (506) 634-2185
Fax: (506) 634-8104

Stantec

October 6, 2010
File: 121910687

Saint John Development Corporation
One Market Square, Suite 301
Saint John, NB E2L 4Z6

Attention: **Mr. Kent MacIntyre, MBA – General Manager**

Dear Mr. MacIntyre:

Reference: **Saint John Waterfront Development**
Document Review - Geotechnical and Environmental Summary

As requested, Stantec Consulting Ltd. (Stantec) has conducted a review of the documents provided by the Saint John Development Corporation. A list of the documents submitted for review is attached. It should be noted that Stantec reviewed only the documents related to Geotechnical and Environmental concerns. The following pages summarize our findings given the reports provided.

We trust this meets with your present requirements. Should you have questions or concerns, please feel free to contact the undersigned at your convenience.

Thank you for selecting Stantec to meet your needs, we look forward to working with you in the future.

Sincerely,

STANTEC CONSULTING LTD.

Rochelle Brown, M.Sc.E., P.Eng.
Associate, Team Lead - Geotechnical Engineering
Tel: (506) 634-2185
Fax: (506) 634-8104
rochelle.brown@stantec.com

Attachment: Summary of Reports

rb v:\01219\active\121910687_sjwaterfront\report\task200_document_review\let_rb_docreview_20101006.docx

Report: Limited Environmental Investigation – Canadian Coast Guard Base
Author: Dillon Consulting
Date: April 27, 2006.

Summary of report

- 14 boreholes and 1 monitoring well were installed on the property.
- 8 soil samples analyzed for metals – 0 exceeded residential CCME– 0 exceeded commercial CCME
- 5 soil samples analyzed for PAHs – 2 exceeded residential CCME – 0 exceeded commercial CCME
- 8 soil samples analyzed for petroleum hydrocarbons – 2 exceeded residential Tier I RBSLs – 0 exceeded commercial Tier I RBSLs
- 1 water sample analyzed for petroleum hydrocarbons – 0 exceeded residential Tier I RBSLs – 0 exceeded commercial Tier I RBSLs

Stantec's Review

- Petroleum hydrocarbon impacts in soil above Tier I RBSLs for residential land use identified in 2 boreholes (BH4 and BH5) in the area of 2 Peters Wharf (area where current Phase I/II ESA is assessing).
- PAH impacts in soil above CCME guidelines for residential land use identified in 2 boreholes (BH5 and BH6) in the area of 2 Peters Wharf (area where current Phase I/II ESA is assessing) and to the south of 2 Peters Wharf.
- All samples tested met the commercial guidelines.

Report: Geotechnical Investigation – Phase I Proposed Multi Phase Development
Author: Conquest Engineering Ltd.
Date: September 24, 2010

Summary of report

- 14 boreholes were drilled on the property for various aspects of the project.
- In general, the subsurface strata was found to be fill underlain by till and bedrock.
- Buildings will be pile and/or caisson supported.
- Waterproofing of the building's lower levels may be required.

Stantec's Review

- The recommendations given in the report are based on preliminary design concepts available at the time of writing. Additional subsurface information may be required.
- All structures on the site will be pile supported
- Large boulders (some described as "man-sized") and timber cribworks were encountered at the site, therefore steel H-piles or caissons must be used. This may also lead to difficulty in pile driving / installation. Large diameter caissons likely are the best alternative (used at Market Square).
- Only two boreholes were drilled within the proposed footprint for the building located at Peters Wharf and Water Street. Additional subsurface information will be required to complete the design.
- The parking garage for the hotel and condominium tower will be below high tide. This will require extensive engineering support and will have to be accounted for with respect to water proofing, buoyancy, etc. The lowest floor will likely be structural. These considerations will have to be accounted for where the parking garage of a structure is anticipated to be below high tide.
- Pedestrian Link to Market Square (underground pedway) construction will be under tidal influence. This will attract additional costs. Construction will have to be scheduled around tidal cycles and must be designed against buoyancy. Potential for settlement issues at junction of above and below tide. More study is required.
- Considerations must be given to the steel sheet pile wall along Market Slip (requires extensive repair) as well as the existing concrete cribs which require repair and maintenance.
- Construction Sequences – where concrete caissons exist, the area was dredged to bedrock and a mattress of rockfill installed prior to caisson installation. Existing wharfs, former slips and timber cribs were left in place to an elevation of 17.0 (LWOST)

Report: Wharf Infrastructure – Coast Guard Terminal Property
Author: Conquest Engineering Ltd.
Date: December 14, 2010

Stantec's Review

- General review of various wharf structures in three separate reports. Conclusions are that deterioration has taken place and repairs and maintenance are required to extend the life of the structures.
- Cost (no detail) of repairs is estimated at $1.4m. This would extend the life of the structure from 12 to 20 years. Replacement of the facility is estimated at $22.7m (no details).
- Surrounding the entire facility with a new Steel Sheet pile wharf (1200' in length) is estimated at $6 - $8m (no details).

Report: Historical Review of 3 Water Street
Author: de Stecher Appraisals Ltd.
Date: March 29, 1999.

Summary of report

1783 – Plan shows 3 Water Street (same as 2 Peters Wharf) is below the high water line of the harbor.
1823 – Subject property on plan with wharves to the west.
1837, 1841, 1877 – Subject property destroyed by fires.
1910 – photo shows a coal dealer and lumber merchants in area of subject property.
1930 – photo shows “The Starr Coal Company” in the area of subject property. Building that was lumber merchants now shows “Thos. Gorman, Wholesale Grocers, established 1874”.
1935 – Aerial photo shows subject property is covered by buildings.
1945 – Aerial photo shows subject property has buildings but less than 1935.
1962 – Aerial photo shows subject property has buildings (one Parrtown Tavern) but less than 1945.
1984 – Aerial photo shows all previous buildings demolished and parking lot improvements evident.

Stantec’s review

- Historical use of the property such as coal dealer, tire retreading, and outboard motor sales & service may have caused adverse environmental impacts to the site. The source of the fill material used at the Site is unknown and may be an environmental concern to the Site.

Report: Complete Appraisal – Self- Contained Report of the Saint John Guard Base Property
Author: Todd Stokes & J. L McDonald
Date: January 30, 2003.

Summary of Report

The Shops Building has 2 oil fired hot water boilers.

Stantec's review

- The tank(s) that contained the oil for the boilers is a potential environmental concern to the site.

Report: Master Valuation Report of Coast Guard Base
Author: Lee Weatherby
Date: November 12, 2002.

Summary of Report

- A 200 gallon metal oil tank is located in the Administration Building to supply the generator.
- A 45,600 L oil tank is located in the Shops Building.
- A review of an Environmental Report completed by Jacques Whitford Environmental Limited dated June 18, 2001 indicated that the buildings on the subject property contain various asbestos materials and lead based paints. In addition, 27 of the 64 light ballasts tested (40%) were found to contain PCBs.

Stantec's review

- The oil storage tanks are a potential environmental concern to the site.

- Hazardous building materials are a potential environmental concern to the site.

Report: The Federal Contaminated Site and Solid Waste Landfills Inventory
Author: Treasure Board of Canada
Date: October 9, 2002.

Summary of Report

- The subject property is listed as a contaminated site. Reportedly there is metal in soil around the underground oil/water separator (shop building) and PAH at the former underground storage tanks.
- Contaminants are listed as petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and heavy metals.
- The site was classified as “action likely required”.

Stantec’s Review

- Potential petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and heavy metals impacts are an environmental concern to the site.

Report: Final Phase II Environmental Site Assessment of Saint John Coast Guard Base
Author: Jacques Whitford Environment Limited
Date: March 25, 2002.

Summary of report

The previous JWEL Phase I ESA (June 18, 2001) and Hazardous Materials Survey (February 27, 2001) identified the following potential concerns for contamination:

- Five former underground petroleum storage tanks on the subject property. A 9,900 L UST was formerly present adjacent to the west side of the Marine Emergency and Helicopter Hanger (removed in 1992). A 13,640 L UST was formerly present adjacent to the helicopter landing pad located near the south western corner of the property (removed in 1997). Two 2,270 L USTs were formerly present in the dock area north of the Buoy Shed (removed in 1997). A 1,140 L UST was formerly present adjacent to the east side of the Marine Emergency and Helicopter hanger. This tank was removed in March 2000 under JWEL's supervision. Based on observations by JWEL and the laboratory results for petroleum hydrocarbons of confirmatory soil samples, the former presence of this underground tank is not likely a concern.
- Fuel spill from a truck filling equipment in the dock area in 1972
- Two in-ground concrete oil-water separators are present on the subject property
- Historic Maintenance of buoys on former gravel covered areas in the dock yard
- Presence of lead based paint on the interior and/or exterior of the shop building, administration building, buoy shed, and tourist light house
- Presence of mercury based paint on the exterior of the shop building
- PCBs in some light ballasts
- Asbestos containing materials in the administration building and buoy shed

Surface soil sampling (SS1 to SS3) was conducted at three locations on the site. One borehole (BH1), seven monitoring wells (MW2 to MW8), and twelve shallow borehole probes (SB1 to SB12) were installed at the site.

- 15 soil samples analyzed for metals –3 exceeded commercial CCME for zinc (1 location, 3 different depths).
- 16 soil samples analyzed for petroleum hydrocarbons – 0 exceeded commercial CCME
- 2 soil samples analyzed for PAHs – 2 exceeded commercial CCME.
- 7 water samples analyzed for petroleum hydrocarbons – 0 exceeded commercial CCME
- 1 water sample analyzed for PAHs – 1 exceeded Canadian Drinking Water Quality Guidelines (CDWQG)for benzo(a)pyrene

Stantec's Review

- As the property will no longer be classified as a Federal Site, the results from the Phase II ESA should be compared to residential guidelines as well as applicable provincial guidelines.
- Metal (zinc) impacts in soil exceeded the commercial CCME in one location at three separate depths.
- PAHs impacts in soil exceeded the commercial CCME. PAHs impacts in groundwater exceeded the CDWQG in one location.

Report: Building Condition Report of Canadian Coast Guard Base
Author: Eastern MacKay Consultants
Date: March 20, 2000

Summary of Report

- Removal of asbestos containing mechanical insulation was undertaken in 1993 in the Shops Building.
- Reportedly there is additional asbestos containing insulation in the Boiler room.
- A former underground storage tank was located on the east side of the Helo/Emergency building. It was intended to act as a waste containment tank in the event of spills in the solvent storage rooms. The tank had never been used.
- Two below grade waste oil interceptors on the site. One is located at the north end of the Sops Building and the other is located on the west side of the Helo/Emergency building centered in the area between the two overhead doors.
- A 1,000 gallon combined aboveground storage tank was located in the Carpentry Shop. A 2,000 gal helicopter fuel aboveground storage tank was located adjacent to the Helicopter Landing pad. A 10,000 gal furnace oil aboveground storage tank was located in the Shops Building.

Stantec's Review

- The storage tanks and interceptors are a potential environmental concern to the site.
- Hazardous building materials are a potential environmental concern to the site.

Report: Disposal and Development of a Portion of the Canadian Coast Guard Base
Author: Public Works and Government Services Canada (PWGSC)
Date: March 15, 2010

Summary of Report

Through a Phase 1 & 2 ESA performed by Jacques Whitford Environment Limited in June 2001 and March 2002, respectively, it was determined that soil impacts from zinc and polycyclic aromatic hydrocarbons were present at two separate locations. Several other documents were reviewed and revealed hazardous materials were associated with several on-site buildings. Lead-based paint, asbestos-containing materials (ACM), polychlorinated binphenyls (PCB) containing lamp ballasts, and mercury-containing products were all present at the site. These hazardous materials were reportedly maintained in good condition and should be administered with management plans.

Stantec's Review

- Potential zinc and polycyclic aromatic hydrocarbons impacts are an environmental concern to the site.
- Hazardous building materials are a potential environmental concern to the site.

SUMMARY OF ENVIRONMENTAL REVIEW OF REPORTS

Based on a review of the above-mentioned reports, the following environmental concerns have been identified:

- Historical use of the property such as coal dealer, tire retreading, and outboard motor sales & service.
- Areas of historical on-site petroleum storage in underground storage tanks and aboveground storage tanks.
- Two in-ground concrete oil-water separators are still present on the subject property.
- Identified petroleum hydrocarbon, polycyclic aromatic hydrocarbons (PAHs), and metals impacts in soil and PAHs impacts in groundwater. As the residential guidelines are more stringent than commercial guidelines, the exceedances of residential guidelines would be greater than the exceedances of commercial guidelines.
- Identified hazardous materials including lead-based paint, mercury-based paint, PCBs in some light ballasts, and asbestos containing materials.
- Fuel spill from a truck filling equipment in the dock area in 1972
- Historic Maintenance of buoys on former gravel covered areas in the dock yard

RECOMMENDATIONS

- As the property will no longer be classified as a Federal Site and future land use includes residential, the results from previous assessments should be compared to applicable provincial residential guidelines, where possible.
- The groundwater sample analyzed for PAHs was compared to Canadian Drinking Water Quality Guidelines. As water at the site and in the area of the site is non potable, groundwater results from previous assessments should be compared to applicable provincial guidelines for non potable sites.
- As the property is located within 150 m of an ecological receptor (Saint John Harbour), results should be compared to applicable ecological guidelines to determine if there is a risk to ecological receptors.
- A Human Health Risk Assessment and Ecological Risk Assessment (if required), could be completed at the site to address petroleum hydrocarbon, PAHs, and metal impacts on the property. Further sampling of soil and groundwater may be required prior to completing a Risk Assessment.
- Suitable precautions and approved contractors should be used for all activities which may disturb hazardous building materials.
- All ballasts removed from service should be checked for PCBs; if found to contain PCBs, ballasts should be removed and disposed of in accordance with the *New Brunswick Policy on the Storage of PCB Light Ballasts* when they are removed from service.
- In accordance with New Brunswick Regulation 92-106, *A Code of Practise for Working with Materials Containing Asbestos in New Brunswick*, made under the Occupational Health and Safety Act, an asbestos management plan must be implemented.

- If paint with elevated (>10,000 mg/kg) lead concentrations is to be disturbed (e.g. by renovations, welding, torch cutting, grinding, sanding or sandblasting), ensure that lead fumes or dust do not exceed the maximum allowable Time Weighted Average Exposure Value (TWAEV) of 1.15 mg/m^3.

Appendix 3: Phase I, II and III Environmental Assessments by Stantec 2010 - 2013

Stantec

130 Somerset Street
Saint John, NB
E2K 2X4

Bur/Bus: 506-634-2185
Telec/Fax: 506-634-8104

FINAL

Phase I Environmental Site Assessment

Canadian Coast Guard Terminal
Commercial Parking Lot Site
2 Peters Wharf
Saint John, NB

SAINT JOHN DEVELOPMENT
CORPORATION

PROJECT NO. 121910687

Stantec

PROJECT NO. 121910687

REPORT TO	**Saint John Development Corporation** **One Market Square, Suite 301** **Saint John, NB E2K 2X4**
FOR	**Phase I Environmental Site Assessment**
ON	**Canadian Coast Guard Terminal Commercial Parking Lot Site** **2 Peters Wharf** **Saint John, NB**

09/20/2010

Stantec
130 Somerset Street
Saint John, NB
E2K 2X4

Phone: 506-634-2185
Fax: 506-634-8104

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Appendices

Executive Summary

Executive Summary

Site Description and Current Operations

Stantec conducted a Phase I Environmental Site Assessment (Phase I ESA) of the commercial parking lot property located at 2 Peters Wharf in Saint John, New Brunswick, herein referred to as the "Site". The Phase I ESA was conducted for Saint John Development Corporation in support of acquisition of the Site. The purpose of the Phase I ESA was to assess if evidence of potential or actual environmental contamination exists in connection with the Site, as a result of current or past activities on the Site or neighbouring properties.

The Site is located in ther commercial uptown area of Saint John, New Brunswick. The Site is currently occupied by a commercial parking lot operated by the Saint John Parking Commission.

Records Review

Based on information gathered during the historical review, it appears the Site was reclaimed in the early 1800s when the Site was filled in with unknown fill materials. From early 1800s to early 1980s the Site was predominately used for commercial purposes, however, there appears to have been some residential land use (suspected upper floor apartments/dwellings) until the 1950s. From early 1980s to present, the Site has been used as a parking lot.

Based on a review of available records, including previous environmental site assessments completed on the Site and adjoining properties, the following environmental concerns associated with the Site have been identified:

- Historical commercial use of the Site including a coal dealer, tire retreading, and outboard motor sales & service.
- Fill material from unknown source used at the Site.
- Petroleum hydrocarbon and polycyclic aromatic hydrocarbons (PAHs) impacts in soil have been identified on the Site.

Site Visit/Interviews

No environmental concerns were identified during the Site visit or through interviews with persons associated with the Site.

Conclusions

The Phase I ESA has revealed evidence of potential environmental contamination associated with the Site. The following environmental concerns were identified:

- Historical commercial use of the Site including a coal dealer, tire retreading, and outboard motor sales & service.
- Fill material from unknown source used at the Site.
- Petroleum hydrocarbon and PAHs impacts in soil have been identified on the Site

Stantec recommends that a Phase II ESA be conducted at the Site. Soil and groundwater samples should be analysed for petroleum hydrocarbons, metals, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and BTEX (benzene, toluene, ethylbenzene, and xylenes).

The statements made in this Executive Summary are subject to the same limitations included in the Closure (Section 7.0) and are to be read in conjunction with the remainder of this report.

Phase I Environmental Site Assessment

1.0 General Information

Client Information:
Saint John Development Corporation
Mr. Kent MacIntyre
One Market Square, Suite 301
Saint John, NB E2K 2X4

Project Information:
121910687 Phase I ESA - 2 Peters Wharf, Saint John, NB
121910687

Site Information:
Canadian Coast Guard Terminal Commercial Parking Lot Site

2 Peters Wharf
Saint John, NB

Consultant Information:
Stantec
130 Somerset Street
Saint John, NB E2K 2X4

Phone: 506-634-2185 **Fax:** 506-634-8104
E-mail Address:
Site Visit Date: 09/13/2010
Report Date: 09/20/2010
Site Assessor: Marilou Toole
Report Preparer: Marilou Toole
Senior Reviewer: Paul D. Paulin

Site Assessor: Marilou Toole
Marilou Toole
P.Eng.

Report Preparer: Marilou Toole
Marilou Toole
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Senior Reviewer: Paul Paulin
Paul D. Paulin
Environmental Engineer

2.0 Introduction

2.1 Objectives

Stantec conducted a Phase I Environmental Site Assessment (Phase I ESA) of the commercial parking lot property located at 2 Peters Wharf in Saint John, New Brunswick, herein referred to as the "Site". The Phase I ESA was conducted for Saint John Development Corporation in support of acquisition of the Site. The purpose of the Phase I ESA was to assess if evidence of potential or actual environmental contamination exists in connection with the Site, as a result of current or past activities on the Site or neighbouring properties.

A site plan is included in Appendix A and selected photographs of the Site are included in Appendix B.

2.2 Scope of Work

The Phase I ESA carried out by Stantec on this property was conducted in general accordance with Stantec's Proposal Number 121900056 dated August 27, 2010 and the Canadian Standards Association's (CSA) Phase I Environmental Site Assessment Standard Z768-01 (R2006) and consisted of the following:

- records review including, but not limited to, publicly available city directories, aerial photographs, fire insurance plans, geological and topographic maps
- provincial government regulatory search
- review of available environmental databases and records
- review of previous environmental reports and existing title searches, if made available
- interviews with persons having knowledge of the Site
- a site visit
- evaluation of information and preparation of the report provided herein

A Phase I ESA does not include sampling or testing of air, soil, groundwater, surface water or building materials. For this Phase I ESA, no enhancements to the CSA standard were made.

This assessment did not include a review or audit of operational environmental compliance issues, or of any environmental management systems, which may exist for the Site.

The assessment of the Site for the potential presence of hazardous building materials was based on the age of the building(s) and components, and a non-intrusive visual review of the Site. No sampling of materials was conducted. A Phase I ESA does not constitute a Hazardous Materials Survey or Designated Substances Survey. However, no buildings were present on the Site, therefore; no assessments were made in relation to hazardous building materials or mold.

The professional qualifications of the project team are provided in Appendix C.

The Site visit was conducted by Marilou Toole, P.Eng., of Stantec, on September 13, 2010. The Site and readily visible and publicly accessible portions of adjoining and neighbouring properties were observed for the presence of potential sources of environmental contamination. Stantec was not accompanied during the Site visit.
There were no interviews completed during the course of the Site visit. However, Mr. Richard Smith of the Saint John Parking Commission was interviewed following the Site visit.

2.3 Regulatory Framework

During a Phase I ESA samples are not collected, however, if there are previous soil or groundwater sample results available, the results are compared to applicable federal and provincial regulations and guidelines.

In New Brunswick, the roles and powers of the New Brunswick Department of the Environment (NBENV) when dealing with contaminated sites are outlined primarily in the Guideline for the Management of Contaminated Sites (NBENV, 2003). The NBENV has a mandate to deal with situations where there is an adverse effect, or the likelihood of an adverse effect, associated with the presence or discharge of a contaminant. The Guideline for

2.3 Regulatory Framework (continued)

the Management of Contaminated Sites (September 2003) provides advice and information to property owners and consultants to use when assessing the environmental condition of a property, when determining whether or not restoration is required, and in determining the kind of restoration needed to allow continued use or reuse of the site. A Phase I ESA is an initial step in the site assessment process, which may lead to the requirement for restoration work if actual or potential sources of environmental contamination are identified.

A Phase I ESA involves a review of any Site buildings for the potential presence of hazardous materials related to building components and materials. Specific federal or provincial regulations, guidelines or codes of practice exist for these individual hazardous materials. Where required, this documentation was utilized to determine appropriate conclusions and formulate appropriate recommendations.

3.0 Records Review

3.1 Information Sources

The applicable search distance for the records review included the Site, properties immediately adjoining the Site and other neighbouring properties where activities considered to be potential sources of environmental contamination were apparent. Information sources obtained and reviewed as part of the records review are listed below.

SOURCE	INFORMATION/CONTACT
Aerial Photographs	1945, 1955, 1965, 1976, 1984, 1994, 2004.
Fire Insurance Plans	1957
City Directories	1931, 1945, 1952, 1959, 1962, 1965, 1966, 1970, 1975, 1980, 1991, 2000.
Previous Environmental Reports	Limited Environmental Investigation – Canadian Coast Guard Base by Dillon Consulting, April 27, 2006. The Federal Contaminated Site and Solid Waste Landfills Inventory by Treasure Board of Canada, October 9, 2002. Final Phase II Environmental Site Assessment of Saint John Coast Guard Base by Jacques Whitford Environment Limited, March 25, 2002.
Company Records	Historical Review of 3 Water Street by de Stecher Appraisals Ltd., March 29, 1999. Complete Appraisal – Self- Contained Report of the Saint John Guard Base Property by Todd Stokes & J. L McDonald, January 30, 2003. Master Valuation Report of Coast Guard Base by Lee Weatherby, November 12, 2002. Building Condition Report of Canadian Coast Guard Base by Eastern MacKay Consultants, March 20, 2000. Disposal and Development of a Portion of the Canadian Coast Guard Base by Public Works and Government Services Canada (PWGSC), March 15, 2010
Geological and Geotechnical Reports	None reviewed.

3.0 Records Review (continued)

3.1 Information Sources (continued)

SOURCE	INFORMATION/CONTACT
Regulatory Infractions	NBENV
Reportable Spill Occurrences	NBENV
Contaminated Sites	NBENV
Hazardous Waste Generator Registration	NBENV
PCB Storage Sites	NBENV
Landfill Records	NBENV
Underground & Aboveground Storage Tanks	NBENV
Water Well Records	None reviewed.
Bedrock Geology	1994: Department of Natural Resources and Energy, Geological Map of Southwestern New Brunswick, Map NR-5, Scale 1:250 000
Surficial Geology	1984: Surficial geology, New Brunswick; Geological Survey of Canada, Map 159A, Scale 1:500 000

3.2 Previous Reports

Stantec was provided with several reports and documents pertaining to the Site as well as adjacent properties. Any previous environmental reports provided to Stantec are described below.

Limited Environmental Investigation - Canadian Coast Guard Base by Dillon Consulting, April 27, 2006

Summary of Report

- 14 boreholes and 1 monitoring well were installed for the investigation. Two of the boreholes were installed on the Site (BH-04 was installed along the northern property boundary and BH-05 was installed along the southern property boundary).
- 8 soil samples analyzed for metals. 0 exceeded residential CCME. 0 exceeded commercial CCME
- 5 soil samples analyzed for PAHs. 2 exceeded residential CCME (the samples were from BH-05 which is located on the Site and BH-06 which is located approximately 45 m to the south of the Site) . 0 exceeded commercial CCME
- 8 soil samples analyzed for petroleum hydrocarbons. 2 exceeded residential Tier I RBSLs (the samples were from BH-04 and BH-05 which are located on the Site). 0 exceeded commercial Tier I RBSLs.
- 1 water sample analyzed for petroleum hydrocarbons. 0 exceeded residential Tier I RBSLs. 0 exceeded commercial Tier I RBSLs

The Federal Contaminated Site and Solid Waste Landfills Inventory by Treasure Board of Canada, October 9, 2002

Summary of Report

The southern and western adjoining property (PID No. 00011569) is listed as a contaminated site. Reportedly there is elevated metal in soil concentrations around the underground oil/water separator (shop building) and

3.2 Previous Reports (continued)

polycyclic aromatic hydrocarbons (PAH) at the former underground storage tanks. Contaminants are listed as petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and heavy metals. The property was classified as "action likely required".

Final Phase II Environmental Site Assessment of Saint John Coast Guard Base by Jacques Whitford Environmental Limited, March 25, 2002

Summary of report
The previous JWEL Phase I ESA (June 18, 2001) and Hazardous Materials Survey (February 27, 2001) identified the following potential concerns for contamination on the southern and western adjoining property (PID No. 00011569):

- Five former underground petroleum storage tanks on the southern and western adjoining property. A 9,900 L UST was formerly present adjacent to the west side of the Marine Emergency and Helicopter Hanger (removed in 1992). A 13,640 L UST was formerly present adjacent to the helicopter landing pad located near the south western corner of the property (removed in 1997). Two 2,270 L USTs were formerly present in the dock area north of the Buoy Shed (removed in 1997). A 1,140 L UST was formerly present adjacent to the east side of the Marine Emergency and Helicopter hanger. This tank was removed in March 2000 under JWEL's supervision. Based on observations by JWEL and the laboratory results for petroleum hydrocarbons of confirmatory soil samples, the former presence of this underground tank is not likely a concern.
- Fuel spill from a truck filling equipment in the dock area in 1972.
- Two in-ground concrete oil-water separators are present on the property.
- Historic Maintenance of buoys on former gravel covered areas in the dock yard.Presence of lead based paint on the interior and/or exterior of the shop building, administration building, buoy shed, and tourist light house.
- Presence of mercury based paint on the exterior of the shop building.
- PCBs in some light ballasts.
- Asbestos containing materials in the administration building and buoy shed.

Surface soil sampling (SS1 to SS3) was conducted at three locations on the property. One borehole (BH1), seven monitoring wells (MW2 to MW8), and twelve shallow borehole probes (SB1 to SB12) were completed on the southern and western adjoining property (PID No. 00011569).

- 15 soil samples analyzed for metals. 3 exceeded commercial CCME for zinc (1 location, 3 different depths).
- 16 soil samples analyzed for petroleum hydrocarbons. 0 exceeded commercial CCME.
- 2 soil samples analyzed for PAHs. 2 exceeded commercial CCME.
- 7 water samples analyzed for petroleum hydrocarbons. 0 exceeded commercial CCME.
- 1 water sample analyzed for PAHs. 1 exceeded Canadian Drinking Water Quality Guidelines (CDWQG)for benzo(a)pyrene.

Based on a review of the above-mentioned reports, the following environmental concerns to the Site have been identified:

- Petroleum hydrocarbon and polycyclic aromatic hydrocarbons (PAHs) impacts identified in soil on the Site.
- Petroleum hydrocarbon, polycyclic aromatic hydrocarbons (PAHs), and metals impacts identified in soil and PAHs impacts identified in groundwater on the southern and western adjoining property (PID No. 00011569).

3.3 Regulatory Information

An information request was submitted to the New Brunswick Department of Environment (NBENV) with regards to the subject and selected adjoining properties (PID Nos. 55011894, 00018614, 55141808, and 00011569). NBENV records only go as far back as 1987. A copy of the NBENV information is included in Appendix D of this report.

A summary of information obtained from NBENV is provided below:

3.3 Regulatory Information (continued)

Minister's Orders: The NBENV reported that no Minister's Orders are in effect for the Site or the adjoining properties searched.

Petroleum Storage: The NBENV reported that there are no former or active petroleum storage tanks registered for the Site. The NBENV reported the following neighbouring property has a petroleum storage tank registered:

- One 18,200 L furnace oil aboveground storage tank (AST) was installed on the eastern neighbouring property across Water Street (PID No. 55141808) in 1982 and is currently active.

Remediation Records: According to the NBENV Remediation Site Management System, no remedial activity has occurred on the Site or the adjoining properties searched.

PCB Storage: The NBENV reported that there are no waste disposal sites registered for the subject or the adjoining properties searched.

Waste Disposal Sites: The NBENV reported that there are no waste disposal sites registered for the subject or the adjoining properties searched.

3.4 Physical Setting

3.4.1 Surficial Geology

Based on a review of the New Brunswick surficial geology map, the native surficial soils on the Site consist of veneer: sand, some gravel and silt, rare clay; discontinuous, generally less than 0.5 m thick over blanket and veneer: loamy lodgement till, minor ablation till, silt, sand, gravel and rubble.
Previous subsurface investigations conducted near the Site indicate the subsurface soil profile at the Site generally consists of fill material. Bedrock was not encountered.

3.4.2 Surface Water Drainage

The surfaces of the Site consist of asphalt. It is assumed that stormwater drains to on-site catch basins, which are connected to the municipal stormwater sewer system. No catch basins were observed during the site visit, however, the parking lot was full of vehicles. Stormwater is also anticipated to drain by infiltration and/or overland flow.

3.4.3 Topography and Regional Drainage

Based on an available topographic map and the observed site topography, regional surface drainage (anticipated shallow groundwater flow direction) appears to be westerly towards the Saint John Harbour, located approximately 60 m from the Site.

It should be noted that the direction of the shallow groundwater flow in limited areas can also be influenced by the presence of underground utility corridors and is not necessarily a reflection of regional or local groundwater flow or a replica of the Site or area topography.

3.4.4 Bedrock Geology

Based on a New Brunswick bedrock geology map, bedrock in the area of the Site consist of quartzose to feldspathic sandstone, siltstone and shale; micaceous sandstone, quartzite and quartzite-pebble to polymictic conglomerate; minor limestone.

4.0 Site Description

4.1 Property Information

The Site is located at 2 Peters Wharf along Water Street in a generally commercial area of Saint John, New Brunswick. The Site consists of one parcel of land legally described by Service New Brunswick (SNB) as PID No. 55011894. According to SNB records, the Site is owned by the City of Saint John. There were no buildings on the Site at the time of the site visit.

Current Site Owner:	City of Saint John
Legal Description:	PID No. 55011894
Property Area:	3,532 Square meters
Utility Providers:	
Water:	Not serviced
Storm and Sanitary Sewers:	City of Saint John
Electricity:	Not serviced
Natural Gas:	Not serviced

4.2 On-Site Buildings and Structures

There were no buildings on the Site at the time of the site visit.

4.3 Historical Land Use

Historical land use for the Site was determined through historical records listed in Section 3.0. A summary of the historical information is presented below.

Based on information gathered during the historical review including a review of the report Historical Review of 3 Water Street by de Stecher Appraisals Ltd. dated March 29 1999, it appears the Site was reclaimed in the early 1800s when the Site was filled in with unknown fill materials. From early 1800s to early 1980s the Site was predominately used for commercial purposes, however, there appears to have been some residential land use (suspected upper floor apartments/dwelllings) until the 1950s. From early 1980s to present, the Site has been used as a parking lot.

The historical review indicated that the Site previously contained (residences, commercial building, etc.) which may have had associated above ground or underground fuel Storage. No evidence of previous fuel storage was observed during the Site visit however abandoned USTs or residual contamination may be on Site.

The following environmental concerns associated with historical land use at the Site have been identified:
- Historical use of the Site such as coal dealer, tire retreading, and outboard motor sales & service.
- Fill material from unknown source used at the Site.

4.3 Historical Land Use (continued)

Period/Date:	**Land Use:**
1783 to early 1800s	Site is below the high water line of the harbour.
Early 1800s to early 1980s	Residential (suspected upper floor apartments/dwellings) until the 1950s with predominately commercial land use. Various commercial tenants including: Smith Brokerage Co. Ltd., Bent Gilbert & Son, Gorman Thos Ltd. Wholesale Grocers, Vincent & Wetmore Ltd., Fruit & grocery brokers, Maritime Tire Plant Ltd., Tire Retreading, Bell Storage Packing & Shipping, Robin Hood Flour Mills, Peters, CH & Sons, lime & general merchants, Wilett Fruit Co. Ltd. garage, Firestone tire distributor, Stairs, WM Son & Morrow Ltd., machinery for contractors, Acme Agencies Ltd. warehouse, Murray Construction Ltd. sidewallers, Harbour Packing Co., Maritime Tobacco Sales Co., Whittaker outboard motor sales & service, Splane J & Co ship chandlers, Highland Transport, Sproul Bros. Tire Shop, and Parrtown Tavern Ltd.
Early 1980s to present	Parking lot.

5.0 Site Visit Findings

5.1 Current Site Operations

The Site is currently occupied by a commercial parking lot operated by the Saint John Parking Commission. There were no buildings on the site at the time of the site visit.

5.2 Waste Generation and Storage

5.2.1 Solid and Liquid Wastes

No wastewater discharges were identified to be produced on the Site at the time of the site visit.

No hazardous waste generation or storage was identified to be conducted on the Site.

5.2.2 Drains, Sumps, Septic Systems and Oil Water Separators

No floor drains, sumps, septic systems, interceptors, or separators are identified on the Site property.

5.2.3 Air Discharges and Odours

No sources of air emissions that are suspected to result in residual contamination to the property were identified on the Site. Further, no strong, pungent, or unusual odours were identified during the site visit.

5.3 Fuel and Chemical Storage

5.3.1 Underground Storage Tanks (USTs)

No chemical or fuel storage USTs were identified on the Site. Further, no vent or fill pipes indicating the potential presence of an abandoned or decommissioned UST were observed.

5.3.2 Aboveground Storage Tanks (ASTs)

No chemical or fuel storage ASTs were identified on the Site.

5.3.3 Other Storage Containers

No chemical storage was observed stored on Site.

5.4 Building Systems/Equipment

5.4.1 Heating and Cooling Systems

No heating or cooling systems are on the Site, as there are no buildings on the Site.

5.4.2 Hydraulic Equipment

No hydraulic equipment is on the Site, as there are no buildings on the Site.

5.5 Exterior Site Observations

5.5.1 Surface Features

No stressed vegetation was observed on the Site. No watercourses, pits, lagoons or ditches were identified on the Site and no standing water was observed.

Minor hydrocarbon staining was observed on asphalt surfaces throughout the parking lot likely associated with parked vehicles. A visual survey of the asphalt revealed slight cracks in proximity of the stains. The hydrocarbon stains likely do not represent an environmental concern to the Site.

5.5.2 Fill Materials

Based on a review of historical information, it appears that imported fill was used on the Site during development. The source of this fill is unknown.

5.5.3 Wells

No abandoned or existing wells (water, oil, gas or disposal) were identified on the Site.

5.6 Hazardous Building Materials

5.6.1 Asbestos-Containing Materials (ACMs)

The common use of friable (crumbles easily by hand pressure) asbestos-containing materials (ACMs) in construction generally ceased voluntarily in the mid 1970s but was only banned through legislation in the mid-late 1980s. Asbestos was used in thousands of building products and the common uses of friable ACMs included boiler and pipe insulation, and spray-on fireproofing. Asbestos was also used in many manufactured products such as floor tiles, ceiling tiles, transite cement products and various other construction materials. Some cement drain piping currently used in the construction of buildings still contains asbestos (non-friable). Vermiculite used as insulation may be contaminated with asbestos fibres.

No suspected ACMs were identified on the Site during the site visit.

5.6.2 Polychlorinated Biphenyls (PCBs)

From the 1930s to the 1970s, PCBs were widely used as coolants and lubricants for electrical equipment, including transformers and capacitors, and in a number of industrial materials, including sealing and caulking compounds, inks and paint additives. The use of PCBs was prohibited in heat transfer and electrical equipment installed after September 1, 1977, and in transformers and capacitors installed after July 1, 1980. Regulations now require that PCB containing equipment be taken out of service prior to regulated deadlines.

No evidence of PCB's or PCB containing equipment was identified on the Site during the site visit.

5.6.3 Lead-Based Materials

In 1976, the lead content in interior paint was limited to 0.5% by weight under the federal Hazardous Products Act. Lead based water supply pipes were used greater than 50 years ago. Between 1930 and 1986, most buildings used copper pipe with lead-solder joints. Other lead-based products include wall shielding (x-ray rooms).

No evidence of lead based products was observed on the Site property during the site visit.

5.6.4 Urea Formaldehyde Foam Insulation (UFFI)

Urea Formaldehyde Foam Insulation (UFFI) was used as an insulation product for existing houses between the mid-1970s and its ban in Canada in 1980. It was not commonly used for commercial or industrial buildings.

No evidence of UFFI was observed on the Site property during the site visit.

5.6.5 Ozone-Depleting Substances (ODSs)

Refrigeration and air conditioning equipment in place before 1998 may contain refrigerants containing Ozone-depleting Substances. Non-ODS refrigerants have been developed and are available to replace these materials in newer equipment.

No evidence of ozone-depleting substances was observed on the Site property during the site visit.

5.7 Special Attention Items

5.7.1 Radon Gas

Radon is a radioactive gas associated with uranium rich black shale and/or granite bedrock. Radon emits alpha particles and produces several solid radioactive products called radon daughters. Harmful levels of radon and radon daughters can accumulate in confined air spaces, such as basements and crawl spaces.

Based on the geology of the area, the production of Radon gas is not likely. Also, since there are no structures presently on the Site, radon gas accumulation is presently not a concern on the Site.

5.7.2 Microbial Contamination (Mold) and Indoor Air Quality

The growth of mold in indoor environments is typically due to a moisture problem related to building envelope or mechanical systems deficiencies or design, and can produce adverse health effects. There is no practical way to eliminate all mold and mold spores in the indoor environment. The way to control mold is to control moisture.

Since there are no structures presently on the Site, mold growth is not a concern at the Site.

5.7.3 Electromagnetic Frequencies (EMFs)

Electrical currents induce electromagnetic fields. No scientific data supports definitive answers to questions about the existence or non-existence of health risks related to electromagnetic fields.

No high-voltage transmission lines or electrical substations, which could generate significant electromagnetic fields, were identified on or adjacent to the Site.

5.7.4 Noise and Vibration

The effects of noise and vibration on human health vary according to the susceptibility of the individual exposed, the nature of the noise/vibration and whether exposure occurs in the working environment or in the home.

No major or persistent sources of noise and vibration were identified on the Site at the time of the site visit.

5.0 Site Visit Findings (continued)

5.8 Adjoining Property Information

The current activities on neighbouring properties observed at the time of the Site visit and a summary of historic information gathered through the records review are presented in the following sections.

<table>
<tr><th>Direction From Site:</th><th>Relation to Property:</th><th>Current Use:</th><th>Across What</th></tr>
<tr><td>North</td><td>Adjacent</td><td>Commercial</td><td>South Market Wharf</td></tr>
<tr><th colspan="2">Occupant Name:</th><th colspan="2">Address:</th></tr>
<tr><td colspan="2">City of Saint John</td><td colspan="2">Market Slip</td></tr>
<tr><th colspan="4">Current Activities:</th></tr>
<tr><td colspan="4">Commercial - Tourist school house (museum), ice cream stand, bar, volleyball courts, outdoor market, and bandstand.</td></tr>
<tr><th colspan="4">Historical Activities</th></tr>
<tr><td colspan="4">Commercial since the early 1960s including Barbour's shop, school house (museum), ice cream stand, bar, parking lot, volleyball courts, outdoor market, bandstand, etc. Portions of Market slip was below the high water mark until the early 1960s.</td></tr>
<tr><th colspan="4">Potential Environmental Concerns:</th></tr>
<tr><td colspan="4">None identified.</td></tr>
</table>

<table>
<tr><th>Direction From Site:</th><th>Relation to Property:</th><th>Current Use:</th><th>Across What</th></tr>
<tr><td>East</td><td>Neighbouring</td><td>Commercial</td><td>Water Street</td></tr>
<tr><th colspan="2">Occupant Name:</th><th colspan="2">Address:</th></tr>
<tr><td colspan="2">Prince William Properties</td><td colspan="2">75 Prince William Street</td></tr>
<tr><th colspan="4">Current Activities:</th></tr>
<tr><td colspan="4">Commercial (across Water Street) - various commercial properties including office buildings, business school, beauty school, etc.</td></tr>
<tr><th colspan="4">Historical Activities</th></tr>
<tr><td colspan="4">Commercial since the 1800's including retail operations, offices, banks, restaurants, night clubs, etc.</td></tr>
<tr><th colspan="4">Potential Environmental Concerns:</th></tr>
<tr><td colspan="4">NBENV reported that 18,200 L furnace oil aboveground storage tank (AST) was installed on the eastern adjacent property (PID No. 55141808) in 1982. It is unlikely that the AST on the eastern neighbouring property would represent an environmental concern to the Site.</td></tr>
</table>

<table>
<tr><th>Direction From Site:</th><th>Relation to Property:</th><th>Current Use:</th><th>Across What</th></tr>
<tr><td>South and west</td><td>Adjacent</td><td>Commercial</td><td>Peters Wharf and Ward Street</td></tr>
<tr><th colspan="2">Occupant Name:</th><th colspan="2">Address:</th></tr>
<tr><td colspan="2">Government of Canada (Canada Coast Guard)</td><td colspan="2">5 Ward Street</td></tr>
<tr><th colspan="4">Current Activities:</th></tr>
<tr><td colspan="4">Commercial - A multi-building Canadian Coast Guard Base.</td></tr>
<tr><th colspan="4">Historical Activities</th></tr>
<tr><td colspan="4">The subject property was occupied by docks and wharves for commercial shipping / receiving and retail activity since at least the early 1800s to the early 1960s. This included various ship chandlers, storage warehouses and wholesalers for commercial retail and industrial items such as general groceries, hardware, paints, glass, flour, wood, freight, etc. A ferry house and landing was present on the southern portion of the property from the late 1800s to the late 1940s. Also, there was some welding, machine shop and tinsmith activity in the early 1900s. Canadian Coast Guard Base - Saint John from the early 1960s to the present.

As discussed in Section 3.2, the following environmental concerns to the Site associated with historical land use of the southern and western adjoining property have been identified:

Areas of historical petroleum storage in underground storage tanks, as well as two active oil/water separators.

Petroleum hydrocarbon, PAHs, and metals impacts in soil and PAHs impacts in groundwater.</td></tr>
</table>

5.8 Adjoining Property Information (continued)

Historical Activities
It is unlikely that petroleum hydrocarbon, PAHs, and metals impacts on the southern and western adjoining property would have a significant environmental impact to the Site.
Potential Environmental Concerns:
None identified

5.9 Client-Specific Items

No specific client requests were made with respect to this Phase I ESA.

6.0 Conclusions and Recommendations

The Phase I ESA has revealed evidence of potential environmental contamination associated with the Site. The following environmental concerns were identified:

- Historical commercial use of the Site including a coal dealer, tire retreading, and outboard motor sales & service.
- Fill material from unknown source used at the Site.
- Petroleum hydrocarbon and PAHs impacts in soil have been identified on the Site

Stantec recommends that a Phase II ESA be conducted at the Site. Soil and groundwater samples should be analysed for petroleum hydrocarbons, metals, VOCs, PAHs, PCBs, and BTEX.

7.0 Closure

This report has been prepared for the sole benefit of Saint John Development Corporation. The report may not be used by any other person or entity without the express written consent of Saint John Development Corporation and Stantec. All parties are subject to the same limit of liability as agreed to in the contract under which the work was completed. Any use which a third party makes of this report, or any reliance on decisions made based on it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

In providing services to the Saint John Development Corporation, Stantec relied on Saint John Development Corporation for providing all existing studies, reports and other available data, including those generated by Saint John Development Corporation or by retained third parties, or reports done by others for which Saint John Development Corporation was entitled to rely upon. During the course of the work, Stantec may also have relied upon certain verbal or written information provided by parties knowledgeable about the Site, including government officials and other parties and on information contained in the files of government agencies available to Stantec at the time of the study. Stantec has not independently verified, and accordingly shall have no responsibility for, the accuracy, completeness, workmanship or any other aspect of the information described above. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, Stantec in certain instances has been required to assume that the information provided is accurate.

The information and conclusions contained in this report are based upon conditions at the time the work was conducted. The work was undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgement of Stantec based on the data obtained during the assessment. Due to the nature of assessment and the limited data available, Stantec cannot warrant against undiscovered environmental liabilities. Conclusions and recommendations presented in this report should not be construed as legal advice.

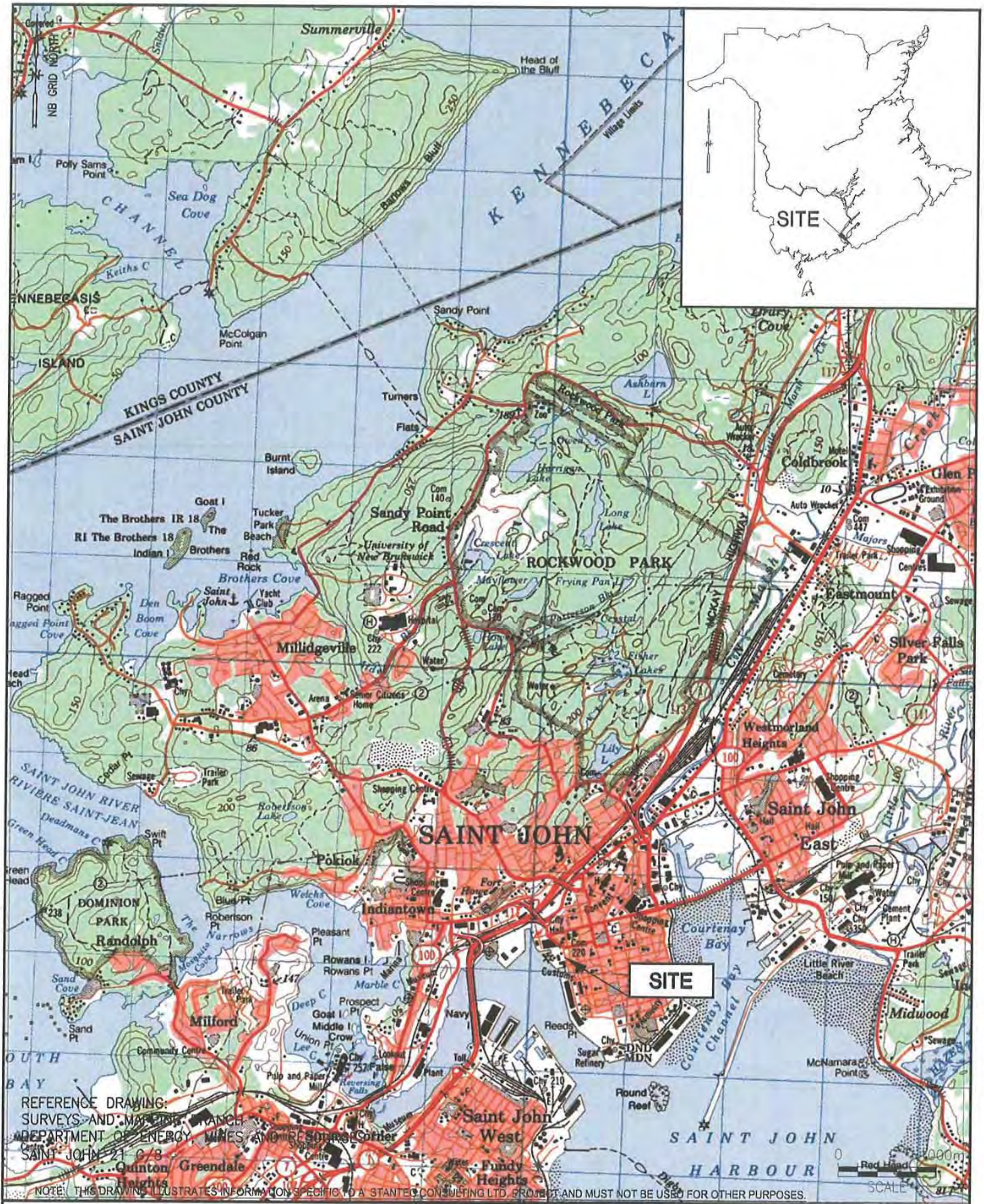
Since the purpose of a Phase I ESA is to identify evidence of potential or actual contamination, the identification of site conditions which may pose a non-environmental risk to buildings or people on the Site is beyond the scope of this assessment. (Examples include but are not limited to underground mine workings, volcanic or earthquake activities, severe weather, and/or flood plains in the area.) Stantec accepts no responsibility for damages, if any, suffered as a result of any non-environmental risk.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, we request that this information be brought to our attention so that we may reassess the conclusions provided herein.

This report was prepared by Marilou Toole, P.Eng. and reviewed by Paul Paulin, P.Eng.

Appendix A

Site Plans



REFERENCE DRAWING:
SURVEYS AND MAPPING BRANCH
DEPARTMENT OF ENERGY, MINES AND RESOURCES
SAINT JOHN 21 G/8

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

SITE LOCATION PLAN

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CCG SITE REDEVELOPMENT, SAINT JOHN, NB

Client: SAINT JOHN DEVELOPMENT CORP.

Scale:	Job No.:	Dwg. No.:
1:50000	121910687	01

Date:	Dwn. By:	Appd. By:
10 09 09	JCB	MLT

Stantec

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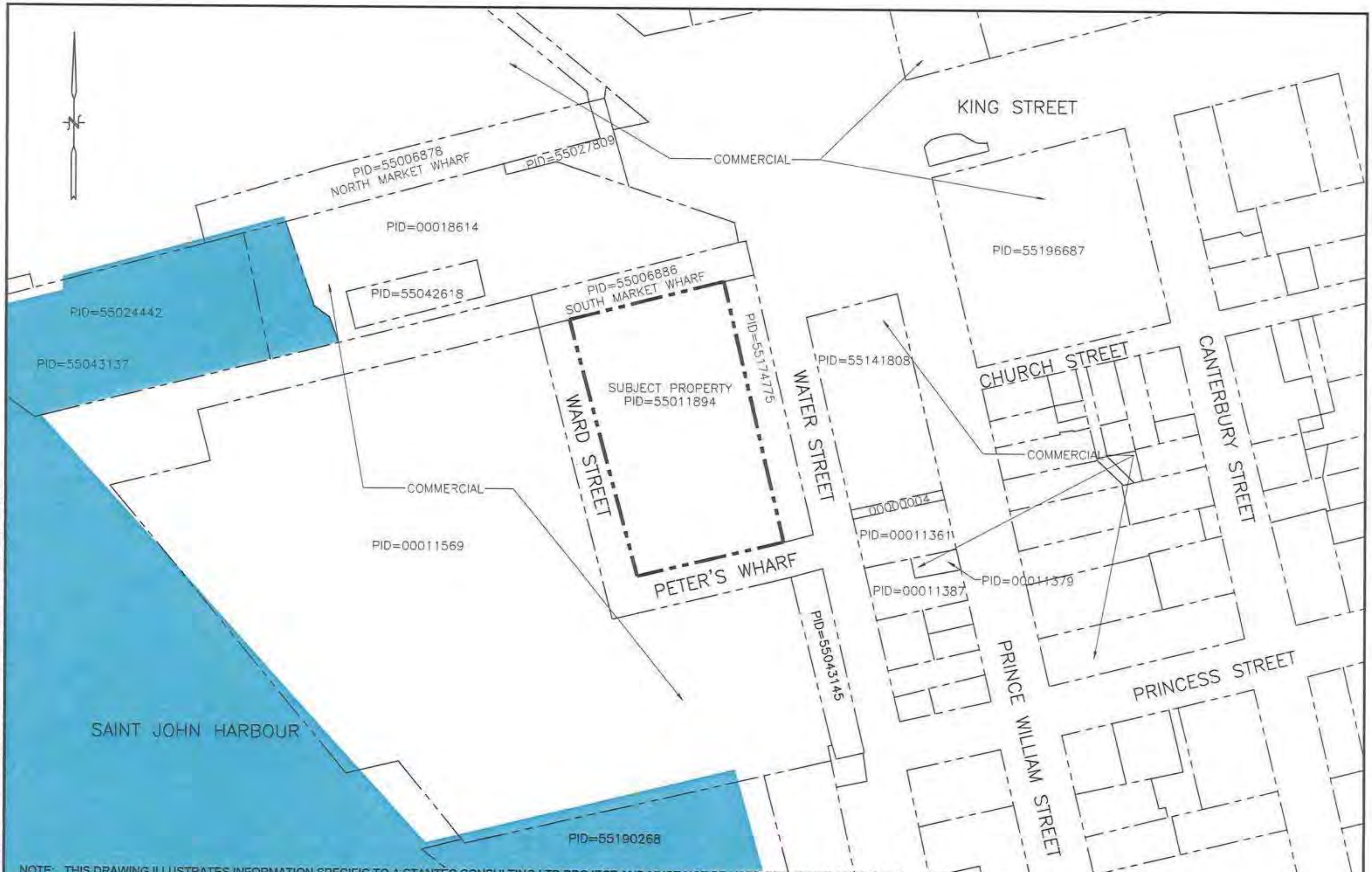

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SITE PLAN AND ADJACENT PROPERTIES

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CANADIAN COAST GUARD SITE REDEVELOPMENT, SAINT JOHN, NB

Client: SAINT JOHN DEVELOPMENT CORP.

Scale:		Job No.:	Dwg. No.:
1:1500		121910687	02
Date:	Dwn. By:	Appd. By:	
10 09 09	JCB	MLT	

Stantec

Appendix B

Photographs

The Site. Photo looking north.

The northern adjoining property. Photo looking north.

The eastern adjacent property. Photo looking east across Water Street.

The southern adjoining property. Photo looking south.

The western adjoining property. Photo looking south.

Appendix C

Assessor Qualifications

Marilou Toole P.Eng.
Engineer

Marilou Toole is an Engineer in the Stantec Saint John Office. She has conducted numerous Phase I Environmental Assessments on residential and commercial properties throughout New Brunswick. She assists with managing Phase II ESAs from project inception including drilling, sampling, writing the report, and forming conclusions and recommendations. She is trained to use the computer model GSI-RBCA Atlantic Risk Assessment Toolkit model for RBCA assessments and has completed Human Health Risk Assessments on several projects. She has worked on a variety of remediation projects.

EDUCATION

B. Sc. Engineering (Civil Engineering), University of New Brunswick, 2001

PROFESSIONAL ASSOCIATIONS

Association of Professional Engineers and Geoscientists of New Brunswick (APEGNB)

PROJECT EXPERIENCE

Environmental Site Assessment and Remediation

Fuel Oil Spill Closure Report, Plant Hope Adjusters Ltd., 2010 (Role – Project Engineer)

Site Remediation, fuel oil spill, Aviva Insurance Company of Canada, 2010 (Role – Site Professional)

Closure Report, diesel spill, Co-operators Insurance, 2009 (Role – Project Engineer)

Phase II ESA, decommissioned gas station, Shell Canada, 2008 (Role – Project Engineer)

Phase I and II ESAs, self storage property, Atcan, 2008 (Role – Project Engineer)

Paul Paulin P.Eng.

Project Manager

Paul Paulin is an Intermediate Project Manager and licensed Professional Engineer in the Province of New Brunswick. Mr. Paulin has been with Jacques Whitford for over 15 years and has extensive experience in the hazardous materials management and environmental engineering fields. He has acted as Project Manager for numerous projects including large-scale, multi-site facilities for public and private sectors. He is responsible for conducting/supervising Phase I and II Environmental Site Assessments (ESA), remediation projects, hazardous building materials surveys, mold investigations and indoor air quality studies. Paul has knowledge of the New Brunswick Department of Environment's Contaminated Sites Management Process and has been involved in assessment and closure of several remediation sites throughout southern New Brunswick. In the past 10 years Paul has taken the lead on the asbestos consulting opportunities for JW in New Brunswick and for the past 6 years all Phase I opportunities in southern New Brunswick. Paul has been certified by the US EPA as an Asbestos Inspector and Management Planner and has trained staff to complete asbestos and hazardous materials surveys, prepared abatement specifications and remediation costs for clients. Recently, Paul provided full time asbestos consulting services onsite at the University of New Brunswick for a 12 month period. He is currently the Practice Leader for Phase I ESA and Hazardous Materials Service lines in New Brunswick.

EDUCATION

B.Sc. Civil Engineering, University of New Brunswick, Saint John, New Brunswick, 1991

REGISTRATIONS

Phase I Environmental Training Course, Associated Environmental Site Assessors of Canada, 1997

Management of Environmental Audits Course, Daltech Continuing Technical Education, October/November, 1999

New York State Asbestos Inspector/Management Planner Course (EPA), April 2001

Jacques Whitford Environment Limited Asbestos and Mold Workshop, February, 2002

Indoor Air Quality Course, Dalhousie University Continuing Education Course, May 2003

WHMIS Training Course, 2007

St. John Ambulance Safety Oriented First Aid Course, 2006

Atlantic Risk Based Corrective Action Seminar, 2005
Jacques Whitford Indoor Environment Summits, February 2002, May 2004 and April 2006

PROFESSIONAL ASSOCIATIONS

Professional Engineer, Association of Professional Engineers of New Brunswick

PROJECT EXPERIENCE

Project Manager / Site Assessor on over 200 Phase I and II ESAs in Saint John, N. B., for a variety of clients including PWGSC, City of Saint John, Department of Fisheries and Oceans, etc. (1997-2008).

Project Manager, On-Site Asbestos Coordinator, University of New Brunswick, Fredericton, NB, 2006-2007.

Hazmat/Phase I and II ESA of Coast Guard Base in Saint John, NB, PWGSC, (2000-2001).

Asbestos Management Plans - over 40 Federal Buildings for BLJC, 2000-2001.

Site inspections on several BLJC-managed buildings in NB, BLJC, (2000).

Project Manager of asbestos abatements at 10 federally owned facilities managed by BLJC in Nova Scotia, 2002

Senior Site Supervisor, Phase II ESA/Environmental Management Plan - Former Creosote Wood Treatment Facility, CPC, Saint John, NB, 1997-2000.

Conducted and participated in numerous Phase I and II Environmental Site Assessments through-out Southern New Brunswick including site visits, research, and reporting.

Field supervision of drilling and sampling procedures for numerous Phase II Environmental Site Assessments throughout Southern New Brunswick including monitoring well installations, sample screening, etc.

** denotes projects completed with other firms*

Field supervision of site remediation activities including contaminated soils removal and systems installations and monitoring. Monitoring and sampling of groundwater and domestic wells, streams, brooks, etc. including pump tests, bail tests, electro-fishing, and parameter analysis.

Appendix D

Supporting Documentation

New Nouveau
Brunswick
C A N A D A

RECEIVED SEP 09 2010

September 2, 2010
File No.: 100-05-R4

Stantec Consulting Ltd.
130 Somerset St.
Saint John, NB
E2K 2X4
Attention: Barry Leger
Your file ref#: 121910687

RE: **Owner:** **City of Saint John, Prince William Properties & Government of Canada**
Location: **Peters Wharf, Market Slip, Prince William St. & Ward St., Saint John**
PID#s: **55011894, 00018614, 55141808 & 00011569**

In response to your request for property-based environmental information regarding the above noted properties, please be advised that a search of related departmental electronic databases has been conducted *with the information provided*, and the following information was found.

There is no record of Ministerial Orders or Remediation Orders related to these PID numbers.

Petroleum storage tank information related to **PID # 55141808** is attached. With respect to the remaining PID numbers, our records indicate that there are no petroleum storage tanks registered with the Department, under the Petroleum Product Storage and Handling Regulation.

We have no records in our database of any remedial activity or contamination for these PID numbers.

These PID numbers are not registered with the Department as PCB Storage sites.

We have no records of landfill sites or former dumpsites located near these PID numbers.

The absence of departmental records in this search does not necessarily indicate that the sites have not been subject to environmental incidents. The information is accurate in that it provides a factual reflection of what is contained in departmental databases. The files themselves may or may not be complete.

Environment/Environnement
P.O. Box/C.P. 6000 Fredericton New Brunswick/Nouveau-Brunswick E3B 5H1 Canada

www.gnb.ca

As an example, in the case of underground petroleum storage tanks, the files accurately reflect all those that were registered with the program; there may be underground storage tanks that were not registered and of which the Department has no knowledge. Likewise, there may be incidents of spills of which the Department was not informed or which pre-date Departmental records. "Remediation Site Management System" was established in the early 2000's and does not contain a complete history of past spills or remediation efforts. Furthermore, if the properties have been recently altered, the PID#'s provided may not correspond with those contained in departmental files and thus on the databases.

Any persons intending to purchase or occupy the property should make their own independent determination of the environmental condition of the property and the extent of responsibility and liability, if any, that may arise from taking ownership or occupancy.

Remediation Section - Environmental Management Division

Enclosures : 1

/ss

SIRS Search Result

Petroleum Storage
(PID 55141808)

PID #: 55141808 Site #: 2363 Address:

PRINCE WILLIAM PROPERTIES ULC
75 PRINCE WILLIAM STREET
SAINT JOHN

Tank Information

Current Status	Active
Date Out of Service	
Installation Date	1982
Tank Size	18200 L
Location	Above Ground
Constructed Of	Single Wall Steel
Substance Stored	Furnace Oil

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE II ENVIRONMENTAL SITE ASSESSMENT

FINAL PHASE II
ENVIRONMENTAL SITE ASSESSMENT
SAINT JOHN COAST GUARD BASE

LDU/PN # 03920
RPIS # MD00309
CCG SECTOR I.D. SN8090
SAINT JOHN, NEW BRUNSWICK
PROJECT NO. NBF12711

PROJECT NO. NBF12711

REPORT TO

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
PHASE II ENVIRONMENTAL SITE ASSESSMENT

ON

FINAL PHASE II ENVIRONMENTAL SITE ASSESSMENT
SAINT JOHN COAST GUARD BASE
LDU/PN # 03920
RPIS # MD00309
CCG SECTOR I.D. SN8090
SAINT JOHN, NEW BRUNSWICK

JACQUES WHITFORD ENVIRONMENT LIMITED
711 WOODSTOCK ROAD
FREDERICTON, NB
E3B 5C2

TEL: 506-457-3200
FAX: 506-452-7652

March 25, 2002

TABLE OF CONTENTS

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LIST OF TABLES, FIGURES, AND APPENDICES

EXECUTIVE SUMMARY

Between January 22, 2002 and February 26, 2002, Jacques Whitford Environment Limited (JWEL) conducted a Phase II Environmental Site Assessment of the Public Works and Government Services Canada (PWGSC) Canadian Coast Guard (CCG) property located at Peter's Wharf in Saint John, New Brunswick.

Based on the information gathered and on observations made during the previous JWEL Phase I Environmental Site Assessment (June 18, 2001), and Hazardous Materials Survey (February 27, 2001), potential contamination was based on the following:

- former underground petroleum storage tanks on the subject property;
- fuel spill from a truck filling equipment in the dock area in 1972;
- two in-ground concrete oil-water separators are present on the subject property;
- historic maintenance of buoys on former gravel covered areas in the dock yard;
- presence of lead based paint on the exterior of the shop building; and
- presence of mercury based paint on the exterior of the shop building.

The Hazardous Materials Survey identified PCBs in some light ballasts, asbestos containing materials in the administration building and buoy shed and lead in paint on interior and/or exterior of the shop building, administration building, buoy shed and tourist light house. Related recommendations are made in the Hazardous Materials Survey report.

The corresponding Phase II included; surface soil sampling, drilling and installation of monitoring wells to allow subsurface soil and water samples to be collected.

Results are as follows:

All soil and water samples analyzed for BTEX/TPH, metals, and mercury were below CCME Guidelines, with the exception of:

- zinc in surface soil at one location and 3 depths, and
- PAHs in 2 depth soil samples and benzo[a]pyrene in groundwater at one location.

The CCME National Classification System (NCS) detailed evaluation form was updated and the site was classified as Class 2, action likely required with a Final Score of 56 ± 10. The Marine and Aquatic Site Ranking method was not conducted since there was no waterlot associated with the property.

The statements made in this Executive Summary are subject to the same limitations included in the Closure Section 6.0, and are to be read in conjunction with the remainder of this report.

1.0 INTRODUCTION

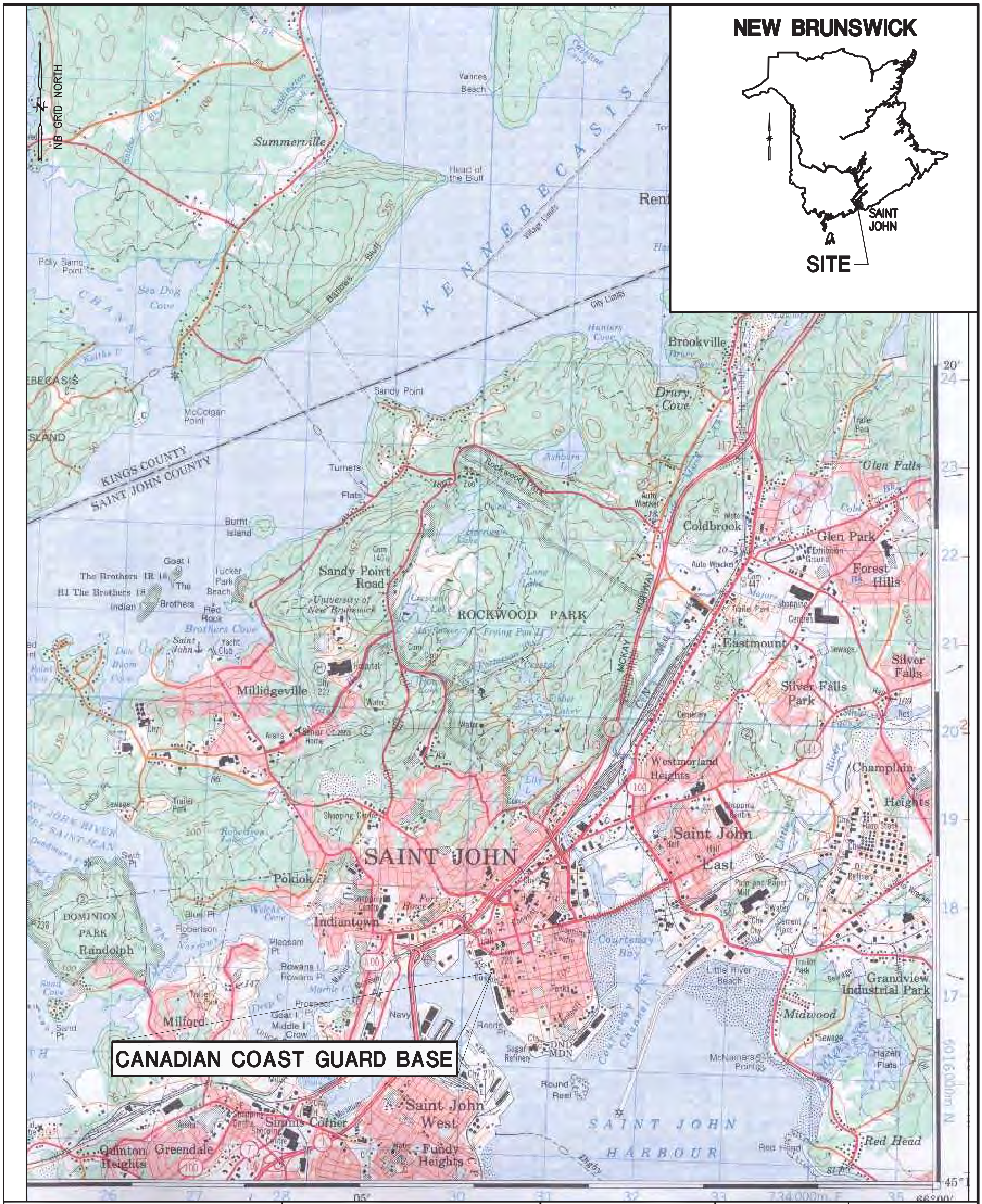
Jacques Whitford Environment Limited (JWEL) was commissioned by Ms. Heather McCleave, P.Eng. of Public Works and Government Services Canada (PWGSC) to complete a Phase II Environmental Site Assessment (ESA) on the PWGSC property known as the Saint John Canadian Coast Guard Base, located at Peter's Wharf in Saint John, New Brunswick (Figure No. 1).

1.1 Objectives

This work has the following general objectives:

- To conduct a CCME Phase II ESA to confirm the presence or absence of contamination related to the potential sources identified in the Phase I ESA;
- To complete a detailed intrusive investigation (Phase III ESA) to identify the source, nature and extent (horizontal and vertical) of contamination in all impacted media;
- To summarize the contaminated sites on the property and complete the detailed evaluation from the National Classification System for Contaminated Sites, Canadian Council of Ministers of the Environment (CCME), March 1992;
- To develop a National Classification System (NCS) score;
- To develop a Marine and Aquatic Sites Ranking for the site, if applicable;
- To provide input data for DFO's RPIS Contaminated Sites Module;
- To develop a remedial action plan for the remediation and/or risk management of the contaminated sites on the property;
- To prepare a scope of work and cost estimate for any additional work requirements; and
- To develop an indicative estimate of financial liability or contingent liability for all contaminated sites on the property.

The latter three bullets are not addressed in this report, but are provided as attachments.



SITE LOCATION PLAN
PHASE II ENVIRONMENTAL SITE ASSESSMENT
CANADA COAST GUARD BASE
LDU/PN# 03920, RPIS# MD00309
CCG SECTOR I.D. SN8090
PETER'S WHARF
SAINT JOHN, NB

Jacques Whitford

Consulting Engineers
Environmental Scientists

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DATE: 02 03 25	SCALE: N.T.S.
PROJECT: 12711	FIGURE: 01

1.2 Regulatory Framework

Applicable federal, provincial and municipal regulations were reviewed to develop appropriate recommendations. It should be noted however, that this assessment did not include a review or audit of operational environmental compliance issues, or of any environmental management system (EMS) which may be in place at the property.

1.2.1 Soil

The subject property is on federal land and therefore the primary source of remediation criteria is the Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 1999). The soil criteria are developed on the basis of land use and the appropriate guidelines for this site are defined by the commercial values. TPH criteria are not included in the CCME Guidelines, hence the Atlantic Canada Partnership in RBCA Implementation (PIRI) Risk Based Screening Levels (RBSLs) were used.

1.2.2 Leachate Criteria

Leachate results are compared to the limits defined in the Transportation of Dangerous Goods Act (5 mg/L for lead) to determine if the material is classified as leachable toxic waste.

1.2.3 Water

The Canadian Drinking Water Quality Guidelines and the Canadian Water Quality Guidelines for the Protection of Aquatic Life are used as comparison for chemical concentrations in potable groundwater and in surface water, respectively.

2.0 SITE DESCRIPTION

The Saint John CCG Base is located at Peter's Wharf on the waterfront in downtown Saint John, New Brunswick (Figure No. 1). It is an active multi-building CCG base accommodating buoy and lighthouse maintenance, emergency response, harbour vessel control and administrative facilities. The on-site buildings and structures include the Administration building, the Marine Emergency & Helicopter Hanger, a Shops Building, a Buoy Shed and a Storage Shed. The surrounding dock area is used for storage of navigational buoys, emergency response equipment, anchors, bulk fuel, etc. The majority of the dock area is asphalt covered.

Surrounding properties are generally commercial to the north and east including a hotel, a retail/office/convention complex, parking lot, office/retail buildings, etc. A marine cargo terminal is located to the south and Saint John Harbour is located immediately adjacent to the property to the west.

There have been various aboveground and underground tanks located on the subject property over the past few years. Active petroleum storage tanks currently present on the property include:

- A 45,600 litre aboveground petroleum storage tank (AST) is present in the oil storage room inside the heating plant located at the south end of the Shops Building;
- A 13,600 litre aboveground contained steel tank assembly is present near the centre of the dock yard, south-southwest of the Buoy Shed;
- A 4,540 litre self-dyked fuel storage tank (containing both gasoline and diesel) is present near the north-western corner of the Shops Building; and
- A 4,540 litre aboveground contained steel tank assembly is present immediately adjacent to the west side of the Ship Storage Shed located near the north-western corner of the subject property.

Former underground petroleum storage on the property included:

- A 9,900 litre underground petroleum storage tank (UST) was formerly present adjacent to the west-side of the Marine Emergency and Helicopter Hanger (Removed in 1992);
- A 13,640 litre UST was formerly present adjacent to the helicopter landing pad located near the south-western corner of the property (Removed in 1997);
- Two 2,270 litre USTs were formerly present in the dock area north of the Buoy Shed (Removed in 1997); and
- A 1,140 litre underground emergency spill collection tank was formerly present adjacent to the east-side of the Marine Emergency and Helicopter Hanger. This tank was removed in March 2000 under JWEL's supervision. Based on observations by JWEL and the laboratory results for petroleum hydrocarbons of confirmatory soil samples, the former presence of this underground tank is not likely a concern and therefore not addressed in this Phase II ESA.

Also located on the property were two concrete in-ground oil-water separators. One separator is present adjacent to the west-side of the Marine Emergency and Helicopter Hanger. One separator is present adjacent to the north side of the Shops Building.

The Hazardous Materials Survey identified PCBs in some light ballasts, asbestos containing materials in the administration building and buoy shed and lead in paint on interior and/or exterior of the shop building, administration building, buoy shed and tourist light house. Related recommendations are made in the Hazardous Materials Survey report.

2.1.1 Water Supply/Groundwater Usage

Groundwater is not used for potable water supply on the subject or adjoining properties. Potable water for the site and adjoining properties is supplied by the Saint John municipal water supply.

2.1.2 Soil, Topography and Drainage

The underlying soils and geological formations have been described based on information obtained from published sources. Based on this review, the texture of overburden in the Saint John area can vary from clay to gravel, possibly due to frequent and diverse changes in sediment depositional environments. Till deposits, glacial outwash, marine deposits and tidal deposits have been reported. According to New Brunswick surficial geology maps, overburden in the area of the subject property generally consists of a veneer of morainal sediments (typically 0.5 to 3.0 m thick) consisting primarily of a stony till, deposited directly by ice or with minor reworking by water. Bedrock geology mapping indicates that the area is underlain by sedimentary rock types including quartzoze feldspathic sandstone, siltstone, shale, micaceous sandstone, quartzite, minor limestone and conglomerate of early Ordovician to early Cambrian age, locally referred to as the Saint John Group.

3.0 PHASE II ENVIRONMENTAL SITE ASSESSMENT

3.1 Scope of work

A Phase II ESA sampling program was carried out based on the following Phase I and Hazardous Materials Survey (which included paint sampling and analysis) findings:

- former underground petroleum storage tanks on the subject property;
- fuel spill from a truck filling equipment in the dock area in 1972;
- two in-ground concrete oil-water separators are present on the subject property;
- historic maintenance of buoys on former gravel covered areas in the dock yard;
- presence of lead based paint (confirmed) on the exterior of the shop building; and
- presence of mercury based paint (confirmed) on the exterior of the shop building.

3.2 Methodology

3.2.1 Surface Soil Sampling Program

Soil conditions encountered in the test holes were logged by JWEL field personnel at the time of sampling. To minimise the potential for cross-contamination, all sampling equipment was thoroughly rinsed between each sampling event using methyl hydrate and water.

Surface soil sampling was conducted at three locations on the site. The soil sample locations are presented on Figure 2.

At all SS locations samples were collected at 3 sampling depths, designated “A” (0-0.15 meters), “B” (0.15-0.3 meters) and “C” (0.3-0.45 meters). For SS-3 there was a ¾ " clear stone/gravel overlying fill, so the “A” depth was 0.15 – 0.3 m, “B” was 0.3 – 0.45 m and “C” was 0.45 – 0.60m. The surface soil sampling records are presented on Table E1 in Appendix E.

3.2.1.1 Metals and Mercury

Samples were collected for metals and mercury analysis from three surface soil sample locations. Areas targeted were adjacent to the north and east sides of the Shops Building. Results of the hazardous materials survey conducted by JWEL revealed elevated concentrations of lead and mercury on some exterior surfaces of the Shops Building. Initially all “A” depth samples were submitted for metals and mercury analysis. Based on observed exceedences in one surface soil sample (SS3), further analyses were completed on the “B” and “C” depths.

3.2.1.2 Petroleum Hydrocarbons

Volatile Organic Compound (VOC) concentration measurements were obtained in the headspace from selected recovered soil samples, at room temperature, using a Gastector Model No. 1238 (with Methane elimination “on”) calibrated to Hexane. This instrument has a detection range from 0 ppm to 500 ppm. Headspace readings exceeding 500 ppm are measured in Lower Explosive Limit (% LEL). No surface soil samples were submitted for analysis of petroleum hydrocarbons since no visual or olfactory evidence of surface impacts were identified and the highest surface sample VOC reading was less that 5 ppm.

3.2.1.3 PAHs

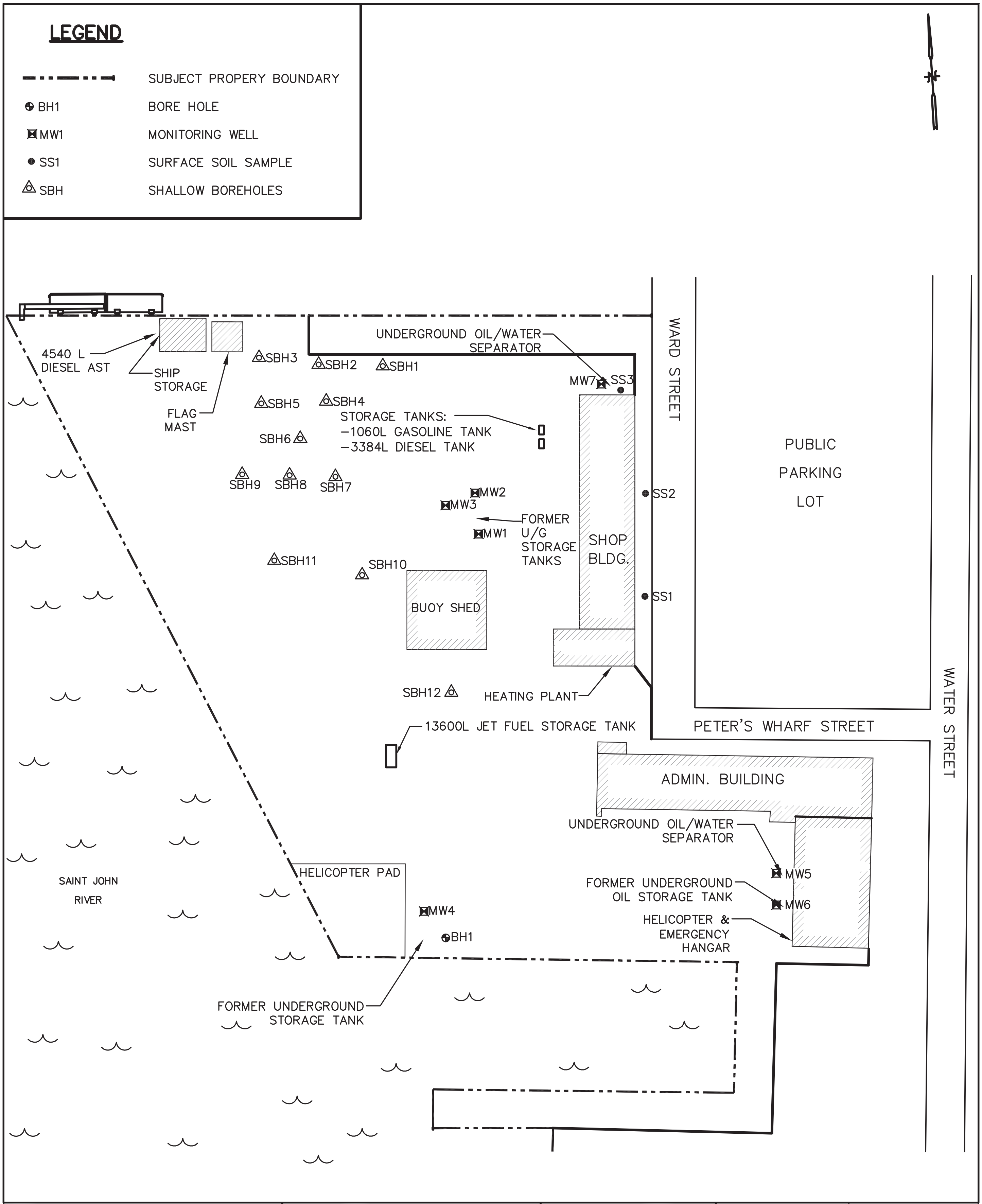
No surface soil samples were submitted for analysis of polycyclic aromatic hydrocarbons (PAHs) since no visual or olfactory evidence of surface impacts from possible PAHs were identified during the field work.

3.2.2 Subsurface Sampling Program – Borehole/Monitoring Well Investigation

A borehole/monitoring well investigation was conducted to assess subsurface soil and groundwater conditions on the subject property. Eight boreholes were drilled by Boart Longyear of Moncton, New Brunswick under the supervision of JWEL personnel. The boreholes were completed to depths of 3.80 to 6.10 meters below ground surface (mbgs) using a truck-mounted geotechnical drill equipped with 200 mm outside diameter hollow-stem augers and HQ core barrels. Groundwater monitoring wells were installed in 7 of the 8 boreholes to assess groundwater conditions at the site.

LEGEND

—··—··—	SUBJECT PROPERY BOUNDARY
⊕ BH1	BORE HOLE
☒ MW1	MONITORING WELL
● SS1	SURFACE SOIL SAMPLE
△ SBH	SHALLOW BOREHOLES



SAMPLE LOCATION PLAN
PHASE II ENVIRONMENTAL SITE ASSESSMENT
CANADA COAST GUARD BASE
LDU/PN# 03920, RPIS# MD00309
CCG SECTOR I.D. SN8090
PETER'S WHARF
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Jacques Whitford

Consulting Engineers
Environmental Scientists

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DATE: 02 03 25	**SCALE:** 1:1200
PROJECT: 12711	**FIGURE:** 2

The monitoring wells were constructed using 50 mm PVC screen (No. 20) and casing with silica sand filter pack, bentonite seal, and flushmount protective cover. The borehole/monitoring well records are presented in Appendix E.

Soil samples were recovered from the boreholes by continuous sampling at 0.6 m intervals using a 50 mm O.D. split-spoon sampler. Subsurface conditions encountered in the boreholes were logged by JWEL field personnel at the time of drilling. The stratigraphic information is presented on the borehole/monitoring well records in Appendix E.

In addition to the deep boreholes, 12 shallow borehole probes (max. 1 m depth) were drilled in areas of former sandblasting/painting activity. At all shallow borehole locations samples were collected at 3 sampling depths using a 50 mm O.D. split-spoon sampler. Due to the presence of asphalt cover from 0 – 0.15m, the sampling depths were designated “A” (0.15-0.45 meters), “B” (0.45-0.75 meters) and “C” (0.75-1.05 meters). The shallow borehole probe stratigraphic information is presented on Table E1 in Appendix E.

3.2.2.1 Metals and Mercury

Samples were collected for metals and mercury analysis from 12 shallow borehole locations. Areas targeted were in the vicinity of former buoy painting/scrapping areas south, west and north of the buoy shed. Initially all “A” depth samples collected from the shallow boreholes were submitted for metals and mercury analysis. Based on these results, no further analyses were completed.

3.2.2.2 Petroleum Hydrocarbons

Volatile Organic Compound (VOC) concentration measurements were obtained in the headspace from selected recovered soil samples, at room temperature, using a Gastector Model No. 1238 (with Methane elimination “on”) calibrated to Hexane. This instrument has a detection range from 0 ppm to 500 ppm. Headspace readings exceeding 500 ppm are measured in Lower Explosive Limit (% LEL). Sixteen soil samples from the boreholes were submitted for analysis of petroleum hydrocarbons based on their VOC readings and relative position compared to the water table. No shallow borehole soil samples were submitted for analysis of petroleum hydrocarbons since no visual or olfactory evidence of surface impacts were identified and the highest surface sample VOC reading was less than 10 ppm.

3.2.2.3 PAHs

Based on the TPH/BTEX laboratory results indicating interference from possible PAHs in two soil samples, the relevant samples were also analyzed for PAHs. No other samples from the boreholes were selected for PAH analysis since indications of impact were not visible from field observations or VOC readings.

3.2.3 Groundwater Sampling Program

Groundwater samples were collected from the seven monitoring wells on February 1, 2002. The monitoring wells were purged prior to sample collection to ensure representative water from the surrounding soil had been drawn into the well casing. All seven samples were submitted for petroleum hydrocarbon analyses.

3.2.4 Laboratory Analytical Program

The analytical program is summarized in Table 1. All samples were submitted to Philip Analytical Services (Philip) in Bedford, NS. Philip is accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL) for each of the methods utilized and has in-house QA/QC programs to govern sample analysis, including replicates. Laboratory reports are presented in Appendix B.

3.2.5 Quality Assurance/Quality Control (QA/QC) Sampling Program

The QA/QC sampling was conducted on approximately 10% of parameters that were analyzed. QA/QC was addressed by collecting duplicates. The results of this testing were used to evaluate the reliability of the sampling. The numbers and types of QA/QC samples are presented in Table 1.

3.3 Field Observations

Pertinent field observations for surface and shallow borehole soil samples are described in Table E1 (Appendix E). The observed stratigraphy as encountered in the boreholes is presented on the borehole/monitoring well records in Appendix E.

3.3.1 Stratigraphy

The soil stratigraphy for surface soil samples (0-0.45 mbgs) was comprised of poorly graded silty sand with gravel. The stratigraphy as encountered during drilling generally consisted of material ranging from poor to well graded loose brown sand with gravel fill to poorly graded dense brown sand with gravel. Boulders were encountered in several holes at depths ranging from 5.1 to 6.0 metres.

3.3.2 Groundwater Conditions

Groundwater was encountered in the boreholes at depths ranging from 2.1 to 4.4 mbgs. Free product or staining was not identified at any sampling location.

3.3.3 Soil Vapour Conditions

Elevated soil vapour concentrations, typically in the % LEL range (1% LEL is equivalent to 100 ppm for gasoline; the % LEL scale is typically used for soil vapours in excess of 500 ppm), are generally indicative of the presence of volatile petroleum products (i.e. gasoline, and to a lesser extent diesel and fuel oil). The VOC measurement does not provide quantification of hydrocarbons in soil, but rather is an indication of the degree of contamination due to volatile hydrocarbon compounds relative to other samples. The headspace VOC readings are provided on the borehole/monitoring well records in Appendix E and range up to 190 ppm.

3.4 Laboratory Analysis Results for Soil

3.4.1 Metals in Soil

Laboratory analytical results for metals in soil are presented in Table 2. Concentrations of metals in soil samples tested around the property were all below the CCME commercial remediation criteria for metal parameters except as follows:

- SS3A, SS3B and SC3C - Zinc

Soil Metal Samples

- 15 submitted
- 3 exceeded CCME guideline for Zinc
- [Zn] 42 – 1300 mg/kg

3.4.2 Metals in Soil Leachate

Soil leachate sample analyses were not necessary as zinc does not have a TDGA leachate criteria.

3.4.3 Petroleum Hydrocarbons in Soil

Laboratory analytical results for petroleum hydrocarbons (BTEX/TPH) are presented in Table 3. Petroleum hydrocarbon concentrations in soil were below the CCME criteria for BTEX/TPH.

TPH/BTEX in Soil

- 16 submitted
- 0 exceeded

Table 1 - Laboratory Program

Matrix	Number of Samples																			
	Metals		Mercury		TPH/BTEX		PAHs		Pesticides/ Herbicides		PCBs		Leachable metals & Hg		ODCA Pkg		Bacteria		Asbestos	
	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC	Actual	QC
Paint	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Building Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface Soil	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shallow Soil Samples	12	1	12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sediment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil (from BHs/MWs)	-	-	-	-	16	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Water (from MWs)	-	-	-	-	7	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Water (from on-site well)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil (from Test pits)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total # of Samples	15	1	15	1	23	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: - denotes not applicable

Table 2 - Metal Concentrations in Soil

			CCME Guidelines		Sample Identification							
Parameter	**Units**	**EQL**	**R/P**	**C**	**SS1A**	**SS2A**	**SS3A**	**SS3B**	**SS3C**	**SBH1A**	**SBH2A**	**SBH2A Field Duplicate (SBHX A)**
				sample depth (mbgs)	**0-0.15**	**0-0.15**	**0.15-0.30**	**0.30-0.45**	**0.45-0.60**	**0.15-0.45**	**0.15-0.45**	**0.15-0.45**
Aluminum	mg/kg	10	nc	nc	9000	10000	9400	na	na	10000	9400	9700
Antimony	mg/kg	2	20	40	nd	nd	nd	na	na	nd	nd	nd
Arsenic	mg/kg	2	12	12	5	6	7	na	na	5	6	6
Barium	mg/kg	5	500	2000	46	60	42	na	na	32	37	35
Beryllium	mg/kg	5	4	8	nd	nd	nd	na	na	nd	nd	nd
Boron	mg/kg	5	nc	nc	nd	nd	nd	na	na	nd	nd	nd
Cadmium	mg/kg	0.3	10	22	nd	nd	0.4	na	na	0.3	nd	nd
Chromium	mg/kg	2	64	87	17	19	20	na	na	22	19	16
Cobalt	mg/kg	1	50	300	8	9	9	na	na	10	9	9
Copper	mg/kg	2	63	91	30	41	51	na	na	33	27	27
Iron	mg/kg	20	nc	nc	16000	18000	19000	na	na	19000	18000	19000
Lead	mg/kg	0.5	140	260	24	38	80	na	na	25	14	13
Manganese	mg/kg	2	nc	nc	480	570	490	na	na	510	450	430
Molybdenum	mg/kg	2	10	40	nd	nd	nd	na	na	nd	nd	nd
Nickel	mg/kg	2	50	50	14	15	22	na	na	16	15	16
Selenium	mg/kg	2	3	10	nd	nd	nd	na	na	nd	nd	nd
Silver	mg/kg	0.5	20	40	nd	nd	nd	na	na	nd	nd	nd
Strontium	mg/kg	5	nc	nc	8	6	10	na	na	11	10	10
Thallium	mg/kg	0.1	1	1	nd	0.1	0.1	na	na	nd	nd	nd
Uranium	mg/kg	0.1	nc	nc	0.5	0.8	0.9	na	na	0.5	0.4	0.4
Vanadium	mg/kg	2	130	130	25	35	44	na	na	34	24	25
Zinc	mg/kg	2	200	360	69	97	**1300**	**520**	**1000**	130	59	58
Mercury	mg/kg	0.01	6.6	24	0.04	0.06	0.04	na	na	0.02	0.01	0.01

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
R/P - Residential/Parkland; C-Commercial
EQL - estimated quantitation limit
nd - less than the EQL; nc - no criteria developed; na - not available
Bold - sample concentration exceeds Commercial criteria

Table 2 - Metal Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines		Sample Identification							
			R/P	C	SBH3A	SBH4A	SBH4A Lab Duplicate	SBH5A	SBH6A	SBH7A	SBH8A	SBH9A
sample depth (mbgs)					0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45
Aluminum	mg/kg	10	nc	nc	9500	8900	8800	8300	9000	8200	10000	8800
Antimony	mg/kg	2	20	40	nd	nd	nd	nd	nd	nd	nd	nd
Arsenic	mg/kg	2	12	12	4	5	5	5	6	< 2	5	6
Barium	mg/kg	5	500	2000	33	37	38	30	34	5	34	33
Beryllium	mg/kg	5	4	8	nd	nd	nd	nd	nd	29	nd	nd
Boron	mg/kg	5	nc	nc	nd	nd	nd	nd	nd	nd	nd	nd
Cadmium	mg/kg	0.3	10	22	nd	nd	nd	nd	nd	nd	nd	nd
Chromium	mg/kg	2	64	87	13	15	20	13	15	nd	21	18
Cobalt	mg/kg	1	50	300	7	9	9	8	9	8	10	8
Copper	mg/kg	2	63	91	24	26	24	30	25	24	27	30
Iron	mg/kg	20	nc	nc	15000	18000	18000	16000	17000	16000	20000	21000
Lead	mg/kg	0.5	140	260	9.1	32	22	12	10	10	26	46
Manganese	mg/kg	2	nc	nc	510	510	510	400	460	480	490	540
Molybdenum	mg/kg	2	10	40	nd	nd	nd	nd	nd	nd	nd	nd
Nickel	mg/kg	2	50	50	11	14	14	12	13	13	17	15
Selenium	mg/kg	2	3	10	nd	nd	nd	nd	nd	nd	nd	nd
Silver	mg/kg	0.5	20	40	nd	nd	nd	nd	nd	nd	nd	nd
Strontium	mg/kg	5	nc	nc	10	12	12	11	8	9	11	17
Thallium	mg/kg	0.1	1	1	nd	0.1	0.1	nd	nd	nd	nd	nd
Uranium	mg/kg	0.1	nc	nc	0.4	0.9	0.8	0.4	0.6	1.4	0.4	0.4
Vanadium	mg/kg	2	130	130	22	26	27	25	24	23	29	29
Zinc	mg/kg	2	200	360	44	52	50	48	84	42	61	53
Mercury	mg/kg	0.01	6.6	24	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.2

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
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EQL - estimated quantitation limit
nd - less than the EQL; nc - no criteria developed; na - not available
Bold - sample concentration exceeds Commercial criteria

Table 2 - Metal Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines		Sample Identification				
			R/P	C	SBH10A	SBH 10A Field Duplicate(SBHY A)	SBH11A	SBH12A	SBH12A Lab Duplicate
sample depth (mbgs)					0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45
Aluminum	mg/kg	10	nc	nc	8800	9100	10000	9500	10000
Antimony	mg/kg	2	20	40	nd	nd	nd	nd	nd
Arsenic	mg/kg	2	12	12	5	5	6	4	5
Barium	mg/kg	5	500	2000	33	33	41	31	33
Beryllium	mg/kg	5	4	8	nd	nd	nd	nd	nd
Boron	mg/kg	5	nc	nc	nd	nd	nd	nd	nd
Cadmium	mg/kg	0.3	10	22	nd	nd	nd	nd	nd
Chromium	mg/kg	2	64	87	16	15	19	17	20
Cobalt	mg/kg	1	50	300	8	8	10	8	10
Copper	mg/kg	2	63	91	24	24	27	28	28
Iron	mg/kg	20	nc	nc	17000	17000	20000	17000	18000
Lead	mg/kg	0.5	140	260	21	19	13	9.7	21
Manganese	mg/kg	2	nc	nc	430	450	480	450	490
Molybdenum	mg/kg	2	10	40	nd	nd	nd	nd	nd
Nickel	mg/kg	2	50	50	14	14	17	14	16
Selenium	mg/kg	2	3	10	nd	nd	nd	nd	nd
Silver	mg/kg	0.5	20	40	nd	nd	nd	nd	nd
Strontium	mg/kg	5	nc	nc	22	20	15	5	5
Thallium	mg/kg	0.1	1	1	nd	nd	nd	nd	nd
Uranium	mg/kg	0.1	nc	nc	0.5	0.5	0.5	0.5	0.5
Vanadium	mg/kg	2	130	130	25	26	26	24	28
Zinc	mg/kg	2	200	360	50	52	58	46	51
Mercury	mg/kg	0.01	6.6	24	0.01	0.01	0.01	0.03	0.02

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
R/P - Residential/Parkland; C-Commercial
EQL - estimated quantitation limit
nd - less than the EQL; nc - no criteria developed; na - not available
Bold - sample concentration exceeds Commercial criteria

Table 3 - TPH/BTEX Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines				Sample Identification				
			Surface		Subsurface		BH1 SA1	BH1 SA3	MW1 SA1	MW1 SA7	MW2 SA1
			R/P	C	R/P	C					
sample depth (mbgs)							0.15-0.60	2.1-2.7	0.15-0.75	4.0-4.3	0.15-0.75
Benzene	mg/kg	0.025	50	120	0.3	1.4	nd	nd	nd	nd	nd
Toluene	mg/kg	0.025	1960	4800	34	34	nd	nd	0.032	nd	nd
Ethylbenzene	mg/kg	0.025	980	2400	20	20	nd	nd	0.237	nd	nd
Xylenes	mg/kg	0.05	1380	3200	19	25	nd	nd	0.651	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nc	nc	nc	nc	nd	nd	22	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15	nc	nc	nc	nc	nd	nd	280	nd	nd
>C21-C32 (Lube Range)	mg/kg	15	nc	nc	nc	nc	nd	nd	350	19	nd
Modified TPH - Tier 1	mg/kg	32	720	1740	175	10,000	nd	nd	650	nd	nd

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for a site with
sandy soil, non-potable groundwater use and fuel oil contamination.

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 3 - TPH/BTEX Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines				Sample Identification				
			Surface		Subsurface		MW2 SA9	MW3 SA2	MW3 SA6	MW4 SA2	MW4 SA2 Field Duplicate (MWZ SA1)
			R/P	C	R/P	C					
						sample depth (mbgs)	5.2-5.8	0.75-1.0	3.4-4.0	0.45-1.0	0.45-1.0
Benzene	mg/kg	0.025	50	120	0.3	1.4	nd	nd	nd	nd	nd
Toluene	mg/kg	0.025	1960	4800	34	34	nd	nd	nd	nd	nd
Ethylbenzene	mg/kg	0.025	980	2400	20	20	nd	nd	nd	nd	nd
Xylenes	mg/kg	0.05	1380	3200	19	25	nd	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nc	nc	nc	nc	nd	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15	nc	nc	nc	nc	120	51	nd	nd	nd
>C21-C32 (Lube Range)	mg/kg	15	nc	nc	nc	nc	280	220	nd	40	34
Modified TPH - Tier 1	mg/kg	32	720	1740	175	10,000	400	270	nd	40	34

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment

Environmental Quality Criteria (1991- 1999)

R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for a site with

sandy soil, non-potable groundwater use and fuel oil contamination.

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 3 - TPH/BTEX Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines				Sample Identification			
			Surface		Subsurface		MW4 SA2 Lab Duplicate (MWZ SA1)	MW4 SA10	MW5 SA2	MW5 SA4A
			R/P	C	R/P	C				
sample depth (mbgs)							0.45-1.0	5.5-6.1	0.75-1.1	2.1-2.7
Benzene	mg/kg	0.025	50	120	0.3	1.4	nd	nd	nd	nd
Toluene	mg/kg	0.025	1960	4800	34	34	nd	nd	nd	0.115
Ethylbenzene	mg/kg	0.025	980	2400	20	20	nd	nd	nd	nd
Xylenes	mg/kg	0.05	1380	3200	19	25	nd	nd	nd	0.242
C6 - C10 HC {less BTEX}	mg/kg	2.5	nc	nc	nc	nc	nd	nd	nd	7.1
>C10-C21 (Fuel Range)	mg/kg	15	nc	nc	nc	nc	nd	nd	35	390
>C21-C32 (Lube Range)	mg/kg	15	nc	nc	nc	nc	36	nd	86	670
Modified TPH - Tier 1	mg/kg	32	720	1740	175	10,000	36	nd	120	1100

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment

Environmental Quality Criteria (1991- 1999)

R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for a site with

sandy soil, non-potable groundwater use and fuel oil contamination.

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 3 - TPH/BTEX Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines				Sample Identification			
			Surface		Subsurface		MW6 SA1	MW6 SA1 Lab Duplicate	MW6 SA8	MW7 SA1
			R/P	C	R/P	C				
						sample depth (mbgs)	0.3-0.9	0.3-0.9	4.6-5.2	0.3-0.9
Benzene	mg/kg	0.025	50	120	0.3	1.4	nd	nd	nd	nd
Toluene	mg/kg	0.025	1960	4800	34	34	nd	nd	nd	nd
Ethylbenzene	mg/kg	0.025	980	2400	20	20	nd	nd	nd	nd
Xylenes	mg/kg	0.05	1380	3200	19	25	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nc	nc	nc	nc	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15	nc	nc	nc	nc	nd	nd	nd	nd
>C21-C32 (Lube Range)	mg/kg	15	nc	nc	nc	nc	18	20	nd	35
Modified TPH - Tier 1	mg/kg	32	720	1740	175	10,000	nd	nd	nd	35

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for a site with
sandy soil, non-potable groundwater use and fuel oil contamination.

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 3 - TPH/BTEX Concentrations in Soil

Parameter	Units	EQL	CCME Guidelines				Sample Identification	
			Surface		Subsurface		MW7 SA1 Field Duplicate	MW7 SA6
			R/P	C	R/P	C		
						sample depth (mbgs)	0.3-0.9	3.3-3.9
Benzene	mg/kg	0.025	50	120	0.3	1.4	nd	nd
Toluene	mg/kg	0.025	1960	4800	34	34	nd	nd
Ethylbenzene	mg/kg	0.025	980	2400	20	20	nd	nd
Xylenes	mg/kg	0.05	1380	3200	19	25	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nc	nc	nc	nc	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15	nc	nc	nc	nc	nd	nd
>C21-C32 (Lube Range)	mg/kg	15	nc	nc	nc	nc	29	39
Modified TPH - Tier 1	mg/kg	32	720	1740	175	10,000	nd	39

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment
Environmental Quality Criteria (1991- 1999)
R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for a site with sandy soil, non-potable groundwater use and fuel oil contamination.

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

3.4.4 PAHs in Soil

PAHs in Soil
• 2 submitted
• 2 exceeded

Laboratory analytical results for PAHs in soil are presented in Table 4. PAH concentrations in soil exceeded the CCME commercial criteria in both samples:

- MW2 : SA9 and
- MW5 : SA4.

3.5 Laboratory Analysis Results for Groundwater

3.5.1 Petroleum Hydrocarbons in Groundwater

TPH/BTEX in Groundwater
• 7 submitted
• 0 exceeded

Laboratory analytical results for petroleum hydrocarbons (BTEX/TPH) are presented in Table 5. Petroleum hydrocarbon concentrations were below CCME commercial criteria for BTEX and the NBDELG criteria for modified BTEX/TPH.

3.5.2 PAHs in Groundwater

PAHs in Groundwater
• 1 submitted
• 1 exceeded

Laboratory analytical results for PAHs in groundwater are presented in Table 6. PAH concentrations in groundwater were detected with groundwater concentrations of benzo[a]pyrene exceeding the Canadian Drinking Water Quality Guidelines in one well.

3.6 Quality Assurance/Quality Control Discussion

QA/QC sampling for the work conducted at the Saint John Canadian Coast Guard Base consisted of the collection and analysis of approximately 10% of the samples for QC. This program permits the evaluation of the representativeness of the samples. The duplicate samples collected for metals and TPH/BTEX analysis are as follows:

- SBHX A and SBHY A (duplicates of SBH2 A and SBH10 A respectively) – soil metal and mercury analysis;
- MWZ Sa#1 and MWY Sa#1 (duplicates of MW4 : Sa 2 and MW7 : Sa 1 respectively) – TPH/BTEX analysis in soil; and
- Water duplicate (MWX) for TPH/BTEX analysis is from MW5.

Table 4 - PAH Concentrations in Soil

			CCME Guidelines		Sample Identification	
Parameter	**Units**	**EQL**	**R/P**	**C**	**MW2 SA9**	**MW5 SA4A**
sample depth (mbgs)					**5.2-5.8**	**2.1-2.7**
Naphthalene	mg/kg	0.05	0.6	22	0.32	1.9
Perylene	mg/kg	0.05	nc	nc	1.1	6.2
1-Methylnaphthalene	mg/kg	0.05	nc	nc	0.21	1.6
2-Methylnaphthalene	mg/kg	0.05	nc	nc	0.24	1.9
Acenaphthylene	mg/kg	0.05	nc	nc	0.65	2.4
Acenaphthene	mg/kg	0.05	nc	nc	0.9	3.9
Fluorene	mg/kg	0.05	1	10	1.2	4.7
Phenanthrene	mg/kg	0.05	5	50	11	**51**
Anthracene	mg/kg	0.05	nc	nc	4.7	11
Fluoranthene	mg/kg	0.05	nc	nc	13	67
Pyrene	mg/kg	0.05	10	100	11	52
Benz[a]anthracene	mg/kg	0.05	1	10	4.6	**27**
Chrysene	mg/kg	0.05	nc	nc	4.6	26
Benzo[b]fluoranthene	mg/kg	0.05	1	10	3.2	**20**
Benzo[k]fluoranthene	mg/kg	0.05	1	10	3.2	**20**
Benzo[a]pyrene	mg/kg	0.05	0.7	0.7	**4.3**	**25**
Indeno[1,2,3-cd]pyrene	mg/kg	0.05	1	10	2.5	**13**
Dibenz[a,h]anthracene	mg/kg	0.05	1	10	0.4	3.1
Benzo[ghi]perylene	mg/kg	0.05	nc	nc	2.1	11

Notes:

CCME Criteria - Canadian Council of Ministers of the Environment

Sediment Quality Guidelines

ISQG - Interim Sediment Quality Guidelines; PEL - Probable Effect Level; Fresh - Fresh water; Marine - Salt water

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed

Bold - sample concentration exceeds Freshwater sediments

Table 5 - TPH/BTEX Concentrations in Groundwater

Parameter	Units	EQL	CCME Guidelines		Sample Identification						
			R/P	C	MW1	MW2	MW3	MW4	MW5	MW6	MW7
Benzene	mg/L	0.001	1	4.7	nd	nd	nd	nd	nd	nd	nd
Toluene	mg/L	0.001	20	20	nd	nd	nd	nd	nd	nd	0.003
Ethylbenzene	mg/L	0.001	20	20	nd	nd	nd	nd	nd	nd	nd
Xylenes	mg/L	0.002	20	20	nd	nd	nd	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/L	0.01	nc	nc	nd	nd	nd	nd	nd	nd	0.01
>C10-C21 (Fuel Range)	mg/L	0.05	nc	nc	nd	0.36	0.14	nd	0.45	nd	0.29
>C21-C32 (Lube Range)	mg/L	0.1	nc	nc	nd	0.5	0.2	nd	0.6	nd	1.1
Modified TPH - Tier 1	mg/L	0.2	20	20	nd	0.9	0.3	nd	1	nd	1.4

Notes:

BTEX guidelines are CDWQGs - Canadian Drinking Water Quality Guidelines

R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for site with sandy soil, non-potable groundwater use and diesel contamination

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 5 - TPH/BTEX Concentrations in Groundwater

Parameter	Units	EQL	CCME Guidelines		Sample Identification	
			R/P	C	MW7 Field Duplicate (MWX)	MW7 Lab Duplicate (MWX)
Benzene	mg/L	0.001	1	4.7	nd	nd
Toluene	mg/L	0.001	20	20	nd	nd
Ethylbenzene	mg/L	0.001	20	20	nd	nd
Xylenes	mg/L	0.002	20	20	nd	nd
C6 - C10 HC {less BTEX}	mg/L	0.01	nc	nc	nd	nd
>C10-C21 (Fuel Range)	mg/L	0.05	nc	nc	0.48	0.34
>C21-C32 (Lube Range)	mg/L	0.1	nc	nc	0.5	0.4
Modified TPH - Tier 1	mg/L	0.2	20	20	1	0.7

Notes:

BTEX guidelines are CDWQGs - Canadian Drinking Water Quality Guidelines

R/P - Residential/Parkland; C-Commercial

Modified TPH - Tier 1 criteria are for site with sandy soil, non-potable groundwater use and diesel contamination

EQL - estimated quantitation limit

nd - less than the EQL; nc - no criteria developed; na - not applicable

Bold - sample concentration exceeds Commercial criteria

Table 6 - PAH Concentrations in Groundwater

Parameter	Units	EQL	CCME Water Quality Guidelines				Sample Identification
			Drinking Water		Aquatic Life		MW 5
			Conc.	Type	Fresh.	Marine	
Naphthalene	ug/L	0.2	nc		1.1	1.4	0.3
Perylene	ug/L	0.01	nc		nc	nc	0.42
1-Methylnaphthalene	ug/L	0.05	nc		nc	nc	0.23
2-Methylnaphthalene	ug/L	0.05	nc		nc	nc	0.27
Acenaphthylene	ug/L	0.01	nc		nc	nc	0.2
Acenaphthene	ug/L	0.01	nc		5.8	nc	0.5
Fluorene	ug/L	0.01	nc		3.0	nc	0.5
Phenanthrene	ug/L	0.01	nc		0.4	nc	3.5
Anthracene	ug/L	0.01	nc		0.012	nc	0.72
Fluoranthene	ug/L	0.01	nc		0.04	nc	4.6
Pyrene	ug/L	0.01	nc		0.025	nc	3.8
Benz[a]anthracene	ug/L	0.01	nc		0.018	nc	1.4
Chrysene	ug/L	0.01	nc		nc	nc	1.4
Benzo[b]fluoranthene	ug/L	0.01	nc		nc	nc	1.1
Benzo[k]fluoranthene	ug/L	0.01	nc		nc	nc	1.1
Benzo[a]pyrene	ug/L	0.01	0.01	MAC	0.015	nc	**<u>1.4</u>**
Indeno[1,2,3-cd]pyrene	ug/L	0.01	nc		nc	nc	0.74
Dibenz[a,h]anthracene	ug/L	0.01	nc		nc	nc	0.19
Benzo[ghi]perylene	ug/L	0.01	nc		nc	nc	0.82

Notes:

Guideline Type - AO- Aesthetic Objective, MAC - Maximum Acceptable Concentration,
IMAC - Interim Maximum Acceptable Concentration

EQL - estimated quantitation limit

Fresh - freshwater; Conc. Concentration

L.Dup - laboratory duplicate

nc - no criteria

<u>Bold</u> - sample concentration exceeds drinking water criteria

The lab also ran five duplicate samples including:

- MWX (duplicate of field duplicate for MW5) - TPH/BTEX analysis in groundwater;
- SBH4A and SBH12A – soil metal and mercury analysis; and
- MWZ (duplicate of field duplicate for MW4 Sa#2) and MW6 Sa1 - TPH/BTEX analysis in soil

The duplicate results agree closely with their corresponding samples and confirm the representativeness of the sampling procedures. The relative percent difference from the mean for individual parameters fell within a range of ± 40%. There are no firm guidelines for the degree of correlation expected between field duplicates due to natural heterogeneity in soil type (eg. grain size, clay fraction) and contaminant distribution. However, the value noted above is considered to indicate an acceptable duplicate correlation.

In relation to the CCME commercial remediation criteria, all individual parameters in the duplicates were classified the same (either above or below criteria).

Background metal sample concentrations were consistent with metal concentrations reported in the other samples, hence it is likely a representative background location.

3.7 Contaminant Distribution

3.7.1 Soil

The magnitude of soil PAH and metal impacts is shown in Table 7 and Figure 3:

Table 7 - Magnitude of PAH and Metal Impacts in Soil

Parameter	CCME Commercial Criteria (mg/kg)	# of Samples Exceeding Criteria	Exceedance Factor	Trends
PAH	0.7 - 50	2	1.03 – 36x	Two exceedances
Zinc	360	1 (3 depths)	4x	1 isolated location.

Land based contamination was not identified other than exceedances of PAH in two subsurface soil samples and zinc at one surface soil location. The source of PAH contamination is likely creosote timbers and other wharf activities associated with the CCG Base while the source of zinc is likely paint.

Table 8 summarizes the extent of contamination associated with soil.

Table 8 - Extent of Contamination - PAHs and Metals in Soil

Issue	Comment	Recommendation
Horizontal Extent of Contamination	Only 2 exceedances for PAH; extent not assessed. Only exceedance for Zinc occurred at 1 location at 3 different depths.	Further on site PAH delineation required.
Off site impacts?	Possible for PAHs given proximity to harbour.	
Vertical Extent of Contamination	Not determined for PAHs although exceedances are at depth. Only exceedance for Zinc occurred at 1 location at 3 different depths.	Further on site delineation required for PAHs.
Summary	Contaminant distribution is consistent with identified sources.	

3.7.2 Groundwater

The magnitude of groundwater PAH impacts is shown in Table 9.

Table 9 - Magnitude of PAH Impacts in Groundwater

Parameter	CDWQG (μg/L)	# of Samples Exceeding Criteria	Exceedance Factor	Trends
Benzo[a]pyrene	0.01	1	140x	Only 1 sample analysed.

Benzo[a]pyrene concentrations exceeded CDWQG's in one groundwater sample at one location. The source of contamination is likely creosote timbers and other wharf activities associated with the CCG Base. The exceedance may be a result of PAHs on suspended soil in the groundwater sample.

Table 10 summarizes the extent of contamination associated with groundwater.

Table 10 - Extent of Contamination - PAHs in Groundwater

Issue	Comment	Recommendation
Horizontal Extent of Contamination	One exceedance for PAH; extent not assessed.	Further on site delineation recommended.
Off site impacts?	Possible given proximity to harbour.	
Vertical Extent of Contamination	N/A for groundwater.	
Summary	Contaminant distribution is consistent with identified sources.	

4.0 SPECIAL DFO REPORTING REQUIREMENTS

4.1 Identification of Contaminated Sites

A contaminated site, as defined by the Contaminated Sites Management Working Group, is a site at which substances occur at concentrations (1) above background levels and pose, or are likely to pose, an immediate or long term hazard to human health or the environment, or (2) exceed levels specified in policies and/or regulations.

Table 11 summarises the identified contaminated sites.

Table 11 - Contaminated Site Summary

Potential Area of Concern/Contaminated Site	Source	Contaminants of Concern	Supporting Documentation	NCS Class
PAH contamination in the subsurface soil, zinc contaminants in surface soil.	PAHs may be from creosote timbers used in the construction of the wharf. Zinc likely from paint.	PAH, Zinc	Lab Samples (see Figure 3)	2

4.2 National Classification System (NCS) Summary

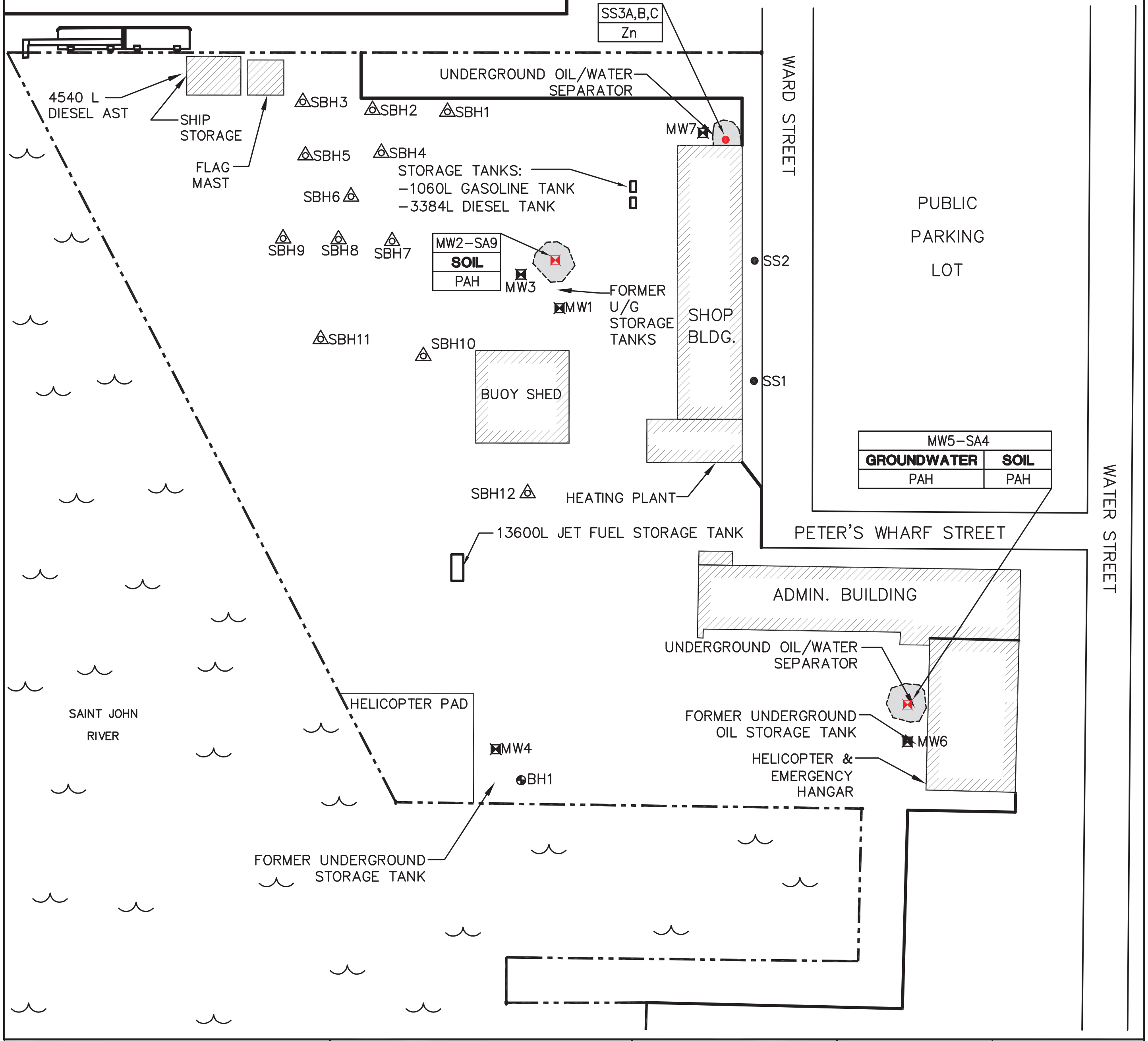
The NCS Detailed Evaluation Form was developed by the CCME to provide a nationally consistent ranking of the priority of sites in terms of potential remediation requirements. The evaluation process generally considers contaminant sources, exposure pathways, and potential human and environmental receptors, but is not intended to be used as a risk assessment tool. The scoring system reflects the concentrations and potential exposures of contaminants in relation to generic CCME remediation criteria, though some flexibility is provided for site-specific factors by the inclusion of Special Consideration scores, which can be either negative or positive. Final site scores are categorised as follows:

Table 12 - NCS Scoring Summary

Total Score	Class	Risk Potential	Action Required
70-100	Class 1	High	Yes
50-69	Class 2	Medium	Likely
38-49	Class 3	Medium-Low	May Be
≤37	Class N	Low	Not Likely
Estimated Score ≥ 15	Class I	Insufficient Information	Insufficient Information

LEGEND

— · · — · · —	SUBJECT PROPERY BOUNDARY
⊕ BH1	BORE HOLE
⌧ MW1	MONITORING WELL
● SS1	SURFACE SOIL SAMPLE
△ SBH	SHALLOW BOREHOLES
SS–3 Zn ●	SOIL SAMPLING LOCATION WITH INDICATED METALS IN EXCESS OF CCME COMMERCIAL GUIDELINES
⌧ MW1	MONITORING WELL LOCATION WITH INDICATED SOIL OR GROUNDWATER CONTAMINANTS IN EXCESS OF CCME COMMERCIAL GUIDELINES
⬭	MINIMUM EXTENT OF CONTAMINANTS ABOVE COMMERCIAL GUIDELINES



ESTIMATED EXTENT OF SOIL CONTAMINATION
PHASE II ENVIRONMENTAL SITE ASSESSMENT
CANADA COAST GUARD BASE
LDU/PN# 03920, RPIS# MD00309
CCG SECTOR I.D. SN8090
PETER'S WHARF
SAINT JOHN, NB

Jacques Whitford
Consulting Engineers
Environmental Scientists

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DATE: 02 03 25	**SCALE:** 1:1200
PROJECT: 12711	**FIGURE:** 3

The NCS Detailed Evaluation Forms for the subject property are presented in Appendix D and a scoring summary is presented in Table 13 below. The site obtained a score of 56 ± 10 and is classified as Class 2, medium risk potential, action likely required.

Table 13 - NCS Detailed Evaluation Form

Factor Categories		Category Score	Estimated Score	Total Category Score	Total Estimated Score
I	Contaminant Characteristics	22	5	22	±5
II	Exposure Pathways				
	A Groundwater	11	0		
	B Surface Water	8.45	0.25		
	C Direct Contact	3	0		
	Total	23.45	0.25	22.45	±0.25
III	Receptors				
	A Human and Animal	6	0		
	B Environment	6	5		
	Total	12	5	12	±5
Classification				56	±10
				Total Score for this Site	Estimated Score for Site
				Class 2	

4.3 Water Lot Classification Using the Aquatic Sites Classification

The Marine and Aquatic Site Ranking method was not conducted at this site since the site does not include a waterlot.

4.4 RPIS

Information related to the DFO's Contaminated Sites Database is provided in Appendix C.

5.0 CONCLUSIONS

Based on the information gathered and on observations made during this investigation the Phase II Environmental Site Assessment has revealed the following evidence of environmental contamination.

Results are as follows:

All soil and water samples analyzed for BTEX/TPH, metals, and mercury were below CCME Guidelines, with the exception of:

- zinc in surface soil at one location and 3 depths, and
- PAHs in 2 depth soil samples and benzo[a]pyrene in groundwater at one location.

The CCME National Classification System (NCS) detailed evaluation form was updated and the site was classified as Class 2, action likely required with a Final Score of 56 ± 10. The Marine and Aquatic Site Ranking method was not conducted since the site does not include a waterlot.

6.0 CLOSURE

This report has been prepared for the sole benefit of Public Works and Government Services Canada and the Department of Fisheries and Oceans. The report may not be relied upon by any other person or entity without the express written consent of Jacques Whitford Environment Limited (JWEL), Public Works and Government Services Canada, and Department of Fisheries and Oceans.

Any use which a third party makes of this report, any reliance on decisions made based on it, are the responsibility of such third parties. JWEL accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this report.

Some of the information presented in this report was provided through existing documents and interviews. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, JWEL in certain instances has been required to assume that the information provided is accurate.

The conclusions and recommendations presented represent the best judgement of the assessor based on current environmental standards and on the site conditions observed during the field work. Due to the nature of the investigation and the limited data available, the assessor cannot warrant against undiscovered environmental liabilities.

The conclusions are based on results from specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. In addition, analysis has been carried out for a limited number of chemical parameters, and it should not be inferred that other chemical species are not present.

Should additional information become available, JWEL requests that this information be brought to our attention so that we may re-assess the conclusions presented herein. This report was prepared by Paul Paulin and reviewed by Clayton Barclay, P.Eng., PhD.

Paul Paulin, P.Eng., CESA	Clayton Barclay, P.Eng., PhD.
Site Assessor	Senior Reviewer

APPENDIX A

ASSESSOR QUALIFICATIONS

Clayton Barclay PhD., P.Eng. is Manager of Environmental Engineering for New Brunswick. He has reviewed over 400 Phase I, II and III Environmental Site Assessments (ESAs), numerous environmental compliance audits, risk assessment and remedial action plans. He co-ordinated and reviewed over 100 Phase I/II•s in four months for the NAVCAN/Transport Canada property transfer and was project manager for recent PWGSC Phase I/II ESA program for 70 DFO sites in PEI, NB. He is experienced at co-ordinating large reports in a short time frame, having been the Technical and/or Reporting Manager for the Environmental Cleanup studies at CFB Goose Bay, CFB Moncton and for the Phase II/III ESA for US Naval Facility at Argentia. He is currently QA/QC manager for two large projects on the Sydney Tar Ponds, NS.

Paul D. Paulin, P. Eng., CESA. Participated in over 125 Phase I and Phase II Environmental Site Assessments for numerous industrial, commercial, residential, and undeveloped sites across New Brunswick, for many clients including the Saint John Port Corporation, Canada Post Corporation, N.B. Department of Environment, Canada Mortgage and Housing, Brookville LePage Johnson Controls, Royal Bank of Canada, Canadian Imperial Bank of Commerce, TDL Group Ltd., Public Works, Esso Petroleum Canada, Royal Trust, and many other clients.

APPENDIX B

LABORATORY ANALYSIS REPORTS

ANALYTICAL SERVICES

Organic Parameters page : 1

Client : Jacques Whitford Environment Ltd. PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5

PSC Project Number : 0201968H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/25
Reported : 2002/02/25

Matrix			Soil	Soil	Water
Philip ID			02-H007313	02-H007314	02-H007315
Client ID			MW2 SA9	MW5 SA4A	MW5
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/19	02/02/19	02/02/19
Analyte	**Units**	**EQL**			
PAH in Water Event #		-	-	-	FL13
Naphthalene	ug/L	0.2	-	-	0.3
2-Methylnaphthalene	ug/L	0.05	-	-	0.27
1-Methylnaphthalene	ug/L	0.05	-	-	0.23
Acenaphthylene	ug/L	0.01	-	-	0.20
Acenaphthene	ug/L	0.01	-	-	0.50
Fluorene	ug/L	0.01	-	-	0.50
Phenanthrene	ug/L	0.01	-	-	3.5
Anthracene	ug/L	0.01	-	-	0.72
Fluoranthene	ug/L	0.01	-	-	4.6
Pyrene	ug/L	0.01	-	-	3.8
Benz[a]anthracene	ug/L	0.01	-	-	1.4
Chrysene	ug/L	0.01	-	-	1.4
Benzo[b]fluoranthene	ug/L	0.01	-	-	1.2
Benzo[k]fluoranthene	ug/L	0.01	-	-	1.1
Benzo[a]pyrene	ug/L	0.01	-	-	1.4
Perylene	ug/L	0.01	-	-	0.42
Indeno[1,2,3-cd]pyrene	ug/L	0.01	-	-	0.74
Dibenz[a,h]anthracene	ug/L	0.01	-	-	0.19
Benzo[ghi]perylene	ug/L	0.01	-	-	0.82
PAH in Soil Event #		-	FK94	FK94	-
Naphthalene	mg/kg	0.05	0.32	1.9	-
2-Methylnaphthalene	mg/kg	0.05	0.24	1.9	-
1-Methylnaphthalene	mg/kg	0.05	0.21	1.6	-
Acenaphthylene	mg/kg	0.05	0.65	2.4	-

Legend:
EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
\- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

page verified Oc

Organic Parameters page : 2

PSC Analytical Services
200 Bluewater Road
Bedford, NS Canada B4B 1G9
Tel (902) 420-0203
Toll free (800) 565-7227
Fax (902) 420-8612

Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5

FAX # : 506-634-8104
PSC Project Number : 0201968H
Printed : 2002/02/25
Client Project Number : NBF 12711
Reported : 2002/02/25

Matrix			Soil	Soil	Water
Philip ID			02-H007313	02-H007314	02-H007315
Client ID			MW2 SA9	MW5 SA4A	MW5
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/19	02/02/19	02/02/19
Analyte	Units	EQL	(Continued from previous page)		
Acenaphthene	mg/kg	0.05	0.90	3.9	-
Fluorene	mg/kg	0.05	1.2	4.7	-
Phenanthrene	mg/kg	0.05	11.	51.	-
Anthracene	mg/kg	0.05	4.7	11.	-
Fluoranthene	mg/kg	0.05	13.	67.	-
Pyrene	mg/kg	0.05	11.	52.	-
Benz[a]anthracene	mg/kg	0.05	4.6	27.	-
Chrysene	mg/kg	0.05	4.6	26.	-
Benzo[b]fluoranthene	mg/kg	0.05	3.2	20.	-
Benzo[k]fluoranthene	mg/kg	0.05	3.2	20.	-
Benzo[a]pyrene	mg/kg	0.05	4.3	25.	-
Perylene	mg/kg	0.05	1.1	6.2	-
Indeno[1,2,3-cd]pyrene	mg/kg	0.05	2.5	13.	-
Dibenz[a,h]anthracene	mg/kg	0.05	0.40	3.1	-
Benzo[ghi]perylene	mg/kg	0.05	2.1	11.	-
Moisture	%	-	22.	11.	-

Naphthalene and methylnaphthalene(s) are commonly found in water method blanks at low concentrations. For these compounds only, sample results have been blank corrected.

02-H007313	MW2 SA9	TEH extract analysed per client request.
02-H007314	MW5 SA4A	TEH extract analysed per client request.
02-H007315	MW5	TEH extract analysed per client request.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
\- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

Page verified

Organic Parameters page : 3

PSC Analytical Services
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Bedford, NS Canada B4B 1G9
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Toll free (800) 565-7227
Fax (902) 420-8612

Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201968H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/25
Reported : 2002/02/25

Certificate of Analysis

Method Summaries :

- Polycyclic Aromatic Hydrocarbons - Soil/Sediment: Acetone/Hexane extr'n. HP5890/5971 GC/MS (SIM mode). Ref: EPA 8270A
- Polycyclic Aromatic Hydrocarbons - Water: Solvent extraction. HP5890/5971 GC/MS (SIM mode). Ref: EPA 610 (Modified)
- Moisture Content: Heating at 103C. Gravimetric det'n - as received basis. Ref: Ontario MOE Analytical Methods for Env. Samples, Vol.1, Method: ME

Conversions:
1 mg/L = 1000 ug/L = 1 part per million (ppm)
1 ug/L = 0.001 mg/L = 1 part per billion (ppb)

All work recorded herein has been done in accordance with normal professional standards using accepted testing technologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis performed. There is no other warranty expressed or implied. Excess sample will be discarded upon expiry of hold time.

Approval of Organic Parameters:

Organics Manager : Bruce Phillips

PSC

ANALYTICAL SERVICES

Inorganic Parameters page : 1

Client : Jacques Whitford Environment Ltd. PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
FAX # : 506-634-8104
PSC Project Number : 0201764H
Printed : 2002/02/18
Client Project Number : 12711
Reported : 2002/02/18

Matrix			Soil	Soil
Philip ID			02-H006620	02-H006621
Client ID			SS-3 #2	SS-3 #3
Date Sampled (y/m/d)			02/02/11	02/02/11
Date Received (y/m/d)			02/02/14	02/02/14

Analyte	Units	EQL		
HNO3 Peroxide Digestion		-	20020215-B	20020215-B
Zinc	mg/kg	2.	520	1000

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample
Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified

PSC Analytical Services
200 Bluewater Road
Bedford, NS Canada B4B 1G9
Tel (902) 420-0203
Toll free (800) 565-7227
Fax (902) 420-8612

Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201764H
Client Project Number : 12711

FAX # : 506-634-8104
Printed : 2002/02/18
Reported : 2002/02/18

Certificate of Analysis

Method Summaries:

- Available Trace Metals in soils/sediments: Nitric/Peroxide Digestion. Ref:USEPA Method #3050B.

Deficiency - There was a sample deficiency with one or more of the samples submitted. Please see faxed Sample Integrity Form for details on which test and the sample description.

All work recorded herein has been done in accordance with normal professional standards using accepted testing technologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis performed. There is no other warranty expressed or implied. Excess sample will be discarded upon expiry of hold time.

Approval of Inorganic Parameters:

Inorganics Manager : ______________
Jerry Arenovich

ANALYTICAL SERVICES

Inorganic Parameters page : 1

Client : Jacques Whitford Environment Ltd. PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5

FAX # : 506-634-8104
Printed : 2002/02/13
Reported : 2002/02/13

PSC Project Number : 0201448H
Client Project Number : NBF 12711

Matrix	**Soil**	**Soil**
Philip ID	**02-H005423**	**02-H005424**
Client ID	**SS1, A**	**SS2, A**
Date Sampled (y/m/d)	**02/02/05**	**02/02/05**
Date Received (y/m/d)	**02/02/06**	**02/02/06**

Analyte	**Units**	**EQL**		
HNO3 Peroxide Digestion		-	20020207-B	20020207-B
Mercury Digestion		-	20020212-A	20020212-A
Aluminum	mg/kg	10	9000	10000
Antimony	mg/kg	2.	nd	nd
Antimony Recovery	%	-	30.	30.
Arsenic	mg/kg	2.	5.	6.
Barium	mg/kg	5.	46.	60.
Beryllium	mg/kg	5.	nd	nd
Boron	mg/kg	5.	nd	nd
Cadmium	mg/kg	0.3	nd	nd
Chromium	mg/kg	2.	17.	19.
Cobalt	mg/kg	1.	8.	9.
Copper	mg/kg	2.	30.	41.
Iron	mg/kg	20	16000	18000
Iron Recovery	%	-	90.	90.
Lead	mg/kg	0.5	24.	38.
Manganese	mg/kg	2.	480	570
Molybdenum	mg/kg	2.	nd	nd
Nickel	mg/kg	2.	14.	15.
Selenium	mg/kg	2.	nd	nd
Silver	mg/kg	0.5	nd	nd
Strontium	mg/kg	5.	8.	6.
Thallium	mg/kg	0.1	nd	0.1
Uranium	mg/kg	0.1	0.5	0.8

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified

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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
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NB E2L 5C5
FAX # : 506-634-8104
PSC Project Number : 0201448H
Printed : 2002/02/13
Client Project Number : NBF 12711
Reported : 2002/02/13

Matrix			Soil	Soil
Philip ID			02-H005423	02-H005424
Client ID			SS1, A	SS2, A
Date Sampled (y/m/d)			02/02/05	02/02/05
Date Received (y/m/d)			02/02/06	02/02/06
Analyte	**Units**	**EQL**	(Continued from previous page)	
Vanadium	mg/kg	2.	25.	35.
Zinc	mg/kg	2.	69.	97.
Mercury	mg/kg	0.01	0.04	0.06

02-H005423 SS1, A — Boron is 50 % recovery in the digested reference material for sample batch 20020207-B.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified JBK

PSC Analytical Services
200 Bluewater Road
Bedford, NS Canada B4B 1G9
Tel (902) 420-0203
Toll free (800) 565-7227
Fax (902) 420-8612

Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201448H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/13
Reported : 2002/02/13

Certificate of Analysis

Method Summaries:

- Mercury in Soils and Sediments: Digestion/Cold Vapour Atomic Absorption.
  Ref: USEPA Method #245.5
- Available Trace Metals in soils/sediments: Nitric/Peroxide Digestion.
  Ref:USEPA Method #3050B.

All work recorded herein has been done in accordance with normal professional standards using accepted testing technologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis performed. There is no other warranty expressed or implied. Excess sample will be discarded upon expiry of hold time.

Approval of Inorganic Parameters:

Inorganics Manager : ____________________
Jerry Arenovich

ANALYTICAL SERVICES

Inorganic Parameters

Client : Jacques Whitford Environment Ltd. PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

PSC Project Number : 0201401H
Client Project Number : NBF 12711

Matrix	Soil	Soil	Soil	Soil
Philip ID	02-H005189	02-H005190	02-H005191	02-H005192
Client ID	SBHX, A	SBHY, A	SS3, A	SBH 1, A
Date Sampled (y/m/d)	02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)	02/02/05	02/02/05	02/02/05	02/02/05

Analyte	Units	EQL				
HNO3 Peroxide Digestion		-	20020207-A	20020207-A	20020207-A	20020207-A
Mercury Digestion		-	20020206-A	20020206-A	20020206-A	20020206-A
Aluminum	mg/kg	10	9700	9100	9400	10000
Antimony	mg/kg	2.	nd	nd	nd	nd
Antimony Recovery	%	-	30.	30.	30.	30.
Arsenic	mg/kg	2.	6.	5.	7.	5.
Barium	mg/kg	5.	35.	33.	42.	32.
Beryllium	mg/kg	5.	nd	nd	nd	nd
Boron	mg/kg	5.	nd	nd	nd	nd
Cadmium	mg/kg	0.3	nd	nd	0.4	0.3
Chromium	mg/kg	2.	16.	15.	20.	22.
Cobalt	mg/kg	1.	9.	8.	9.	10.
Copper	mg/kg	2.	27.	24.	51.	33.
Iron	mg/kg	20	19000	17000	19000	19000
Iron Recovery	%	-	90.	90.	90.	90.
Lead	mg/kg	0.5	13.	19.	80.	25.
Manganese	mg/kg	2.	430	450	490	510
Molybdenum	mg/kg	2.	nd	nd	nd	nd
Nickel	mg/kg	2.	16.	14.	22.	16.
Selenium	mg/kg	2.	nd	nd	nd	nd
Silver	mg/kg	0.5	nd	nd	nd	nd
Strontium	mg/kg	5.	10.	20.	10.	11.
Thallium	mg/kg	0.1	nd	nd	0.1	nd
Uranium	mg/kg	0.1	0.4	0.5	0.9	0.5

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified

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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005189	02-H005190	02-H005191	02-H005192
Client ID			SBHX, A	SBHY, A	SS3, A	SBH 1, A
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL	(Continued from previous page)			
Vanadium	mg/kg	2.	25.	26.	44.	34.
Zinc	mg/kg	2.	58.	52.	1300	130
Mercury	mg/kg	0.01	0.01	0.01	0.04	0.02

02-H005189 SBHX, A Boron is 60 % recovery in the digested reference material for sample batch 20020207-A.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
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Saint John
NB E2L 5C5
FAX # : 506-634-8104
PSC Project Number : 0201401H
Printed : 2002/02/12
Client Project Number : NBF 12711
Reported : 2002/02/12

Matrix	Soil	Soil	Soil	Soil
Philip ID	02-H005193	02-H005194	02-H005195	02-H005196
Client ID	SBH 2, A	SBH 3, A	SBH 4, A	SBH 4, ADUP
Date Sampled (y/m/d)	02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)	02/02/05	02/02/05	02/02/05	02/02/05

Analyte	Units	EQL				DUP
HNO3 Peroxide Digestion		-	20020207-A	20020207-A	20020207-A	20020207-A
Mercury Digestion		-	20020206-A	20020206-A	20020206-A	20020206-A
Aluminum	mg/kg	10	9400	9500	8900	8800
Antimony	mg/kg	2.	nd	nd	nd	nd
Antimony Recovery	%	-	30.	30.	30.	30.
Arsenic	mg/kg	2.	6.	4.	5.	5.
Barium	mg/kg	5.	37.	33.	37.	38.
Beryllium	mg/kg	5.	nd	nd	nd	nd
Boron	mg/kg	5.	nd	nd	nd	nd
Cadmium	mg/kg	0.3	nd	nd	nd	nd
Chromium	mg/kg	2.	19.	13.	15.	20.
Cobalt	mg/kg	1.	9.	7.	9.	9.
Copper	mg/kg	2.	27.	24.	26.	24.
Iron	mg/kg	20	18000	15000	18000	18000
Iron Recovery	%	-	90.	90.	90.	90.
Lead	mg/kg	0.5	14.	9.1	32.	22.
Manganese	mg/kg	2.	450	510	510	510
Molybdenum	mg/kg	2.	nd	nd	nd	nd
Nickel	mg/kg	2.	15.	11.	14.	14.
Selenium	mg/kg	2.	nd	nd	nd	nd
Silver	mg/kg	0.5	nd	nd	nd	nd
Strontium	mg/kg	5.	10.	10.	12.	12.
Thallium	mg/kg	0.1	nd	nd	0.1	0.1
Uranium	mg/kg	0.1	0.4	0.4	0.9	0.8

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005193	02-H005194	02-H005195	02-H005196
Client ID			SBH 2, A	SBH 3, A	SBH 4, A	SBH 4, ADUP
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL	(Continued from previous page)			
Vanadium	mg/kg	2.	24.	22.	26.	27.
Zinc	mg/kg	2.	59.	44.	52.	50.
Mercury	mg/kg	0.01	0.01	0.01	0.01	0.01

02-H005196 SBH 4, ADUP

Poor chromium and lead RPD result due to sample inhomogeneity.
Antimony is 10 % recovery in the digested matrix spike.
Poor lead spike recovery due to to sample inhomogeneity.
Pb = 250 % recovery in the spike.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005197	02-H005206	02-H005207	02-H005208
Client ID			SBH 5, A	SBH6, A	SBH7, A	SBH8, A
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	**Units**	**EQL**				
HNO3 Peroxide Digestion		-	20020207-A	20020207-A	20020207-A	20020207-A
Mercury Digestion		-	20020206-B	20020206-B	20020206-B	20020206-B
Aluminum	mg/kg	10	8300	9000	8200	10000
Antimony	mg/kg	2.	nd	nd	nd	nd
Antimony Recovery	%	-	30.	30.	30.	30.
Arsenic	mg/kg	2.	5.	6.	5.	5.
Barium	mg/kg	5.	30.	34.	29.	34.
Beryllium	mg/kg	5.	nd	nd	nd	nd
Boron	mg/kg	5.	nd	nd	nd	nd
Cadmium	mg/kg	0.3	nd	nd	nd	nd
Chromium	mg/kg	2.	13.	15.	21.	21.
Cobalt	mg/kg	1.	8.	9.	8.	10.
Copper	mg/kg	2.	30.	25.	24.	27.
Iron	mg/kg	20	16000	17000	16000	20000
Iron Recovery	%	-	90.	90.	90.	90.
Lead	mg/kg	0.5	12.	10.	10.	26.
Manganese	mg/kg	2.	400	460	480	490
Molybdenum	mg/kg	2.	nd	nd	nd	nd
Nickel	mg/kg	2.	12.	13.	13.	17.
Selenium	mg/kg	2.	nd	nd	nd	nd
Silver	mg/kg	0.5	nd	nd	nd	nd
Strontium	mg/kg	5.	11.	8.	9.	11.
Thallium	mg/kg	0.1	nd	nd	nd	nd
Uranium	mg/kg	0.1	0.4	0.6	1.4	0.4

Legend:

EQL	=	Estimated Quantitation Limit for routine analysis
nd	=	not detected above standard EQL
nd()	=	not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
-	=	Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified

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200 Bluewater Road
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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005197	02-H005206	02-H005207	02-H005208
Client ID			SBH 5, A	SBH6, A	SBH7, A	SBH8, A
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL	(Continued from previous page)			
Vanadium	mg/kg	2.	25.	24.	23.	29.
Zinc	mg/kg	2.	48.	84.	42.	61.
Mercury	mg/kg	0.01	0.01	0.01	0.01	0.06

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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Saint John
NB E2L 5C5

FAX # : 506-634-8104
PSC Project Number : 0201401H
Printed : 2002/02/12
Client Project Number : NBF 12711
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005209	02-H005210	02-H005211	02-H005212
Client ID			SBH9, A	SBH10, A	SBH11, A	SBH12, A
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	**Units**	**EQL**				
HNO3 Peroxide Digestion		-	20020207-A	20020207-A	20020207-A	20020207-A
Mercury Digestion		-	20020206-B	20020206-B	20020206-B	20020206-B
Aluminum	mg/kg	10	8800	8800	10000	9500
Antimony	mg/kg	2.	nd	nd	nd	nd
Antimony Recovery	%	-	30.	30.	30.	30.
Arsenic	mg/kg	2.	6.	5.	6.	4.
Barium	mg/kg	5.	33.	33.	41.	31.
Beryllium	mg/kg	5.	nd	nd	nd	nd
Boron	mg/kg	5.	nd	nd	nd	nd
Cadmium	mg/kg	0.3	nd	nd	nd	nd
Chromium	mg/kg	2.	18.	16.	19.	17.
Cobalt	mg/kg	1.	8.	8.	10.	8.
Copper	mg/kg	2.	30.	24.	27.	28.
Iron	mg/kg	20	21000	17000	20000	17000
Iron Recovery	%	-	90.	90.	90.	90.
Lead	mg/kg	0.5	46.	21.	13.	9.7
Manganese	mg/kg	2.	540	430	480	450
Molybdenum	mg/kg	2.	nd	nd	nd	nd
Nickel	mg/kg	2.	15.	14.	17.	14.
Selenium	mg/kg	2.	nd	nd	nd	nd
Silver	mg/kg	0.5	nd	nd	nd	nd
Strontium	mg/kg	5.	17.	22.	15.	5.
Thallium	mg/kg	0.1	nd	nd	nd	nd
Uranium	mg/kg	0.1	0.4	0.5	0.5	0.5

Legend:
EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
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NB E2L 5C5

FAX # : 506-634-8104
PSC Project Number : 0201401H
Printed : 2002/02/12
Client Project Number : NBF 12711
Reported : 2002/02/12

Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005209	02-H005210	02-H005211	02-H005212
Client ID			SBH9, A	SBH10, A	SBH11, A	SBH12, A
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL	(Continued from previous page)			
Vanadium	mg/kg	2.	29.	25.	26.	24.
Zinc	mg/kg	2.	53.	50.	58.	46.
Mercury	mg/kg	0.01	0.20	0.01	0.01	0.03

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix	Soil
Philip ID	02-H005213
Client ID	SBH12, A D UP
Date Sampled (y/m/d)	02/01/29
Date Received (y/m/d)	02/02/05

Analyte	Units	EQL	DUP
HNO3 Peroxide Digestion		-	20020207-A
Mercury Digestion		-	20020206-B
Aluminum	mg/kg	10	10000
Antimony	mg/kg	2.	nd
Antimony Recovery	%	-	30.
Arsenic	mg/kg	2.	5.
Barium	mg/kg	5.	33.
Beryllium	mg/kg	5.	nd
Boron	mg/kg	5.	nd
Cadmium	mg/kg	0.3	nd
Chromium	mg/kg	2.	20.
Cobalt	mg/kg	1.	10.
Copper	mg/kg	2.	28.
Iron	mg/kg	20	18000
Iron Recovery	%	-	90.
Lead	mg/kg	0.5	21.
Manganese	mg/kg	2.	490
Molybdenum	mg/kg	2.	nd
Nickel	mg/kg	2.	16.
Selenium	mg/kg	2.	nd
Silver	mg/kg	0.5	nd
Strontium	mg/kg	5.	5.
Thallium	mg/kg	0.1	nd
Uranium	mg/kg	0.1	0.5

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

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Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix	Soil
Philip ID	02-H005213
Client ID	SBH12, A D UP
Date Sampled (y/m/d)	02/01/29
Date Received (y/m/d)	02/02/05

Analyte	Units	EQL	(Continued from previous page)
Vanadium	mg/kg	2.	28.
Zinc	mg/kg	2.	51.
Mercury	mg/kg	0.01	0.02

02-H005213 SBH12, A DUP Poor lead RPD result due to sample inhomogeneity.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

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PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Certificate of Analysis

Method Summaries:

- Mercury in Soils and Sediments: Digestion/Cold Vapour Atomic Absorption.
  Ref: USEPA Method #245.5
- Available Trace Metals in soils/sediments: Nitric/Peroxide Digestion.
  Ref:USEPA Method #3050B.

All work recorded herein has been done in accordance with normal professional standards using accepted testing technologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis performed. There is no other warranty expressed or implied. Excess sample will be discarded upon expiry of hold time.

Approval of Inorganic Parameters:

Inorganics Manager : ______________________
Jerry Arenovich

Organic Parameters

Client : Jacques Whitford Environment Ltd. PAULIN, PAUL
20 Broadview Ave.
Saint John
NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Water	Water	Water	Water
Philip ID			02-H005160	02-H005161	02-H005162	02-H005163
Client ID			MW 1	MW 2	MW 3	MW 4
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL				
TEH C11-32 Water Event #		-	FJ74	FJ74	FJ74	FJ74
VPH Water Event #		-	FJ87	FJ87	FJ87	FJ87
Benzene	mg/L	0.001	nd	nd	nd	nd
Toluene	mg/L	0.001	nd	nd	nd	nd
Ethylbenzene	mg/L	0.001	nd	nd	nd	nd
Xylenes	mg/L	0.002	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/L	0.01	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/L	0.05	nd	0.36	0.14	nd
>C21-C32 (Lube Range)	mg/L	0.1	nd	0.5	0.2	nd
Modified TPH - Tier 1	mg/L	0.2	nd	0.9	0.3	nd
VPH Surrogate (IBB)	% Rec.	-	95.	94.	96.	94.
TEH Surrogate (IBB)	% Rec.	-	101.	102.	98.	98.
TEH Surrogate (C32)	% Rec	-	92.		129.	110.

Note: **The product resemblance comments are provided for general guidance only and may not be accurate.** Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005160	MW 1	TEH sample contained sediment.
02-H005161	MW 2	One product in fuel / lube range; interference due to possible PAHs. TEH (NT) surrogate is not within acceptable limits. Sample was repeated. TEH sample contained sediment.
02-H005162	MW 3	Lube oil fraction; interference from possible PAHs. TEH sample contained sediment.
02-H005163	MW 4	TEH sample contained sediment.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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PSC Analytical Services
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Client : Jacques Whitford Environment Ltd.PAULIN, PAUL
20 Broadview Ave.
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NB E2L 5C5
PSC Project Number : 0201401H
Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Water	Water	Water	Water
Philip ID			02-H005164	02-H005165	02-H005166	02-H005167
Client ID			MW 5	MW 6	MW 7	MW X
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL				
TEH C11-32 Water Event #		-	FJ74	FJ74	FJ74	FJ74
VPH Water Event #		-	FJ87	FJ87	FJ87	FJ87
Benzene	mg/L	0.001	nd	nd	nd	nd
Toluene	mg/L	0.001	nd	nd	0.003	nd
Ethylbenzene	mg/L	0.001	nd	nd	nd	nd
Xylenes	mg/L	0.002	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/L	0.01	nd	nd	0.01	nd
>C10-C21 (Fuel Range)	mg/L	0.05	0.45	nd	0.29	0.48
>C21-C32 (Lube Range)	mg/L	0.1	0.6	nd	1.1	0.5
Modified TPH - Tier 1	mg/L	0.2	1.0	nd	1.4	1.0
VPH Surrogate (IBB)	% Rec.	-	94.	93.	98.	100.
TEH Surrogate (IBB)	% Rec.	-	96.	101.	95.	99.
TEH Surrogate (C32)	% Rec	-	125.	113.	119.	121.

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005164	MW 5	One product in fuel / lube range; interference due to possible PAHs. TEH sample contained sediment.
02-H005165	MW 6	TEH sample contained sediment.
02-H005166	MW 7	Gasoline range.
02-H005166	MW 7	Lube oil fraction. TEH sample contained sediment.
02-H005167	MW X	One product in fuel / lube range; interference due to possible PAHs.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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Client Project Number : NBF 12711

FAX # : 506-634-8104
Printed : 2002/02/12
Reported : 2002/02/12

Matrix			Water	Soil	Soil	Soil
Philip ID			02-H005168	02-H005169	02-H005170	02-H005171
Client ID			MW X DUP	MW 1, Sa#1	MW 1, Sa#7	MW 2, Sa#1
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	**Units**	**EQL**	**DUP**			
TEH C11-32 Water Event #		-	FJ74	-	-	-
TEH C11-32 Soil Event #		-	-	FJ67	FJ67	FJ67
VPH Water Event #		-	FJ87	-	-	-
Benzene	mg/L	0.001	nd	-	-	-
Toluene	mg/L	0.001	nd	-	-	-
Ethylbenzene	mg/L	0.001	nd	-	-	-
Xylenes	mg/L	0.002	nd	-	-	-
C6 - C10 HC {less BTEX}	mg/L	0.01	nd	-	-	-
>C10-C21 (Fuel Range)	mg/L	0.05	0.34	-	-	-
>C21-C32 (Lube Range)	mg/L	0.1	0.4	-	-	-
Modified TPH - Tier 1	mg/L	0.2	0.7	-	-	-
VPH Surrogate (IBB)	% Rec.	-	97.	-	-	-
TEH Surrogate (IBB)	% Rec.	-	99.	-	-	-
VPH in Soil Event #		-	-	FJ73	FJ73	FJ73
Benzene	mg/kg	0.025	-	nd	nd	nd
Toluene	mg/kg	0.025	-	0.032	nd	nd
Ethylbenzene	mg/kg	0.025	-	0.237	nd	nd
Xylenes	mg/kg	0.050	-	0.651	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	-	22.	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15.	-	280	nd	nd
>C21-C32 (Lube Range)	mg/kg	15.	-	350	19.	nd
Modified TPH - Tier 1	mg/kg	32.	-	650	nd	nd
TEH Surrogate (IBB)	% Rec.	-	-	93.	88.	97.
TEH Surrogate (C32)	% Rec	-	120.	100.	92.	94.
VPH Surrogate (IBB)	% Rec.	-	-	73.	116.	84.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
\- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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Matrix			Water	Soil	Soil	Soil
Philip ID			02-H005168	02-H005169	02-H005170	02-H005171
Client ID			MW X DUP	MW 1, Sa#1	MW 1, Sa#7	MW 2, Sa#1
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL	(Continued from previous page)			
Moisture	%	-	-	4.7	9.6	4.3

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005168	MW X DUP	One product in fuel / lube range; interference due to possible PAHs.
02-H005169	MW 1, Sa#1	Fuel oil fraction. Lube oil fraction.
02-H005170	MW 1, Sa#7	Lube oil range.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
\- = Parameter not requested in Sample
Note : Soil results are expressed on a dry weight basis.
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% Rec = Percent Recovery of added surrogate compound(s)

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Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005172	02-H005173	02-H005174	02-H005175
Client ID			MW 2, Sa#9	MW 3, Sa#2	MW 3, Sa#6	MW 4, Sa#2
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL				
TEH C11-32 Soil Event #		-	FJ67	FJ67	FJ67	FJ67
VPH in Soil Event #		-	FJ73	FJ73	FJ73	FJ73
Benzene	mg/kg	0.025	nd	nd	nd	nd
Toluene	mg/kg	0.025	nd	nd	nd	nd
Ethylbenzene	mg/kg	0.025	nd	nd	nd	nd
Xylenes	mg/kg	0.050	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15.	120	51.	nd	nd
>C21-C32 (Lube Range)	mg/kg	15.	280	220	nd	40.
Modified TPH - Tier 1	mg/kg	32.	400	270	nd	40.
TEH Surrogate (IBB)	% Rec.	-	90.	93.	91.	99.
TEH Surrogate (C32)	% Rec	-	113.	120.	90.	105.
VPH Surrogate (IBB)	% Rec.	-	99.	71.	95.	75.
Moisture	%	-	32.	4.7	15.	3.9

Note: **The product resemblance comments are provided for general guidance only and may not be accurate.** Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005172	MW 2, Sa#9	Lube oil fraction; interference from possible PAHs.
02-H005173	MW 3, Sa#2	Traces of fuel oil fraction. Lube oil fraction.
02-H005175	MW 4, Sa#2	Lube oil range.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
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Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005176	02-H005177	02-H005178	02-H005179
Client ID			MW 4, Sa#10	MW 5, Sa#2	MW 5A, Sa#4A	MW 6, Sa#1
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	Units	EQL				
TEH C11-32 Soil Event #		-	FJ67	FJ67	FJ67	FJ67
VPH in Soil Event #		-	FJ73	FJ73	FJ73	FJ73
Benzene	mg/kg	0.025	nd	nd	nd	nd
Toluene	mg/kg	0.025	nd	nd	0.115	nd
Ethylbenzene	mg/kg	0.025	nd	nd	nd	nd
Xylenes	mg/kg	0.050	nd	nd	0.242	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nd	nd	7.1	nd
>C10-C21 (Fuel Range)	mg/kg	15.	nd	35.	390	nd
>C21-C32 (Lube Range)	mg/kg	15.	nd	86.	670	18.
Modified TPH - Tier 1	mg/kg	32.	nd	120	1100	nd
TEH Surrogate (IBB)	% Rec.	-	87.	89.	93.	93.
TEH Surrogate (C32)	% Rec	-	88.	101.	129.	91.
VPH Surrogate (IBB)	% Rec.	-	90.	85.	91.	86.
Moisture	%	-	10.	6.7	11.	5.8

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005177	MW 5, Sa#2	Fuel/Lube oil range.
02-H005178	MW 5A, Sa#4A	Gasoline range.
02-H005178	MW 5A, Sa#4A	Lube oil fraction; interference from possible PAHs.
02-H005179	MW 6, Sa#1	Lube oil range.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
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Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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Client Project Number : NBF 12711

FAX # : 506-634-8104
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Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005180	02-H005181	02-H005182	02-H005183
Client ID			MW 6, Sa#1 DUP	MW 6, Sa#8	MW 7, Sa#1 A	MW 7, Sa#6
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	**Units**	**EQL**	**DUP**			
TEH C11-32 Soil Event #		-	FJ67	FJ67	FJ67	FJ67
VPH in Soil Event #		-	FJ73	FJ73	FJ73	FJ73
Benzene	mg/kg	0.025	nd	nd	nd	nd
Toluene	mg/kg	0.025	nd	nd	nd	nd
Ethylbenzene	mg/kg	0.025	nd	nd	nd	nd
Xylenes	mg/kg	0.050	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15.	nd	nd	nd	nd
>C21-C32 (Lube Range)	mg/kg	15.	20.	nd	35.	39.
Modified TPH - Tier 1	mg/kg	32.	nd	nd	35.	39.
TEH Surrogate (IBB)	% Rec.	-	97.	90.	95.	87.
TEH Surrogate (C32)	% Rec	-	97.	91.	103.	93.
VPH Surrogate (IBB)	% Rec.	-	96.	108.	100.	84.
Moisture	%	-	5.8	9.9	5.9	11.

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005180	MW 6, Sa#1DUP	Lube oil range.
02-H005182	MW 7, Sa#1A	Lube oil range.
02-H005183	MW 7, Sa#6	Lube oil range.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
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Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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Matrix			Soil	Soil	Soil	Soil
Philip ID			02-H005184	02-H005185	02-H005186	02-H005187
Client ID			BH1, Sa#1	BH1, Sa#3	MWY, Sa#1	MWZ, Sa#1
Date Sampled (y/m/d)			02/01/29	02/01/29	02/01/29	02/01/29
Date Received (y/m/d)			02/02/05	02/02/05	02/02/05	02/02/05
Analyte	**Units**	**EQL**				
TEH C11-32 Soil Event #		-	FJ67	FJ67	FJ67	FJ68
VPH in Soil Event #		-	FJ73	FJ73	FJ73	FJ85
Benzene	mg/kg	0.025	nd	nd	nd	nd
Toluene	mg/kg	0.025	nd	nd	nd	nd
Ethylbenzene	mg/kg	0.025	nd	nd	nd	nd
Xylenes	mg/kg	0.050	nd	nd	nd	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nd	nd	nd	nd
>C10-C21 (Fuel Range)	mg/kg	15.	nd	nd	nd	nd
>C21-C32 (Lube Range)	mg/kg	15.	nd	nd	29.	34.
Modified TPH - Tier 1	mg/kg	32.	nd	nd	nd	34.
TEH Surrogate (IBB)	% Rec.	-	92.	86.	88.	76.
TEH Surrogate (C32)	% Rec	-	105.	87.	93.	58.
VPH Surrogate (IBB)	% Rec.	-	80.	94.	89.	61.
Moisture	%	-	3.1	15.	4.6	11.

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005186 MWY, Sa#1 Lube oil range.
02-H005187 MWZ, Sa#1 VPH surrogate not within acceptance limits. Sample was repeated with similar results.
02-H005187 MWZ, Sa#1 Lube oil fraction.
TEH Surrogate (NT) is not within acceptance limits. Sample repeated with similar results

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
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Note : Soil results are expressed on a dry weight basis.
Biota results are expressed on a wet weight basis.
% Rec = Percent Recovery of added surrogate compound(s)

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FAX # : 506-634-8104
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Matrix	Soil
Philip ID	02-H005188
Client ID	MWZ, Sa#1D UP
Date Sampled (y/m/d)	02/01/29
Date Received (y/m/d)	02/02/05

Analyte	Units	EQL	DUP
TEH C11-32 Soil Event #		-	FJ68
VPH in Soil Event #		-	FJ85
Benzene	mg/kg	0.025	nd
Toluene	mg/kg	0.025	nd
Ethylbenzene	mg/kg	0.025	nd
Xylenes	mg/kg	0.050	nd
C6 - C10 HC {less BTEX}	mg/kg	2.5	nd
>C10-C21 (Fuel Range)	mg/kg	15.	nd
>C21-C32 (Lube Range)	mg/kg	15.	36.
Modified TPH - Tier 1	mg/kg	32.	36.
TEH Surrogate (IBB)	% Rec.	-	92.
TEH Surrogate (C32)	% Rec	-	71.
VPH Surrogate (IBB)	% Rec.	-	75.
Moisture	%	-	11.

Note: The product resemblance comments are provided for general guidance only and may not be accurate. Resemblances are based on comparison with available reference standards. Due to chromatographic similarity of certain products, the influence of weathering effects and interference of non-petrogenic compounds, it is not always possible to positively identify products.

Notes: Modified TPH - Tier 1 (C6-C32) does not include BTEX

02-H005188 MWZ, Sa#1DUP Lube oil fraction.

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL shown in parentheses
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% Rec = Percent Recovery of added surrogate compound(s)

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Certificate of Analysis

Method Summaries :

- Purgeable Hydrocarbons - Soil: Methanol extr'n. Headspace/GC-PID-FID. Varian Genesis/3400 or HP5890 GC. Ref: Atlantic PIRI Guidelines for Laboratories, Draft 1.0, 1999.
- Extractable Hydrocarbons - Water: Hexane extraction. HP5890 GC/FID. Ref: Atlantic PIRI Guidelines for Laboratories, Draft 1.0, 1999.
- Volatile Petroleum Hydrocarbons - Water: Tekmar LSC2000. Autosampler. Varian 3400/Saturn II or HP6890 GC/MS. Ref: Atlantic PIRI Guidelines for Laboratories, Draft 1.0, 1999.
- Extractable Hydrocarbons - Soil: Acetone/Hexane extraction. HP5890 GC/FID. Ref: Atlantic PIRI Guidelines for Laboratories, Draft 1.0, 1999.
- Moisture Content: Heating at 103C. Gravimetric det'n - as received basis. Ref: Ontario MOE Analytical Methods for Env. Samples, Vol.1, Method: ME

Approval of Organic Parameters:

Organics Manager : Bruce Phillips
Bruce Phillips

ANALYTICAL SERVICES

PSC Analytical Services Inc.

Quality Assurance Data for TEH by GC/FID

Matrix: Soil

Date: February 7, 2002

Event Number: FJ67

Compound	QCA Target mg/kg	QCA % Recovery	QCB Target mg/kg	QCB % Recovery	Method Blank mg/kg
TEH (>C10-C32)	1000	99	1000	99	< 30

Analyst

Manager

ANALYTICAL SERVICES

PSC Analytical Services Inc.

Quality Assurance Data for TEH by GC/FID

Matrix: Soil
Date: February 7, 2002
Event Number: FJ68

Compound	QCA Target mg/kg	QCA % Recovery	QCB Target mg/kg	QCB % Recovery	Method Blank mg/kg
TEH (>C10-C32)	1000	106			< 30
TEH (>C10-C32)			1000	105	< 30

Analyst

Manager

ANALYTICAL SERVICES

PSC Analytical Services Inc.

Quality Assurance Data for TPH by Headspace GC/PID/FID

Matrix: Headspace Soils

Date: February 8, 2002

Event Number: FJ73

Compound	QCA Target mg/kg	QCA % Recovery	QCB Target mg/kg	QCB % Recovery	Method Blank mg/kg
Benzene	1.00	95	1.00	92	< 0.025
Toluene	1.00	96	1.00	94	< 0.025
Ethyl Benzene	1.00	94	1.00	94	< 0.025
Xylenes	3.00	93	3.00	93	< 0.05
Gasoline	66	92	66	97	< 2.5

Analyst

Manager

PSC Analytical Services Inc.

Quality Assurance Data for TEH by GC/FID

Matrix: Water
Date: February 8, 2002
Event Number: FJ74

Compound	QCA Target mg/L	QCA % Recovery	QCB Target mg/L	QCB % Recovery	Method Blank mg/L
TEH (>C10-C32)	8	107			< 0.15
TEH (>C10-C32)			8	103	< 0.15

Analyst

Manager

PSC Analytical Services Inc.

Quality Assurance Data for TPH by Headspace GC/PID/FID

Matrix: Headspace Soils

Date: February 8, 2002

Event Number: FJ85

Compound	QCA Target mg/kg	QCA % Recovery	QCB Target mg/kg	QCB % Recovery	Method Blank mg/kg
Benzene	1.00	93	1.00	93	< 0.025
Toluene	1.00	91	1.00	91	< 0.025
Ethyl Benzene	1.00	88	1.00	89	< 0.025
Xylenes	3.00	87	3.00	87	< 0.05
Gasoline	66	95	66	88	< 2.5

Analyst

Manager

PSC

ANALYTICAL SERVICES

PSC Analytical Services Inc.

Quality Assurance Data for TPH by Purge & Trap GC/MS

Matrix: P&T Waters

Date: February 8, 2002

Event Number: FJ87

Compound	QCA Target mg/L	QCA % Recovery	QCB Target mg/L	QCB % Recovery	Method Blank mg/L
Benzene	0.0200	90	0.0200	89	< 0.001
Toluene	0.0200	95	0.0200	93	< 0.001
Ethyl Benzene	0.0200	93	0.0200	93	< 0.001
Xylenes	0.0600	91	0.0600	91	< 0.002
Gasoline	0.49	84	0.49	82	< 0.01

Analyst

Manager

APPENDIX C

RPIS CONTAMINATED SITE MODULE

Contaminated Sites Summary

Friday, March [illegible], 2002

Region: [illegible]

Site Name Canadian Coast Guard Base Saint John

Site Number M D 00309

Site Descriptor Base

List of Lights Number

Province New Brunswick

Land Descriptor Unit 03920

Sector Corporate Services

Status Surplused

Custodian F&OO

Site Location

Street Address Water Street at Princess Street, Peters Wharf

City

Postal Code

Latitude 45-16-16

Longitude 66-03-52

Contaminated Site Name PAHs and metals in soil near shop building

CS Number 001

Status Under Assessment

Regional File Number

National File Number

Location of Contamination PAH contamination in subsurface soils located near the former UST location situated west of the shop building. Metals contamination located in soils near the north end of the shop building near the oil-water seperator location.

Latitude 45 16 16

Longitude 166 3 52

Action Plan

Additional Information PAHs were also identified in surface soils at MW5 (South of admin building near wharf) and in groundwater.

APPENDIX D

DETAILED NCS EVALUATION FORM / MARINE RANKING SUMMARY FORM

Site Identification: <u>Saint John CCG Base PAH and Zinc Impacted Soils</u>

DETAILED EVALUATION FORM

I **CONTAMINANTS CHARACTERISTIC** (Maximum Total Score is 33)
Complete **Sections A, B, C,** and **Special Considerations**
If answer is an estimate, circle the question mark (?) beside your score;
if not an estimate circle the checkmark (✓)

Factors		Scoring Guideline	Site Score		Totals
			?	✓	
A	**Degree of Hazard (max. 14)**				
	High concern contaminants - high concentration	14			
	High concern contaminants - low concentration	11		14	
	Medium concern contaminants - high concentration	8			
	Medium concern contaminants - low concentration	5			
	Low concern contaminants	3			14 Section A max. 14
B	**Contaminant Quantity** (area of volume of site contamination) (max.10)				
	>10 ha or 1000 m^3 or drums of liquid	10	5		
	2 to 10 ha or 100 to 1000 m^3	6			
	<2 ha or 100 m^3	2			5 Section B max. 10
C	**Physical State of Contaminants** (max.9)				
	Liquid/gas	9			
	Sludge	7			
	Solid	3		3	3 Section C max. 9
Special Considerations					
	Discretionary addition or subtraction to this category score (Contaminant Characteristics) by up to 6 points based on technical judgment of the user. (Special considerations scores must not cause total score for this category to exceed the maximum (33) or be lower than the minimum (0) allowable.)				
	DETAILED RATIONALE MUST BE DOCUMENTED	-6 to +6			0 max. 6

I **Total Site Score for CONTAMINANT CHARACTERS**

Add:

	Total "✓"	Total "?"	Total "✓"+"?"
Section A	14	0	14
Section B	0	5	5
Section C	3	0	3
Special Considerations	0	0	0
TOTAL	17	5	22
			max. 33

Site Identification: <u>Saint John CCG Base PAH and Zinc Impacted Soils</u>

DETAILED EVALUATION FORM (Cont'd)

II **EXPOSURE PATHWAYS** (Maximum Total Score is 33)
Complete **Sections A, B, C**

A **Groundwater** (Maximum Score is 11)
Score **Section 1 (Known)** or **2 (Potential)**, and **Section 3.**
If answer is an estimate, circle the question mark (?) beside your score;
if not an estimate circle the checkmark (✓)

			Site Score		
Factors		Scoring Guideline	?	✓	Totals
1	**Known Contamination of Groundwater at or beyond the Property Boundary**				
	(measured contamination of, or known contact with, groundwater (max. 11))				
	Groundwater significantly exceeds CDWG (by >2x) or known contact of contaminants with groundwater	11		11	
	Between 1 and 2x CDWG or probable contact with groundwater	6			
	Meets Canadian Drinking Water Guidelines	0			11 Section 1 max. 11
	If impact on groundwater is not known complete **2**				
OR 2	**Potential for Groundwater Contamination** (max. 11)				
	a) Engineered subsurface containment (max. 4)				
	No containment	4			
	Partial Containment	2			
	Full Containment	0			
	b) Thickness of confining layer over aquifer (max. 1.5)				
	3 m or less	1.5			
	3 to 10 m	1			
	> 10 m	0			
	c) Hydraulic conductivity of the confining layer (max. 1.5)				
	$>10^{-4}$ cm/sec	1.5			
	10^{-4} to 10-6 cm/sec	1			
	$<10^{-6}$ cm/sec	0.5			
	d) Annual rainfall (max. 1)				
	>1,000 mm	1			
	600 mm	0.6			
	400 mm	0.4			
	200 mm	0.2			
	e) Hydraulic conductivity of aquifer(s) of concern (max. 3)				
	$>10^{-2}$ cm/sec	3			
	10^{-2} to 10^{-4} cm/sec	1.5			0 Section 2 max. 11
	$<10^{-4}$ cm/sec	0.5			

3 **Special Considerations**

Discretionary addition or subtraction to this sub-category score (Groundwater Pathway) by up to 4 points based on technical judgment of the user. (Special considerations scores must not cause total score for this sub-category to exceed the maximum (11) or be lower than the minimum (0) allowable.)

DETAILED RATIONALE MUST BE DOCUMENTED -4 to +4 0

Section 3
max. 4

A **Groundwater Total**

		Total "✓"	Total "?"	Total "✓"+"?"
Add:	Section 1 or 2	11	0	11
	Section 3	0	0	0
	TOTAL	11	0	11
				max. 11

Site Identification: Saint John CCG Base PAH and Zinc Impacted Soils

DETAILED EVALUATION FORM (Cont'd)

II EXPOSURE PATHWAYS (Cont'd)

B Surface Water (Maximum Score is 11)

Score **Section 1 (Known)** or **2 (Potential)**, and **Section 3.**

			Site Score		
Factors		Scoring Guideline	?	✓	Totals
1	**Observed or Measured Contamination of Water/Effluent Discharged from Site** (max.11)				
	Known or strongly suspected to exceed CWQG by >2x	11			
	Known or strongly suspected to be between 1 and 2x CWQG	6			
	Meets Canadian Water Quality Guidelines	0			0
					Section 1 max. 11
	If impact on surface water is not known complete **2**				
OR 2	**Potential for Surface Water Contamination** (max. 11)				
	a) Surface containment (max. 5)				
	No containment	5			
	Partial Containment	3			
	Full Containment	3		3	
	b) Distance to perennial surface water (max. 3)				
	0 to <100 m	3		3	
	100-300 m	2			
	>300 m	0.5			
	c) Topography (max. 1.5)				
	Contaminants above ground level and slope is steep	1.5			
	Contaminants at or below ground level and slope is steep	1.2			
	Contaminants above ground level and slope is flat	0.8			
	Contaminants at or below ground level and slope is flat	0		1.2	
	d) Run-off potential (see nomograph at end of Appendix D) (max. 1)				
	>1,000 mm rainfall and low permeability surface material	1			
	500-1000 mm rainfall and moderately permeable surface material	0.6		1	
	<500 mm rainfall and highly permeable surface material	0.2			
	e) Flood potential (max. 0.5)				
	1 in 2 years	0.5	0.25		
	1 in 10 years	0.3			8.45
	1 in 50 years	0.1			Section 2 max. 11

Special Considerations

Discretionary addition or subtraction to this sub-category score (Surface Water Pathway) by up to 4 points based on technical judgment of the user. (Special considerations scores must not cause total score for this sub-category to exceed the maximum (11) or be lower than the minimum (0) allowable.)

DETAILED RATIONALE MUST BE DOCUMENTED -4 to +4 0

Section 3 max. 4

				Total "✓"	Total "?"	Total "✓"+"?"
B	**Surface Water Total**	Add:	Section 1 or 2	8.2	0.25	8.45
			Section 3	0	0	0
			TOTAL	8.2	0.25	8.45
						max. 11

Site Identification: Saint John CCG Base PAH and Zinc Impacted Soils

DETAILED EVALUATION FORM (Cont'd)

II **EXPOSURE PATHWAYS** (Cont'd)

C **Direct Contact** (Maximum Score is 11)
Score **Section 1 (Known)** or **2 (Potential)**, and **Section 3.**

			Site Score		
	Factors	Scoring Guideline	?	✓	Totals
1	**Known Contamination of Media Off-site (max. 11)**				
	Known contamination of media (soil, sediment, air) off-site due to direct contact with contaminated soil, dust, air etc. (vector transported should also be considered)	11			
	Strongly suspected contamination of media (soil, sediment, air) off-site	6			
	No contamination of media off-site	0			0
	If impact due to direct contact is not known complete **2**				Section 1 max. 11
OR 2	**Potential for Direct Human and/or animal Contact (max. 11)**				
	a) Airborne Emissions (gases, vapour, contaminated dust, etc.) (max. 5)				
	Known or suspected airborne emissions impacting on neighbouring properties (see User's Guide)	5			
	Airborne emissions generally restricted to site	3			
	No airborne emissions	0		0	
	b) Accessibility of Site (Ability to Contact Materials) (max. 4)				
	Limited barriers to prevent site access; contaminants not covered	4			
	Moderate accessibility or no intervening barriers; contaminants are covered	3		3	
	Controlled access or remote location and contaminants are covered	0			
	c) Hazardous soil gas migration from the site (max. 2)				
	Contaminants are putrescible and soil permeability is high				
	Site contaminants are putrescible but soil permeability is low, and/or	2			
	groundwater is <2 m from surface	1			
	No putrescible contaminants at the site	0		0	3
					Section 2 max. 11
3	**Special Considerations**				
	Discretionary addition or subtraction to this sub-category score (Direct Contact Pathway) by up to 4 points based on technical judgment of the user. (Special considerations scores must not cause total score for this sub-category to exceed the maximum (11) or be lower than the minimum (0) allowable.)				
	DETAILED RATIONALE MUST BE DOCUMENTED	-4 to +4			0
					Section 3 max. 4

				Total "✓"	Total "?"	Total "✓"+"?"
C	**Direct Contact Total**	Add:	Section 1 or 2	3	0	3
			Section 3	0	0	0
			TOTAL	3	0	3
						max. 11
II	**Total Site Score for EXPOSURE PATHWAYS**	Add:	Groundwater	11	0	11
			Surface Water	8.2	0.25	8.45
			Direct Contact	3	0	3
			TOTAL	22.2	0.25	22.45
						max. 33

Site Identification: Saint John CCG Base PAH and Zinc Impacted Soils

DETAILED EVALUATION FORM (Cont'd)

III **RECEPTORS** (Maximum Total Score is 34)
Complete Section A and B

A **Human and Animal Uses** (Maximum score is 18)
Score **Section 1 (Known)** or **2 (Potential)**, and **Section 3.**
If answer is an estimate, circle the question mark (?) beside your score;
if **not** an estimate circle the checkmark (✓)

Factors		Scoring Guideline	Site Score ?	Site Score ✓	Totals
1	**Known Impact on Humans or Animals** (max. 18)				
	Known adverse impact on humans or domestic animals as a result of the contaminated site (see User's Guide)				
	Known adverse effect on humans or domestic animals	18			
	Strongly suspected adverse effect on humans or domestic animals	15			0
					Section 1 max. 18
	If adverse effect on humans is not known complete **2**				Class 1
OR 2	**Potential for Impact on Humans or Animals** (max. 18)				
	a) Drinking Water Supply (max. 9) (groundwater or surface water; private, commercial or municipal supply) Complete **Section i) (Known) OR ii) (Potential)**				
	i) Known impact on drinking water supply (max. 9) (see User's Guide)				
	Drinking water supply is known to be adversely affected as a result of site contamination				
	Known contamination of drinking water supply (to levels exceeding CDWG)	9			
	Strongly suspected contamination of drinking water supply	7			
	Drinking water supply is known not to be contaminated	0		0	
	ii Potential for impact on drinking water supply (max. 9)				
	■ Proximity to drinking water supply (max. 6)				
	0 to <100 m	6			
	100 to <300 m	5			
	300 m to <1 km	4			
	1 to 5 km	3			
	■ "Availability" of alternate drinking water supply (max. 3)				
	Alternate drinking water supply is not available	3			
	Alternate drinking water supply difficult to obtain	2			
	Alternate drinking water supply available	0.5			

Factors	Scoring Guideline	Site Score ?	Site Score ✓	Totals
b) Other Water Resources (max. 4) (groundwater or surface water)				
Complete **i) (Known) OR ii) (Potential)**				
i) Known Impact of water resources (max. 4) (See User's Guide) Water resources (used for recreational purposes, commercial food preparation, livestock watering, irrigation and other food chain uses) is known to be adversely affected as a result of site contamination				
Water resource is known to be contaminated above CWQG	4			
Water resource is strongly suspected to be contaminated above CWQG	3			
Water resource is known not to be contaminated	0			
If impact on water resource is not known, complete **ii)**				
ii) Potential for impact on water resources (max. 4)				
■ Proximity to water resources used for activities listed above (max. 2)				
0 to <100 m	2		2	
100 to <300 m	1.5			
300 m to < 1km	1			
1 to 5 km	0.5			
■ Use of water resources (max. 2) If multiple uses, give highest score automatically (use following table)				

	Frequency of Use			
Water Use	Frequent	Occasional		
Recreational (swimming, fishing, ect.)	2	1		0.5
Commercial food preparation	1.5	0.8		
Livestock watering	1	0.5		
Irrigation	1	0.5		
Other domestic or food chain uses	0.5	0.3		
Not currently used but likely future use	0.5	0.2		

DETAILED EVALUATION FORM (Cont'd)

III **RECEPTORS** (Cont'd)

A **Human and Animal Uses** (Cont'd)

Factors	Scoring Guideline	?	✓	Totals
c) **Direct Human Exposure (max. 5)**				
Complete **i) (Known) OR ii) (Potential)**				
i) Known contamination of land used by humans (max .5) (see User's Guide)				
* Known contamination of land used for agricultural or residential/parkland/school purposes above AG or R/P EQC values	5			
* Known contamination of land used for commercial or industrial purposes above C/I EQC values	3.5		3.5	
* Land is known not be contaminated	0			
If adverse effect on humans is not known complete **ii)**				
ii) Potential human exposure through land use (give highest score to worst case scenario) (max. 5) ■ Use of land at and surrounding site Determine use(s) of land at and surrounding site and assign score using following table:				

	Distance from Site		
Land Use	0- <300 m	300 m- <1 km	1 km- 5 km
Residential	5	4.5	3
Agricultural	5	4	2.5
Parkland/School	4	3	1.5
Commercial/Industrial	3	1	0.5

Totals: 6 (Section 2 max. 18)

Factors	Scoring Guideline	?	✓	Totals
Special Considerations				
Discretionary addition or subtraction to this sub-category (Impact on Human and Animal Receptors) by up to 5 points based on technical judgment of the user. (Special considerations scores must not cause total score for this sub-category to exceed the maximum (18) or be lower than the minimum (0) allowable.)				
DETAILED RATIONALE MUST BE DOCUMENTED	-5 to +5			0 Section 2 max. 18

A **Total Human and Animal Receptors** Add:

	Total "✓"	Total "?"	Total "✓"+"?"
Section 1 or 2	6	0	6
Section 3	0	0	0
TOTAL	6	0	6
			max. 18

Site Identification: Saint John CCG Base PAH and Zinc Impacted Soils

DETAILED EVALUATION FORM (Cont'd)

III **RECEPTORS** (Cont'd)

B **Environmental Receptors** (Maximum Score is 16)
Score **Section 1 (Known)** or **2 (Potential)**, and **Section 3.**

Factors		Scoring Guideline	Site Score ?	Site Score ✓	Totals
1	**Known Adverse Impact on the Environment as a Result of the Contaminated Site (max. 16)**				
	Known adverse impact on sensitive environment	16			
	Evidence of stress on aquatic species, or vegetative stress on trees, crops or plant life located on properties neighbouring the site	14			
	Strongly suspected adverse impact on sensitive environment	12			0
	If impact on environment is not known complete **2**				Section 1 max. 16
OR 2	**Potential for Impact on Sensitive Environments** (max. 16)				
	a) Distance from the site to the nearest sensitive environment (max. 10) e.g., sensitive aquatic environment, nature preserve, habitat for endangered species, sensitive forest reserves, national parks or forests, etc.)				
	0 to <500 m	10	5		
	500 m to <2 km	6			
	2 to <5 km	2			
	5 to 10 km	0.5			
	b) Groundwater (max. 6) Distance to an important or susceptible groundwater resource (e.g. recharge area)				
	0 to <500 m	6			
	500 m to <2 km	4			
	2 to <5 km	2		1	6
	5 to 10 km	1			Section 2 max. 16
Special Considerations					
	Discretionary addition or subtraction to this sub-category (Environmental Receptors) by up to 5 points based on technical judgment of the user. (Special considerations scores must not cause total score for this sub-category to exceed the maximum (16) or be lower than the minimum (0) allowable.)				0
	DETAILED RATIONALE MUST BE DOCUMENTED	-5 to +5			Section 3 max. 5

					Total "✓"	Total "?"	Total "✓"+"?"
B	**Total Environmental Receptors**	Add:		Section 1 or 2	1	5	6
				Section 3	0	0	0
				TOTAL	1	5	6
							max. 16
III	**Total Site Score for RECEPTORS**	Add:	**A**	**Human & Animal Use**	6	0	6
			B	**Environmental Receptors**	1	5	6
				TOTAL	7	5	12
							max. 33

Site Identification: Saint John CCG Base PAH and Zinc Impacted Soils

DETAILED EVALUATION FORM (Cont'd)

FINAL SCORE SHEET AND SITE CATEGORIES

	Factor Categories	Category Score (CS) ("✓+?")	Estimated Score (ES) ("?")	Total Category Score (CS)	Total Estimated Score (ES)
I	**CONTAMINANT CHARACTERISTICS** (33)	22	5	**Total →** **22**	± **5**
II	**EXPOSURE PATHWAYS** (33)				
A	Groundwater (11)	11	0		
B	Surface Water (11)	8.45	0.25		
C	Direct Contact (11)	3	0		
	Total	22.45	0.25	**Total →** **22.45**	± **0.25**
III	**RECEPTORS** (34)				
A	Human and Animal (18)	6	0		
B	Environment (16)	6	5		
	Total	12	5	**Total →** **12**	± **5**
				56	± **10**
				TOTAL SCORE FOR THE SITE (TS) (Sum of scores marked "✓" and "?", rounded to nearest whole number)	**ESTIMATED SCORE FOR SITE (ES)** (Sum of scores marked "?", i.e., score estimated or unknown)

TOTAL SCORE	CLASS	RISK POTENTIAL	ACTION REQUIRED
70-100	Class 1	High	Yes
50-69	Class 2	Medium	Likely
38-49	Class 3	Medium Low	May Be
≤37	Class N	Low	Not Likely

CLASSIFICATION (1, 2, 3, or N)
If **ES** ≥ 15, then site is categorized as **I**
(insufficient information to classify site)

2

APPENDIX E

TEST PIT, BOREHOLE, MONITORING WELL RECORDS, AND FIELD OBSERVATIONS

BOREHOLE RECORD

BH1

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

DATES: BORING **2002-01-29**

WATER LEVEL **None Observed**

PROJECT No. **NBF12711**

BOREHOLE No. **BH1**

DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm or % LEL)
						TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
								mm		
0	8.87									
	8.7	ASPHALT								
		Loose to compact black to brown silty SAND with gravel: FILL			Bentonite Seal	SS	1	300	61	0
1						SS	2	200	8	5
		- boulder 1.2 to 1.95 m								
2										
						SS	3	130	7	30
3						SS	4	100	11	0
	5.1					SS	5	200	9	5
4		CONCRETE			Backfilled with cuttings					
	4.5									
		End of borehole @ 4.35 m								
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

MW1

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

DATES: BORING **2002-01-30**

WATER LEVEL **4.1 m on 2002-02-15**

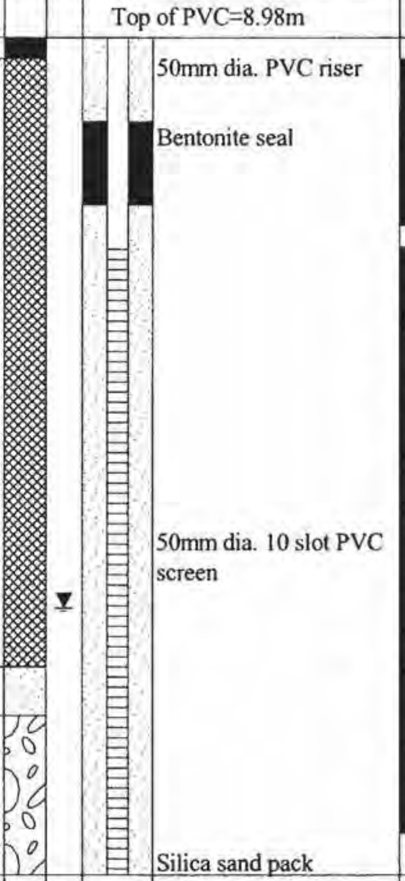
PROJECT No. **NBF12711**

BOREHOLE No. **MW1**

DATUM **Assumed**

ELEVATION (m)	SOIL DESCRIPTION
9.02	
8.9	ASPHALT
	Dense to compact brown silty SAND with gravel: FILL - slight hydrocarbon odour in soil 0.15 to 0.75m
4.5	Loose to compact brown SAND (SP)
4.2	COBBLES and BOULDERS (Shale)
3.0	End of borehole @ 6.0 m

Note: water level recorded @ 1403
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)



SAMPLES				
TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	460	33	10
SS	2	230	14	5
SS	3	510	44	0
SS	4	460	36	0
SS	5	180	12	0
SS	6	300	27	3
SS	7	280	14	45
SS	8	430	11	15
SS	9	360	12	25

DEPTH (m): 0 1 2 3 4 5 6 7 8 9 10

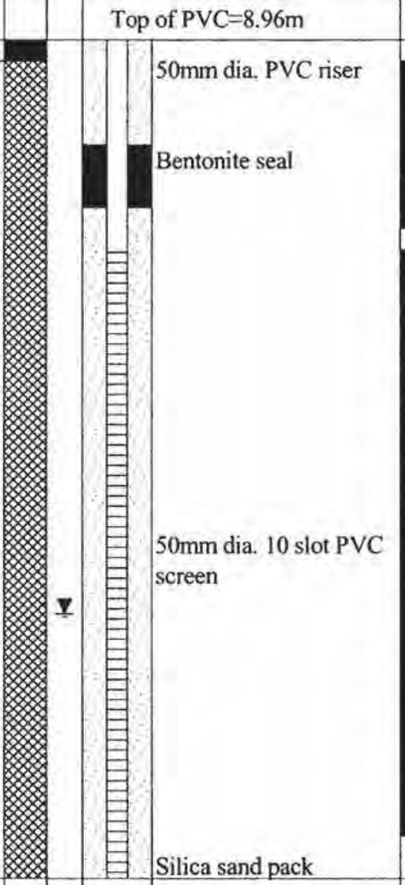
MONITORING WELL RECORD

MW2

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**
LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**
DATES: BORING **2002-01-31** WATER LEVEL **4.1 m on 2002-02-15**

PROJECT No. **NBF12711**
BOREHOLE No. **MW2**
DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0	9.00	
	8.9	ASPHALT
		Dense to compact brown to black silty SAND with gravel: FILL
		- brick pieces @ 4.5 m
		- wood pieces @ 5.1 m
		- some silty clay @ 5.7 m
6	3.0	End of borehole @ 6.0 m



SAMPLES				
TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	580	71	0
SS	2	500	24	0
SS	3	550	34	0
SS	4	430	22	0
SS	5	50	12	0
SS	6	100	16	0
SS	7	200	19	5
SS	8	200	20	20
SS	9	350	8	25

Note: water level recorded @ 1407
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)

MONITORING WELL RECORD

MW3

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

PROJECT No. **NBF12711**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

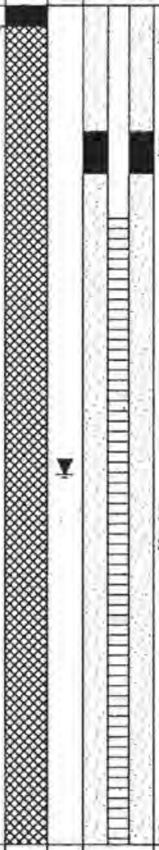
BOREHOLE No. **MW3**

DATES: BORING **2002-01-30**

WATER LEVEL **3.4 m on 2002-02-15**

DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	8.92		Top of PVC=8.85m			mm		
0	8.8	ASPHALT						
		Loose to dense brown silty SAND with gravel: FILL	50mm dia. PVC riser	SS	1	450	51	0
1			Bentonite seal	SS	2	500	26	3
2				SS	3	500	42	0
				SS	4	450	14	0
3				SS	5	100	11	0
			50mm dia. 10 slot PVC screen	SS	6	280	11	60
4				SS	7	33	10	5
		- boulder @ 4.9 m		SS	8	100	69/225	5
5		- some wood and brick fragments @ 5.2 m		RC	9	67%	67%	-
				SS	10	300	52	15
6	2.9	End of borehole @ 6.0 m	Silica sand pack					
7								
8								
9								
10								



Note: water level recorded @ 1417
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)

MONITORING WELL RECORD

MW4

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

DATES: BORING **2002-01-29**

WATER LEVEL **2.0 m on 2002-02-15**

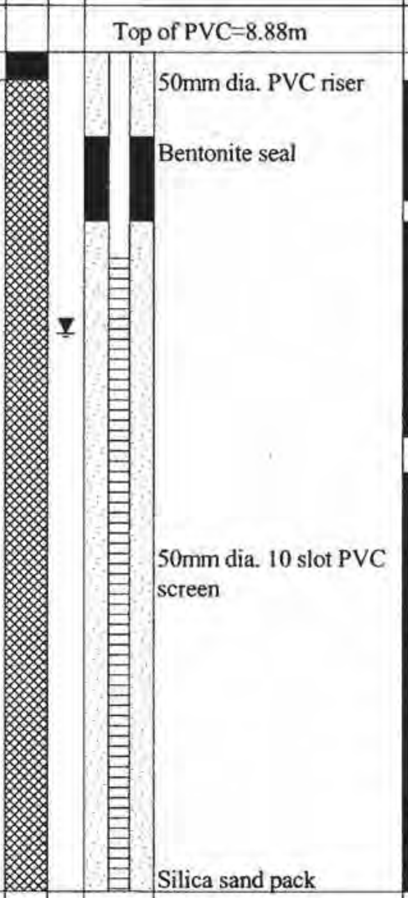
PROJECT No. **NBF12711**

BOREHOLE No. **MW4**

DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
	8.90	
0	8.7	ASPHALT
		Loose to dense brown to black silty SAND with gravel: FILL
6	2.9	End of borehole @ 6.0 m

Note: water level recorded @ 1356
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)



SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	230	50/100	0
SS	2	200	11	50
SS	3	100	8	0
SS	4	100	11	0
SS	5	50	58/200	0
SS	6	150	22	5
SS	7	100	20	0
SS	8	130	31	45
SS	9	430	20	15
SS	10	130	21	190

MONITORING WELL RECORD

MW5

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

DATES: BORING **2002-01-30**

WATER LEVEL **2.1 m on 2002-02-15**

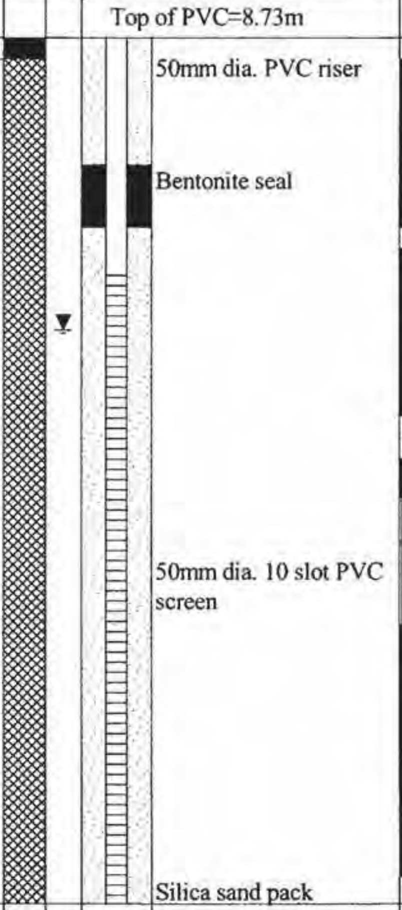
PROJECT No. **NBF12711**

BOREHOLE No. **MW5**

DATUM **Assumed**

ELEVATION (m)	SOIL DESCRIPTION
8.91	
8.8	ASPHALT
	Loose to dense brown to black silty SAND with gravel: FILL
	- boulder encountered @ 3.1 m
	- wood and ash observed @ 4.9 m
2.7	End of borehole @ 6.2 m

Note: water level recorded @ 1351
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)



			SAMPLES		
TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	200	18	0
SS	2	80	25	0
SS	3	80	12	0
SS	4	200	12	20
SS	5	0	50/125	-
RC	6	62%		
RC	7	25%		
SS	8	100	4	10
SS	9	600	5	10
SS	10	600	4	10

DEPTH (m): 0 1 2 3 4 5 6 7 8 9 10

MONITORING WELL RECORD

MW6

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

DATES: BORING **2002-01-28**

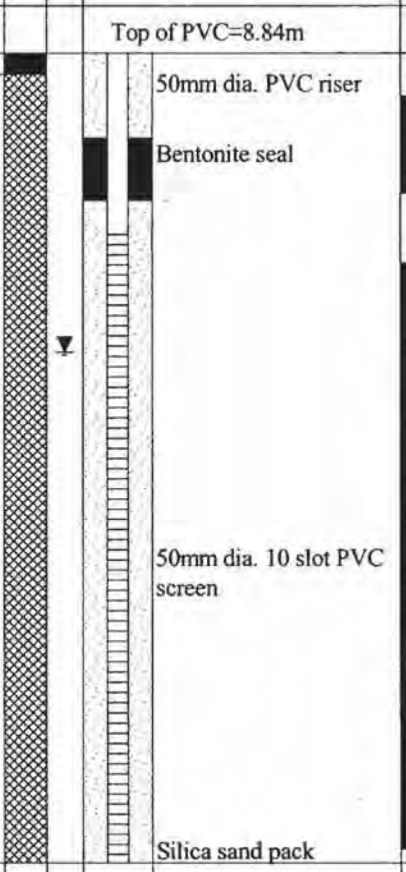
WATER LEVEL **2.1 m on 2002-02-15**

PROJECT No. **NBF12711**

BOREHOLE No. **MW6**

DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
	9.14	
0	9.0	ASPHALT
		Loose to dense brown to black silty SAND with gravel: FILL
	3.3	End of borehole @ 5.8 m



SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	400	33	0
~~SS~~	~~2~~	~~100~~	~~50/100~~	0
SS	3	300	25	0
SS	4	300	14	15
SS	5	250	12	5
SS	6	100	18	5
SS	7	0	20	-
SS	8	180	29	30
SS	9	50	18	20

Note: water level recorded @ 1353
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)

MONITORING WELL RECORD

MW7

CLIENT **PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

PROJECT No. **NBF12711**

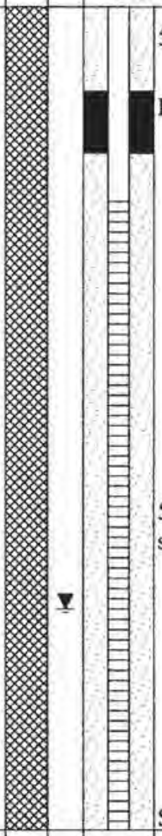
LOCATION **Canadian Coast Guard Base, Peter's Wharf, Saint John, NB**

BOREHOLE No. **MW7**

DATES: BORING **2002-01-31**

WATER LEVEL **4.3 m on 2002-02-15**

DATUM **Assumed**



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	9.11		Top of PVC=8.95m			mm		
0		Loose to compact black to brown silty SAND with gravel: FILL	50mm dia. PVC riser					
			Bentonite seal	SS	1	300	11	0
1				SS	2	200	6	0
2				SS	3	300	8	0
				SS	4	300	7	5
3				SS	5	150	16	10
			50mm dia. 10 slot PVC screen	SS	6	150	18	25
4				SS	7	100	20	20
		- cobbles encountered @ 4.6 m		SS	8	0	22	-
5				SS	9	100	10	5
	3.2		Silica sand pack					
6		End of borehole @ 5.9 m						
7								
8								
9								
10								

Note: water level recorded @ 1412
high tide @ 1345 (7.5m)
low tide @ 2000 (1.2m)

Table E1 - Soil Descriptions

Sample Location	Depth (mbgs)	Designation A, B, C	Colour	Description	Fill/Till/ Bedrock	Stains Y/N	Odours Y/N	Debris Type Present	VOC Reading ppm
SS-1	0-0.15	A	Dark Brown	Silty Sand with Organics	Fill	N	N	N	0
	0.15-0.3	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.3-0.45	C	Brown	Sand with Gravel	Fill	N	N	N	5
SS-2	0-0.15	A	Dark Brown	Silty Sand with Organics	Fill	N	N	N	0
	0.15-0.3	B	Dark Brown	Sand with Gravel	Fill	N	N	N	0
	0.3-0.45	C	Dark Brown	Sand with Gravel	Fill	N	N	N	0
SS-3	0-0.15		Grey	3/4" clear stone/gravel	Fill	N	N	N	No sample
	0.15-0.3	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.3-0.45	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.6	C	Brown	Sand with Gravel	Fill	N	N	N	5
SBH1	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	5
SBH2	0.0-0.15			Asphalt	Fill	N	N	N	No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	0
SBH3	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Silty Sand with Gravel	Fill	N	N	N	0
SBH4	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Silty Sand with Gravel	Fill	N	N	N	5
	0.75-1.0	C	Brown	Silty Sand with Gravel	Fill	N	N	N	0

Table E1 - Soil Descriptions

Sample Location	Depth (mbgs)	Designation A, B, C	Colour	Description	Fill/Till/ Bedrock	Stains Y/N	Odours Y/N	Debris Type Present	VOC Reading ppm
SBH5	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Silty Sand with Gravel	Fill	N	N	N	10
SBH6	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	5
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	0
SBH7	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	0
SBH8	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Silty Sand with Gravel	Fill	N	N	N	5
SBH9	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	5
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	0
SBH10	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Silty Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Silty Sand with Gravel	Fill	N	N	N	0

Table E1 - Soil Descriptions

Sample Location	Depth (mbgs)	Designation A, B, C	Colour	Description	Fill/Till/ Bedrock	Stains Y/N	Odours Y/N	Debris Type Present	VOC Reading ppm
SBH11	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	0
SBH12	0.0-0.15			Asphalt					No sample
	0.15-0.45	A	Brown	Sand with Gravel	Fill	N	N	N	0
	0.45-0.75	B	Brown	Sand with Gravel	Fill	N	N	N	0
	0.75-1.0	C	Brown	Sand with Gravel	Fill	N	N	N	10

Notes:

VOC readings obtained with an Gastector Model 1238 (with methane elimination "on") calibrated with hexane.

Stantec

Phase III Environmental Site Assessment Report

Fundy Quay Development
Saint John, New Brunswick

Report Prepared for:
Saint John Development Corporation

Project No. 121811071

March 28, 2013

Stantec

PROJECT NO:	**121811071**
REPORT TO	**Saint John Development Corporation** **1 Market Square Suite 301** **Saint John, NB E2L 4Z6**
ON	**Phase III Environmental Site Assessment** **Fundy Quay Development** **Saint John, New Brunswick**

March 28, 2013

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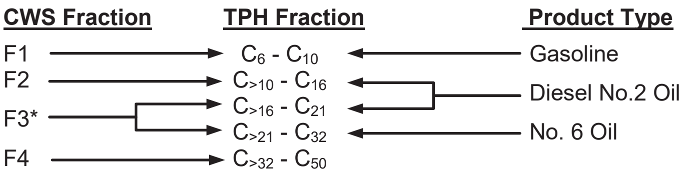
GLOSSARY OF TERMS AND LIST OF ACRONYMS

Screening Levels: Atlantic RBCA for PHC Impacted Sites in Atlantic Canada Version 3 User Guidance, July 2012

Tier I ESLs: Appendix 2
Tier I RBSLs: Appendix 3
Tier II PSSLs: Appendix 4
Tier II SSTLs: ARBCA v.3

Petroleum Hydrocarbons and Fraction Codes

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
mTPH = Modified Total Petroleum Hydrocarbons
TPH = Total Petroleum Hydrocarbons
*F3 results are approximated using $C_{>16}$ – C_{32} in Atlantic Canada.



F3 is calculated by adding the two fractions. If only one of the fractions is below its RL, F3 equals the concentration of the other fraction. If both fractions are below their RLs, the F3 concentration will be reported as less than the higher RL.

LIST OF ACRONYMS

AC CDC = Atlantic Canada Conservation Data Centre
AST = Aboveground Storage Tank
B[a]P PEF = Benzo(a)pyrene Potency Equivalence Factor
B[a]P TPE = Benzo(a)pyrene Total Potency Equivalents
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
CCME = Canadian Council of Ministers of the Environment
COPC = Chemical of Potential Concern
CSA = Canadian Standards Association
CWS = Canada Wide Standards
DELG = Department of Environment and Local Government
EPC = Exposure Point Concentration
ERA = Ecological Risk Assessment
ESA = Environmental Site Assessment
ESL = Ecological Screening Level
F4? = Sample did not return to baseline at C_{32}, F4 may be present
FD = Field Duplicate
GPS = Global Positioning System
HHRA = Human Health Risk Assessment
IACR = Index of Additive Cancer Risk
LD = Laboratory Duplicate
LRA = Limited Remedial Action
mbgs = Metres Below Ground Surface
N/A = Not Applicable
NAD83 = North American Datum of 1983
NB = New Brunswick
NBHN = New Brunswick Hydrographic Network
PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
PHC = Petroleum Hydrocarbons
PEF = Potency Equivalence Factor
PID = Property Identification
PIRI = Partnership in RBCA Implementation
ppm = Parts Per Million
QA/QC = Quality Assurance / Quality Control
RBCA = Risk Based Corrective Action
RBSLs = Risk Based Screening Levels
RDL/RL = Reporting Detection Limit/ Reporting Limit
RPC = Research and Productivity Council
RPD = Relative Percent Difference from the mean
SAR = Species At Risk
SCC = Standards Council of Canada
SNB = Service New Brunswick
SoQG = Soil Quality Guideline
SSTL = Site-Specific Target Level
TPH = Total Petroleum Hydrocarbons
UCL = Upper Confidence Limit
USEPA = United States Environmental Protection Agency
UST = Underground Storage Tank
VEC = Valued Environmental Component
VOC = Volatile Organic Compound

LABORATORY RESEMBLANCE CODES

AG = Aviation Gasoline
ARO. = Aroclor
FO = Fuel Oil Fraction
FO.LO = Fuel Oil and Lube Oil Fraction
G = Gasoline Fraction
LO = Lube Oil Fraction
MIXTURE = Mix of Aroclors 1242, 1254, and1260
ND = Not Detected
NR = No Resemblance (not petrogenic in origin)
NRFR = No Resemblance in the Fuel Oil Range ($C_{>10}$-C_{21})
NRLR = No Resemblance in the Lube Oil Range ($C_{>21}$-C_{32})
OP = One Product (unidentified)
PAH = Possible PAHs Detected
PG = Possible Gasoline Fraction
PLO = Possible Lube Oil Fraction
PWFO = Possible Weathered Fuel Oil Fraction
PWG = Possible Weathered Gasoline Fraction
TO = Transformer Oil
UP = Unknown Peaks/Unidentified Compounds
VOCS? = Interference from VOCs
WFO = Weathered Fuel Oil Fraction
WG = Weathered Gasoline Fraction

Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Saint John Development Corporation to conduct a Phase III Environmental Site Assessment (ESA) at the site of the proposed Fundy Quay development (herein referred to as the “site”) located on Water Street in Saint John, New Brunswick. The assessment work presented in this report is intended to evaluate the environmental suitability of the site for the proposed land use and to support a determination of potential remediation costs to address environmental impacts.

The Fundy Quay development site consists of a six-acre parcel of land intended for mixed residential and commercial land use. The development will encompass the existing Water Street public parking lot and the Canadian Coast Guard base located to the south of Market Slip.

Previous assessment work completed on the site between 2002 and 2010 revealed environmental impacts in soil and/or groundwater associated with petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs) and trace metals. Under the proposed development concept, ground disturbance and excavations are anticipated.

Work completed in the course of this assessment included a preliminary screening of historical assessment results along with soil and groundwater sampling and laboratory analysis programs. Historical results were evaluated against published screening levels for the protection of both human and ecological (environmental) health prior to field implementation to confirm the assessment approach. The field sampling locations included areas of documented environmental impacts along with other areas where ground disturbance may occur.

The results of the assessment work revealed that petroleum hydrocarbons are present in soil at concentrations exceeding the screening levels for residential land use in at least three areas of former petroleum storage and/or underground oil/water separators on the Canadian Coast Guard base and in the area of the Water Street public parking lot. In many instances observations of PHCs in soil exceeding the screening levels were associated with the potential presence/interference from PAHs in the samples. The highest PHC concentrations in soil were observed in heterogeneous fill materials in the area of the Shop Building and the Water Street public parking lot, with the observed depths of impact across the site ranging from within 1 m to 6 m or more below ground surface. PHC concentrations that were observed in groundwater in 2013 were relatively low compared to screening levels.

PAH impacts in soil appear to be widely distributed with concentrations exceeding screening levels (typically one order of magnitude or more greater than screening levels) at depths of up to 6 m or more. Exceedances of the PAH screening levels appear to be associated with a number of sample locations in the eastern part of the site and at depth within the northern half of the Canadian Coast Guard base. These areas coincide with areas that were developed prior to the early 1800s and subsequently lost to a number of fires, including the Great Fire in 1877. PAH concentrations that were observed in groundwater in 2013 were low relative to screening levels.

Several trace metals at concentrations exceeding the screening levels (typically within one order of magnitude of screening levels) were found in soils of various depths across the site, suggesting heterogeneity within the fill layers. Metal impacts were observed in shallow (<1.5 m depth) and deeper soils on both the Canadian Coast Guard base and in the Water Street public parking lot.

On the basis of the assessment results, further action will be required to manage the observed impacts under the proposed development concept. Potential actions include remediation of the impacts to meet the prescribed screening levels or alternatively, further assessment to define appropriate risk management options. Remediation of all impacts is likely to be both impractical and very expensive, and as such, a number of risk management recommendations are presented in this report.

The statements made in this Executive Summary are subject to the same limitations included in the Closure Section, and are to be read in conjunction with the remainder of the report.

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1.0 Introduction

Stantec Consulting Ltd. (Stantec) was retained by Saint John Development Corporation to conduct a Phase III Environmental Site Assessment (ESA) at the site of the proposed Fundy Quay development (herein referred to as the “site”) located on Water Street in Saint John, New Brunswick (Drawing 1, Appendix A).

The Fundy Quay development site consists of a six-acre parcel of land intended for mixed residential and commercial land use. The development will encompass the existing Water Street public parking lot and the Canadian Coast Guard base located to the south of Market Slip (Drawing 2, Appendix A).

Previous assessment work completed on the site between 2002 and 2010 revealed environmental impacts in soil and/or groundwater associated with petroleum hydrocarbons, polycyclic aromatic hydrocarbons and trace metals. Under the proposed development concept, ground disturbance and excavations are anticipated. Details on the development concept (*i.e.*, location and extent of excavations) were limited at the time of this report.

The assessment work presented in this report is intended to evaluate the environmental suitability of the site for the proposed land use and to support a determination of potential remediation costs to address environmental impacts. Information on potential remediation costs are presented in a separate report. Assessment of ongoing operations and activities on the site was beyond the scope of this assessment.

2.0 Background

2.1 Historical Land Use

Historical information for the Fundy Quay site indicates that the lands associated with the site were lying below the high water line of the harbour circa 1783. By 1837, Water Street had been established through infilling and a number of wharves extended from Water Street into the harbour. Buildings and structures contained within the limits of the site were reportedly lost to fires on more than one occasion, including the Great Fire of June 20, 1877.

Survey mapping from 1923 indicates that a number of properties existed within the current Water Street public parking lot extending to the west along South Market Wharf. An air photo from 1935 reportedly shows evidence of wharves remaining to the west of the Water Street public parking lot which at the time was fully covered with buildings.

Records show that the Canadian Coast Guard base was developed in the late 1950s with construction of wharf structures along its perimeter and infilling of the land. While some buildings remained on the Water Street public parking lot site in the early 1960s, all buildings had been removed and parking lot improvements made by the early 1980s.

Additional details on the history of the site, including information on specific business enterprises (*i.e.*, coal dealer) are contained in the report entitled *Historical Review* for the City of Saint John property located at 3 Water Street (deStecher Appraisals Ltd., 1999).

Environmental conditions and the presence of environmental impacts may be influenced by historical use of the lands and activities within the surrounding urban environment. In this instance, both point and non-point sources of impacts may be anticipated. Potential point sources for environmental impacts include such things as underground storage tanks. Non-point sources may include historical fires and infilling activity (*i.e.*, source and nature of fill).

2.2 Previous Environmental Reports

Previous environmental assessment work for the site was documented in a series of reports provided by Saint John Development Corporation. The reports included:

- *Phase I Environmental Site Assessment, Coast Guard Facility, Peter's Wharf, Saint John, NB*. Jacques Whitford Environment Limited for Public Works and Government Services Canada, June 18, 2001.
- *Phase II Environmental Site Assessment, Saint John Coast Guard Base, Saint John, New Brunswick*. Jacques Whitford Environment Limited for Public Works and Government Services Canada, March 25, 2002.
- *Limited Environmental Investigation, Canadian Coast Guard Base, Saint John, New Brunswick*. Dillon Consulting for Conquest Engineering Limited, April 27, 2006.

The Phase I ESA (2001) for the Canadian Coast Guard base reported that the handling and storage of petroleum products, oily wastewater from maintenance facilities, and historical maintenance of buoys constituted potential sources of environmental impacts on the property.

The Phase II ESA (2002) for the base revealed impacts in soil and/or groundwater from petroleum hydrocarbons (PHCs) and polycyclic aromatic hydrocarbons (PAHs) in the vicinity of potential source areas (*i.e.*, former underground storage tank (UST) site). Impacts from trace metals were also identified as isolated occurrences in soil. In spite of the presence of PHC impacts, only the PAH and trace metal impacts were reported to exceed environmental quality criteria for the existing commercial land use.

The Limited Environmental Investigation (2006) completed by Dillon was undertaken in conjunction with a geotechnical investigation of the larger development site that also included the Water Street public parking lot and an area to the north near Market Slip. The results of the work were complementary to prior work and revealed impacts from PHCs and PAHs within the Water Street public parking lot, and PAH impacts at two locations on the Canadian Coast Guard base. PHC and PAH concentrations were reported to exceed environmental quality criteria for residential land use at three sample sites within the Water Street public parking lot and near the Emergency Marine & Helicopter Hanger building.

The results from the previous environmental assessment work have been integrated into this assessment. Additional details on the historical results are presented in Section 5.0.

3.0 Site Description

3.1 Subject Property

The subject property or site is located to the west of Water Street and south of Market Slip. Saint John Harbour borders the site to the west. The Property Identification numbers (PID Nos.) as available from Service New Brunswick for the properties within the assessment area are summarized in Table 1. The approximate limits of the site are shown on Drawing 2, Appendix A.

Table 1 Properties Within Assessment Area

Current Property Owner	PID No(s).
City of Saint John	55209159, 55011894, 55209167
City of Saint John (South Market Wharf)	55006886
City of Saint John (Ward Street)	None
City of Saint John (Peter's Wharf)	None

The site measures approximately six acres and contains a number of buildings. The buildings associated with the Canadian Coast Guard base include the Administration building, the Marine Emergency & Helicopter Hanger, a Shop Building, and a Buoy Shed. Areas surrounding the buildings are predominantly asphalt covered and used for storage of navigational buoys, emergency response equipment, anchors, bulk fuel storage, and parking.

A small Attendant Parking Booth is located at the entrance to the paved Water Street public parking lot. A landscaped area abuts the Water Street public parking lot to the north.

3.2 Adjoining and Neighbouring Properties

Adjacent land use consists of commercial land use to the north, east, and south, and residential land use (upper floor apartments) to the east. Market Slip and Market Square, a large retail complex containing restaurants, retail stores, library and a museum, are located immediately to the north. Commercial properties with upper floor residential apartments are located 20 m to the east across Water Street. Another slip and a parking lot border the site to the south.

3.3 Groundwater, Topography and Drainage

Regional drainage (anticipated groundwater flow direction) is to the west toward Saint John Harbour. Tides may locally influence groundwater depths and flow patterns near the harbour through the tidal cycle.

The surface of the site is relatively flat with a lower lying area in the Water Street public parking lot (along Ward Street) with surface elevations an estimated 1 m below the majority of the Canadian Coast Guard base. The landscaped area to the north of the public parking lot is slightly elevated with the ground surface an estimated 1 m higher than the Canadian Coast Guard base. Previous work on the Canadian Coast Guard base reported that the elevation of the wharf deck is 9.75 m +/- or 32 feet +/- (LWOST datum).

Water and sewer services in the local area are provided by the City of Saint John infrastructure systems. A number of catch basins located on the site intercept local drainage. Some local surface drainage is expected to discharge to the harbour.

3.4 Ecological Habitat

Table 2 identifies observed ecological habitat within 200 m of the site. The habitat was assessed by Heather Button, B.Sc. using available mapping. Additional details on ecological screenings in the management of contaminated sites are provided in Section 4.0.

Table 2 Ecological Habitat Within 200 m of the Site

Habitat Type	Is Habitat Present?	Habitat Location	Data source
Wetland	No mapped wetlands are present within 200 m.	None	GeoNB wetland mapping (http://geonb.snb.ca/geonb)
Aquatic (marine) habitat	Site lies near the mouth of Saint John River, on the edge of Saint John Harbor.	Adjacent	SNB NB Hydro NetworkGIS Servers\ArcGIS (http://geonb.snb.ca)
Forested habitats	Significant forested habitat was not identified within 200 m.	None	Aerial interpretation GeoNB Basemap Enhanced Imagery GIS Servers\ArcGIS (http://geonb.snb.ca)
Grassland habitats	Significant grassland habitat was not identified within 200 m.	None	Aerial interpretation GeoNB Basemap Enhanced Imagery GIS Servers\ArcGIS (http://geonb.snb.ca)
Provincial or National parks, or ecological reserves	Provincial or National parks, or ecological reserves were not identified within 200 m.	None	SNB Provincial Themes http://www.snb.ca/gdam-igec/e/2900e_1e_i.asp
Known rare, threatened or endangered species	Atlantic salmon (Outer Bay of Fundy Population) spawn and mature in Saint John River. This species may be found in the vicinity of the site during migration periods (spring and fall). Atlantic salmon (Outer Bay of Fundy Population) is ranked as Endangered by COSEWIC, but does not currently have a SARA schedule or status designation. No other species are known to occur within 200 m. Likelihood is low based on aerial imagery, as no unusual or rare terrestrial habitat is evident, and the area is highly developed. However, ACCDC was not consulted.	Adjacent	Aerial interpretation of habitat conditions in the vicinity of the site (http://geonb.snb.ca

Table 2 Ecological Habitat Within 200 m of the Site

Habitat Type	Is Habitat Present?	Habitat Location	Data source
Other critical or sensitive habitat	Environmentally sensitive areas are not designated in the area. The area is highly developed and sensitive habitats are not evident on imagery.	None	SNB Provincial Themes (ESAs) http://www.snb.ca/gdam-igec/e/2900e_1e_i.asp
Other local or regional receptor habitat concerns	Potential impacts appear to be localized.	None	Aerial interpretation of habitat conditions in the vicinity of the site (http://geonb.snb.ca

4.0 Regulatory Framework

4.1 Contaminated Sites Management Process

The Guideline for the Management of Contaminated Sites, Version 2.0 New Brunswick Department of Environment and Local Government (NBDELG), October 2003 contains a Contaminated Sites Management Process. The management process reflects the desire of the NBDELG to move the remediation of contaminated sites into a risk-based management approach rather than depending on generic clean-up values. The guideline was issued in conjunction with a number of technical supporting documents, including the *Atlantic RBCA (Risk-Based Corrective Action) for Petroleum Impacted Sites in Atlantic Canada Version 3 User Guidance* (July 2012) issued by the Atlantic Partners in RBCA (Risk Based Corrective Action) Implementation (PIRI).

4.2 Screening Levels

The Atlantic RBCA User Guidance for Petroleum Impacted Sites in Atlantic Canada, (Version 3.0, July 2012) was used to evaluate petroleum hydrocarbon (PHC) concentrations that were detected in soil and groundwater.

The results of the *Site Assessment and Tier I/II Checklist* presented in Appendix B reveal that the human health Tier I RBSLs are appropriate for screening of potential human health exposures with future residential land use. Some of the mandatory conditions and default site characteristics (*i.e.*, presence of open sumps in buildings) should be reviewed where risk management or remedial action is indicated from the assessment.

Site characteristics used to select screening levels considered in this assessment are presented in Table 3. The applicability of Ecological Screening Levels (ESLs) is outlined in Table 4.

Table 3 Screening Level Selection Based on Source, Pathways, and Receptors

Criteria	Applicable Selection	Rationale
Receptor	Residential (most sensitive future use)	Existing land use consists of commercial use only. Proposed land use will include residential occupancy. Commercial and residential properties neighbour the site, with residential use expected within 30 m of site.
Groundwater Use	Non-potable	Potable water in the area is supplied by the municipal water distribution system. No potable wells expected.
Soil Type	Coarse-grained	Coarse-grained soil was observed (predominant).
Source	Diesel/#2 oil and #6/Lube oil	Laboratory resemblance indicates hydrocarbon mixtures typically in the fuel oil and/or lube oil range. Interferences from possible PAHs are common. Diesel/#2 oil RBSLs are protective.
Depth of Impacts	Varies	Some impacts within or near 1.5 m depth below ground surface, while others are deeper.

Table 3 Screening Level Selection Based on Source, Pathways, and Receptors

Criteria	Applicable Selection	Rationale
Depth of Groundwater	Varies	Water levels vary with proximity to Saint John Harbour and tidal cycle.
Preferential Pathways	Potential	Preferential pathways include buried utility corridors such as water and sewer lines associated with buildings and catch basins.

Table 4 ESL Applicability Within 200 m of the Site

Pathway	Are ESLs Applicable?	Rationale
Protection of Plants and Soil Invertebrates; Direct Soil Contact (Table 1a)*	No	Potential impacts may be present within 1.5 m of ground surface; however, current built environment is not considered potential ecological habitat.
Protection of Wildlife (mammals and birds) and Livestock; Soil and Food Ingestion (Table 1b)*	No	Agricultural habitat was not identified within 200 m of the site.
Plant and Invertebrate Direct Contact with Shallow Groundwater (Table 2)*	No	Groundwater may be located within 3 m of ground surface, however, current built environment is not considered potential ecological habitat.
Protection of Freshwater and Marine Aquatic Life from groundwater and surface water impacts (Table 3a or Table 3b)*	Yes	Saint John Harbour (marine aquatic habitat) borders the site.
Protection of Freshwater and Marine Aquatic Life from sediment impacts (Table 4)*	No	Assessment of sediment and surface water is beyond the scope of this Phase III ESA.
*Table references based on *Atlantic RBCA Version 3 (July 2012) User Guidance (Appendix 2)*		

Atlantic PIRI currently provides screening levels only for petroleum hydrocarbons. As such, for non-petroleum hydrocarbon chemicals of potential concern (COPC), Stantec has referenced screening levels published by the following agencies, in order of preference:

- Canadian Council of Ministers of the Environment (CCME): online Soil Quality Guideline database (http://ceqg-rcqe.ccme.ca/, accessed March 2013)
- Alberta Environment: *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (December 2010).
- OMOE: *Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario* (April 2011).
- United States Environmental Protection Agency (USEPA): online database (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/, accessed March 2013.

Consistent with the Atlantic PIRI approach, screening levels were selected for the protection of both human and ecological (environmental) health. The presence of non-petroleum hydrocarbon COPCs is considered a Tier III assessment under current provincial guidance.

5.0 Development of Work Plan

5.1 Objectives and General Approach

The overall objective of the current assessment work was to obtain an appropriate level of site characterization necessary to evaluate the environmental suitability of the site for the proposed land use and to support a determination of potential remediation costs to address documented environmental impacts. It is anticipated that remedial action plans and other assessments will be required to address the observed environmental impacts or COPCs. Remediation requirements and potential risk management approaches should be revisited as development plans materialize.

In order to advance the assessment objective, sampling and testing of soil and groundwater, including potential COPCs, was completed. The testing locations included areas of documented environmental impacts along with other areas where ground disturbance may occur. Where possible, attempts were made to delineate documented impacts within the scope of work. Additional delineation may be required under the NBDELG Contaminated Sites Management Process.

Site assessment information previously presented by Jacques Whitford (2002) and Dillon (2006) are referenced and evaluated in this report. Changes to environmental quality guidelines or screening levels since the original assessment work have been considered in the course of this assessment.

The assessment approach incorporates screening of COPCs against current guidelines protective of human and ecological health. The results of the screening provide the basis upon which remedial action plans may be defined.

5.2 Preliminary Screening and Recommended Work Plan

A number of areas having potential environmental concerns were identified in the previous assessment work. A preliminary screening of the previous results was conducted prior to field implementation to confirm the assessment approach, including the locations for environmental sampling and testing. The results of the preliminary screening are presented in Table 5. Compiled analytical results along with current screening levels are provided in Appendix C. Sampling locations are illustrated on Drawing 3, Appendix A.

Table 5 Preliminary Screening and Recommended Work Plan

Area of Potential Environmental Concern	Preliminary Screening Results (based on Phase II ESA and Environmental Sampling)	Sampling Program to Address Concern
Water Street Public Parking Lot		
PHC and PAH detected in soil and / or groundwater. Previous drilling to depths ranging between 6 m and 8 m depths.	PHC concentrations in soil at BH-04 and BH-05 exceed RBSL (residential). Impacts detected at 2 m and 4 m depths, respectively. PAH concentrations in soil at BH-05 exceed SoQG HH and EH. Impacts detected at 4 m depth. No metals analysis completed.	Scope: 2 boreholes with monitoring wells up to 6 m depth: 13MW-01, 13MW-02 Analytical Program: PHC, PAH, Metals
Former Underground Storage Tank (UST) Site (north of Buoy Shed)		
PHC and PAH detected in soil and / or groundwater. Previous drilling to depths of 6 m.	PHC concentrations in soil at MW1 and MW2 exceed RBSL (residential). PHC concentration in groundwater at MW2 exceeds ESL GW AL. Impacts also detected at MW3. Impacts in soil detected within 1 m and at 6 m depth (MW2). PAH concentrations in soil at MW2 exceed SoQG HH and EH. Impacts detected at 5.5 m depth. No metals analysis completed.	Scope: 2 boreholes with monitoring wells to depth of 6 m: 13MW-03, 13MW-04 Analytical Program: PHC, PAH, Metals
Shop Underground (U/G) Oil Water Separator (north end of Shop Building)		
PHC detected in soil and groundwater. Elevated metals (zinc, vanadium) detected in soil. Previous drilling depths to 6 m.	Trace PHC concentrations in soil at MW7. Impacts detected within 1 m and at 3.5 m depth. PHC concentration in groundwater at MW7 exceeds ESL GW AL. No PAH analysis completed. Metal (vanadium, zinc) concentration in soil at SS3 exceeds SoQG HH and/or EH. Impacts within 1 m depth.	Scope: 2 boreholes with monitoring wells to depth of 6 m: 13MW-05, 13MW-06 Analytical Program: PHC, PAHs, Metals

Table 5 Preliminary Screening and Recommended Work Plan

Area of Potential Environmental Concern	Preliminary Screening Results (based on Phase II ESA and Environmental Sampling)	Sampling Program to Address Concern
Marine Emergency & Helicopter Hanger Underground (U/G) Oil Water Separator (west side of building)		
PHC and PAH detected in soil and / or groundwater. Previous drilling to depths ranging between 6 m and 14 m.	PHC concentrations in soil at MW5 exceed RBSL (residential). Impacts detected within 1 m and at 2.5 m depth. PHC concentration in groundwater at MW5 exceeds ESL GW AL. PAH concentrations in soil at MW5 and BH-06 exceed SoQG HH and EH. Impacts detected at 2 m and 3 m depth. PAH concentration in groundwater at MW5 exceeds WQG E. No metals analysis completed.	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-07 Analytical Program: PHC, PAH, Metals
Helicopter Pad Former Underground Storage Tank (UST)		
PHC detected in soil. Previous drilling to depths ranging between 6 m and greater than 15 m.	Trace PHC concentrations in soil at MW4. Impacts detected within 1 m depth. No PAH analysis completed. No metals analysis completed.	Scope: Re-sample MW4. Analytical Program: PHC
Other Areas of Interest		
Heating Plant: Baseline information only	No information available	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-08 Analytical Program: PHC, PAH + Metals
Administration Building: Baseline information only	No information available	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-09 Analytical Program: PHC, PAH + Metals

Table 5 Preliminary Screening and Recommended Work Plan

Area of Potential Environmental Concern	Preliminary Screening Results (based on Phase II ESA and Environmental Sampling)	Sampling Program to Address Concern
North of Helicopter Pad: Baseline information only	Previous testing in the area for PHC. No PHC detected.	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-10 Analytical Program: PHC, PAH + Metals
Northwest corner: Baseline information only	Previous testing in the area for Metals. Metal (vanadium) concentration in soil exceeds SoQG HH at BH-11. Impacts within 1 m depth.	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-11 Analytical Program: PHC, PAH + Metals
Northern property boundary adjacent to Market Slip: PAH detected in soil at BH-12.	PAH concentration in soil at BH-12 exceeds most conservative SoQG EH (protection of FAL). Impacts detected at 5.5 m depth.	Scope: 1 borehole with monitoring well to depth of 6 m: 13MW-12 Analytical Program: PHC, PAH + Metals

Notes:

Conceptual development plan was not available at the time of preparation of work plan. Additional assessment (including delineation) and/or remediation may be required to obtain regulatory closure under NBDELG Contaminated Sites Management Process.

List of Acronyms (refer to *Glossary of Terms and List of Acronyms* and Appendix C for details): HH = human health; EH = ecological (environmental) health; GW AL = groundwater protective of aquatic life; WQG E = water quality guideline protective of ecological receptors; FAL = freshwater aquatic life.

5.3 Field Investigation

Stantec personnel were on-site over several days between January 28 and February 25, 2013 to complete the assessment work. Specific field investigation tasks included underground utility clearances, borehole drilling and monitoring well installation, level surveying and tie-ins, and groundwater monitoring and sampling. Details on field methodologies are summarized in Appendix D.

A private underground utility locate contractor was engaged by Stantec to assist in obtaining utility clearances prior to drilling. A total of 12 boreholes were proposed to nominal depths of 6 m below ground surface. Some adjustments in borehole depths were made during the field investigation with final depths ranging from 6 m to 9 m below ground surface.

5.4 Field and Laboratory Program

The field and laboratory program completed during the assessment is summarized in Table 6.

Table 6 Field and Laboratory Program

Analytes (media)	Type of Sampling	Samples Submitted	Sample IDs	QA/QC Samples		
				Original	Duplicates	
					Lab	Field
PHCs (soil)	Boreholes	21	13MW-01 through 13MW-12 (selected samples)	13MW01 SS3 13MW02 SS2 13MW09 SS3	13MW01 SS3 LD 13MW02 SS2 LD 13MW09 SS3 LD	NA
PHCs (groundwater)	Monitoring wells	11	13MW-01 through 13MW-12 (except 13MW-5, -11, -12), MW2 and MW4	13MW01	13MW01 LD	NA
PAHs (soil)	Boreholes	12	13MW-01 through 13MW-12 (selected samples)	13MW-02 SS6	13MW-02 SS6 LD	NA
PAHs (groundwater)	Monitoring wells	2	13MW-07 and 13MW-10	NA	NA	NA
Metals (soil)	Boreholes	11	13MW-01 through 13MW-12, except 13MW-04 (selected samples)	13MW-01 SS3 13MW-08 SS3	13MW-01 SS3 LD 13MW-08 SS3 LD	NA

- Soil and water samples were analyzed by the accredited Maxxam Analytics Inc. laboratory in Bedford, Nova Scotia. The laboratory used various quality control procedures including analysis of blanks, surrogate recoveries, matrix spike recoveries and other activities in addition to the lab duplicates.
- MEG Drilling Services completed the drilling program between January 30 and February 4, 2013.

Groundwater samples were not collected from three monitoring wells (13MW-5, 13MW-11 and 13MW-12) on account of the water in the wells being frozen at the time of sampling. Level surveying of one well (13MW-11) could also not be completed when all other wells were surveyed as snow had been piled on top of the well.

6.0 Field Observations

6.1 Non-Aqueous Phase Liquids

Free-phase non-aqueous phase liquids or "NAPL" (*i.e.*, petroleum product or other liquid chemicals) were not observed during the borehole drilling or groundwater sampling activities.

6.2 Soil

The stratigraphy observed at the borehole locations generally consisted of relatively thick layers of coarse-grained soil below asphalt pavements. Shallow soils were characterized as fill comprising predominantly sand with varying amounts of gravel and silt. Silt content within the fills was observed to be greater in the eastern part of the site (Water Street public parking lot area) and at depth. Shallow soils within the limits of the Canadian Coast Guard base were generally sand with gravel with occasional cobbles.

Evidence of wood and debris (*i.e.* bricks) was observed throughout the fill materials underlying the Water Street public parking lot extending to depths of more than 9 m below ground surface. Wood and debris were also observed in the deeper fill layers on the Canadian Coast Guard base located at a depth of 4 m or more.

Practical refusal to further penetration with the auger was observed at a depth of approximately 9 m in the Water Street public parking lot indicating possible bedrock. Refusal was also observed at depths ranging between 6 m and 7 m at select locations on the Canadian Coast Guard base, indicating the possible presence of timber wharves. Prior geotechnical investigation work on the site indicates bedrock was either inferred or confirmed at depths ranging between less than 6 m in the east and more than 19 m to the west.

Detailed descriptions of the stratigraphy observed at the borehole and monitoring well locations are provided in Appendix E.

Measurement of organic vapours is often used as a screening tool to identify soils that may be impacted by volatile organic chemicals (*i.e.*, petroleum products). Where sample recoveries permitted, vapour concentrations were measured with a photoionization detector (PID), calibrated to isobutylene. Soil vapour concentrations may vary with contaminant type and age, soil type, moisture content and organic matter content. The measured soil vapour concentrations are intended to provide only a qualitative indication of potential impact levels associated with volatile organics and are not necessarily directly correlated with soil analytical results.

There are no regulatory criteria for organic vapour concentrations, however, elevated vapour concentrations are generally indicative of the presence of volatile organics. Vapour readings were used as a guide in the selection of soil samples for laboratory analysis.

Peak organic vapour concentrations in the range of approximately 16 ppm to 92 ppm were observed in the Water Street public parking lot (13MW-02) and on the Canadian Coast Guard base (13MW-03, 13MW-04) at depths ranging between 5.5 m and 8 m. The majority of the samples returned relatively low organic vapour concentrations (<3 ppm).

Olfactory evidence (*i.e.*, odour) of potential hydrocarbon impacts was observed in the Water Street public parking lot (13MW—01) and on the Canadian Coast Guard base (13MW-03, 13MW-04) at depths ranging between 4 m and 6 m. The odour associated with one sample from 13MW-01 was found to be consistent with a petroleum product (*i.e.*, fuel oil). An odour resembling burnt wood was noted at a depth of approximately 4.5 m on the western edge of the Water Street public parking lot (13MW-06).

6.3 Groundwater

Groundwater elevation data collected during the field investigation are presented in Table 7.

The measured water levels indicate that groundwater depths vary across the site with local influences on groundwater depths (and shallow groundwater flow patterns) near the harbour through the tidal cycle. Water levels in the area of the Water Street public parking lot were measured at depths ranging from approximately 3 m to 4.5 m below grade. Water levels on the Canadian Coast Guard base were found to be variable with water depths ranging from less than 2 m to greater than 6.5 m below grade. Water level fluctuations of more than 4 m were evident in a number of monitoring wells located closest to the harbour.

Table 7 Groundwater Measurements

Well ID	Ground Elevation (m)	Top of PVC Casing Elevation (m)	Ground-water Depth (m)	Ground-water Elevation (m)	Ground-water Depth (m)	Groundwater Elevation (m)	Groundwater Depth (m)	Groundwater Elevation (m)	Groundwater Depth (m)	Groundwater Elevation (m)
			Feb 5, 2013		Feb 6, 2013		Feb 7, 2013		Feb 25, 2013	
13MW-01	8.27	8.18	-	**-**	-	**-**	3.36	**4.82**	-	**-**
13MW-02	9.81	9.72	-	**-**	-	**-**	4.68	**5.04**	-	**-**
13MW-03	8.97	8.83	-	**-**	-	**-**	3.85	**4.98**	-	**-**
13MW-04	8.96	8.84	-	**-**	2.76	**6.08**	2.54	**6.3**	-	**-**
MW2	9.00	8.96	-	**-**	-	**-**	3.56	**5.4**	3.27	**5.69**
13MW-05	8.82	8.76	-	**-**	3.77	**4.99**	-	**-**	-	**-**
13MW-06	8.26	8.19	-	**-**	-	**-**	3.48	**4.71**	-	**-**
13MW-07	8.74	8.61	6.42	**2.19**	1.63	**6.98**	-	**-**	3	**5.61**
13MW-08	9.11	9.01	Dry	**<2.7**	2.17	**6.84**	2.78	**6.23**	-	**-**
MW4	8.90	8.88	-	**-**	-	**-**	3.59	**5.29**	1.63	**7.25**
13MW-09	9.17	9.03	4.7	**4.33**	3.77	**5.26**	3.64	**5.39**	-	**-**
13MW-10	9.00	8.92	6.52	**2.4**	2	**6.92**	-	**-**	2.22	**6.7**
13MW-11	-	-	Dry	**Dry**	1.83	**-**	-	**-**	-	**-**
13MW-12	9.01	8.89	5.15	**3.74**	2.81	**6.08**	-	**-**	-	**-**

Water levels are measured from the top of the PVC monitoring well casing.
Elevations are with reference to a temporary benchmark established at the southwest corner of the Administration building foundation (elevation of 10.6 m).

6.4 Preferential Pathways

Preferential pathways include buried utility corridors for water and sewer lines associated with buildings and catch basins associated with storm drainage systems. Details on the locations and extent of all buried utilities were not obtained during this assessment.

7.0 Laboratory Results

The following sections present a discussion of the analytical results from historical and current assessment work in the context of the current screening levels. Available laboratory results are presented in Tables C1 through C6, Appendix C along with applicable screening levels identified in Section 4.0.

Exceedances of applicable screening levels are identified in these summary tables, with red, bolded, and underlined text for ecological exceedances, and orange fill with red text for human health exceedances. Exceedances of ecological screening levels are not necessarily indicative of an ecological exposure or risk.

7.1 QA/QC

Laboratory certificates of analysis are presented in Appendix F. All samples were submitted within prescribed hold times.

All laboratory QC results were within acceptable ranges. The laboratory reporting limit for each analyte was below its respective guideline.

Results of the duplicate sampling and analysis programs conducted in 2013 are provided in Table 8.

Table 8 Results of the Duplicate Sampling and Analysis Programs

Analytes (media)	Duplicate Type	Range of %RPD	Number of Analytes within ±50% RPD (soil) ±30% RPD (water)	Acceptable Duplicate Correlation
PHCs (soil)	LD	0% to 27.6 %	12 of 12	Yes
PHCs (groundwater)	LD	0% to 0%	4 of 4	Yes
PAHs (soil)	LD	0% to 42.1%	20 of 20	Yes
PAHs (groundwater)	N/A (no duplicates)	N/A	N/A	N/A
Metals (soil)	LD	0% to 27.6%	54 of 54	Yes

The duplicate results agree closely with their corresponding samples and confirm the representativeness of the sampling procedures. There are no firm guidelines for the degree of correlation expected between duplicates due to natural heterogeneity in soil type (*e.g.*, grain size, clay fraction) and contaminant distribution. A high RPD can be expected when analyte concentrations are close to the analytical detection limit. However, the values noted above are considered to indicate an acceptable duplicate correlation. All individual parameters in the duplicates were classified the same (either both above or both below guidelines) with the exception of vanadium at sample location 13MW-08 (human health), and zinc at sample location 13MW-01 (ecological health).

Where laboratory certificates indicate that the chromatograms associated with PHC analysis did not return to baseline, it may be necessary to conduct additional analysis for F4 hydrocarbons. However, due to limited solubility and volatility, F4 hydrocarbons are relevant only to the direct contact pathway, which is restricted to samples collected from 0 to 1.5 mbgs. Thus, although the chromatograms did not return to baseline for subsurface samples from 13MW-01 (3.6 to 4.2 mbgs), 13MW-06 (4.6 to 5.2 mbgs), and 13MW-12 (5.5 to 6.1 mbgs), further testing for F4 was not conducted.

Data quality objectives were met and the overall data quality is considered acceptable.

7.2 Petroleum Hydrocarbons

Concentrations of PHC in soil were below the referenced RBSLs in several samples with the exception of Modified TPH in samples recovered from the following locations:

- Water Street public parking lot: BH4, BH5 13MW-01, 13MW-02 (Modified TPH concentrations up to 3,400 mg/kg)
- Former UST Site (north of Buoy Shed): MW1, MW2 13MW-03, 13MW-04 (Modified TPH concentrations up to 870 mg/kg)
- Shop U/G Oil Water Separator (north end of Shop Building): S13MW-06 (Modified TPH concentration of 5,200 mg/kg)
- Marine Emergency & Helicopter Hanger U/G Oil Water Separator: MW5 (Modified TPH concentrations up to 1,100 mg/kg), and
- Northern Property Boundary adjacent to Market Slip: 13MW-12 (Modified TPH concentration of 2,900 mg/kg).

In addition, samples from BH-4 and 13MW-01 in the Water Street parking lot also contained concentrations of benzene greater than the RBSL. Exceedances of the soil ESLs (for direct soil contact with ecological receptors) are limited and include F2 and/or F3 hydrocarbons in samples from MW1 and 13MW-01.

PHC impacts in soil exceeding the RBSLs were generally associated with samples where the laboratory indicated potential presence/interference from PAHs with the exception of MW1 (0.15 m to 0.75 m depth). Analysis results show indicators of light petroleum products (*i.e.*, gasoline; diesel/#2 oil) at sample locations MW1, MW5, BH-4, BH-5 and 13MW-01. Petroleum product sources are not ruled out for other sample locations.

Impacts in soil exceeding the RBSLs in the Water Street public parking lot were identified at depths ranging from 0.6 m to 4.6 m below ground surface. Samples collected from 13MW-06 (near Shop Building) are proximal to, and resemble the impacts in the Water Street public parking lot; impacts at 13MW-06 were identified at depths ranging from 1.5 m to 5.2 m.

PHC impacts in soil exceeding the RBSLs near the former UST area (near Buoy Shed) were identified at depths ranging from 0.15 m to 6.6 m. Impacts in soil along the northern property boundary at 13MW-12 were confirmed at a depth of 5.5 m. PHC impacts near the Marine Emergency & Helicopter Hanger (MW5) were identified at a depth of approximately 2 m.

Groundwater samples collected historically and as part of this assessment contained concentrations of petroleum hydrocarbons below the RBSLs and the ESLs for direct contact. Concentrations of PHC in groundwater were below the ESLs protective of surface water with the exception of Modified TPH concentrations in historical samples collected from MW2, MW5, MW7 and BH-5.

7.3 Polycyclic Aromatic Hydrocarbons

Concentrations of PAHs above human health and/or ecological screening levels were reported for 10 of the 19 analyzed samples. Seventeen of 19 samples contained PAHs at concentrations above laboratory detection limits.

The sample locations where exceedences were identified included BH-5, BH-6, MW2, MW5, 13MW-01, 13MW-03, 13MW-04, 13MW-05, 13MW-08 (ecological exceedance only), and 13MW-12. The highest concentrations (*i.e.*, BaP TPE > 100 mg/kg) were measured in samples from MW5 and 13MW-05. Samples exceeding screening levels were recovered from depths ranging between 2.1 m and 6.6 m below ground surface.

PAH concentrations in the historical groundwater sample from MW5 were below the referenced screening levels with the exception of benzo(*g,h,i*)perlyene and chrysene, which exceeded the ecological screening level. Groundwater samples collected in 2013 using low-flow methods contained concentrations of PAHs below the laboratory detection limits.

7.4 Metals

Concentrations of metals in soil samples were below the human health screening levels with the exception of arsenic, lead, and/or vanadium in surface (<1.5 mbgs) samples from locations SS3, BH-8, BH-11, BH-14, 13MW-01 and 13MW-02, and subsurface (>1.5 mbgs) samples from 13MW-06 and 13MW-08. Exceedances of the human health guidelines were generally located in the northern portion of the site.

Exceedances of the ecological screening levels were noted in isolated samples from SS3 (zinc) and SBH7, BH-12 lab duplicate (molybdenum), while one or more of the following parameters exceeded the ecological screening levels for samples from 13MW-01 and 13MW-06: arsenic, copper, molybdenum, nickel, tin, and zinc.

8.0 Interpretation

An interpretation of exceedances of the screening levels presented in Section 7.0 is provided in the following sections.

8.1 Human Health

Exceedances of the PHC RBSLs in soil were identified in at least three areas of former petroleum storage and/or underground oil/water separators on the Canadian Coast Guard base. In many instances observations of petroleum hydrocarbons (i.e., Modified TPH) in soil exceeding the RBSLs were associated with the potential presence/interference from PAHs. As such, the reported concentrations of Modified TPH are not necessarily considered to be an indication of petroleum-based impacts alone, but rather a mixture or combination of PHCs and PAHs.

Nonetheless, analytical results and field observations from samples collected around the former UST site (near the Buoy Shed) are suggestive of petroleum-based impacts at depths extending to more than 6.6 m below ground surface. PHC impacts near the Shop Building, Helicopter Hanger and the Water Street public parking lot may also be associated historical petroleum storage or oily wastewater (depths up to 5.2 m, 2.7 m and 4.6 m, respectively).

PAH impacts in soil appear to be widely distributed with concentrations exceeding screening levels at depths of up to 6.6 m, and may extend deeper. Exceedances of the PAH screening levels appear to be associated with a number of sample locations in the eastern part of the site and at depth within the northern half of the Canadian Coast Guard base. These areas coincide with areas that were developed prior to the early 1800s (prior to the reported infilling to the west for the establishment of the Canadian Coast Guard base) and subsequently lost to a number of fires, including the Great Fire in 1877. It is anticipated that coal may have been a common fuel source during the early history of the site. Both coal use and the history of fire could lead to surface deposition of PAHs, while creosote timber cribwork associated with wharves could lead to localized PAH impacts.

Selected trace metals were also found at varying concentrations in soils of various depths across the site, again suggesting heterogeneity within the fill layers. Metals concentrations at 13MW-01 and 13MW-06 (lead exceeds SQG_{HH}), are generally consistent with lead paint impacts, and may be attributable to former structures in the Water Street parking lot area (removed prior to 1980).

The assessment of potential risks to human health requires not only a comparison of the measured concentrations to screening levels, but also an analysis of the relevant potential exposure pathways:

- Potential exposure pathways for PHCs considered to be active at this site (given the proposed redevelopment for mixed residential and commercial use) are the inhalation of petroleum hydrocarbon-derived vapours in indoor air (in buildings located up to 30 m of the impacts), and direct contact with/incidental ingestion of surface soil (up to 1.5 m depth). All analyzed samples contained concentrations of PHCs below the Pathway Specific Screening Levels (PSSLs) for direct contact/ingestion.

- The guidelines used for screening PAHs and metals are protective of direct contact with/incidental ingestion of impacted soil, which is generally restricted to the top 1.5 m of soil. Soil samples with concentrations of PAHs exceeding the screening levels were collected at depths greater than 1.5 m, while some of the noted metals exceedances were in surface soil samples. PAH impacts in surface soil cannot be ruled out.

Risk management, remediation, and/or additional assessment are among the options to mitigate and/or further assess potential exposures to petroleum hydrocarbons via the indoor air pathway. Risk management and/or risk assessment is also recommended to further assess the potential direct contact pathway for PAHs and metals. Should surface cover be removed and soils excavated as part of the proposed redevelopment, additional assessment may be warranted regarding the suitability of the material to be reused on site (*e.g.* grading, landscaping, *etc.*) and/or off-site disposal options. Considering the potential for groundwater impacts on the site, care may also be required in handling and disposal of groundwater (*i.e.*, dewatering).

Additional assessment and/or delineation of the observed soil and groundwater impacts may be required under the NBDELG Contaminated Sites Management Process.

8.2 Ecological

The referenced ecological screening levels represent a number of exposure pathways including soil contact (invertebrates), uptake by plants, and groundwater discharge to a surface water environment. At the outset of this assessment, historical data were conservatively screened against the most stringent ecological guidelines. In the case of the PAH constituents naphthalene and phenanthrene, the most conservative guidelines for soil are protective of groundwater discharging to a freshwater body. Historical data at BH-12 exceeded these guidelines, and as such 13MW-12 was drilled in the same vicinity to confirm soil conditions and to assess groundwater conditions. It has since been confirmed that the nearby water body is considered a marine aquatic environment. As such, and as per the CCME guidance document, alternative CCME screening levels have been referenced; concentrations of naphthalene and phenanthrene at BH-12 meet current screening levels.

The site is anticipated to remain as a developed site, and as such, is not considered to be significant ecological habitat for animals or plants (see Results of Ecological Screening Protocol in Appendix G). Therefore, the groundwater discharging to a marine habitat is deemed to be the only complete exposure pathway. Concentrations of Modified TPH and PAHs in several historical samples exceeded the applicable screening levels. However, the reported concentrations for many parameters were also near to or greater than reported solubility values, which can be reflective of entrained sediment in the water sample. Groundwater samples for PAH analysis in 2013 were collected using low-flow methods, and yielded results below laboratory detection limits. All PHC groundwater samples collected in 2013 met the applicable screening levels, suggesting that historical sampling methodology may have upwardly biased historical results by introducing sediment into the water samples. Additionally, samples collected in 2013 from locations between the historical exceedances and the marine environment met the screening levels for the protection of surface water. On account of winter conditions (*i.e.*, frozen monitoring wells), groundwater samples were not able to be collected from 13MW-05 or 13MW-12.

Additional assessment of potential groundwater impacts (*i.e.*, groundwater sampling) may be required under the NBDELG Contaminated Sites Management Process.

9.0 Conclusions and Recommendations

Petroleum hydrocarbons are present in soil at concentrations exceeding the RBSLs for residential land use in at least three areas of former petroleum storage and/or underground oil/water separators on the Canadian Coast Guard base and in the area of the Water Street public parking lot. In many instances observations of PHCs in soil exceeding the RBSLs were associated with the potential presence/interference from PAHs in the samples. As such, the reported concentrations of Modified TPH (up to 5,200 mg/kg) are not necessarily considered to be an indication of petroleum-based impacts alone, but rather a mixture or combination of petroleum hydrocarbons and polycyclic aromatic hydrocarbons. The highest PHC concentrations in soil were observed in heterogeneous fill materials in the area of the Shop Building and the Water Street public parking lot, with the observed depths of impact across the site ranging from within 1 m to 6 m or more below ground surface. PHC concentrations that were observed in groundwater in 2013 were relatively low compared to human health and ecological screening levels.

PAH impacts in soil appear to be widely distributed with concentrations exceeding screening levels (typically one order of magnitude or more greater than screening levels) at depths of up to 6 m or more. Exceedances of the PAH screening levels appear to be associated with a number of sample locations in the eastern part of the site and at depth within the northern half of the Canadian Coast Guard base. These areas coincide with areas that were developed prior to the early 1800s and subsequently lost to a number of fires, including the Great Fire in 1877. It is anticipated that coal may have been a common fuel source during the early history of the site. Both coal use and the history of fire could lead to surface deposition of PAHs, while creosote timber cribwork associated with wharves could lead to localized PAH impacts. PAH concentrations that were observed in groundwater in 2013 were low relative to human health and ecological screening levels.

Several trace metals at concentrations exceeding the screening levels (typically within one order of magnitude of screening levels) were found in soils of various depths across the site, suggesting heterogeneity within the fill layers. Metal impacts were observed in shallow (<1.5 m depth) and deeper soils on both the Canadian Coast Guard base and in the Water Street public parking lot.

On the basis of the assessment results, further action will be required to manage the observed impacts under the proposed development concept having mixed commercial and residential land use. Potential actions include remediation of the impacts to meet the prescribed screening levels or alternatively, further assessment to define appropriate risk management options. On the understanding that remediation of all impacts is likely to be both impractical and very expensive, the following actions are recommended:

- Further assessment of the observed petroleum hydrocarbon impacts should be completed to determine if the impacts will create hydrocarbon vapours in indoor air at concentrations greater than human health based reference concentrations. The results of vapour intrusion assessments will determine if remedial action is warranted and what controls may be necessary to mitigate vapour intrusion in existing and any proposed buildings. Risk management plans would define necessary corrective actions or controls. Limited remediation of impacts may be required in order to accommodate construction of new buildings.

- Risk management plans should be developed to manage potential exposures for direct contact with PAH and metal impacts. Potential exposures under current site conditions are considered to be substantially mitigated. Should surface cover be removed and soils excavated as part of the proposed development, additional assessment may be warranted regarding the suitability of the material to be reused on site (*e.g.* grading, landscaping, *etc.*). Risk management plans would define necessary corrective actions or controls. Remediation of impacts may be required in order to accommodate construction of new buildings.
- Risk management plans should be developed for construction waste (*i.e.*, waste soil, groundwater, timbers, debris, *etc.*). Should surface cover be removed and soils excavated as part of the proposed development, additional assessment and consultation with NBDELG may be warranted regarding off-site disposal options. Considering the potential for groundwater impacts on the site, care may also be required in handling and disposal of groundwater (*i.e.*, dewatering). Risk management plans would define necessary corrective actions or controls. Additional testing of existing fill materials located within proposed excavation zones would be prudent once design details are available.

NBDELG should be consulted and the findings of the report should be incorporated into a Remedial Action Plan for submission to the NBDELG.

10.0 Closure

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

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

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

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

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

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed. Stantec assumes no liability for damage to property or to human or ecological health based on the misuse or misinterpretation of our report drawings or figures.

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

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec requests that this information be brought to our attention. The primary authors of this report were Melanie Langille, M.Env.Sc. and Robert S. Fiander, P.Eng. The report was reviewed by Tania Noble, M.Eng, P.Eng.

Respectfully submitted,

STANTEC CONSULTING LTD.

REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
#3627
R. S. Fiander
28 MAR '13
Province du Nouveau-Brunswick
INGÉNIEUR IMMATRICULÉ

for

Robert S. Fiander, P.Eng.
Environmental Services

Tania Noble, M.Eng, P.Eng.
National Service Lead
for Risk Assessment

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APPENDIX A

Drawings

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

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NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Site Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:50,000

Project No.: 121811071

Data Sources: ESRI ArcGIS Online SNB

Dwg. No.: 1

Date: (dd/mm/yyyy) 26/03/2013

Dwn. By: JAB

Appd. By: RSF

Stantec

Stantec Consulting Ltd. © 2013

Map: NAD83 CSRS NB Double Stereographic

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Subject and Surrounding Properties

Saint John, N.B.

Client:	Saint John Development Corporation

Scale:	Project No.:	Data Sources:	Dwg. No.:
1:1,500	121811071	SNB ArcGIS Online Bing Imagery	2

Date: (dd/mm/yyyy):	Fig. By:	Appd. By:
26/03/2013	JAB	RSF

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Path: C:\gis\121811071\drawing\13_draft_figures\mxd\rpt\fig3_20130326_sample_plan.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Sample Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,000

Project No.: 121811071

Data Sources:
SNB
ArcGIS Online Bing Imagery

Dwg. No.: 3

Date: (dd/mm/yyyy): 26/03/2013

Fig. By: JAB

Appd. By: RSF

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

APPENDIX B

Tier I/II Checklist

SITE ASSESSMENT & TIER I/II TABLE CHECKLIST

		Method Used	
Site Location:	Fundy Quay, Saint John, New Brunswick	Tier I RBSL	X
Site Professional:	Robert S. Fiander, P.Eng.	Tier II PSSL	
Date:	March 2013	Tier II SSTL	

Minimum Site Assessment Requirements	**Other**	
Issue	**Yes or No***	**Comment**
PID, owner, location identified	Yes	
Current and anticipated future land use identified	Yes	Residential (future) land use evaluated
Review of underground services as conduits	No	Section 6
Historical review completed	Yes	Refer to previous environmental reports
Local groundwater use identified	Yes	
Adjacent land uses and receptors identified	Yes	
Ecological screening completed	Yes	
Soil and groundwater samples from all source areas obtained	N/A	Refer to Section 5
Soil and groundwater impacts delineated to Tier I RBSLs for potential receptor (adjacent property receptor may be lower Tier I RBSLs)	N/A	Refer to Section 5
Groundwater flow direction and gradient established	Yes	Section 6
Combination of surface and sub-surface soil samples analysed	Yes	
Free product observations made in soil and groundwater	Yes	None observed
Low lab detection level for benzene in soil if potable water area	N/A	
Grain size and organic carbon analysis completed on soil	No	Predominately coarse-grained soils observed (most stringent criteria considered)
TPH fractionation done on soil and water if calculating Tier II SSTL	N/A	
Scaled site plan showing all relevant site features	Yes	
Receptor building characteristics obtained (stories, floor condition, ceiling height, *etc.*)	No	Detailed building condition review not completed

Mandatory Conditions		
Issue	**Yes or No***	**Comment**
Non-aqueous phase liquids not present in groundwater	Yes	None observed
Potable water free of objectionable taste and odour	N/A	
Soils do not contain liquid and/or free petroleum product	Yes	None observed
Residual hydrocarbons do not create objectionable odours or explosive conditions in indoor or outdoor air	Yes	None observed
Surface soils are not stained	Yes	None observed
No dirt basement floors, sumps with dirt bottoms, *etc*.	N/A	Detailed building condition review not completed
Confirmed that correct TPH type selected in RBSL or PSSL Table	Yes	
Confirmed that correct soil type selected in RBSL or PSSL Table	Yes	

Default Site Characteristics and Exposure Scenarios		
Issue	**Yes or No***	**Comment**
Depth to groundwater approximately 3.0 metres	Yes	Variable; influenced by tides
Impacted soil thickness is less than 3.0 metres	No	Section 7
Default foundation crack fraction is appropriate	N/A	Detailed building condition review not completed
Default foundation thickness is appropriate	N/A	Detailed building condition review not completed
Two floors exist if using a residential scenario	N/A	To be determined for future land use
Hydrocarbon impacts above RBSL or PSSL Table soil values are not within 0.3 m of foundation walls or floor slab	N/A	Delineation not completed
Confirmed that RBSL or PSSL Table values are correct for adjacent property receptors (*i.e.* use residential at property line if adjacent property is residential)	Yes	Section 4
Where exposure pathways have been eliminated at Tier II, detailed explanation is provided in the report to explain why pathways are not relevant	N/A	
Where PSSL tables are used based on elimination or control of a pathway that could be reopened by changes in site use, this condition is specified as a limitation in the report	N/A	

From Appendix 6, Atlantic RBCA Version 3, July 2012

Where Tier II SSTLs have been calculated by changing default values, the report includes the parameter changed, the default value, the site-specific value used, and the rationale and/or detailed written justification	N/A	

* If No, indicate in comment section if and where in report the issue is addressed.
Consult the Best Management Practices (Appendix 2) for additional details.

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APPENDIX C

Analytical Data

Table C1: Hydrocarbon Concentrations in Soil

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH*	
Tier I RBSLs			0.099	77	30	8.8	N/A	N/A	N/A	N/A	270 / 1100	
Tier I ESLs - Soil Contact for Samples < 1.5 mbgs			31	75	55	95	210	150	300	2800	N/A	
ID	**Date**	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
MW1 SA1	2002	0.15-0.75	nd	0.032	0.237	0.651	22	**280**	**350**	N/A	650	FO.LO
MW1 SA7	2002	4.0-4.3	nd	nd	nd	nd	nd	nd	19	N/A	nd	LO
MW2 SA1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW2 SA9	2002	5.2-5.8	nd	nd	nd	nd	nd	120	280	N/A	400	LO. PAH?
MW3 SA2	2002	0.75-1.0	nd	nd	nd	nd	nd	51	220	N/A	270	FO/LO
MW3 SA6	2002	3.4-4.0	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW4 SA10	2002	5.5-6.1	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW4 SA2	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	40	N/A	40	LO
MW4 SA2 FD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	34	N/A	34	-
MW4 SA2 LD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	36	N/A	36	-
MW5 SA2	2002	0.75-1.1	nd	nd	nd	nd	nd	35	86	N/A	120	FO.LO
MW5 SA4A	2002	2.1-2.7	nd	0.115	nd	0.242	7.1	390	670	N/A	1100	G.LO.PAH?
MW6 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	18	N/A	nd	LO
MW6 SA1 LD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	20	N/A	nd	LO
MW6 SA8	2002	4.6-5.2	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW7 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	35	N/A	35	LO
MW7 SA1 FD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	29	N/A	nd	-
MW7 SA6	2002	3.3-3.9	nd	nd	nd	nd	nd	nd	39	N/A	39	LO
BH1 Sa1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
BH1 Sa3	2002	2.1-2.7	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
BH4 SA9	5-Apr-06	1.8-2.4	0.1	0.46	1.6	7.2	36	1100	1100	N/A	2200	PAH?
BH5 SS7	31-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	4	460	220	N/A	680	FO. PAH?
BH7 SS7	30-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
BH9 SA10	28-Mar-06	6.4-7.0	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
BH12 SA9	22-Mar-06	5.2-5.8	<0.005	<0.05	<0.01	<0.05	<2.5	<15	19	N/A	<21	PAH?
BH13 SA10	28-Mar-06	5.8-6.4	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
13MW-01 SS3	30-Jan-13	0.6-1.2	0.11	0.33	0.034	0.41	5	34	**570**	N/A	600	OP(FO/LO) PAH?
13MW-01 SS3 LD	30-Jan-13	0.6-1.2	N/A	N/A	N/A	N/A	N/A	28	**630**	N/A	N/A	N/A
13MW-01 SS8	30-Jan-13	3.6-4.2	0.054	0.14	0.17	0.47	<2.5	530	2800	N/A	3400	OP(FO/LO) PAH? F4?
13MW-02 SS2	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	47	770	N/A	820	OP(FO/LO) PAH?
13MW-02 SS2 LD	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02 SS6	30-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	10	135	N/A	140	LO

Table C1: Hydrocarbon Concentrations in Soil

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH***	
Tier I RBSLs			0.099	77	30	8.8	N/A	N/A	N/A	N/A	270 / 1100	
Tier I ESLs - Soil Contact for Samples < 1.5 mbgs			31	75	55	95	210	150	300	2800	N/A	
ID	**Date**	**Depth (mbgs)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
13MW-03 SS7	30-Jan-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-03 SS10	30-Jan-13	5.5-6.1	<0.025	<0.025	<0.025	<0.050	<2.5	24	340	N/A	360	OP(FO/LO) PAH?
13MW-04 SS2	31-Jan-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-04 SS10	31-Jan-13	6.0-6.6	<0.025	<0.025	<0.025	<0.050	<2.5	64	810	N/A	870	OP(FO/LO) PAH?
13MW-05 SS8	31-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	48	N/A	48	LO. UP(FO/LO)
13MW-06 SS3	1-Feb-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	51	990	N/A	1000	OP(FO/LO) PAH?
13MW-06 SS8	1-Feb-13	4.6-5.2	<0.025	0.19	<0.025	<0.050	<2.5	800	4400	N/A	5200	OP(FO/LO) PAH? F4?
13MW-07 SS8	1-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-08 SS6	1-Feb-13	3.3-3.9	<0.025	<0.025	<0.025	<0.050	<2.5	<10	49	N/A	49	LO
13MW-09 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	20	N/A	20	LO
13MW-09 SS3 LD	4-Feb-13	1.2-1.8	N/A	N/A	N/A	N/A	N/A	<10	25	N/A	N/A	N/A
13MW-09 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-10 SS1	4-Feb-13	0.0-0.6	<0.025	<0.025	<0.025	<0.050	<2.5	<10	52	N/A	52	OP(FO/LO). PLO
13MW-10 SS7	4-Feb-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-12 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	17	N/A	17	LO
13MW-12 SS10	4-Feb-13	5.5-6.1	<0.025	<0.025	<0.025	0.23	<2.5	140	2740	N/A	2900	LO. PAH? F4?

Most Conservative Land Use: Residential

Water Use: Non-potable

Soil Type: Coarse-grained

*Product Type: Diesel / No. 2 Fuel Oil (270 mg/kg), No. 6 Oil / Lube Oil (1100 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)

Depth of Groundwater: Unknown / Varies

Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)

Table C2: Hydrocarbon Concentrations in Groundwater

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH*	
Tier I RBSLs		2.6	20	20	20	N/A	N/A	N/A	N/A	20 / 20	
Tier I ESLs - Shallow Groundwater Contact		61	59	20	31	N/A	7.1	1.8	N/A	N/A	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
MW1	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW2	2002	nd	nd	nd	nd	N/A	nd	0.36	0.5	0.9	OP(FO/LO) PAH?
MW2	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW3	2002	nd	nd	nd	nd	N/A	nd	0.14	0.2	0.3	LO. PAH?
MW4	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW4	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW5	2002	nd	nd	nd	nd	N/A	nd	0.45	0.6	1	OP(FO/LO) PAH?
MW6	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW7	2002	nd	0.003	nd	nd	N/A	0.01	0.29	1.1	1.4	G. LO.
MW7 FD	2002	nd	nd	nd	nd	N/A	nd	0.48	0.5	1	OP(FO/LO) PAH?
MW7 FD(LD)	2002	nd	nd	nd	nd	N/A	nd	0.34	0.4	0.7	OP(FO/LO) PAH?
BH5	3-Apr-06	<0.001	<0.001	<0.001	<0.001	N/A	<0.1	0.92	0.1	1.1	FO
13MW-01	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.383	0.38	LO. UP(FO/LO)
13MW-01 LD	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-03	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.226	0.22	OP(FO/LO). UP(FO/LO)
13MW-04	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-06	7-Feb-13	<0.0010	0.0042	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-07	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.058	< 0.12	<0.12	N/A
13MW-08	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.36	0.36	OP(FO/LO). UP(FO/LO)
13MW-09	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-10	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A

Most Conservative Land Use: Residential

Water Use: Non-potable

Soil Type: Coarse-grained

*Product Type: Diesel / No. 2 Fuel Oil (20 mg/kg), No. 6 Oil / Lube Oil (20 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)

Depth of Groundwater: Unknown / Varies

Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)

Table C3: Hydrocarbon Concentrations in Water Protective of Aquatic Life

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH*	
Tier I ESLs - Surface Water		2.1	0.77	0.32	0.33	5	N/A	N/A	N/A	0.1 / 0.1	
Tier I ESLs - Groundwater		4.6	4.2	3.2	2.8	N/A	N/A	N/A	N/A	0.84 / 0.48	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
Groundwater Samples											
MW1	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW2	2002	nd	nd	nd	nd	N/A	nd	0.36	0.5	0.9	OP(FO/LO) PAH?
MW2	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW3	2002	nd	nd	nd	nd	N/A	nd	0.14	0.2	0.3	LO. PAH?
MW4	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW4	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW5	2002	nd	nd	nd	nd	N/A	nd	0.45	0.6	1	OP(FO/LO) PAH?
MW6	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW7	2002	nd	0.003	nd	nd	N/A	0.01	0.29	1.1	1.4	G. LO.
MW7 FD	2002	nd	nd	nd	nd	N/A	nd	0.48	0.5	1	OP(FO/LO) PAH?
MW7 FD(LD)	2002	nd	nd	nd	nd	N/A	nd	0.34	0.4	0.7	OP(FO/LO) PAH?
BH5	3-Apr-06	<0.001	<0.001	<0.001	<0.001	N/A	<0.1	0.92	0.1	1.1	FO
13MW-01	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.383	0.38	LO. UP(FO/LO)
13MW-01 LD	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-03	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.226	0.22	OP(FO/LO). UP(FO/LO)
13MW-04	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-06	7-Feb-13	<0.0010	0.0042	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-07	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.058	< 0.12	<0.12	N/A
13MW-08	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.36	0.36	OP(FO/LO). UP(FO/LO)
13MW-09	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-10	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A

Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)
Fuel Type: Diesel / No. 2 Fuel Oil
Soil Type: Coarse-grained

*Product Type (Surface Water ESLs): Diesel / No. 2 Fuel Oil (0.1 mg/kg), No. 6 Oil / Lube Oil (0.1 mg/kg)

*Product Type (Groundwater ESLs): Diesel / No. 2 Fuel Oil (0.84 mg/kg), No. 6 Oil / Lube Oil (0.48 mg/kg)

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Table C4: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	Concentration (mg/kg)															
		SQG_{HH} Residential		SQG_E Residential		Sample Identification											
						BH6 SS5	BH5 SS7	BH8 SS8	BH12 SA9	BH13 SA10	MW2 SA9	MW5 SA4A	13MW-01 SS8	13MW-02 SS6	13MW-02 SS6 LD	13MW-03 SS10
Non-Carcinogenic PAHs																	
Acenaphthene	--	3900	AE	--		0.74	1.4	<0.01	0.08	<0.01	0.9	3.9	16	0.030	0.046	1.8
Acenaphthylene	--	--		--		0.06	0.02	<0.01	<0.01	<0.01	0.65	2.40	0.45	0.017	0.024	1.1
Anthracene	--	24000	AE	2.5	CCME	1.7	**3.4**	<0.01	0.17	<0.01	**4.7**	**11**	**15**	0.086	0.13	**9.9**
Fluoranthene	--	3500	AE	50	CCME	7.4	17	0.02	0.72	<0.01	13	**67**	43	0.32	0.4	37
Fluorene	--	2700	AE	--		0.82	1.3	<0.01	0.09	<0.01	1.2	4.7	11	0.033	0.047	2.3
Naphthalene	--	2.2	AE	0.6	CCME	0.25	0.42	<0.01	0.06	<0.01	0.32	**1.9**	**5.2**	0.029	0.044	0.53
Phenanthrene	--	--		5	CCME	**6.7**	**17**	0.02	0.61	<0.01	**11**	**51**	**93**	0.42	0.36	**19**
Pyrene	--	2100	AE	10	CCME	6.8	**15**	0.02	0.63	<0.01	**11**	**52**	**53**	0.25	0.27	**28**
Perylene	--	--		--		na	na	na	na	na	1.1	6.2	2.8	0.032	0.043	3.0
1-Methylnaphthalene	--	--		--		na	na	na	na	na	0.21	1.6	11	0.043	0.036	0.34
2-Methylnaphthalene	--	--		--		na	na	na	na	na	0.24	1.9	12	0.042	0.046	0.39
Carcinogenic PAHs																	
Benzo[a]anthracene	0.1	--		1	CCME	**3.5**	**7**	0.01	0.27	<0.01	**4.6**	**27**	**22**	0.2	0.23	**15**
Benzo[a]pyrene	1	--		20	CCME	3.5	6.4	<0.01	0.24	<0.01	4.3	**25**	14	1.2	0.15	12
Benzo[b]fluoranthene	0.1	--		1[2]	CCME	**3.6**	**7.2**	0.01	0.22	<0.01	**3.2**	**20**	**11**	0.099	0.12	**9.2**
Benzo[ghi]perylene	0.01	--		--		2.1	3.8	<0.01	0.14	<0.01	2.1	11	7.0	0.10	0.10	6.0
Benzo[j]fluoranthene	0.1	--		1[2]	CCME	na	na	na	na	na	na	na	**7.1**	0.068	0.084	**5.9**
Benzo[k]fluoranthene	0.1	--		1[2]	CCME	**1.9**	**4**	0.01	0.18	<0.01	**3.2**	**20**	**6**	0.053	0.066	**5.6**
Chrysene	0.01	--		--		3.3	6.8	<0.01	0.28	<0.01	4.6	26	24	0.19	0.2	13
Dibenz[a,h]anthracene	1	--		1	CCME	0.48	**1.1**	<0.01	0.03	<0.01	0.4	**3.1**	**2.1**	0.019	0.023	**1.9**
Indeno[1,2,3-cd]pyrene	0.1	--		1	CCME	**2.2**	**4.2**	<0.01	0.14	<0.01	**2.5**	**13**	**5.9**	0.063	0.079	**5.3**
B(a)P TPE	-	5.3	CCME	--		**15.46**	**29.54**	0.04	1.07	0.04	**18.35**	**109.41**	**64.83**	3.81	0.70	**54.57**
Sample Depth (mbgs)						3.00	4.30	2.40	5.50	6.10	5.2-5.8	2.1-2.7	3.6-4.2	4.2-4.8	4.2-4.8	5.5-6.1
Sample Date						2006	2006	2006	2006	2006	2002	2002	1/30/2013	1/30/2013	1/30/2013	1/30/2013

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

CCME = Canadian Council of Ministers of the Environment Soil Quality Guidelines.

Accessed online March 2013

AE = Alberta Environment Tier 1 Soil & Groundwater Remediation

Guidelines (AE, 2010)

1/2 the detection limit was used in B(a)P TPE calculations.

Table C4: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Residential		SQG_E Residential		Concentration (mg/kg)								
						Sample Identification								
						13MW-04 SS10	13MW-05 SS8	13MW-06 SS8	13MW-07 SS8	13MW-08 SS6	13MW-09 SS3	13MW-10 GS1	13MW-11 SS3	13MW-12 SS10
Non-Carcinogenic PAHs														
Acenaphthene	--	3900	AE	--		9.1	31	0.032	<0.010	0.24	0.020	<0.010	<0.010	6.0
Acenaphthylene	--	--		--		1.3	0.54	0.017	<0.010	0.075	0.016	<0.010	<0.010	1.1
Anthracene	--	24000	AE	2.5	CCME	**23**	**68**	0.055	<0.010	0.40	0.051	<0.010	<0.010	**10**
Fluoranthene	--	3500	AE	50	CCME	**77**	**200**	0.29	<0.010	2.9	0.31	0.032	<0.010	**53**
Fluorene	--	2700	AE	--		10	28	0.040	<0.010	0.25	0.022	<0.010	<0.010	7.7
Naphthalene	--	2.2	AE	0.6	CCME	**6.9**	**6.1**	0.062	<0.010	0.25	0.016	<0.010	<0.010	**10**
Phenanthrene	--	--		5	CCME	**87**	**250**	0.22	<0.010	2.2	0.22	0.024	<0.010	**52**
Pyrene	--	2100	AE	10	CCME	**56**	**160**	0.30	<0.010	2.5	0.27	0.028	<0.010	**43**
Perylene	--	--		--		5.2	15	0.043	<0.010	0.26	0.033	<0.010	<0.010	3.9
1-Methylnaphthalene	--	--		--		2.0	3.7	0.040	<0.010	0.075	<0.010	0.011	<0.010	1.8
2-Methylnaphthalene	--	--		--		2.9	4.8	0.042	<0.010	0.11	<0.010	0.017	<0.010	2.1
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		1	CCME	**27**	**60**	0.14	<0.010	**1.3**	0.16	0.017	<0.010	**22**
Benzo[a]pyrene	1	--		20	CCME	**21**	**55**	0.13	<0.010	0.96	0.12	0.012	<0.010	13
Benzo[b]fluoranthene	0.1	--		1[2]	CCME	**15**	**44**	0.12	<0.010	**0.76**	0.096	0.011	<0.010	**10**
Benzo[ghi]perylene	0.01	--		--		11	32	0.090	<0.010	0.60	0.083	<0.010	<0.010	7.6
Benzo[j]fluoranthene	0.1	--		1[2]	CCME	**9.3**	**27**	0.061	<0.010	**0.41**	0.054	<0.010	<0.010	**5.9**
Benzo[k]fluoranthene	0.1	--		1[2]	CCME	**9**	**26**	0.064	<0.010	**0.41**	0.054	<0.010	<0.010	**5.8**
Chrysene	0.01	--		--		25	58	0.16	<0.010	1.2	0.16	0.022	<0.010	21
Dibenz[a,h]anthracene	1	--		1	CCME	**2.8**	**7.7**	0.023	<0.010	0.14	0.021	<0.010	<0.010	**2.1**
Indeno[1,2,3-cd]pyrene	0.1	--		1	CCME	**10**	**29**	0.072	<0.010	0.50	0.073	<0.010	<0.010	**6.7**
B(a)P TPE	-	5.3	CCME	--		**93.57**	**246.60**	0.60	0.04	4.37	0.56	0.06	0.04	**61.28**
					Sample Depth (mbgs)	6.0-6.6	4.2-4.8	4.6-5.2	4.2-4.8	3.3-3.9	1.2-1.8	0-0.6	1.2-1.8	5.5-6.1
					Sample Date	1/31/2013	1/31/2013	2/1/2013	2/1/2013	2/1/2013	2/4/2013	2/4/2013	2/4/2013	2/4/2013

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

CCME = Canadian Council of Ministers of the Environment Soil Quality Guidelines.

Accessed online March 2013

AE = Alberta Environment Tier 1 Soil & Groundwater Remediation

Guidelines (AE, 2010)

1/2 the detection limit was used in B(a)P TPE calculations.

Table C5 - Polycyclic Aromatic Hydrocarbons in Groundwater

Parameter (µg/L)	WQG_{HH} Residential		WQG_E [1]		Concentration (µg/L) Sample Identification		
					MW5	13-MW-07*	13-MW-10*
1-Methylnaphthalene	62000	OMOE	1500	OMOE	0.23	<0.050	<0.060
2-Methylnaphthalene			1500	OMOE	0.27	<0.050	<0.060
Acenaphthene	600	OMOE	5200	OMOE	0.5	<0.010	<0.020
Acenaphthylene	36	OMOE	1.4	OMOE	0.2	<0.010	<0.020
Anthracene	--		1	OMOE	0.72	<0.010	<0.020
Benzo(a)anthracene	70	OMOE	1.8	OMOE	1.4	<0.010	<0.020
Benzo(a)pyrene	130	OMOE	2.1	OMOE	1.4	<0.010	<0.020
Benzo(b)fluoranthene	1100	OMOE	4.2	OMOE	1.1	<0.010	<0.020
Benzo(g,h,i)perylene	--		0.2	OMOE	**0.82**	<0.010	<0.020
Benzo(j)fluoranthene	--		--		na	<0.010	<0.020
Benzo(k)fluoranthene	1300	OMOE	1.4	OMOE	1.1	<0.010	<0.020
Chrysene	2400	OMOE	0.7	OMOE	**1.4**	<0.010	<0.020
Dibenz(a,h)anthracene	1300	OMOE	0.4	OMOE	0.19	<0.010	<0.020
Fluoranthene	1100	OMOE	73	OMOE	4.6	<0.010	<0.020
Indeno(1,2,3-cd)pyrene	2200	OMOE	1.4	OMOE	0.74	<0.010	<0.020
Naphthalene	1400	OMOE	6200	OMOE	0.3	<0.20	<0.30
Perylene	--		--		0.42	<0.010	<0.020
Phenanthrene	--		380	OMOE	3.5	<0.010	<0.020
Pyrene	9300	OMOE	5.7	OMOE	3.8	<0.010	<0.020
				Sampling Date	2002	23-Feb-13	23-Feb-13

Notes:

WQGHH = Water Quality Guideline protective of Human Health (Industrial receptor)

WQGE = Water Quality Guideline protective of ecological receptors

OMOE = Ontario Ministry of Environment. Rationale for the Development of Soil and Groundwater Quality Standards for Use at Contaminated Sites in Ontario. 2009, updated April 2011. (Appendix A3 - Groundwater components non-potable water scenario, coarse textured soil)

water body have been referenced, and represent 10 x the aquatic protection value

na = not appliable

* indicates sample collected using low-flow methods

Table C6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SHG$_{HH}$ Residential**		**SQG$_E$ Residential**		**SS1A**	**SS2A**	**SS3A**	**SS3B**	**SS3C**	**SBH1A**	**SBH2A**	**SBH2A FD (SBHX A)**	**SBH3A**	**SBH4A**	**SBH4A LD**	**SBH5A**
Aluminum	--		--		9000	10000	9400	na	na	10000	9400	9700	9500	8900	8800	8300
Antimony	7.5	OMOE	20	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Arsenic	31	CCME	17	CCME	5	6	7	na	na	5	6	6	4	5	5	5
Barium	3800	OMOE	500	AE	46	60	42	na	na	32	37	35	33	37	38	30
Beryllium	38	OMOE	5	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Bismuth	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Boron	4300	OMOE	120	OMOE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Cadmium	14	CCME	10	CCME	nd	nd	0.4	na	na	0.3	nd	nd	nd	nd	nd	nd
Chromium	220	CCME	64	CCME	17	19	20	na	na	22	19	16	13	15	20	13
Cobalt	22	OMOE	20	AE	8	9	9	na	na	10	9	9	7	9	9	8
Copper	1100	CCME	63	CCME	30	41	51	na	na	33	27	27	24	26	24	30
Iron	--		--		16000	18000	19000	na	na	19000	18000	19000	15000	18000	18000	16000
Lead	140	CCME	300	CCME	24	38	80	na	na	25	14	13	9.1	32	22	12
Lithium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Manganese	--		--		480	570	490	na	na	510	450	430	510	510	510	400
Mercury	6.6	CCME	12		0.04	0.06	0.04	na	na	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Molybdenum	110	OMOE	4	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Nickel	330	OMOE	50	CCME	14	15	22	na	na	16	15	16	11	14	14	12
Rubidium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Selenium	80	CCME	1	CCME	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Silver	77	OMOE	20	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Strontium	--		--		8	6	10	na	na	11	10	10	10	12	12	11
Thallium	1	CCME	1.4	CCME	nd	0.1	0.1	na	na	nd	nd	nd	nd	0.1	0.1	nd
Tin	9400	USEPA	5	AE	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	23	CCME	500	CCME	0.5	0.8	0.9	na	na	0.5	0.4	0.4	0.4	0.9	0.8	0.4
Vanadium	39	OMOE	130	CCME	25	35	**44**	na	na	34	24	25	22	26	27	25
Zinc	5600	OMOE	200	CCME	69	97	**1300**	**520**	**1000**	130	59	58	44	52	50	48
Sampling Depth (m bgs)					0-0.15	0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002

Notes:

SQG$_{HH}$ = Soil Quality Guideline for the protection of Human Health (Residential)

SQG$_E$ = Soil Quality Guideline for the protection of Ecological receptors.

AE = Alberta Environment Tier 1 Soil &Groundwater Remediation Guidelines (AE, 2010)

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OMOE = Ontario Ministry of the Environment Guidelines (OMOE, 2011) – Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition – Residential/Parkland Land Use, Coarse-grained Soil.

USEPA = United States Environmental Protection Agency, Generic Tables. Accessed online, March 2013. (Value is adjusted by a factor of 0.2 to account for multiple exposure sources, as per Health Canada PQRA guidance, 2012)

"-"/na = Not applicable mbgs = meters below ground surface

Table C6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SHG$_{HH}$ Residential**		**SQG$_E$ Residential**		**SBH6A**	**SBH7A**	**SBH8A**	**SBH9A**	**SBH10A**	**SBH10A FD (SBHY A)**	**SBH11A**	**SBH12A**	**SBH12A LD**	**BH8 SA1**	**BH8 SA1 LD**	**BH10 SA1**
Aluminum	--		--		9000	8200	10000	8800	8800	9100	10000	9500	10000	14400	14600	12500
Antimony	7.5	OMOE	20	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Arsenic	31	CCME	17	CCME	6	< 2	5	6	5	5	6	4	5	5	5	5
Barium	3800	OMOE	500	AE	34	5	34	33	33	33	41	31	33	48	47	34
Beryllium	38	OMOE	5	AE	nd	**29**	nd	nd	nd	nd	nd	nd	nd	0.7	0.7	0.5
Bismuth	--		--		na	na	na	na	na	na	na	na	na	<1	<1	<1
Boron	4300	OMOE	120	OMOE	nd	nd	nd	nd	nd	nd	nd	nd	nd	4	3	3
Cadmium	14	CCME	10	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	0	<0.1
Chromium	220	CCME	64	CCME	15	nd	21	18	16	15	19	17	20	29	28	15
Cobalt	22	OMOE	20	AE	9	8	10	8	8	8	10	8	10	10.4	10.8	9
Copper	1100	CCME	63	CCME	25	24	27	30	24	24	27	28	28	33	33	28
Iron	--		--		17000	16000	20000	21000	17000	17000	20000	17000	18000	24400	25100	18500
Lead	140	CCME	300	CCME	10	10	26	46	21	19	13	9.7	21	19.3	17.7	10.5
Lithium	--		--		na	na	na	na	na	na	na	na	na	18.2	18.4	17.8
Manganese	--		--		460	480	490	540	430	450	480	450	490	553	571	406
Mercury	6.6	CCME	12		0.01	0.01	0.06	0.2	0.01	0.01	0.01	0.03	0.02	na	na	na
Molybdenum	110	OMOE	4	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.9	0.8	0.4
Nickel	330	OMOE	50	CCME	13	13	17	15	14	14	17	14	16	19	19	14
Rubidium	--		--		na	na	na	na	na	na	na	na	na	10.6	10.2	7.1
Selenium	80	CCME	1	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<1	<1	<1
Silver	77	OMOE	20	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Strontium	--		--		8	9	11	17	22	20	15	5	5	35	36	23
Thallium	1	CCME	1.4	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Tin	9400	USEPA	5	AE	na	na	na	na	na	na	na	na	na	2	1	<1
Uranium	23	CCME	500	CCME	0.6	1.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Vanadium	39	OMOE	130	CCME	24	23	29	29	25	26	26	24	28	**44**	**46**	34
Zinc	5600	OMOE	200	CCME	84	42	61	53	50	52	58	46	51	68	67	52
Sampling Depth (m bgs)					0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0-0.6	0-0.6	0-0.6
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	20-Mar-06	29-Mar-06	23-Mar-06

Notes:

SQG$_{HH}$ = Soil Quality Guideline for the protection of Human Health (Residential)

SQG$_E$ = Soil Quality Guideline for the protection of Ecological receptors.

AE = Alberta Environment Tier 1 Soil &Groundwater Remediation Guidelines (AE, 2010)

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"-"/na = Not applicable

mbgs = meters below ground surface

Table C6: Metals in Soil

Elements (mg/kg)	SHG$_{HH}$ Residential		SQG$_{E}$ Residential		Concentration (mg/kg)									
					Sample Identification									
					BH 11 SA1	BH11 SA1 LD	BH12 SA2	BH12 SA2 LD	BH13 SA1	BH14 SA1	13MW-01 SS3	13MW-01 SS3 LD	13MW-02 SS2	13MW-03 SS3
Aluminum	--		--		1400	14300	13600	13500	12000	14400	8400	8900	15000	11000
Antimony	7.5	OMOE	20	AE	<0.1	0.1	0.1	0.1	0.2	<0.1	3.0	3.0	2.1	<2.0
Arsenic	31	CCME	17	CCME	10	5	5	6	5	4	**61**	**63**	6.3	4.5
Barium	3800	OMOE	500	AE	56	49	53	53	51	52	110	110	150	30
Beryllium	38	OMOE	5	AE	0.8	0.7	0.8	0.8	1	0.7	<2.0	<2.0	<2.0	<2.0
Bismuth	--		--		<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0
Boron	4300	OMOE	120	OMOE	3	3	3	4	3	3	11	10	<5.0	<5.0
Cadmium	14	CCME	10	CCME	0.2	0.2	0.2	0.2	0.2	0.1	0.62	0.7	<0.30	<0.30
Chromium	220	CCME	64	CCME	26	27	22	42	23	21	22	22	20	17
Cobalt	22	OMOE	20	AE	11.5	11.4	11.2	11	9.9	11.6	19	20	9.7	9.1
Copper	1100	CCME	63	CCME	32	32	31	33	37	31	**130**	**130**	47	26
Iron	--		--		24100	24400	24300	26400	23300	25800	47000	49000	25000	23000
Lead	140	CCME	300	CCME	17.3	15.8	20.1	23.4	21.4	18.4	110	100	**270**	10
Lithium	--		--		21.7	21.7	19.8	20.9	18.7	20.9	17	17	16	14
Manganese	--		--		614	615	566	578	585	566	300	320	510	520
Mercury	6.6	CCME	12		na	na	na	na	na	na	0.28	0.3	0.23	<0.10
Molybdenum	110	OMOE	4	AE	0.8	0.7	1.1	**5.4**	2.2	0.7	**44**	**44**	<2.0	<2.0
Nickel	330	OMOE	50	CCME	18	18	16	18	17	16	**89**	**110**	15	13
Rubidium	--		--		11	10.6	10.5	11.3	10.8	10.2	4.6	4.9	6.0	4.7
Selenium	80	CCME	1	CCME	<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0
Silver	77	OMOE	20	AE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.50	<0.50	<0.50	<0.50
Strontium	--		--		30	28	23	23	14	19	92	96	27	12
Thallium	1	CCME	1.4	CCME	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.56	0.58	<0.10	<0.10
Tin	9400	USEPA	5	AE	1	1	1	2	2	2	3.5	2.8	2.6	<2.0
Uranium	23	CCME	500	CCME	0.9	0.9	0.8	0.8	0.9	0.8	23	23	0.54	0.56
Vanadium	39	OMOE	130	CCME	**42**	**43**	36	36	35	**44**	**280**	**370**	**54**	37
Zinc	5600	OMOE	200	CCME	86	85	71	77	77	82	**210**	190	170	52
Sampling Depth (m bgs)					0-0.6	0-0.6	0.6-1.2	0.6-1.2	0-0.6	0-0.6	0.6-1.2	0.6-1.2	1.5-2.1	1.2-1.8
Sampling Date					25-Mar-03	25-Mar-06	22-Mar-06	22-Mar-06	26-Mar-06	27-Mar-06	30-Jan-13	30-Jan-13	30-Jan-13	30-Jan-13

Notes:

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SQG$_{E}$ = Soil Quality Guideline for the protection of Ecological receptors.

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"-"/na = Not applicable

mbgs = meters below ground surface

Table C6: Metals in Soil

					Concentration (mg/kg)								
					Sample Identification								
Elements (mg/kg)	**SHG$_{HH}$ Residential**		**SQG$_{E}$ Residential**		**13MW-05 SS3**	**13MW-06 SS3**	**13MW-07 SS3**	**13MW-08 SS3**	**13MW-08 SS3 LD**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**13MW-12 SS3**
Aluminum	--		--		11000	15000	11000	11000	11000	11000	11000	12000	11000
Antimony	7.5	OMOE	20	AE	<2.0	2.9	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	31	CCME	17	CCME	4.8	**20**	2.8	5.4	5.4	5.3	4.1	5.3	4.9
Barium	3800	OMOE	500	AE	30	340	20	23	23	32	33	33	31
Beryllium	38	OMOE	5	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	--		--		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	4300	OMOE	120	OMOE	<5.0	9.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium	14	CCME	10	CCME	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium	220	CCME	64	CCME	23	25	15	23	23	17	33	21	25
Cobalt	22	OMOE	20	AE	9.7	14	7.3	8.9	8.9	8.3	8.6	10	9.2
Copper	1100	CCME	63	CCME	27	**140**	22	31	31	27	28	33	25
Iron	--		--		24000	37000	18000	23000	23000	20000	20000	25000	22000
Lead	140	CCME	300	CCME	14	**1500**	6.1	12	12	24	25	12	15
Lithium	--		--		17	27	15	18	18	17	16	20	16
Manganese	--		--		490	810	360	530	530	520	440	480	500
Mercury	6.6	CCME	12		<0.10	1.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	110	OMOE	4	AE	<2.0	3.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nickel	330	OMOE	50	CCME	17	25	11	15	13	13	13	17	15
Rubidium	--		--		6.1	10	4.3	7.1	6.2	6.2	5.7	6.4	5.2
Selenium	80	CCME	1	CCME	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Silver	77	OMOE	20	AE	<0.50	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Strontium	--		--		11	93	20	16	13	58	27	17	18
Thallium	1	CCME	1.4	CCME	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tin	9400	USEPA	5	AE	<2.0	**36**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	23	CCME	500	CCME	0.51	1.3	0.32	0.75	0.64	0.56	0.71	0.59	0.73
Vanadium	39	OMOE	130	CCME	36	35	31	**41**	37	28	35	34	33
Zinc	5600	OMOE	200	CCME	57	**350**	37	52	49	64	74	57	55
				Sampling Depth (m bgs)	1.2-1.8	1.5-2.1	1.2-1.8	1.5-2.1	1.5-2.1	1.2-1.8	0-0.6	1.2-1.8	1.2-1.8
				Sampling Date	30-Jan-13	30-Jan-13	30-Jan-13	1-Feb-13	1-Feb-13	4-Feb-13	4-Feb-13	4-Feb-13	4-Feb-13

Notes:

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APPENDIX D

Field Methodology

C-1.0 Pre-Intrusive Investigation Site Activities

The locations of services and utilities were established prior to the drilling and sampling phases of the investigation by contacting the utility providers and persons knowledgeable with the site services. For this assessment a private underground utility locate contractor was engaged to assist in obtaining utility clearances prior to drilling.

C-2.0 Drilling

The drill was equipped with standard augers and HQ coring equipment. Soil samples were recovered from split-spoons, where feasible. Soil samples were logged by Stantec personnel at the time of the drilling. Soil classification was carried out in accordance with the procedures in the ASTM D2488 Standard (Visual-Manual Procedure).

C-3.0 Monitoring Wells

A 50 mm diameter PVC monitoring well was installed in each borehole converted to a monitoring well. Monitoring wells were completed to the following general specifications:

- 5 cm ID, 10 slot, PVC Screen;
- 5 cm ID PVC riser pipe to the surface;
- No. 2 silica sand filter pack 0.3 m above the well screen;
- minimum 0.3 m thick bentonite seal above the filter pack; and
- flush-mount or above-ground protective casings.

The monitoring wells were fitted with caps and well casings with covers to protect them from accidental damage and accidental or intentional contamination. Completion details for the wells are included on the Monitoring Well Records.

C-4.0 Determining Elevations and Sample Locations

Soil sampling locations were located using a hand-held GPS unit.

The ground surface and monitoring well casings (top of PVC pipe) were surveyed with reference to a temporary benchmark established at the southwest corner of the Administration building foundation (elevation of 10.6 m).

C-5.0 Sample Handling

All samples were placed in laboratory supplied clean glass jars. The jars were placed in a cooler with ice packs for transport back to our office. To minimize the potential for cross-contamination, all sampling equipment was thoroughly rinsed between each sampling event.

C-6.0 Soil Sample Selection for Laboratory Analysis

Soil samples were visually classified (for soil type, petroleum odours, and staining), and screened for vapours using a Mini Rae 2000 photoionization detector, calibrated to isobutylene. Selected samples were submitted to the laboratory for analysis based on these results, the location of the source(s), and field observations.

C-7.0 Groundwater Sampling

An electronic water level meter was used to measure the groundwater elevations in the monitoring wells. Prior to groundwater sampling, field equipment was cleaned / decontaminated. The monitoring wells were purged a minimum of three well volumes and allowed to recover to ensure that representative groundwater from the surrounding formation had been drawn into the monitoring well casings. Groundwater samples were then collected from the monitoring wells for laboratory analysis.

C-8.0 Quality Assurance/Quality Control

Samples were uniquely labeled and control was maintained through use of chain of custody forms. Samples were collected in laboratory supplied containers and preserved as directed by the laboratory.

APPENDIX E

Borehole and Monitoring Well Records (2013)

Stantec

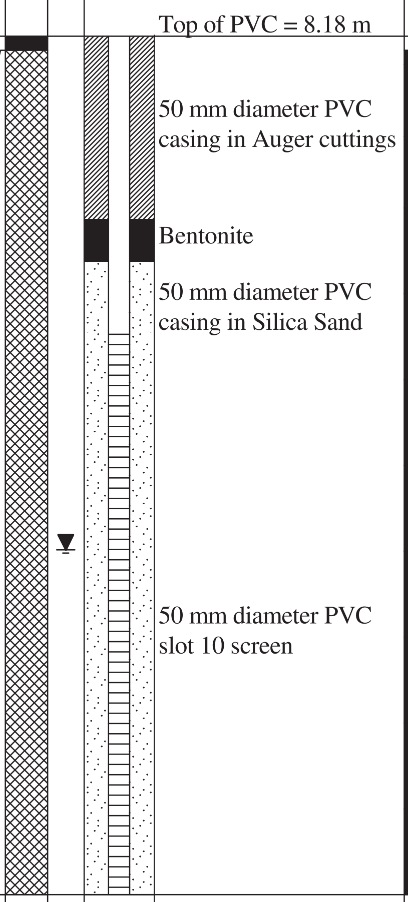
MONITORING WELL RECORD

13 MW-1

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2013-01-30**
WATER LEVEL **3.7 on 2013-01-30**
PROJECT No. **121811071**
BOREHOLE No. **13 MW-1**
DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
	8.27	
0	8.2	Asphalt
		FILL: dark brown to black sand with silt and gravel with wood, brick, and debris throughout
3.6		- hydrocarbon odour at 3.6 m
6.1	2.2	End of Monitoring Well

STRATA PLOT / WATER LEVEL / WELL CONSTRUCTION



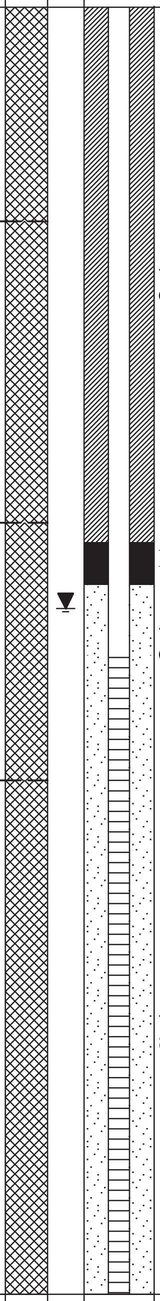
SAMPLES				VOC CONCENTRATION (ppm)
TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	
SS	1	100	50/100	
SS	2	100	11	
SS	3	200	5	
SS	4	100	5	
SS	5	125	5	
SS	6	225	6	0
SS	7	275	8	0.1
SS	8	75	11	
SS	9	500	8	0
SS	10	450	5	0
SS	11	500	4	0

Stantec

MONITORING WELL RECORD

13 MW-2

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
PROJECT No. 121811071
LOCATION Fundy Quay
BOREHOLE No. 13 MW-2
DATES: BORING 2013-01-30
WATER LEVEL 4.3 on 2013-01-30
DATUM Assumed



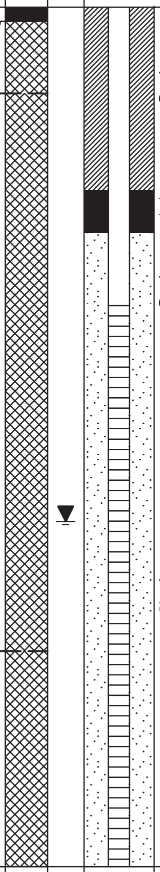
ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
9.81	FILL: crushed rock	Top of PVC = 9.72	AS	1			0.1
8.3	FILL: brown sand with gravel and silt, bricks, and debris throughout	50 mm diameter PVC casing in Auger cuttings	SS	2	250	63/255	0
			SS	3	200	8	
			SS	4	250	17	0.2
6.2	FILL: dark brown silty/clayey sand with gravel, with wood throughout	Bentonite	SS	5	350	11	0
		50 mm diameter PVC casing in Silica sand	SS	6	325	6	0.2
			SS	7	500	13	0
4.3	FILL: dark brown silt with sand and gravel, with wood throughout		SS	8	175	10	
			SS	9	525	10	0
		50 mm diameter PVC slot 10 screen	SS	10	550	15	0
			SS	11	250	57	0
			AS	12			20.3
0.7	End of Monitoring Well Practical refusal to further penetration with auger						

MONITORING WELL RECORD

13 MW-3

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2013-01-30**
WATER LEVEL **3.7 on 2013-01-30**
PROJECT No. **121811071**
BOREHOLE No. **13 MW-3**
DATUM **Assumed**

ELEVATION (m)	SOIL DESCRIPTION
8.97	
8.9	Asphalt
	FILL: crushed rock
8.4	FILL: brown sand with gravel and trace silt
4.4	FILL: brown sand with gravel, wood and bricks throughout - possible hydrocarbon odour at 5.5 m
2.9	End of Monitoring Well



WELL CONSTRUCTION

Top of PVC = 8.83

50 mm diameter PVC casing in Auger cuttings

Bentonite

50 mm diameter PVC casing in Silica sand

50 mm diameter PVC slot 10 screen

SAMPLES				
TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			3.5
SS	2	325	80/280	1.1
SS	3	475	68	2.3
SS	4	300	30	1.5
SS	5	250	16	0.9
SS	6	300	15	2.2
SS	7	350	9	2.3
SS	8	225	36	0.1
SS	9	475	10	0.9
SS	10	450	10	16.6

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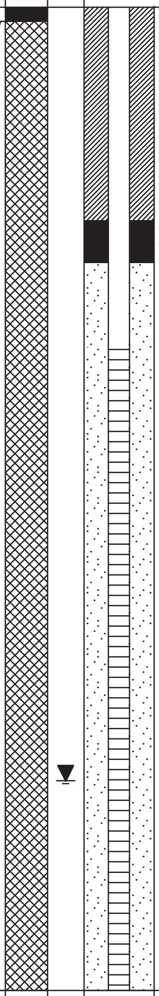
MONITORING WELL RECORD

13 MW-4

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
LOCATION Fundy Quay
DATES: BORING 2013-01-31
WATER LEVEL 5.5 on 2013-01-31
PROJECT No. 121811071
BOREHOLE No. 13 MW-4
DATUM Assumed

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION
	8.96		Top of PVC = 8.84
0	8.9	Asphalt	
		FILL: brown sand with gravel and trace silt	50 mm diameter PVC casing in Auger cuttings
			Bentonite
			50 mm diameter PVC casing in Silica sand
		- wood and bricks throughout from 4.3 m to bottom of well	
			50 mm diameter PVC slot 10 screen
		- possible hydrocarbon odour at 6.1 m	
7	2.0	End of Monitoring Well Practical refusal to further penetration with auger	



SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
SS	1	200	80/230	1
SS	2	400	44	1.3
SS	3	200	48	
SS	4	125	15	
SS	5	350	11	0.8
SS	6	50	17	
SS	7	150	31	
SS	8	125	14	
SS	9	125	18	
SS	10	550	44	92.8
SS	11	275	50/125	6.6

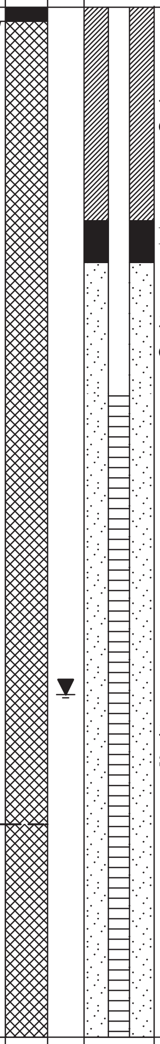
DEPTH (m): 0 1 2 3 4 5 6 7 8 9 10

MONITORING WELL RECORD

13 MW-5

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
LOCATION Fundy Quay
DATES: BORING 2013-01-31
WATER LEVEL 4.9 on 2013-01-31
PROJECT No. 121811071
BOREHOLE No. 13 MW-5
DATUM Assumed

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
	8.82	
0	8.7	Asphalt
		FILL: grey to brown sand with gravel and trace silt
5		- bricks throughout below 4.9 m
	3.0	FILL: dark brown silt with wood throughout
	1.5	End of Monitoring Well



WELL CONSTRUCTION

Top of PVC = 8.76

50 mm diameter PVC casing in Auger cuttings

Bentonite

50 mm diameter PVC casing in Silica sand

50 mm diameter PVC slot 10 screen

SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
SS	1	180	60/275	1.0
SS	2	100	31	0.4
SS	3	150	8	0.8
SS	4	0	12	0.4
SS	5	100	18	1.5
SS	6	280	14	0.9
SS	7	180	16	1.0
SS	8	100	7	1.4
SS	9	150	11	0.6
SS	10	510	6	0.5
SS	11	510	2	0.5
SS	12	560	4	0.5

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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MONITORING WELL RECORD

13 MW-6

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

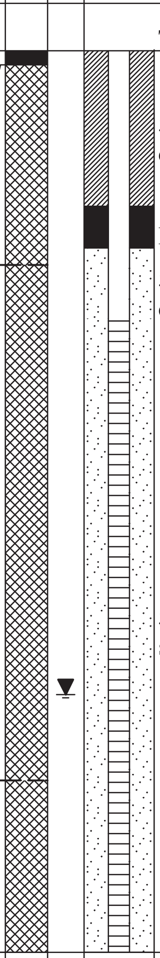
DATES: BORING **2013-02-01**

WATER LEVEL **4.6 on 2013-02-01**

PROJECT No. **121811071**

BOREHOLE No. **13 MW-6**

DATUM **Assumed**



ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm)
			TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
8.26		Top of PVC = 8.19			mm		
8.2	Asphalt						
	FILL: black sand with gravel and trace silt	50 mm diameter PVC casing in Auger cuttings	SS	1	300	100/275	0.3
		Bentonite	AS	2			0.6
6.7	FILL: black sand with silt	50 mm diameter PVC casing in Silica sand	SS	3	125	12	3.9
	- construction debris from 1.5 to 2.7 m		SS	4	150	7	0.5
			SS	5	150	4	0.5
	- wood debris from 2.7 to 5.18 m		SS	6	325	9	0.6
		50 mm diameter PVC slot 10 screen	SS	7	0	3	
	- burnt wood odour at 4.6 m		SS	8	125	6	0.8
3.1	FILL: black SILT with wood throughout		SS	9	500	3	0.4
			SS	10	475	3	0.2
1.9	End of Monitoring Well						

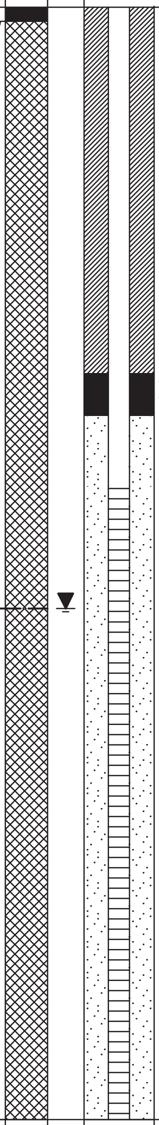
DEPTH (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

MONITORING WELL RECORD

13 MW-7

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2013-02-01**
WATER LEVEL **4.3 on 2013-02-01**
PROJECT No. **121811071**
BOREHOLE No. **13 MW-7**
DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0	8.74	
	8.6	Asphalt
		FILL: grey to brown SAND with gravel and trace silt
	4.5	FILL: brown gravel with sand and trace silt, with occasional cobbles and wood throughout
	0.8	End of Monitoring Well



WELL CONSTRUCTION

Top of PVC = 8.61

50 mm diameter PVC casing in Auger cuttings

Bentonite

50 mm diameter PVC casing in Silica sand

50 mm diameter PVC slot 10 screen

SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			0.6
SS	2	100	54/180	0.5
SS	3	350	19	0.3
SS	4	325	14	0.3
SS	5	100	50/125	0.2
SS	6	300	21	0.6
SS	7	275	9	0.4
SS	8	125	11	0.6
SS	9	200	18	0.3
SS	10	125	19	0.3
SS	11	125	13	
SS	12	75	12	0.4
SS	13	0	18	

MONITORING WELL RECORD

13 MW-8

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

PROJECT No. **121811071**

LOCATION **Fundy Quay**

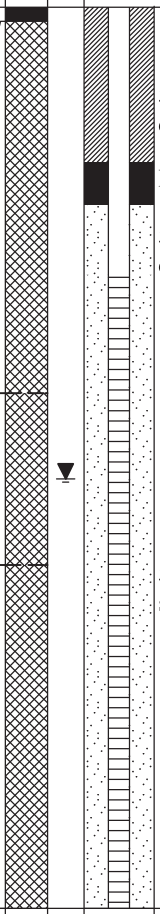
BOREHOLE No. **13 MW-8**

DATES: BORING **2013-02-01**

WATER LEVEL **3.4 on 2013-02-01**

DATUM **Assumed**

ELEVATION (m)	SOIL DESCRIPTION
9.11	
9.0	Asphalt
	FILL: grey to brown sand with gravel and trace silt - boulder at 0.7 m
6.4	FILL: brown gravel with sand and trace silt
5.2	FILL: brown to black sand with trace gravel and silt, bricks throughout
2.7	End of Monitoring Well



DEPTH (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			1.0
SS	2	0	50/125	
SS	3	125	16	0.6
SS	4	400	27	0.2
SS	5	100	12	0.2
SS	6	325	36	0.9
SS	7	100	6	0.2
SS	8	350	10	0.1
SS	9	475	11	0.1
SS	10	250	16	

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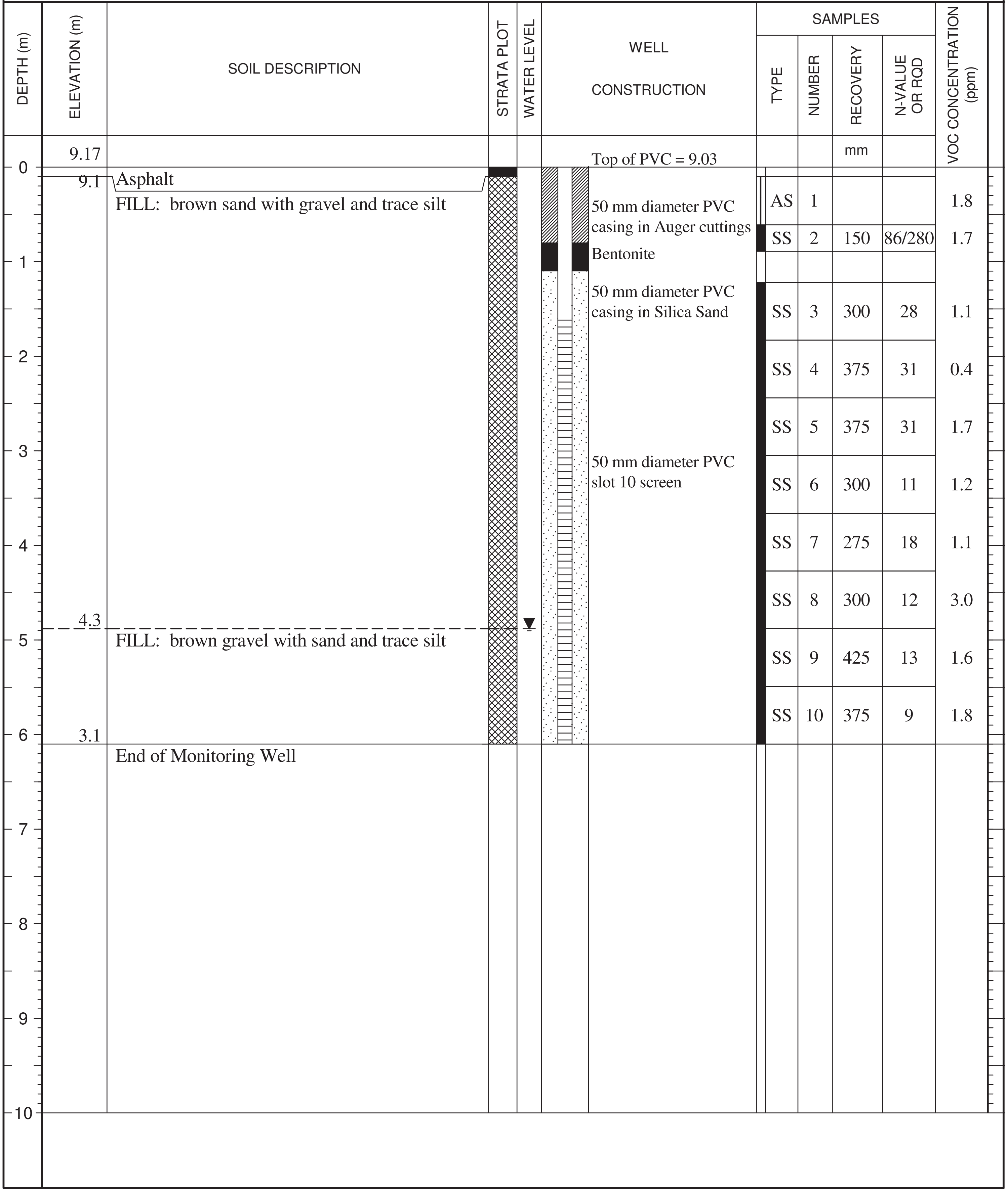
MONITORING WELL RECORD

13 MW-9

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
PROJECT No. 121811071
LOCATION Fundy Quay
BOREHOLE No. 13 MW-9
DATES: BORING 2013-02-04
WATER LEVEL 4.9 on 2013-02-04
DATUM Assumed



ELEVATION (m)	SOIL DESCRIPTION
9.17	
9.1	Asphalt
	FILL: brown sand with gravel and trace silt
4.3	FILL: brown gravel with sand and trace silt
3.1	End of Monitoring Well

WELL CONSTRUCTION

Top of PVC = 9.03

50 mm diameter PVC casing in Auger cuttings

Bentonite

50 mm diameter PVC casing in Silica Sand

50 mm diameter PVC slot 10 screen

SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			1.8
SS	2	150	86/280	1.7
SS	3	300	28	1.1
SS	4	375	31	0.4
SS	5	375	31	1.7
SS	6	300	11	1.2
SS	7	275	18	1.1
SS	8	300	12	3.0
SS	9	425	13	1.6
SS	10	375	9	1.8

MONITORING WELL RECORD

13 MW-10

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

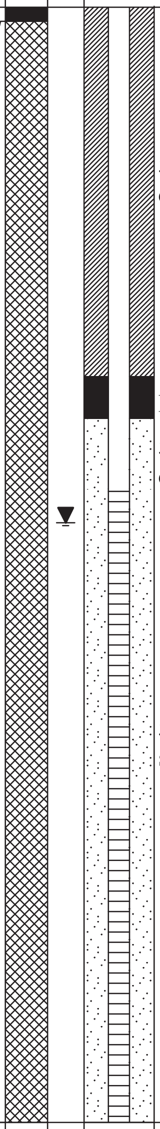
DATES: BORING **2013-02-04**

WATER LEVEL **3.7 on 2013-02-04**

PROJECT No. **121811071**

BOREHOLE No. **13 MW-10**

DATUM **Assumed**



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	WELL CONSTRUCTION	TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
	9.00			Top of PVC = 8.92					
0	8.9	Asphalt							
		FILL: grey to brown sand with gravel and trace silt			AS	1			5.4
					SS	2	50	50/75	
1				50 mm diameter PVC casing in Auger cuttings	SS	3	0	17	
2					SS	4	25	87/230	
				Bentonite	SS	5	325	3	1.5
3				50 mm diameter PVC casing in Silica Sand	SS	6	250	9	
4			▼		SS	7	100	16	2.4
					SS	8	450	41	1.4
5		- occasional cobbles present below 5.2 m		50 mm diameter PVC slot 10 screen	SS	9	250	56	0.8
6					SS	10	75	23	2.0
					SS	11	200	39	2.1
7					SS	12	350	20	1.0
	1.1				SS	13	500	26	1.3
8		End of Monitoring Well							
9									
10									

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MONITORING WELL RECORD

13 MW-11

CLIENT: **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION: **Fundy Quay**

DATES: BORING **2013-02-04**

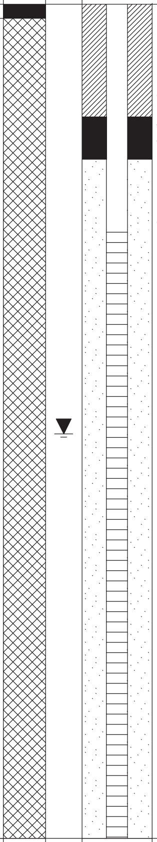
WATER LEVEL **3.1 on 2013-02-04**

PROJECT No. **121811071**

BOREHOLE No. **13 MW-11**

DATUM **Assumed**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0		Asphalt
		FILL: grey to brown sand with gravel and trace silt
		- occasional cobbles below 2.4 m
6		End of Monitoring Well Practical refusal to further penetration with auger



WELL CONSTRUCTION

50 mm diameter PVC casing in Auger cuttings

Bentonite

50 mm diameter PVC casing in Silica Sand

50 mm diameter PVC slot 10 screen

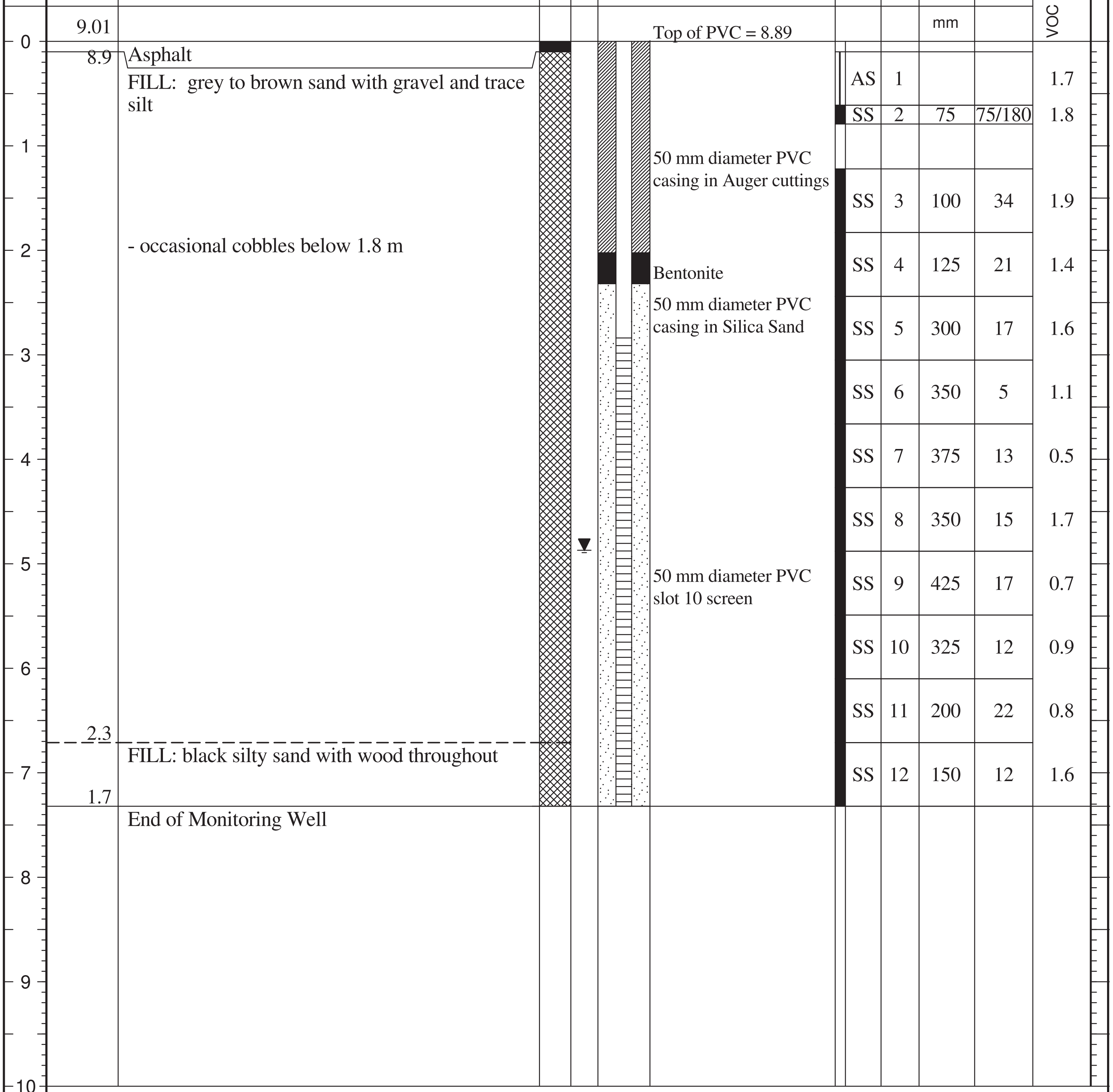
SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			1.3
SS	2	75	50/125	
SS	3	250	15	3.8
SS	4	250	7	2.8
SS	5	175	8	0.8
SS	6	50	13	
SS	7	300	24	0.9
SS	8	250	11	1.7
SS	9	100	8	1.0
SS	10	200	61/280	1.8

MONITORING WELL RECORD

13 MW-12

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2013-02-04**
WATER LEVEL **4.9 on 2013-02-04**
PROJECT No. **121811071**
BOREHOLE No. **13 MW-12**
DATUM **Assumed**

ELEVATION (m)	SOIL DESCRIPTION
9.01	
8.9	Asphalt
	FILL: grey to brown sand with gravel and trace silt - occasional cobbles below 1.8 m
2.3	FILL: black silty sand with wood throughout
1.7	End of Monitoring Well



TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
AS	1			1.7
SS	2	75	75/180	1.8
SS	3	100	34	1.9
SS	4	125	21	1.4
SS	5	300	17	1.6
SS	6	350	5	1.1
SS	7	375	13	0.5
SS	8	350	15	1.7
SS	9	425	17	0.7
SS	10	325	12	0.9
SS	11	200	22	0.8
SS	12	150	12	1.6

APPENDIX F

Laboratory Certificates of Analysis

Your P.O. #: 16300R-20
Your Project #: 121811071
Your C.O.C. #: B 158458

Attention: Kent Wiezel
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/03/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B328545
Received: 2013/02/26, 10:50

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	4	2013/02/28	2013/02/28	ATL SOP 00113	Based on Atl. PIRI
PAH in Water by GC/MS (SIM)	2	2013/03/01	2013/03/01	ATL SOP 00103	Based on EPA 8270C
VPH in Water (PIRI)	2	2013/02/27	2013/02/27	ATL SOP 00118	Based on Atl. PIRI
VPH in Water (PIRI)	2	2013/02/27	2013/02/28	ATL SOP 00118	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	4	N/A	2013/03/01		Based on Atl. PIRI

Remarks:

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

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

Encryption Key

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

Marie (McNair) Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

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

Total cover pages: 1

Maxxam Job #: B328545
Report Date: 2013/03/04

Stantec Consulting Ltd
Client Project #: 121811071

Your P.O. #: 16300R-20
Sampler Initials: HF

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		QR0194		QR0195		
Sampling Date		2013/02/23		2013/02/23		
COC Number		B 158458		B 158458		
	Units	**13-MW-07**	**RDL**	**13-MW-10**	**RDL**	**QC Batch**

Polyaromatic Hydrocarbons						
1-Methylnaphthalene	ug/L	<0.050	0.050	<0.060	0.060	3137861
2-Methylnaphthalene	ug/L	<0.050	0.050	<0.060	0.060	3137861
Acenaphthene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Acenaphthylene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Anthracene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(a)anthracene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(a)pyrene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(b)fluoranthene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(g,h,i)perylene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(j)fluoranthene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Benzo(k)fluoranthene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Chrysene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Dibenz(a,h)anthracene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Fluoranthene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Fluorene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Naphthalene	ug/L	<0.20	0.20	<0.30	0.30	3137861
Perylene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Phenanthrene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Pyrene	ug/L	<0.010	0.010	<0.020	0.020	3137861
Surrogate Recovery (%)						
D10-Anthracene	%	116		91		3137861
D14-Terphenyl	%	100		99 (1)		3137861
D8-Acenaphthylene	%	102		96		3137861

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to insufficient sample.

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		QR0194		QR0195	QR0196	QR0197		
Sampling Date		2013/02/23		2013/02/23	2013/02/23	2013/02/23		
COC Number		B 158458		B 158458	B 158458	B 158458		
	Units	**13-MW-07**	**RDL**	**13-MW-10**	**JWA-MW2**	**JWA-MW4**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/L	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	3135485
Toluene	mg/L	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	3135485
Ethylbenzene	mg/L	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	3135485
Xylene (Total)	mg/L	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	3135485
C6 - C10 (less BTEX)	mg/L	<0.010	0.010	<0.010	<0.010	<0.010	0.010	3135485
>C10-C16 Hydrocarbons	mg/L	<0.058 (1)	0.058	<0.050	<0.050	<0.050	0.050	3136550
>C16-C21 Hydrocarbons	mg/L	<0.058 (1)	0.058	<0.050	<0.050	<0.050	0.050	3136550
>C21-<C32 Hydrocarbons	mg/L	<0.12 (1)	0.12	<0.10	<0.10	<0.10	0.10	3136550
Modified TPH (Tier1)	mg/L	<0.12	0.12	<0.10	<0.10	<0.10	0.10	3135286
Reached Baseline at C32	mg/L	NA	N/A	NA	NA	NA	N/A	3136550
Hydrocarbon Resemblance	mg/L	NA	N/A	NA	NA	NA	N/A	3136550
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	104		76	89	82		3136550
n-Dotriacontane - Extractable	%	113		88	106	98		3136550
Isobutylbenzene - Volatile	%	97		95	97	97		3135485

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated TEH RDL(s) due to limited sample.

Package 1	6.7°C

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

GENERAL COMMENTS

Results relate only to the items tested.

Stantec Consulting Ltd
Attention: Kent Wiezel
Client Project #: 121811071
P.O. #: 16300R-20
Site Location:

Quality Assurance Report

Maxxam Job Number: DB328545

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3135485	TWE	Matrix Spike	Isobutylbenzene - Volatile	2013/02/27		98	%	70 - 130
			Benzene	2013/02/27		109	%	70 - 130
			Toluene	2013/02/27		109	%	70 - 130
			Ethylbenzene	2013/02/27		109	%	70 - 130
			Xylene (Total)	2013/02/27		109	%	70 - 130
		Spiked Blank	Isobutylbenzene - Volatile	2013/02/27		99	%	70 - 130
			Benzene	2013/02/27		103	%	70 - 130
			Toluene	2013/02/27		105	%	70 - 130
			Ethylbenzene	2013/02/27		105	%	70 - 130
			Xylene (Total)	2013/02/27		106	%	70 - 130
		Method Blank	Isobutylbenzene - Volatile	2013/02/27		102	%	70 - 130
			Benzene	2013/02/27	<0.0010		mg/L	
			Toluene	2013/02/27	<0.0010		mg/L	
			Ethylbenzene	2013/02/27	<0.0010		mg/L	
			Xylene (Total)	2013/02/27	<0.0020		mg/L	
			C6 - C10 (less BTEX)	2013/02/27	<0.010		mg/L	
		RPD	Benzene	2013/02/27	NC		%	40
			Toluene	2013/02/27	NC		%	40
			Ethylbenzene	2013/02/27	NC		%	40
			Xylene (Total)	2013/02/27	NC		%	40
			C6 - C10 (less BTEX)	2013/02/27	NC		%	40
3136550	CMI	Matrix Spike	Isobutylbenzene - Extractable	2013/02/28		103	%	30 - 130
			n-Dotriacontane - Extractable	2013/02/28		148 (1)	%	30 - 130
			>C10-C16 Hydrocarbons	2013/02/28		86	%	30 - 130
			>C16-C21 Hydrocarbons	2013/02/28		92	%	30 - 130
			>C21-<C32 Hydrocarbons	2013/02/28		NC	%	30 - 130
		Spiked Blank	Isobutylbenzene - Extractable	2013/02/28		89	%	30 - 130
			n-Dotriacontane - Extractable	2013/02/28		102	%	30 - 130
			>C10-C16 Hydrocarbons	2013/02/28		78	%	30 - 130
			>C16-C21 Hydrocarbons	2013/02/28		89	%	30 - 130
			>C21-<C32 Hydrocarbons	2013/02/28		96	%	30 - 130
		Method Blank	Isobutylbenzene - Extractable	2013/02/28		88	%	30 - 130
			n-Dotriacontane - Extractable	2013/02/28		97	%	30 - 130
			>C10-C16 Hydrocarbons	2013/02/28	<0.050		mg/L	
			>C16-C21 Hydrocarbons	2013/02/28	<0.050		mg/L	
			>C21-<C32 Hydrocarbons	2013/02/28	<0.10		mg/L	
		RPD	>C10-C16 Hydrocarbons	2013/02/28	NC		%	40
			>C16-C21 Hydrocarbons	2013/02/28	37.9		%	40
			>C21-<C32 Hydrocarbons	2013/02/28	38.8		%	40
3137861	GTH	Matrix Spike	D10-Anthracene	2013/03/01		103	%	30 - 130
			D14-Terphenyl	2013/03/01		97	%	30 - 130
			D8-Acenaphthylene	2013/03/01		102	%	30 - 130
			1-Methylnaphthalene	2013/03/01		94	%	30 - 130
			2-Methylnaphthalene	2013/03/01		102	%	30 - 130
			Acenaphthene	2013/03/01		107	%	30 - 130
			Acenaphthylene	2013/03/01		93	%	30 - 130
			Anthracene	2013/03/01		97	%	30 - 130
			Benzo(a)anthracene	2013/03/01		87	%	30 - 130
			Benzo(a)pyrene	2013/03/01		84	%	30 - 130
			Benzo(b)fluoranthene	2013/03/01		84	%	30 - 130
			Benzo(g,h,i)perylene	2013/03/01		91	%	30 - 130
			Benzo(j)fluoranthene	2013/03/01		85	%	30 - 130
			Benzo(k)fluoranthene	2013/03/01		84	%	30 - 130
			Chrysene	2013/03/01		91	%	30 - 130
			Dibenz(a,h)anthracene	2013/03/01		77	%	30 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: DB328545

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3137861 GTH	Matrix Spike	Fluoranthene	2013/03/01		94	%	30 - 130
		Fluorene	2013/03/01		105	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/03/01		83	%	30 - 130
		Naphthalene	2013/03/01		107	%	30 - 130
		Perylene	2013/03/01		86	%	30 - 130
		Phenanthrene	2013/03/01		110	%	30 - 130
		Pyrene	2013/03/01		98	%	30 - 130
	Spiked Blank	D10-Anthracene	2013/03/01		105	%	30 - 130
		D14-Terphenyl	2013/03/01		100	%	30 - 130
		D8-Acenaphthylene	2013/03/01		101	%	30 - 130
		1-Methylnaphthalene	2013/03/01		98	%	30 - 130
		2-Methylnaphthalene	2013/03/01		104	%	30 - 130
		Acenaphthene	2013/03/01		110	%	30 - 130
		Acenaphthylene	2013/03/01		92	%	30 - 130
		Anthracene	2013/03/01		103	%	30 - 130
		Benzo(a)anthracene	2013/03/01		87	%	30 - 130
		Benzo(a)pyrene	2013/03/01		84	%	30 - 130
		Benzo(b)fluoranthene	2013/03/01		85	%	30 - 130
		Benzo(g,h,i)perylene	2013/03/01		94	%	30 - 130
		Benzo(j)fluoranthene	2013/03/01		83	%	30 - 130
		Benzo(k)fluoranthene	2013/03/01		84	%	30 - 130
		Chrysene	2013/03/01		92	%	30 - 130
		Dibenz(a,h)anthracene	2013/03/01		79	%	30 - 130
		Fluoranthene	2013/03/01		98	%	30 - 130
		Fluorene	2013/03/01		109	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/03/01		90	%	30 - 130
		Naphthalene	2013/03/01		112	%	30 - 130
		Perylene	2013/03/01		85	%	30 - 130
		Phenanthrene	2013/03/01		108	%	30 - 130
		Pyrene	2013/03/01		101	%	30 - 130
	Method Blank	D10-Anthracene	2013/03/01		90	%	30 - 130
		D14-Terphenyl	2013/03/01		93	%	30 - 130
		D8-Acenaphthylene	2013/03/01		102	%	30 - 130
		1-Methylnaphthalene	2013/03/01	<0.050		ug/L	
		2-Methylnaphthalene	2013/03/01	<0.050		ug/L	
		Acenaphthene	2013/03/01	<0.010		ug/L	
		Acenaphthylene	2013/03/01	<0.010		ug/L	
		Anthracene	2013/03/01	<0.010		ug/L	
		Benzo(a)anthracene	2013/03/01	<0.010		ug/L	
		Benzo(a)pyrene	2013/03/01	<0.010		ug/L	
		Benzo(b)fluoranthene	2013/03/01	<0.010		ug/L	
		Benzo(g,h,i)perylene	2013/03/01	<0.010		ug/L	
		Benzo(j)fluoranthene	2013/03/01	<0.010		ug/L	
		Benzo(k)fluoranthene	2013/03/01	<0.010		ug/L	
		Chrysene	2013/03/01	<0.010		ug/L	
		Dibenz(a,h)anthracene	2013/03/01	<0.010		ug/L	
		Fluoranthene	2013/03/01	<0.010		ug/L	
		Fluorene	2013/03/01	<0.010		ug/L	
		Indeno(1,2,3-cd)pyrene	2013/03/01	<0.010		ug/L	
		Naphthalene	2013/03/01	<0.20		ug/L	
		Perylene	2013/03/01	<0.010		ug/L	
		Phenanthrene	2013/03/01	<0.010		ug/L	
		Pyrene	2013/03/01	<0.010		ug/L	
	RPD	Acenaphthylene	2013/03/01	NC		%	40
		Anthracene	2013/03/01	NC		%	40

Quality Assurance Report (Continued)

Maxxam Job Number: DB328545

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3137861 GTH	RPD	Fluorene	2013/03/01	NC		%	40
		Naphthalene	2013/03/01	NC		%	40
		Phenanthrene	2013/03/01	NC		%	40
		Pyrene	2013/03/01	NC		%	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) TEH surrogate(s) not within acceptance limits. Analysis was repeated with similar results.

Validation Signature Page

Maxxam Job #: B328545

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

Rosemarie MacDonald

Rose Macdonald, Scientific Specialist (Organics)

==

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

Your P.O. #: 16300R-20
Your Project #: 121811071.200
Your C.O.C. #: ES677713

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/03/15
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B319627
Received: 2013/02/08, 10:37

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	6	2013/02/11	2013/02/11	ATL SOP 00113	Based on Atl. PIRI
TEH in Water (PIRI)	1	2013/02/11	2013/02/12	ATL SOP 00113	Based on Atl. PIRI
VPH in Water (PIRI)	6	2013/02/11	2013/02/11	ATL SOP 00118	Based on Atl. PIRI
VPH in Water (PIRI)	1	2013/02/11	2013/02/12	ATL SOP 00118	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	7	N/A	2013/02/13		Based on Atl. PIRI

Remarks:

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

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

Encryption Key

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

Marie (McNair) Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

==
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Total cover pages: 1

Maxxam Job #: B319627
Report Date: 2013/03/15

Stantec Consulting Ltd
Client Project #: 121811071.200

Your P.O. #: 16300R-20
Sampler Initials: CV

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		QM6042	QM6042	QM6043	QM6044	QM6045		
Sampling Date		2013/02/07	2013/02/07	2013/02/07	2013/02/07	2013/02/07		
COC Number		ES677713	ES677713	ES677713	ES677713	ES677713		
	Units	**13MW-01**	**13MW-01 Lab-Dup**	**13MW-02**	**13MW-03**	**13MW-04**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	3119845
Toluene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	3119845
Ethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	3119845
Xylene (Total)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	3119845
C6 - C10 (less BTEX)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3119845
>C10-C16 Hydrocarbons	mg/L	<0.050		<0.050	<0.050	<0.050	0.050	3119505
>C16-C21 Hydrocarbons	mg/L	0.093		<0.050	0.076	<0.050	0.050	3119505
>C21-<C32 Hydrocarbons	mg/L	0.29		<0.10	0.15	<0.10	0.10	3119505
Modified TPH (Tier1)	mg/L	0.38		<0.10	0.22	<0.10	0.10	3118196
Reached Baseline at C32	mg/L	Yes		NA	Yes	NA	N/A	3119505
Hydrocarbon Resemblance	mg/L	COMMENT (1)		NA	COMMENT (2)	NA	N/A	3119505
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	105		119	113	104		3119505
n-Dotriacontane - Extractable	%	112 (3)		127 (3)	125 (3)	94		3119505
Isobutylbenzene - Volatile	%	99 (4)	98 (4)	99 (4)	94 (4)	98		3119845

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Lube oil fraction. Unidentified compound(s) in fuel / lube range.
(2) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(3) TEH sample contained sediment.
(4) VPH sample contained sediment.

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		QM6046	QM6047	QM6048		
Sampling Date		2013/02/07	2013/02/07	2013/02/07		
COC Number		ES677713	ES677713	ES677713		
	Units	**13MW-06**	**13MW-08**	**13MW-09**	**RDL**	**QC Batch**

Petroleum Hydrocarbons						
Benzene	mg/L	<0.0010	<0.0010	<0.0010	0.0010	3119845
Toluene	mg/L	0.0042	<0.0010	<0.0010	0.0010	3119845
Ethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	0.0010	3119845
Xylene (Total)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	3119845
C6 - C10 (less BTEX)	mg/L	<0.010	<0.010	<0.010	0.010	3119845
>C10-C16 Hydrocarbons	mg/L	<0.050	<0.050	<0.050	0.050	3119505
>C16-C21 Hydrocarbons	mg/L	<0.050	0.13	<0.050	0.050	3119505
>C21-<C32 Hydrocarbons	mg/L	<0.10	0.23	<0.10	0.10	3119505
Modified TPH (Tier1)	mg/L	<0.10	0.36	<0.10	0.10	3118196
Reached Baseline at C32	mg/L	NA	Yes	NA	N/A	3119505
Hydrocarbon Resemblance	mg/L	NA	COMMENT (1)	NA	N/A	3119505
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	107	113	113		3119505
n-Dotriacontane - Extractable	%	108	118 (2)	129		3119505
Isobutylbenzene - Volatile	%	97	97	90		3119845

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(2) TEH sample contained sediment.

Package 1	2.0°C

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

GENERAL COMMENTS

Revised report: Re-issued report as duplicates not showing up on EXCEL file. 3/15/13 MMC

Results relate only to the items tested.

Stantec Consulting Ltd
Attention: ROB FIANDER
Client Project #: 121811071.200
P.O. #: 16300R-20
Site Location:

Quality Assurance Report

Maxxam Job Number: DB319627

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3119505 AJS	Matrix Spike	Isobutylbenzene - Extractable	2013/02/11		120	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/11		126	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/11		77	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/11		86	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/11		112	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2013/02/11		116	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/11		118	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/11		76	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/11		85	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/11		98	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/02/13		108	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/13		98	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/13	<0.050		mg/L	
		>C16-C21 Hydrocarbons	2013/02/13	<0.050		mg/L	
		>C21-<C32 Hydrocarbons	2013/02/13	<0.10		mg/L	
	RPD	>C10-C16 Hydrocarbons	2013/02/11	NC		%	40
		>C16-C21 Hydrocarbons	2013/02/11	NC		%	40
		>C21-<C32 Hydrocarbons	2013/02/11	NC		%	40
3119845 TWE	Matrix Spike [QM6043-02]	Isobutylbenzene - Volatile	2013/02/11		98 (1)	%	70 - 130
		Benzene	2013/02/11		100	%	70 - 130
		Toluene	2013/02/11		100	%	70 - 130
		Ethylbenzene	2013/02/11		100	%	70 - 130
		Xylene (Total)	2013/02/11		101	%	70 - 130
	Spiked Blank	Isobutylbenzene - Volatile	2013/02/11		101	%	70 - 130
		Benzene	2013/02/11		102	%	70 - 130
		Toluene	2013/02/11		104	%	70 - 130
		Ethylbenzene	2013/02/11		104	%	70 - 130
		Xylene (Total)	2013/02/11		106	%	70 - 130
	Method Blank	Isobutylbenzene - Volatile	2013/02/11		99	%	70 - 130
		Benzene	2013/02/11	<0.0010		mg/L	
		Toluene	2013/02/11	<0.0010		mg/L	
		Ethylbenzene	2013/02/11	<0.0010		mg/L	
		Xylene (Total)	2013/02/11	<0.0020		mg/L	
		C6 - C10 (less BTEX)	2013/02/11	<0.010		mg/L	
	RPD [QM6042-02]	Benzene	2013/02/11	NC		%	40
		Toluene	2013/02/11	NC		%	40
		Ethylbenzene	2013/02/11	NC		%	40
		Xylene (Total)	2013/02/11	NC		%	40
		C6 - C10 (less BTEX)	2013/02/11	NC		%	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix 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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) VPH sample contained sediment.

Validation Signature Page

Maxxam Job #: B319627

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

RoseMarie MacDonald

Rose Macdonald, Scientific Specialist (Organics)

==

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Your P.O. #: 16300R-20
Your Project #: 121811071.200
Site Location: FUNDY QUAY
Your C.O.C. #: ES677213

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/03/15
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B319523
Received: 2013/02/07, 10:30

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI) (1)	9	2013/02/11	2013/02/11	ATL SOP 00111	Based on Atl. PIRI
Metals Solids Acid Extr. ICPMS	5	2013/02/11	2013/02/12	ATL SOP 00059	Based on EPA6020A
Moisture	9	N/A	2013/02/08	ATL SOP 00001	MOE Handbook 1983
PAH Compounds by GCMS (SIM) (1)	4	2013/02/11	2013/02/11	ATL SOP 00102	Based on EPA8270C
PAH Compounds by GCMS (SIM) (1)	1	2013/02/11	2013/02/12	ATL SOP 00102	Based on EPA8270C
VPH in Soil (PIRI)	9	2013/02/08	2013/02/08	ATL SOP 00119	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	9	2013/02/08	2013/02/12		Based on Atl. PIRI

Remarks:

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

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

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

Encryption Key

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

Marie (McNair) Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

==
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Total cover pages: 1

Maxxam Job #: B319523
Report Date: 2013/03/15

Stantec Consulting Ltd
Client Project #: 121811071.200
Site Location: FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: JM

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QM5664	QM5665	QM5665	QM5666	QM5667		
Sampling Date		2013/02/01	2013/02/04	2013/02/04	2013/02/04	2013/02/04		
COC Number		ES677213	ES677213	ES677213	ES677213	ES677213		
	Units	**13MW-08 SS6**	**13MW-09 SS3**	**13MW-09 SS3 Lab-Dup**	**13MW-09 SS8**	**13MW-10 GS1**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	10	6		9	5	1	3118175
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	<0.025		<0.025	<0.025	0.025	3118328
Toluene	mg/kg	<0.025	<0.025		<0.025	<0.025	0.025	3118328
Ethylbenzene	mg/kg	<0.025	<0.025		<0.025	<0.025	0.025	3118328
Xylene (Total)	mg/kg	<0.050	<0.050		<0.050	<0.050	0.050	3118328
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5		<2.5	<2.5	2.5	3118328
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	<10	10	3119560
>C16-C21 Hydrocarbons	mg/kg	13	<10	<10	<10	15	10	3119560
>C21-<C32 Hydrocarbons	mg/kg	36	20	25	<15	37	15	3119560
Modified TPH (Tier1)	mg/kg	49	20		<15	52	15	3118185
Reached Baseline at C32	mg/kg	Yes	Yes		NA	Yes	N/A	3119560
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (1)		NA	COMMENT (2)	N/A	3119560
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	88	93	91	86	86		3119560
n-Dotriacontane - Extractable	%	98 (3)	94	91	102 (3)	105		3119560
Isobutylbenzene - Volatile	%	104	100		101	102		3118328

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Lube oil fraction.
(2) One product in fuel / lube range. Possible lube oil fraction.
(3) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Job #: B319523
Report Date: 2013/03/15

Stantec Consulting Ltd
Client Project #: 121811071.200
Site Location: FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: JM

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QM5669	QM5670	QM5672	QM5673	QM5677		
Sampling Date		2013/02/04	2013/02/04	2013/02/04	2013/02/04	2013/02/04		
COC Number		ES677213	ES677213	ES677213	ES677213	ES677213		
	Units	**13MW-10 SS7**	**13MW-11 SS3**	**13MW-11 SS8**	**13MW-12 SS3**	**13MW-12 SS10**	**RDL**	**QC Batch**

Inorganics								
Moisture	%	7	3	6	5	45	1	3118175
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	3118328
Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	3118328
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	3118328
Xylene (Total)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.23	0.050	3118328
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	3118328
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	140	10	3119560
>C16-C21 Hydrocarbons	mg/kg	<10	<10	<10	<10	740	10	3119560
>C21-<C32 Hydrocarbons	mg/kg	<15	<15	<15	17	2000	15	3119560
Modified TPH (Tier1)	mg/kg	<15	<15	<15	17	2900	15	3118185
Reached Baseline at C32	mg/kg	NA	NA	NA	Yes	No	N/A	3119560
Hydrocarbon Resemblance	mg/kg	NA	NA	NA	COMMENT (1)	COMMENT (2)	N/A	3119560
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	87	85	82	86	94		3119560
n-Dotriacontane - Extractable	%	94	93	102	113	98		3119560
Isobutylbenzene - Volatile	%	103	98	101	101	117		3118328

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Lube oil fraction.
(2) Lube oil fraction; interference from possible PAHs.

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		QM5663	QM5663	QM5665	QM5667	QM5670		
Sampling Date		2013/02/01	2013/02/01	2013/02/04	2013/02/04	2013/02/04		
COC Number		ES677213	ES677213	ES677213	ES677213	ES677213		
	Units	**13MW-08 SS3**	**13MW-08 SS3 Lab-Dup**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	11000	10000	11000	11000	12000	10	3119701
Acid Extractable Antimony (Sb)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Arsenic (As)	mg/kg	5.4	5.4	5.3	4.1	5.3	2.0	3119701
Acid Extractable Barium (Ba)	mg/kg	23	21	32	33	33	5.0	3119701
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Boron (B)	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	3119701
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	3119701
Acid Extractable Chromium (Cr)	mg/kg	23	21	17	33	21	2.0	3119701
Acid Extractable Cobalt (Co)	mg/kg	8.9	8.2	8.3	8.6	10	1.0	3119701
Acid Extractable Copper (Cu)	mg/kg	31	30	27	28	33	2.0	3119701
Acid Extractable Iron (Fe)	mg/kg	23000	22000	20000	20000	25000	50	3119701
Acid Extractable Lead (Pb)	mg/kg	12	12	24	25	12	0.50	3119701
Acid Extractable Lithium (Li)	mg/kg	18	18	17	16	20	2.0	3119701
Acid Extractable Manganese (Mn)	mg/kg	530	500	520	440	480	2.0	3119701
Acid Extractable Mercury (Hg)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	3119701
Acid Extractable Molybdenum (Mo)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Nickel (Ni)	mg/kg	15	13	13	13	17	2.0	3119701
Acid Extractable Rubidium (Rb)	mg/kg	7.1	6.2	6.2	5.7	6.4	2.0	3119701
Acid Extractable Selenium (Se)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Silver (Ag)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3119701
Acid Extractable Strontium (Sr)	mg/kg	16	13	58	27	17	5.0	3119701
Acid Extractable Thallium (Tl)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	3119701
Acid Extractable Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3119701
Acid Extractable Uranium (U)	mg/kg	0.75	0.64	0.56	0.71	0.59	0.10	3119701
Acid Extractable Vanadium (V)	mg/kg	41	37	28	35	34	2.0	3119701
Acid Extractable Zinc (Zn)	mg/kg	52	49	64	74	57	5.0	3119701

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		QM5673		
Sampling Date		2013/02/04		
COC Number		ES677213		
	Units	**13MW-12 SS3**	**RDL**	**QC Batch**
Metals				
Acid Extractable Aluminum (Al)	mg/kg	11000	10	3119701
Acid Extractable Antimony (Sb)	mg/kg	<2.0	2.0	3119701
Acid Extractable Arsenic (As)	mg/kg	4.9	2.0	3119701
Acid Extractable Barium (Ba)	mg/kg	31	5.0	3119701
Acid Extractable Beryllium (Be)	mg/kg	<2.0	2.0	3119701
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	2.0	3119701
Acid Extractable Boron (B)	mg/kg	<5.0	5.0	3119701
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	0.30	3119701
Acid Extractable Chromium (Cr)	mg/kg	25	2.0	3119701
Acid Extractable Cobalt (Co)	mg/kg	9.2	1.0	3119701
Acid Extractable Copper (Cu)	mg/kg	25	2.0	3119701
Acid Extractable Iron (Fe)	mg/kg	22000	50	3119701
Acid Extractable Lead (Pb)	mg/kg	15	0.50	3119701
Acid Extractable Lithium (Li)	mg/kg	16	2.0	3119701
Acid Extractable Manganese (Mn)	mg/kg	500	2.0	3119701
Acid Extractable Mercury (Hg)	mg/kg	<0.10	0.10	3119701
Acid Extractable Molybdenum (Mo)	mg/kg	<2.0	2.0	3119701
Acid Extractable Nickel (Ni)	mg/kg	15	2.0	3119701
Acid Extractable Rubidium (Rb)	mg/kg	5.2	2.0	3119701
Acid Extractable Selenium (Se)	mg/kg	<2.0	2.0	3119701
Acid Extractable Silver (Ag)	mg/kg	<0.50	0.50	3119701
Acid Extractable Strontium (Sr)	mg/kg	18	5.0	3119701
Acid Extractable Thallium (Tl)	mg/kg	<0.10	0.10	3119701
Acid Extractable Tin (Sn)	mg/kg	<2.0	2.0	3119701
Acid Extractable Uranium (U)	mg/kg	0.73	0.10	3119701
Acid Extractable Vanadium (V)	mg/kg	33	2.0	3119701
Acid Extractable Zinc (Zn)	mg/kg	55	5.0	3119701

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		QM5664	QM5665	QM5667	QM5670		QM5677		
Sampling Date		2013/02/01	2013/02/04	2013/02/04	2013/02/04		2013/02/04		
COC Number		ES677213	ES677213	ES677213	ES677213		ES677213		
	Units	**13MW-08 SS6**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**RDL**	**13MW-12 SS10**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	0.075	<0.010	0.011	<0.010	0.010	1.8	0.010	3119486
2-Methylnaphthalene	mg/kg	0.11	<0.010	0.017	<0.010	0.010	2.1	0.010	3119486
Acenaphthene	mg/kg	0.24	0.020	<0.010	<0.010	0.010	6.0	0.010	3119486
Acenaphthylene	mg/kg	0.075	0.016	<0.010	<0.010	0.010	1.1	0.010	3119486
Anthracene	mg/kg	0.40	0.051	<0.010	<0.010	0.010	10	0.010	3119486
Benzo(a)anthracene	mg/kg	1.3	0.16	0.017	<0.010	0.010	22	0.10	3119486
Benzo(a)pyrene	mg/kg	0.96	0.12	0.012	<0.010	0.010	13	0.10	3119486
Benzo(b)fluoranthene	mg/kg	0.76	0.096	0.011	<0.010	0.010	10	0.10	3119486
Benzo(g,h,i)perylene	mg/kg	0.60	0.083	<0.010	<0.010	0.010	7.6	0.10	3119486
Benzo(j)fluoranthene	mg/kg	0.41	0.054	<0.010	<0.010	0.010	5.9	0.10	3119486
Benzo(k)fluoranthene	mg/kg	0.41	0.054	<0.010	<0.010	0.010	5.8	0.10	3119486
Chrysene	mg/kg	1.2	0.16	0.022	<0.010	0.010	21	0.10	3119486
Dibenz(a,h)anthracene	mg/kg	0.14	0.021	<0.010	<0.010	0.010	2.1	0.010	3119486
Fluoranthene	mg/kg	2.9	0.31	0.032	<0.010	0.010	53	0.10	3119486
Fluorene	mg/kg	0.25	0.022	<0.010	<0.010	0.010	7.7	0.010	3119486
Indeno(1,2,3-cd)pyrene	mg/kg	0.50	0.073	<0.010	<0.010	0.010	6.7	0.10	3119486
Naphthalene	mg/kg	0.25	0.016	<0.010	<0.010	0.010	10	0.010	3119486
Perylene	mg/kg	0.26	0.033	<0.010	<0.010	0.010	3.9	0.010	3119486
Phenanthrene	mg/kg	2.2	0.22	0.024	<0.010	0.010	52	0.10	3119486
Pyrene	mg/kg	2.5	0.27	0.028	<0.010	0.010	43	0.10	3119486
Surrogate Recovery (%)									
D10-Anthracene	%	73	79	74	99		82		3119486
D14-Terphenyl (FS)	%	99	100	90	108		98 (1)		3119486
D8-Acenaphthylene	%	79	95	76	104		79		3119486

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

GENERAL COMMENTS

Revised report: Re-issued report as duplicates not showing up on EXCEL file. 3/15/13 MMC

Results relate only to the items tested.

Quality Assurance Report

Maxxam Job Number: DB319523

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3118328 THL	Matrix Spike	Isobutylbenzene - Volatile	2013/02/08		92	%	60 - 140
		Benzene	2013/02/08		92	%	60 - 140
		Toluene	2013/02/08		119	%	60 - 140
		Ethylbenzene	2013/02/08		118	%	60 - 140
		Xylene (Total)	2013/02/08		124	%	60 - 140
	Spiked Blank	Isobutylbenzene - Volatile	2013/02/08		99	%	60 - 140
		Benzene	2013/02/08		91	%	60 - 140
		Toluene	2013/02/08		92	%	60 - 140
		Ethylbenzene	2013/02/08		89	%	60 - 140
		Xylene (Total)	2013/02/08		93	%	60 - 140
	Method Blank	Isobutylbenzene - Volatile	2013/02/08		97	%	60 - 140
		Benzene	2013/02/08	<0.025		mg/kg	
		Toluene	2013/02/08	<0.025		mg/kg	
		Ethylbenzene	2013/02/08	<0.025		mg/kg	
		Xylene (Total)	2013/02/08	<0.050		mg/kg	
		C6 - C10 (less BTEX)	2013/02/08	<2.5		mg/kg	
	RPD	Benzene	2013/02/08	NC		%	50
		Toluene	2013/02/08	NC		%	50
		Ethylbenzene	2013/02/08	NC		%	50
		Xylene (Total)	2013/02/08	NC		%	50
		C6 - C10 (less BTEX)	2013/02/08	NC		%	50
3119486 GTH	Matrix Spike	D10-Anthracene	2013/02/12		91	%	30 - 130
		D14-Terphenyl (FS)	2013/02/12		105	%	30 - 130
		D8-Acenaphthylene	2013/02/12		105	%	30 - 130
		1-Methylnaphthalene	2013/02/12		95	%	30 - 130
		2-Methylnaphthalene	2013/02/12		101	%	30 - 130
		Acenaphthene	2013/02/12		97	%	30 - 130
		Acenaphthylene	2013/02/12		111	%	30 - 130
		Anthracene	2013/02/12		97	%	30 - 130
		Benzo(a)anthracene	2013/02/12		103	%	30 - 130
		Benzo(a)pyrene	2013/02/12		94	%	30 - 130
		Benzo(b)fluoranthene	2013/02/12		86	%	30 - 130
		Benzo(g,h,i)perylene	2013/02/12		84	%	30 - 130
		Benzo(j)fluoranthene	2013/02/12		89	%	30 - 130
		Benzo(k)fluoranthene	2013/02/12		88	%	30 - 130
		Chrysene	2013/02/12		110	%	30 - 130
		Dibenz(a,h)anthracene	2013/02/12		89	%	30 - 130
		Fluoranthene	2013/02/12		107	%	30 - 130
		Fluorene	2013/02/12		106	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/02/12		91	%	30 - 130
		Naphthalene	2013/02/12		97	%	30 - 130
		Perylene	2013/02/12		94	%	30 - 130
		Phenanthrene	2013/02/12		102	%	30 - 130
		Pyrene	2013/02/12		108	%	30 - 130
	Spiked Blank	D10-Anthracene	2013/02/11		77	%	30 - 130
		D14-Terphenyl (FS)	2013/02/11		89	%	30 - 130
		D8-Acenaphthylene	2013/02/11		83	%	30 - 130
		1-Methylnaphthalene	2013/02/11		75	%	30 - 130
		2-Methylnaphthalene	2013/02/11		82	%	30 - 130
		Acenaphthene	2013/02/11		76	%	30 - 130
		Acenaphthylene	2013/02/11		87	%	30 - 130
		Anthracene	2013/02/11		80	%	30 - 130
		Benzo(a)anthracene	2013/02/11		105	%	30 - 130
		Benzo(a)pyrene	2013/02/11		83	%	30 - 130
		Benzo(b)fluoranthene	2013/02/11		81	%	30 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: DB319523

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3119486 GTH	Spiked Blank	Benzo(g,h,i)perylene	2013/02/11		83	%	30 - 130
		Benzo(j)fluoranthene	2013/02/11		80	%	30 - 130
		Benzo(k)fluoranthene	2013/02/11		79	%	30 - 130
		Chrysene	2013/02/11		99	%	30 - 130
		Dibenz(a,h)anthracene	2013/02/11		82	%	30 - 130
		Fluoranthene	2013/02/11		91	%	30 - 130
		Fluorene	2013/02/11		84	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/02/11		85	%	30 - 130
		Naphthalene	2013/02/11		77	%	30 - 130
		Perylene	2013/02/11		86	%	30 - 130
		Phenanthrene	2013/02/11		91	%	30 - 130
		Pyrene	2013/02/11		91	%	30 - 130
	Method Blank	D10-Anthracene	2013/02/11		82	%	30 - 130
		D14-Terphenyl (FS)	2013/02/11		95	%	30 - 130
		D8-Acenaphthylene	2013/02/11		83	%	30 - 130
		1-Methylnaphthalene	2013/02/11	<0.010		mg/kg	
		2-Methylnaphthalene	2013/02/11	<0.010		mg/kg	
		Acenaphthene	2013/02/11	<0.010		mg/kg	
		Acenaphthylene	2013/02/11	<0.010		mg/kg	
		Anthracene	2013/02/11	<0.010		mg/kg	
		Benzo(a)anthracene	2013/02/11	<0.010		mg/kg	
		Benzo(a)pyrene	2013/02/11	<0.010		mg/kg	
		Benzo(b)fluoranthene	2013/02/11	<0.010		mg/kg	
		Benzo(g,h,i)perylene	2013/02/11	<0.010		mg/kg	
		Benzo(j)fluoranthene	2013/02/11	<0.010		mg/kg	
		Benzo(k)fluoranthene	2013/02/11	<0.010		mg/kg	
		Chrysene	2013/02/11	<0.010		mg/kg	
		Dibenz(a,h)anthracene	2013/02/11	<0.010		mg/kg	
		Fluoranthene	2013/02/11	<0.010		mg/kg	
		Fluorene	2013/02/11	<0.010		mg/kg	
		Indeno(1,2,3-cd)pyrene	2013/02/11	<0.010		mg/kg	
		Naphthalene	2013/02/11	<0.010		mg/kg	
		Perylene	2013/02/11	<0.010		mg/kg	
		Phenanthrene	2013/02/11	<0.010		mg/kg	
		Pyrene	2013/02/11	<0.010		mg/kg	
	RPD	1-Methylnaphthalene	2013/02/11	NC		%	50
		2-Methylnaphthalene	2013/02/11	NC		%	50
		Acenaphthene	2013/02/11	NC		%	50
		Acenaphthylene	2013/02/11	NC		%	50
		Anthracene	2013/02/11	NC		%	50
		Benzo(a)anthracene	2013/02/11	NC		%	50
		Benzo(a)pyrene	2013/02/11	NC		%	50
		Benzo(b)fluoranthene	2013/02/11	NC		%	50
		Benzo(g,h,i)perylene	2013/02/11	NC		%	50
		Benzo(j)fluoranthene	2013/02/11	NC		%	50
		Benzo(k)fluoranthene	2013/02/11	NC		%	50
		Chrysene	2013/02/11	NC		%	50
		Dibenz(a,h)anthracene	2013/02/11	NC		%	50
		Fluoranthene	2013/02/11	NC		%	50
		Fluorene	2013/02/11	NC		%	50
		Indeno(1,2,3-cd)pyrene	2013/02/11	NC		%	50
		Naphthalene	2013/02/11	NC		%	50
		Perylene	2013/02/11	NC		%	50
		Phenanthrene	2013/02/11	NC		%	50
		Pyrene	2013/02/11	NC		%	50

Quality Assurance Report (Continued)

Maxxam Job Number: DB319523

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3119560 CMI	Matrix Spike						
	[QM5665-01]	Isobutylbenzene - Extractable	2013/02/11		94	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/11		93	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/11		85	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/11		97	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/11		91	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2013/02/11		93	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/11		102	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/11		75	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/11		88	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/11		101	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/02/11		94	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/11		97	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/11	<10		mg/kg	
		>C16-C21 Hydrocarbons	2013/02/11	<10		mg/kg	
		>C21-<C32 Hydrocarbons	2013/02/11	<15		mg/kg	
	RPD [QM5665-01]	>C10-C16 Hydrocarbons	2013/02/11	NC		%	50
		>C16-C21 Hydrocarbons	2013/02/11	NC		%	50
		>C21-<C32 Hydrocarbons	2013/02/11	NC		%	50
3119701 DLB	Matrix Spike						
	[QM5663-01]	Acid Extractable Antimony (Sb)	2013/02/12		103	%	75 - 125
		Acid Extractable Arsenic (As)	2013/02/12		99	%	75 - 125
		Acid Extractable Barium (Ba)	2013/02/12		89	%	75 - 125
		Acid Extractable Beryllium (Be)	2013/02/12		98	%	75 - 125
		Acid Extractable Bismuth (Bi)	2013/02/12		102	%	75 - 125
		Acid Extractable Boron (B)	2013/02/12		91	%	75 - 125
		Acid Extractable Cadmium (Cd)	2013/02/12		97	%	75 - 125
		Acid Extractable Chromium (Cr)	2013/02/12		95	%	75 - 125
		Acid Extractable Cobalt (Co)	2013/02/12		96	%	75 - 125
		Acid Extractable Copper (Cu)	2013/02/12		NC	%	75 - 125
		Acid Extractable Lead (Pb)	2013/02/12		98	%	75 - 125
		Acid Extractable Lithium (Li)	2013/02/12		105	%	75 - 125
		Acid Extractable Manganese (Mn)	2013/02/12		NC	%	75 - 125
		Acid Extractable Mercury (Hg)	2013/02/12		97	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2013/02/12		94	%	75 - 125
		Acid Extractable Nickel (Ni)	2013/02/12		91	%	75 - 125
		Acid Extractable Rubidium (Rb)	2013/02/12		96	%	75 - 125
		Acid Extractable Selenium (Se)	2013/02/12		100	%	75 - 125
		Acid Extractable Silver (Ag)	2013/02/12		100	%	75 - 125
		Acid Extractable Strontium (Sr)	2013/02/12		92	%	75 - 125
		Acid Extractable Thallium (Tl)	2013/02/12		103	%	75 - 125
		Acid Extractable Tin (Sn)	2013/02/12		99	%	75 - 125
		Acid Extractable Uranium (U)	2013/02/12		107	%	75 - 125
		Acid Extractable Vanadium (V)	2013/02/12		NC	%	75 - 125
		Acid Extractable Zinc (Zn)	2013/02/12		NC	%	75 - 125
	Spiked Blank	Acid Extractable Antimony (Sb)	2013/02/11		110	%	75 - 125
		Acid Extractable Arsenic (As)	2013/02/11		102	%	75 - 125
		Acid Extractable Barium (Ba)	2013/02/11		99	%	75 - 125
		Acid Extractable Beryllium (Be)	2013/02/11		96	%	75 - 125
		Acid Extractable Bismuth (Bi)	2013/02/11		103	%	75 - 125
		Acid Extractable Boron (B)	2013/02/11		97	%	75 - 125
		Acid Extractable Cadmium (Cd)	2013/02/11		99	%	75 - 125
		Acid Extractable Chromium (Cr)	2013/02/11		98	%	75 - 125
		Acid Extractable Cobalt (Co)	2013/02/11		99	%	75 - 125
		Acid Extractable Copper (Cu)	2013/02/11		100	%	75 - 125

Quality Assurance Report (Continued)

Maxxam Job Number: DB319523

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3119701	DLB	Spiked Blank	Acid Extractable Lead (Pb)	2013/02/11		100	%	75 - 125
			Acid Extractable Lithium (Li)	2013/02/11		103	%	75 - 125
			Acid Extractable Manganese (Mn)	2013/02/11		98	%	75 - 125
			Acid Extractable Mercury (Hg)	2013/02/11		100	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2013/02/11		102	%	75 - 125
			Acid Extractable Nickel (Ni)	2013/02/11		98	%	75 - 125
			Acid Extractable Rubidium (Rb)	2013/02/11		97	%	75 - 125
			Acid Extractable Selenium (Se)	2013/02/11		102	%	75 - 125
			Acid Extractable Silver (Ag)	2013/02/11		99	%	75 - 125
			Acid Extractable Strontium (Sr)	2013/02/11		99	%	75 - 125
			Acid Extractable Thallium (Tl)	2013/02/11		105	%	75 - 125
			Acid Extractable Tin (Sn)	2013/02/11		100	%	75 - 125
			Acid Extractable Uranium (U)	2013/02/11		104	%	75 - 125
			Acid Extractable Vanadium (V)	2013/02/11		98	%	75 - 125
			Acid Extractable Zinc (Zn)	2013/02/11		104	%	75 - 125
		Method Blank	Acid Extractable Aluminum (Al)	2013/02/11	<10		mg/kg	
			Acid Extractable Antimony (Sb)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Arsenic (As)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Barium (Ba)	2013/02/11	<5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Boron (B)	2013/02/11	<5.0		mg/kg	
			Acid Extractable Cadmium (Cd)	2013/02/11	<0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2013/02/11	<1.0		mg/kg	
			Acid Extractable Copper (Cu)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Iron (Fe)	2013/02/11	<50		mg/kg	
			Acid Extractable Lead (Pb)	2013/02/11	<0.50		mg/kg	
			Acid Extractable Lithium (Li)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2013/02/11	<0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Selenium (Se)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Silver (Ag)	2013/02/11	<0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2013/02/11	<5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2013/02/11	<0.10		mg/kg	
			Acid Extractable Tin (Sn)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Uranium (U)	2013/02/11	<0.10		mg/kg	
			Acid Extractable Vanadium (V)	2013/02/11	<2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2013/02/11	<5.0		mg/kg	
		RPD [QM5663-01]	Acid Extractable Aluminum (Al)	2013/02/12	6.7		%	35
			Acid Extractable Antimony (Sb)	2013/02/12	NC		%	35
			Acid Extractable Arsenic (As)	2013/02/12	NC		%	35
			Acid Extractable Barium (Ba)	2013/02/12	NC		%	35
			Acid Extractable Beryllium (Be)	2013/02/12	NC		%	35
			Acid Extractable Bismuth (Bi)	2013/02/12	NC		%	35
			Acid Extractable Boron (B)	2013/02/12	NC		%	35
			Acid Extractable Cadmium (Cd)	2013/02/12	NC		%	35
			Acid Extractable Chromium (Cr)	2013/02/12	9.0		%	35
			Acid Extractable Cobalt (Co)	2013/02/12	7.2		%	35
			Acid Extractable Copper (Cu)	2013/02/12	3.9		%	35
			Acid Extractable Iron (Fe)	2013/02/12	4.5		%	35
			Acid Extractable Lead (Pb)	2013/02/12	2.6		%	35

Quality Assurance Report (Continued)

Maxxam Job Number: DB319523

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3119701	DLB	RPD [QM5663-01]	Acid Extractable Lithium (Li)	2013/02/12	2.4		%	35
			Acid Extractable Manganese (Mn)	2013/02/12	5.7		%	35
			Acid Extractable Mercury (Hg)	2013/02/12	NC		%	35
			Acid Extractable Molybdenum (Mo)	2013/02/12	NC		%	35
			Acid Extractable Nickel (Ni)	2013/02/12	14.6		%	35
			Acid Extractable Rubidium (Rb)	2013/02/12	NC		%	35
			Acid Extractable Selenium (Se)	2013/02/12	NC		%	35
			Acid Extractable Silver (Ag)	2013/02/12	NC		%	35
			Acid Extractable Strontium (Sr)	2013/02/12	NC		%	35
			Acid Extractable Thallium (Tl)	2013/02/12	NC		%	35
			Acid Extractable Tin (Sn)	2013/02/12	NC		%	35
			Acid Extractable Uranium (U)	2013/02/12	15.5		%	35
			Acid Extractable Vanadium (V)	2013/02/12	8.6		%	35
			Acid Extractable Zinc (Zn)	2013/02/12	5.4		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B319523

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

Alan Stewart, Scientific Specialist (Organics)

Mike Macgillivray, Scientific Specialist (Inorganics)

Rose Macdonald, Scientific Specialist (Organics)

==

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

Your P.O. #: 16300R-20
Your Project #: 121811071.200
Site Location: FUNDY QUAY
Your C.O.C. #: ES676713, ES676813

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/03/15
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B318056
Received: 2013/02/06, 10:25

Sample Matrix: Soil
Samples Received: 15

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI) (1)	2	2013/02/06	2013/02/06	ATL SOP 00111	Based on Atl. PIRI
TEH in Soil (PIRI) (1)	10	2013/02/07	2013/02/07	ATL SOP 00111	Based on Atl. PIRI
Metals Solids Acid Extr. ICPMS	6	2013/02/07	2013/02/07	ATL SOP 00059	Based on EPA6020A
Moisture	12	N/A	2013/02/06	ATL SOP 00001	MOE Handbook 1983
PAH Compounds by GCMS (SIM) (1)	2	2013/02/06	2013/02/08	ATL SOP 00102	Based on EPA8270C
PAH Compounds by GCMS (SIM) (1)	1	2013/02/07	2013/02/07	ATL SOP 00102	Based on EPA8270C
PAH Compounds by GCMS (SIM) (1)	4	2013/02/07	2013/02/08	ATL SOP 00102	Based on EPA8270C
VPH in Soil (PIRI)	9	2013/02/06	2013/02/06	ATL SOP 00119	Based on Atl. PIRI
VPH in Soil (PIRI)	3	2013/02/06	2013/02/07	ATL SOP 00119	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	2	2013/02/06	2013/02/07		Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	10	2013/02/06	2013/02/08		Based on Atl. PIRI

Remarks:

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

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

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

Your P.O. #: 16300R-20
Your Project #: 121811071.200
Site Location: FUNDY QUAY
Your C.O.C. #: ES676713, ES676813

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/03/15
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS
-2-

Encryption Key

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

Marie (McNair) Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

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

Total cover pages: 2

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QL8713	QL8713		QL8715		QL8717		
Sampling Date		2013/01/30	2013/01/30		2013/01/30		2013/01/30		
COC Number		ES676713	ES676713		ES676713		ES676713		
	Units	**13MW-01 SS3**	**13MW-01 SS3 Lab-Dup**	**QC Batch**	**13MW-01 SS8**	**QC Batch**	**13MW-02 SS2**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	10		3115502	25	3115502	8	1	3115575
Petroleum Hydrocarbons									
Benzene	mg/kg	0.11		3115811	0.054	3115811	<0.025	0.025	3115811
Toluene	mg/kg	0.33		3115811	0.14	3115811	<0.025	0.025	3115811
Ethylbenzene	mg/kg	0.034		3115811	0.17	3115811	<0.025	0.025	3115811
Xylene (Total)	mg/kg	0.41		3115811	0.47	3115811	<0.050	0.050	3115811
C6 - C10 (less BTEX)	mg/kg	5.0		3115811	<2.5	3115811	<2.5	2.5	3115811
>C10-C16 Hydrocarbons	mg/kg	34	28	3116758	530	3115315	47	10	3116758
>C16-C21 Hydrocarbons	mg/kg	170	190	3116758	1000	3115315	250	10	3116758
>C21-<C32 Hydrocarbons	mg/kg	400	440	3116758	1800	3115315	520	15	3116758
Modified TPH (Tier1)	mg/kg	600		3115541	3400	3115541	820	15	3115541
Reached Baseline at C32	mg/kg	Yes		3116758	No	3115315	Yes	N/A	3116758
Hydrocarbon Resemblance	mg/kg	COMMENT (1)		3116758	COMMENT (1)	3115315	COMMENT (1)	N/A	3116758
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	94	94	3116758	91	3115315	93		3116758
n-Dotriacontane - Extractable	%	79	81	3116758	92	3115315	91		3116758
Isobutylbenzene - Volatile	%	96		3115811	104	3115811	104		3115811

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range: interference from possible PAHs.

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QL8717		QL8718	QL8720	QL8721		
Sampling Date		2013/01/30		2013/01/30	2013/01/30	2013/01/30		
COC Number		ES676713		ES676713	ES676713	ES676713		
	Units	**13MW-02 SS2 Lab-Dup**	**QC Batch**	**13MW-02 SS6**	**13MW-03 SS7**	**13MW-03 SS10**	**RDL**	**QC Batch**
Inorganics								
Moisture	%		3115575	29	13	12	1	3115502
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	3115811	<0.025	<0.025	<0.025	0.025	3115811
Toluene	mg/kg	<0.025	3115811	<0.025	<0.025	<0.025	0.025	3115811
Ethylbenzene	mg/kg	<0.025	3115811	<0.025	<0.025	<0.025	0.025	3115811
Xylene (Total)	mg/kg	<0.050	3115811	<0.050	<0.050	<0.050	0.050	3115811
C6 - C10 (less BTEX)	mg/kg	<2.5	3115811	<2.5	<2.5	<2.5	2.5	3115811
>C10-C16 Hydrocarbons	mg/kg		3116758	10	<10	24	10	3116758
>C16-C21 Hydrocarbons	mg/kg		3116758	41	<10	110	10	3116758
>C21-<C32 Hydrocarbons	mg/kg		3116758	94	<15	230	15	3116758
Modified TPH (Tier1)	mg/kg		3115541	140	<15	360	15	3115541
Reached Baseline at C32	mg/kg		3116758	Yes	NA	Yes	N/A	3116758
Hydrocarbon Resemblance	mg/kg		3116758	COMMENT (1)	NA	COMMENT (2)	N/A	3116758
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%		3116758	93	90	85		3116758
n-Dotriacontane - Extractable	%		3116758	87	91	76		3116758
Isobutylbenzene - Volatile	%	103	3115811	103	100	102		3115811

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Lube oil fraction.
(2) One product in fuel / lube range: interference from possible PAHs.

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QL8778	QL8780	QL8782	QL8783		
Sampling Date		2013/01/31	2013/01/31	2013/01/31	2013/02/01		
COC Number		ES676813	ES676813	ES676813	ES676813		
	Units	**13MW-04 SS2**	**13MW-04 SS10**	**13MW-05 SS8**	**13MW-06 SS3**	**RDL**	**QC Batch**
Inorganics							
Moisture	%	6	16	10	22	1	3115575
Petroleum Hydrocarbons							
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3115811
Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3115811
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	3115811
Xylene (Total)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	3115811
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	<2.5	<2.5	2.5	3115811
>C10-C16 Hydrocarbons	mg/kg	<10	64	<10	51	10	3116758
>C16-C21 Hydrocarbons	mg/kg	<10	290	15	200	10	3116758
>C21-<C32 Hydrocarbons	mg/kg	<15	520	33	790	15	3116758
Modified TPH (Tier1)	mg/kg	<15	870	48	1000	15	3115541
Reached Baseline at C32	mg/kg	NA	Yes	Yes	Yes	N/A	3116758
Hydrocarbon Resemblance	mg/kg	NA	COMMENT (1)	COMMENT (2)	COMMENT (1)	N/A	3116758
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	92	90	79	90		3116758
n-Dotriacontane - Extractable	%	96	84	83	82		3116758
Isobutylbenzene - Volatile	%	95	98	102	93		3115811

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range: interference from possible PAHs.
(2) Lube oil fraction. Unidentified compound(s) in fuel / lube range.

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		QL8784		QL8787		
Sampling Date		2013/02/01		2013/02/01		
COC Number		ES676813		ES676813		
	Units	**13MW-06 SS8**	**QC Batch**	**13MW-07 SS8**	**RDL**	**QC Batch**
Inorganics						
Moisture	%	56	3115502	10	1	3115575
Petroleum Hydrocarbons						
Benzene	mg/kg	<0.025	3115811	<0.025	0.025	3115811
Toluene	mg/kg	0.19	3115811	<0.025	0.025	3115811
Ethylbenzene	mg/kg	<0.025	3115811	<0.025	0.025	3115811
Xylene (Total)	mg/kg	<0.050	3115811	<0.050	0.050	3115811
C6 - C10 (less BTEX)	mg/kg	<2.5	3115811	<2.5	2.5	3115811
>C10-C16 Hydrocarbons	mg/kg	800	3115315	<10	10	3116758
>C16-C21 Hydrocarbons	mg/kg	1600	3115315	<10	10	3116758
>C21-<C32 Hydrocarbons	mg/kg	2800	3115315	<15	15	3116758
Modified TPH (Tier1)	mg/kg	5200	3115541	<15	15	3115541
Reached Baseline at C32	mg/kg	No	3115315	NA	N/A	3116758
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	3115315	NA	N/A	3116758
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	89	3115315	83		3116758
n-Dotriacontane - Extractable	%	98	3115315	76		3116758
Isobutylbenzene - Volatile	%	77	3115811	92		3115811

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range: interference from possible PAHs.

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		QL8713	QL8713	QL8717	QL8719	QL8781		
Sampling Date		2013/01/30	2013/01/30	2013/01/30	2013/01/30	2013/01/31		
COC Number		ES676713	ES676713	ES676713	ES676713	ES676813		
	Units	**13MW-01 SS3**	**13MW-01 SS3 Lab-Dup**	**13MW-02 SS2**	**13MW-03 SS3**	**13MW-05 SS3**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	8400	8900	15000	11000	11000	10	3116785
Acid Extractable Antimony (Sb)	mg/kg	3.0	3.0	2.1	<2.0	<2.0	2.0	3116785
Acid Extractable Arsenic (As)	mg/kg	61	63	6.3	4.5	4.8	2.0	3116785
Acid Extractable Barium (Ba)	mg/kg	110	110	150	30	30	5.0	3116785
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3116785
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3116785
Acid Extractable Boron (B)	mg/kg	11	10	<5.0	<5.0	<5.0	5.0	3116785
Acid Extractable Cadmium (Cd)	mg/kg	0.62	0.70	<0.30	<0.30	<0.30	0.30	3116785
Acid Extractable Chromium (Cr)	mg/kg	22	22	20	17	23	2.0	3116785
Acid Extractable Cobalt (Co)	mg/kg	19	20	9.7	9.1	9.7	1.0	3116785
Acid Extractable Copper (Cu)	mg/kg	130	130	47	26	27	2.0	3116785
Acid Extractable Iron (Fe)	mg/kg	47000	49000	25000	23000	24000	50	3116785
Acid Extractable Lead (Pb)	mg/kg	110	100	270	10	14	0.50	3116785
Acid Extractable Lithium (Li)	mg/kg	17	17	16	14	17	2.0	3116785
Acid Extractable Manganese (Mn)	mg/kg	300	320	510	520	490	2.0	3116785
Acid Extractable Mercury (Hg)	mg/kg	0.28	0.30	0.23	<0.10	<0.10	0.10	3116785
Acid Extractable Molybdenum (Mo)	mg/kg	44	44	<2.0	<2.0	<2.0	2.0	3116785
Acid Extractable Nickel (Ni)	mg/kg	89	110	15	13	17	2.0	3116785
Acid Extractable Rubidium (Rb)	mg/kg	4.6	4.9	6.0	4.7	6.1	2.0	3116785
Acid Extractable Selenium (Se)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	3116785
Acid Extractable Silver (Ag)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3116785
Acid Extractable Strontium (Sr)	mg/kg	92	96	27	12	11	5.0	3116785
Acid Extractable Thallium (Tl)	mg/kg	0.56	0.58	<0.10	<0.10	<0.10	0.10	3116785
Acid Extractable Tin (Sn)	mg/kg	3.5	2.8	2.6	<2.0	<2.0	2.0	3116785
Acid Extractable Uranium (U)	mg/kg	23	23	0.54	0.56	0.51	0.10	3116785
Acid Extractable Vanadium (V)	mg/kg	280	370	54	37	36	2.0	3116785
Acid Extractable Zinc (Zn)	mg/kg	210	190	170	52	57	5.0	3116785

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B318056
Report Date: 2013/03/15

Stantec Consulting Ltd
Client Project #: 121811071.200
Site Location: FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: JM

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		QL8783	QL8785		
Sampling Date		2013/02/01	2013/02/01		
COC Number		ES676813	ES676813		
	Units	**13MW-06 SS3**	**13MW-07 SS3**	**RDL**	**QC Batch**

Metals					
Acid Extractable Aluminum (Al)	mg/kg	15000	11000	10	3116785
Acid Extractable Antimony (Sb)	mg/kg	2.9	<2.0	2.0	3116785
Acid Extractable Arsenic (As)	mg/kg	20	2.8	2.0	3116785
Acid Extractable Barium (Ba)	mg/kg	340	20	5.0	3116785
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	2.0	3116785
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	2.0	3116785
Acid Extractable Boron (B)	mg/kg	9.0	<5.0	5.0	3116785
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	<0.30	0.30	3116785
Acid Extractable Chromium (Cr)	mg/kg	25	15	2.0	3116785
Acid Extractable Cobalt (Co)	mg/kg	14	7.3	1.0	3116785
Acid Extractable Copper (Cu)	mg/kg	140	22	2.0	3116785
Acid Extractable Iron (Fe)	mg/kg	37000	18000	50	3116785
Acid Extractable Lead (Pb)	mg/kg	1500	6.1	0.50	3116785
Acid Extractable Lithium (Li)	mg/kg	27	15	2.0	3116785
Acid Extractable Manganese (Mn)	mg/kg	810	360	2.0	3116785
Acid Extractable Mercury (Hg)	mg/kg	1.2	<0.10	0.10	3116785
Acid Extractable Molybdenum (Mo)	mg/kg	3.1	<2.0	2.0	3116785
Acid Extractable Nickel (Ni)	mg/kg	25	11	2.0	3116785
Acid Extractable Rubidium (Rb)	mg/kg	10	4.3	2.0	3116785
Acid Extractable Selenium (Se)	mg/kg	<2.0	<2.0	2.0	3116785
Acid Extractable Silver (Ag)	mg/kg	0.53	<0.50	0.50	3116785
Acid Extractable Strontium (Sr)	mg/kg	93	20	5.0	3116785
Acid Extractable Thallium (Tl)	mg/kg	0.14	<0.10	0.10	3116785
Acid Extractable Tin (Sn)	mg/kg	36	<2.0	2.0	3116785
Acid Extractable Uranium (U)	mg/kg	1.3	0.32	0.10	3116785
Acid Extractable Vanadium (V)	mg/kg	35	31	2.0	3116785
Acid Extractable Zinc (Zn)	mg/kg	350	37	5.0	3116785

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		QL8715		QL8718	QL8718		QL8721		
Sampling Date		2013/01/30		2013/01/30	2013/01/30		2013/01/30		
COC Number		ES676713		ES676713	ES676713		ES676713		
	Units	**13MW-01 SS8**	**RDL**	**13MW-02 SS6**	**13MW-02 SS6 Lab-Dup**	**RDL**	**13MW-03 SS10**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	11	0.20	0.043	0.036	0.010	0.34	0.010	3116732
2-Methylnaphthalene	mg/kg	12	0.20	0.042	0.046	0.010	0.39	0.010	3116732
Acenaphthene	mg/kg	16	0.20	0.030	0.015	0.010	1.8	0.010	3116732
Acenaphthylene	mg/kg	0.45	0.010	0.017	0.024	0.010	1.1	0.010	3116732
Anthracene	mg/kg	15	0.20	0.086	0.13	0.010	9.9	0.010	3116732
Benzo(a)anthracene	mg/kg	22	0.20	0.20	0.23	0.010	15	0.20	3116732
Benzo(a)pyrene	mg/kg	14	0.20	0.12	0.15	0.010	12	0.20	3116732
Benzo(b)fluoranthene	mg/kg	11	0.20	0.099	0.12	0.010	9.2	0.20	3116732
Benzo(g,h,i)perylene	mg/kg	7.0	0.20	0.10	0.10	0.010	6.0	0.20	3116732
Benzo(j)fluoranthene	mg/kg	7.1	0.20	0.068	0.084	0.010	5.9	0.20	3116732
Benzo(k)fluoranthene	mg/kg	6.0	0.20	0.053	0.066	0.010	5.6	0.20	3116732
Chrysene	mg/kg	24	0.20	0.19	0.20	0.010	13	0.20	3116732
Dibenz(a,h)anthracene	mg/kg	2.1	0.20	0.019	0.023	0.010	1.9	0.010	3116732
Fluoranthene	mg/kg	43	0.20	0.32	0.40	0.010	37	0.20	3116732
Fluorene	mg/kg	11	0.20	0.033	0.047	0.010	2.3	0.010	3116732
Indeno(1,2,3-cd)pyrene	mg/kg	5.9	0.20	0.063	0.079	0.010	5.3	0.20	3116732
Naphthalene	mg/kg	5.2	0.010	0.029	0.044	0.010	0.53	0.010	3116732
Perylene	mg/kg	2.8	0.20	0.032	0.043	0.010	3.0	0.010	3116732
Phenanthrene	mg/kg	93	0.20	0.42	0.36	0.010	19	0.20	3116732
Pyrene	mg/kg	53	0.20	0.25	0.27	0.010	28	0.20	3116732
Surrogate Recovery (%)									
D10-Anthracene	%	126		90	85		100		3116732
D14-Terphenyl (FS)	%	117 (1)		92	81		90 (1)		3116732
D8-Acenaphthylene	%	94		82	81		84		3116732

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		QL8780		QL8782		QL8784	QL8787		
Sampling Date		2013/01/31		2013/01/31		2013/02/01	2013/02/01		
COC Number		ES676813		ES676813		ES676813	ES676813		
	Units	**13MW-04 SS10**	**RDL**	**13MW-05 SS8**	**RDL**	**13MW-06 SS8**	**13MW-07 SS8**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	2.0	0.10	3.7	0.10	0.040	<0.010	0.010	3116732
2-Methylnaphthalene	mg/kg	2.9	0.10	4.8	0.10	0.042	<0.010	0.010	3116732
Acenaphthene	mg/kg	9.1	0.10	31	0.10	0.032	<0.010	0.010	3116732
Acenaphthylene	mg/kg	1.3	0.10	0.54	0.10	0.017	<0.010	0.010	3116732
Anthracene	mg/kg	23	0.10	68	0.10	0.055	<0.010	0.010	3116732
Benzo(a)anthracene	mg/kg	27	0.10	60	0.50	0.14	<0.010	0.010	3116732
Benzo(a)pyrene	mg/kg	21	0.10	55	0.50	0.13	<0.010	0.010	3116732
Benzo(b)fluoranthene	mg/kg	15	0.10	44	0.50	0.12	<0.010	0.010	3116732
Benzo(g,h,i)perylene	mg/kg	11	0.10	32	0.10	0.090	<0.010	0.010	3116732
Benzo(j)fluoranthene	mg/kg	9.3	0.10	27	0.10	0.061	<0.010	0.010	3116732
Benzo(k)fluoranthene	mg/kg	9.0	0.10	26	0.10	0.064	<0.010	0.010	3116732
Chrysene	mg/kg	25	0.10	58	0.50	0.16	<0.010	0.010	3116732
Dibenz(a,h)anthracene	mg/kg	2.8	0.10	7.7	0.10	0.023	<0.010	0.010	3116732
Fluoranthene	mg/kg	77	0.10	200	0.50	0.29	<0.010	0.010	3116732
Fluorene	mg/kg	10	0.10	28	0.10	0.040	<0.010	0.010	3116732
Indeno(1,2,3-cd)pyrene	mg/kg	10	0.10	29	0.10	0.072	<0.010	0.010	3116732
Naphthalene	mg/kg	6.9	0.10	6.1	0.10	0.062	<0.010	0.010	3116732
Perylene	mg/kg	5.2	0.10	15	0.10	0.043	<0.010	0.010	3116732
Phenanthrene	mg/kg	87	0.10	250	0.50	0.22	<0.010	0.010	3116732
Pyrene	mg/kg	56	0.10	160	0.50	0.30	<0.010	0.010	3116732
Surrogate Recovery (%)									
D10-Anthracene	%	89		107		71	80		3116732
D14-Terphenyl (FS)	%	73 (1)		74 (1)		81	91		3116732
D8-Acenaphthylene	%	74		79		66	74		3116732

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

Package 1	4.7°C

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

GENERAL COMMENTS

Headspace present in samples 13MW-01 SS8 (3.6-4.2m) and sample 13MW-06 SS8 (4.6-5.2m) which may result in a loss of volatiles.

Sample 13MW-02 SS2 (1.5-2.1m) was received broken and was transferred to a 60mL jar. As a result some volatiles may have been lost.
Analysis has proceeded as requested by Rob Fiander. 2/6/13 MMC

Revised report: Re-issued report as duplicates not showing up on EXCEL file. 3/14/13 MMC

Results relate only to the items tested.

Quality Assurance Report

Maxxam Job Number: DB318056

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3115315 AJS	Matrix Spike	Isobutylbenzene - Extractable	2013/02/08		84	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/08		84	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/08		76	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/08		90	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/08		104	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2013/02/06		92	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/06		80	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/06		75	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/06		82	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/06		98	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/02/07		91	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/07		93	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/07	<10		mg/kg	
		>C16-C21 Hydrocarbons	2013/02/07	<10		mg/kg	
		>C21-<C32 Hydrocarbons	2013/02/07	<15		mg/kg	
	RPD	>C10-C16 Hydrocarbons	2013/02/08	NC		%	50
		>C16-C21 Hydrocarbons	2013/02/08	NC		%	50
		>C21-<C32 Hydrocarbons	2013/02/08	NC		%	50
3115811 SHL	Matrix Spike [QL8717-01]	Isobutylbenzene - Volatile	2013/02/06		92	%	60 - 140
		Benzene	2013/02/06		83	%	60 - 140
		Toluene	2013/02/06		116	%	60 - 140
		Ethylbenzene	2013/02/06		101	%	60 - 140
		Xylene (Total)	2013/02/06		110	%	60 - 140
	Spiked Blank	Isobutylbenzene - Volatile	2013/02/06		101	%	60 - 140
		Benzene	2013/02/06		90	%	60 - 140
		Toluene	2013/02/06		88	%	60 - 140
		Ethylbenzene	2013/02/06		88	%	60 - 140
		Xylene (Total)	2013/02/06		87	%	60 - 140
	Method Blank	Isobutylbenzene - Volatile	2013/02/06		105	%	60 - 140
		Benzene	2013/02/06	<0.025		mg/kg	
		Toluene	2013/02/06	<0.025		mg/kg	
		Ethylbenzene	2013/02/06	<0.025		mg/kg	
		Xylene (Total)	2013/02/06	<0.050		mg/kg	
		C6 - C10 (less BTEX)	2013/02/06	<2.5		mg/kg	
	RPD [QL8717-01]	Benzene	2013/02/06	NC		%	50
		Toluene	2013/02/06	NC		%	50
		Ethylbenzene	2013/02/06	NC		%	50
		Xylene (Total)	2013/02/06	NC		%	50
		C6 - C10 (less BTEX)	2013/02/06	NC		%	50
3116732 GTH	Matrix Spike [QL8718-01]	D10-Anthracene	2013/02/07		93	%	30 - 130
		D14-Terphenyl (FS)	2013/02/07		68	%	30 - 130
		D8-Acenaphthylene	2013/02/07		87	%	30 - 130
		1-Methylnaphthalene	2013/02/07		76	%	30 - 130
		2-Methylnaphthalene	2013/02/07		82	%	30 - 130
		Acenaphthene	2013/02/07		78	%	30 - 130
		Acenaphthylene	2013/02/07		90	%	30 - 130
		Anthracene	2013/02/07		101	%	30 - 130
		Benzo(a)anthracene	2013/02/07		104	%	30 - 130
		Benzo(a)pyrene	2013/02/07		83	%	30 - 130
		Benzo(b)fluoranthene	2013/02/07		83	%	30 - 130
		Benzo(g,h,i)perylene	2013/02/07		77	%	30 - 130
		Benzo(j)fluoranthene	2013/02/07		86	%	30 - 130
		Benzo(k)fluoranthene	2013/02/07		85	%	30 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: DB318056

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3116732 GTH	Matrix Spike						
	[QL8718-01]	Chrysene	2013/02/07		89	%	30 - 130
		Dibenz(a,h)anthracene	2013/02/07		81	%	30 - 130
		Fluoranthene	2013/02/07		107	%	30 - 130
		Fluorene	2013/02/07		87	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/02/07		82	%	30 - 130
		Naphthalene	2013/02/07		77	%	30 - 130
		Perylene	2013/02/07		82	%	30 - 130
		Phenanthrene	2013/02/07		80	%	30 - 130
		Pyrene	2013/02/07		77	%	30 - 130
	Spiked Blank	D10-Anthracene	2013/02/07		99	%	30 - 130
		D14-Terphenyl (FS)	2013/02/07		98	%	30 - 130
		D8-Acenaphthylene	2013/02/07		81	%	30 - 130
		1-Methylnaphthalene	2013/02/07		78	%	30 - 130
		2-Methylnaphthalene	2013/02/07		83	%	30 - 130
		Acenaphthene	2013/02/07		83	%	30 - 130
		Acenaphthylene	2013/02/07		87	%	30 - 130
		Anthracene	2013/02/07		104	%	30 - 130
		Benzo(a)anthracene	2013/02/07		104	%	30 - 130
		Benzo(a)pyrene	2013/02/07		92	%	30 - 130
		Benzo(b)fluoranthene	2013/02/07		99	%	30 - 130
		Benzo(g,h,i)perylene	2013/02/07		96	%	30 - 130
		Benzo(j)fluoranthene	2013/02/07		94	%	30 - 130
		Benzo(k)fluoranthene	2013/02/07		98	%	30 - 130
		Chrysene	2013/02/07		100	%	30 - 130
		Dibenz(a,h)anthracene	2013/02/07		95	%	30 - 130
		Fluoranthene	2013/02/07		101	%	30 - 130
		Fluorene	2013/02/07		85	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/02/07		97	%	30 - 130
		Naphthalene	2013/02/07		80	%	30 - 130
		Perylene	2013/02/07		91	%	30 - 130
		Phenanthrene	2013/02/07		94	%	30 - 130
		Pyrene	2013/02/07		97	%	30 - 130
	Method Blank	D10-Anthracene	2013/02/07		99	%	30 - 130
		D14-Terphenyl (FS)	2013/02/07		108	%	30 - 130
		D8-Acenaphthylene	2013/02/07		82	%	30 - 130
		1-Methylnaphthalene	2013/02/07	<0.010		mg/kg	
		2-Methylnaphthalene	2013/02/07	<0.010		mg/kg	
		Acenaphthene	2013/02/07	<0.010		mg/kg	
		Acenaphthylene	2013/02/07	<0.010		mg/kg	
		Anthracene	2013/02/07	<0.010		mg/kg	
		Benzo(a)anthracene	2013/02/07	<0.010		mg/kg	
		Benzo(a)pyrene	2013/02/07	<0.010		mg/kg	
		Benzo(b)fluoranthene	2013/02/07	<0.010		mg/kg	
		Benzo(g,h,i)perylene	2013/02/07	<0.010		mg/kg	
		Benzo(j)fluoranthene	2013/02/07	<0.010		mg/kg	
		Benzo(k)fluoranthene	2013/02/07	<0.010		mg/kg	
		Chrysene	2013/02/07	<0.010		mg/kg	
		Dibenz(a,h)anthracene	2013/02/07	<0.010		mg/kg	
		Fluoranthene	2013/02/07	<0.010		mg/kg	
		Fluorene	2013/02/07	<0.010		mg/kg	
		Indeno(1,2,3-cd)pyrene	2013/02/07	<0.010		mg/kg	
		Naphthalene	2013/02/07	<0.010		mg/kg	
		Perylene	2013/02/07	<0.010		mg/kg	
		Phenanthrene	2013/02/07	<0.010		mg/kg	

Stantec Consulting Ltd
Attention: ROB FIANDER
Client Project #: 121811071.200
P.O. #: 16300R-20
Site Location: FUNDY QUAY

Quality Assurance Report (Continued)

Maxxam Job Number: DB318056

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3116732 GTH	Method Blank	Pyrene	2013/02/07	<0.010		mg/kg	
	RPD [QL8718-01]	1-Methylnaphthalene	2013/02/07	NC		%	50
		2-Methylnaphthalene	2013/02/07	NC		%	50
		Acenaphthene	2013/02/07	NC		%	50
		Acenaphthylene	2013/02/07	NC		%	50
		Anthracene	2013/02/07	38.8		%	50
		Benzo(a)anthracene	2013/02/07	10.6		%	50
		Benzo(a)pyrene	2013/02/07	20.2		%	50
		Benzo(b)fluoranthene	2013/02/07	19.1		%	50
		Benzo(g,h,i)perylene	2013/02/07	1.5		%	50
		Benzo(j)fluoranthene	2013/02/07	21.0		%	50
		Benzo(k)fluoranthene	2013/02/07	21.8		%	50
		Chrysene	2013/02/07	5.0		%	50
		Dibenz(a,h)anthracene	2013/02/07	NC		%	50
		Fluoranthene	2013/02/07	20.5		%	50
		Fluorene	2013/02/07	NC		%	50
		Indeno(1,2,3-cd)pyrene	2013/02/07	23.5		%	50
		Naphthalene	2013/02/07	NC		%	50
		Perylene	2013/02/07	NC		%	50
		Phenanthrene	2013/02/07	17.4		%	50
		Pyrene	2013/02/07	10.3		%	50
3116758 CMI	Matrix Spike [QL8713-01]	Isobutylbenzene - Extractable	2013/02/07		97	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/07		80	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/07		84	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/07		NC	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/07		NC	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2013/02/07		84	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/07		86	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/07		85	%	30 - 130
		>C16-C21 Hydrocarbons	2013/02/07		95	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/02/07		95	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/02/07		92	%	30 - 130
		n-Dotriacontane - Extractable	2013/02/07		87	%	30 - 130
		>C10-C16 Hydrocarbons	2013/02/07	<10		mg/kg	
		>C16-C21 Hydrocarbons	2013/02/07	<10		mg/kg	
		>C21-<C32 Hydrocarbons	2013/02/07	<15		mg/kg	
	RPD [QL8713-01]	>C10-C16 Hydrocarbons	2013/02/07	NC		%	50
		>C16-C21 Hydrocarbons	2013/02/07	15.3		%	50
		>C21-<C32 Hydrocarbons	2013/02/07	8.6		%	50
3116785 DLB	Matrix Spike [QL8713-01]	Acid Extractable Antimony (Sb)	2013/02/07		NC	%	75 - 125
		Acid Extractable Arsenic (As)	2013/02/07		NC	%	75 - 125
		Acid Extractable Barium (Ba)	2013/02/07		NC	%	75 - 125
		Acid Extractable Beryllium (Be)	2013/02/07		95	%	75 - 125
		Acid Extractable Bismuth (Bi)	2013/02/07		97	%	75 - 125
		Acid Extractable Boron (B)	2013/02/07		91	%	75 - 125
		Acid Extractable Cadmium (Cd)	2013/02/07		91	%	75 - 125
		Acid Extractable Chromium (Cr)	2013/02/07		93	%	75 - 125
		Acid Extractable Cobalt (Co)	2013/02/07		98	%	75 - 125
		Acid Extractable Copper (Cu)	2013/02/07		NC	%	75 - 125
		Acid Extractable Lead (Pb)	2013/02/07		NC	%	75 - 125
		Acid Extractable Lithium (Li)	2013/02/07		104	%	75 - 125
		Acid Extractable Manganese (Mn)	2013/02/07		NC	%	75 - 125
		Acid Extractable Mercury (Hg)	2013/02/07		92	%	75 - 125

Quality Assurance Report (Continued)

Maxxam Job Number: DB318056

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3116785 DLB	Matrix Spike [QL8713-01]	Acid Extractable Molybdenum (Mo)	2013/02/07		NC	%	75 - 125
		Acid Extractable Nickel (Ni)	2013/02/07		NC	%	75 - 125
		Acid Extractable Rubidium (Rb)	2013/02/07		94	%	75 - 125
		Acid Extractable Selenium (Se)	2013/02/07		91	%	75 - 125
		Acid Extractable Silver (Ag)	2013/02/07		92	%	75 - 125
		Acid Extractable Strontium (Sr)	2013/02/07		NC	%	75 - 125
		Acid Extractable Thallium (Tl)	2013/02/07		92	%	75 - 125
		Acid Extractable Tin (Sn)	2013/02/07		NC	%	75 - 125
		Acid Extractable Uranium (U)	2013/02/07		110	%	75 - 125
		Acid Extractable Vanadium (V)	2013/02/07		NC	%	75 - 125
		Acid Extractable Zinc (Zn)	2013/02/07		NC	%	75 - 125
	Spiked Blank	Acid Extractable Antimony (Sb)	2013/02/07		97	%	75 - 125
		Acid Extractable Arsenic (As)	2013/02/07		96	%	75 - 125
		Acid Extractable Barium (Ba)	2013/02/07		96	%	75 - 125
		Acid Extractable Beryllium (Be)	2013/02/07		96	%	75 - 125
		Acid Extractable Bismuth (Bi)	2013/02/07		96	%	75 - 125
		Acid Extractable Boron (B)	2013/02/07		103	%	75 - 125
		Acid Extractable Cadmium (Cd)	2013/02/07		92	%	75 - 125
		Acid Extractable Chromium (Cr)	2013/02/07		97	%	75 - 125
		Acid Extractable Cobalt (Co)	2013/02/07		96	%	75 - 125
		Acid Extractable Copper (Cu)	2013/02/07		94	%	75 - 125
		Acid Extractable Lead (Pb)	2013/02/07		96	%	75 - 125
		Acid Extractable Lithium (Li)	2013/02/07		94	%	75 - 125
		Acid Extractable Manganese (Mn)	2013/02/07		98	%	75 - 125
		Acid Extractable Mercury (Hg)	2013/02/07		97	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2013/02/07		95	%	75 - 125
		Acid Extractable Nickel (Ni)	2013/02/07		93	%	75 - 125
		Acid Extractable Rubidium (Rb)	2013/02/07		96	%	75 - 125
		Acid Extractable Selenium (Se)	2013/02/07		92	%	75 - 125
		Acid Extractable Silver (Ag)	2013/02/07		95	%	75 - 125
		Acid Extractable Strontium (Sr)	2013/02/07		94	%	75 - 125
		Acid Extractable Thallium (Tl)	2013/02/07		96	%	75 - 125
		Acid Extractable Tin (Sn)	2013/02/07		98	%	75 - 125
		Acid Extractable Uranium (U)	2013/02/07		104	%	75 - 125
		Acid Extractable Vanadium (V)	2013/02/07		99	%	75 - 125
		Acid Extractable Zinc (Zn)	2013/02/07		98	%	75 - 125
	Method Blank	Acid Extractable Aluminum (Al)	2013/02/07	<10		mg/kg	
		Acid Extractable Antimony (Sb)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Arsenic (As)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Barium (Ba)	2013/02/07	<5.0		mg/kg	
		Acid Extractable Beryllium (Be)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Bismuth (Bi)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Boron (B)	2013/02/07	<5.0		mg/kg	
		Acid Extractable Cadmium (Cd)	2013/02/07	<0.30		mg/kg	
		Acid Extractable Chromium (Cr)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Cobalt (Co)	2013/02/07	<1.0		mg/kg	
		Acid Extractable Copper (Cu)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Iron (Fe)	2013/02/07	<50		mg/kg	
		Acid Extractable Lead (Pb)	2013/02/07	<0.50		mg/kg	
		Acid Extractable Lithium (Li)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Manganese (Mn)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Mercury (Hg)	2013/02/07	<0.10		mg/kg	
		Acid Extractable Molybdenum (Mo)	2013/02/07	<2.0		mg/kg	
		Acid Extractable Nickel (Ni)	2013/02/07	<2.0		mg/kg	

Quality Assurance Report (Continued)

Maxxam Job Number: DB318056

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3116785	DLB	Method Blank	Acid Extractable Rubidium (Rb)	2013/02/07	<2.0		mg/kg	
			Acid Extractable Selenium (Se)	2013/02/07	<2.0		mg/kg	
			Acid Extractable Silver (Ag)	2013/02/07	<0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2013/02/07	<5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2013/02/07	<0.10		mg/kg	
			Acid Extractable Tin (Sn)	2013/02/07	<2.0		mg/kg	
			Acid Extractable Uranium (U)	2013/02/07	<0.10		mg/kg	
			Acid Extractable Vanadium (V)	2013/02/07	<2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2013/02/07	<5.0		mg/kg	
		RPD [QL8713-01]	Acid Extractable Aluminum (Al)	2013/02/07	6.4		%	35
			Acid Extractable Antimony (Sb)	2013/02/07	NC		%	35
			Acid Extractable Arsenic (As)	2013/02/07	3.5		%	35
			Acid Extractable Barium (Ba)	2013/02/07	0.8		%	35
			Acid Extractable Beryllium (Be)	2013/02/07	NC		%	35
			Acid Extractable Bismuth (Bi)	2013/02/07	NC		%	35
			Acid Extractable Boron (B)	2013/02/07	NC		%	35
			Acid Extractable Cadmium (Cd)	2013/02/07	NC		%	35
			Acid Extractable Chromium (Cr)	2013/02/07	3.1		%	35
			Acid Extractable Cobalt (Co)	2013/02/07	2.4		%	35
			Acid Extractable Copper (Cu)	2013/02/07	1.7		%	35
			Acid Extractable Iron (Fe)	2013/02/07	3.0		%	35
			Acid Extractable Lead (Pb)	2013/02/07	10.8		%	35
			Acid Extractable Lithium (Li)	2013/02/07	2.5		%	35
			Acid Extractable Manganese (Mn)	2013/02/07	6.0		%	35
			Acid Extractable Mercury (Hg)	2013/02/07	NC		%	35
			Acid Extractable Molybdenum (Mo)	2013/02/07	1.2		%	35
			Acid Extractable Nickel (Ni)	2013/02/07	20.1		%	35
			Acid Extractable Rubidium (Rb)	2013/02/07	NC		%	35
			Acid Extractable Selenium (Se)	2013/02/07	NC		%	35
			Acid Extractable Silver (Ag)	2013/02/07	NC		%	35
			Acid Extractable Strontium (Sr)	2013/02/07	3.8		%	35
			Acid Extractable Thallium (Tl)	2013/02/07	3.5		%	35
			Acid Extractable Tin (Sn)	2013/02/07	NC		%	35
			Acid Extractable Uranium (U)	2013/02/07	0.5		%	35
			Acid Extractable Vanadium (V)	2013/02/07	29.0		%	35
			Acid Extractable Zinc (Zn)	2013/02/07	12.3		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B318056

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

Alan G Stewart

Alan Stewart, Scientific Specialist (Organics)

Mike Mac Gillivray

Mike Macgillivray, Scientific Specialist (Inorganics)

RoseMarie MacDonald

Rose Macdonald, Scientific Specialist (Organics)

==

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

APPENDIX G

Results of Ecological Screening Protocol

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

Ecological Screening Component	Yes or No	Report Name(s):Phase III ESA
		Location of details and explanations
Part I - Identification of petroleum hydrocarbons in media		
1. Do site characterization data indicate the presence of PHC in site surface soil (depth from surface to 1.5 mbgs) above the appropriate screening levels in Atlantic RBCA Version 3 Tables 1a and 1b?	Yes	Section 7 and Table 1 (Appendix C)
2. Do site characterization data indicate the presence of PHC in shallow site groundwater (depth from surface to 3.0 mbgs) above appropriate ecological screening levels that were derived for the protection of terrestrial plants and soil invertebrates in contact with site groundwater in Atlantic RBCA Version 3 Table 2?	No	Section 7 and Table 2 (Appendix C)
3. Do existing site characterization data indicate the presence of PHC in site groundwater above appropriate ecological screening levels derived for the protection of aquatic receptors in Table 3a/3b?	No	Section 8 and Table 3 (Appendix C)
4. Do site characterization data indicate the presence of PHC in site surface water above the appropriate screening levels in Atlantic RBCA Version 3 Table 3a?	N/A	No off-site sampling completed
5. Do site characterization data indicate the presence of PHC in on-site or adjacent sediments above “typical” or “other” screening levels in Atlantic RBCA Version 3 Table 4?	N/A	No off-site sampling completed
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 within 200 metres of the site? • 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	Section 3
2a. Are there visible indications of stressed vegetation on the site?	N/A	Section 4
2b. Is there evidence that the site vegetation community differs from what would be expected?	N/A	Section 4
2c. Are there indications that the site soil cannot support a soil invertebrate community?	N/A	Section 4
3. Is there evidence that terrestrial plants in the habitats above are likely to be in root contact with site groundwater above screening levels?	N/A	Section 4
4. Would wildlife receptors be expected to forage on or near the contaminated areas of the site?	N/A	Section 4

From Appendix 2, Atlantic RBCA Version 3, July 2012

Ecological Screening Component	Yes or No	Report Name(s):Phase III ESA Location of details and explanations
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	Sections 3, 7 and 8
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 a suitable habitat?	No	Sections 3, 7 and 8
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	Sections 3, 7 and 8
3. Is it reasonable to conclude that dissolved hydrocarbons in site groundwater with concentrations exceeding applicable screening levels will come into contact with aquatic receptors or aquatic receptor habitat?	No	Sections 7 and 8
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 runoff (*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	Sections 7 and 8
5. Are there site specific conditions present, which were not considered in any section above that should require further ecological assessment?	Yes	Non-petroleum contaminants are discussed in Sections 7 and 8
IF ALL ANSWERS IN PART III ARE"NO" THEN NO FURTHER ACTION IS REQUIRED		

From Appendix 2, Atlantic RBCA Version 3, July 2012

Appendix 4: Site Closure Report by Stantec 2015

CLOSURE REPORT
FUNDY QUAY DEVELOPMENT
PID Nos. 55209159, 55011894, 55209167, and 55006886

NBDELG File 6515-4-1221

Fundy Quay Development
Saint John, New Brunswick

Prepared for:
Mr. Kent MacIntyre, General Manager
Saint John Development Corporation
1 Market Square, Suite 301
Saint John N.B. E2L 4Z6

Prepared by:
Stantec Consulting Ltd.
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Fax: (506) 634-8104
www.stantec.com

Stantec Project No. 121811071 Task 205.

March 7, 2014

GLOSSARY OF TERMS AND LIST OF ACRONYMS

Screening Levels: Atlantic RBCA for PHC Impacted Sites in Atlantic Canada Version 3 User Guidance, July 2012

Tier I ESLs: Appendix 2 Tier I RBSLs: Appendix 3 Tier II PSSLs: Appendix 4 Tier II SSTLs: Atlantic RBCA Tool Kit Version 3

Petroleum Hydrocarbons and Fraction Codes

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
mTPH = Modified Total Petroleum Hydrocarbons
*F3 results are approximated using $C_{>16}$ – C_{32} in Atlantic Canada. F3 is calculated by adding the two fractions. If only one of the fractions is below its RL, F3 equals the concentration of the other fraction. If both fractions are below their RLs, the F3 concentration will be reported as less than the higher RL.

CWS PHC Fraction	PHC Fraction
F1	C_6 - C_{10} less BTEX
F2	$C_{>10}$ - C_{16}
F3*	$C_{>16}$ - C_{21}
	$C_{>21}$ - C_{32}
F4	$C_{>32}$ - C_{50}

LIST OF ACRONYMS

AC CDC = Atlantic Canada Conservation Data Centre
AST = Aboveground Storage Tank
B[a]P PEF = Benzo(a)pyrene Potency Equivalence Factor
B[a]P TPE = Benzo(a)pyrene Total Potency Equivalents
CCME = Canadian Council of Ministers of the Environment
COPC = Chemical of Potential Concern
CSA = Canadian Standards Association
CWS = Canada Wide Standards
DELG = Department of Environment and Local Government
EPC = Exposure Point Concentration
ERA = Ecological Risk Assessment
ESA = Environmental Site Assessment
ESL = Ecological Screening Level
F4? = Sample did not return to baseline at C_{32}, F4 may be present
FD = Field Duplicate
GPS = Global Positioning System
HHRA = Human Health Risk Assessment
HQ = Hazard Quotient
IACR = Index of Additive Cancer Risk
LD = Laboratory Duplicate
LRA = Limited Remedial Action
mbgs = Metres Below Ground Surface
N/A = Not Applicable
NAD83 = North American Datum of 1983
NB = New Brunswick
NBHN = New Brunswick Hydrographic Network

PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
PHC = Petroleum Hydrocarbon
PID = Property Identification
PIRI = Partnership in RBCA Implementation
ppm = Parts Per Million
QA/QC = Quality Assurance / Quality Control
RBCA = Risk Based Corrective Action
RBSLs = Risk Based Screening Levels
RDL/RL = Reporting Detection Limit/ Reporting Limit
RfC = Reference Concentration
RPC = Research and Productivity Council
RPD = Relative Percent Difference from the mean
RSC = Risk Specific Concentration
SAR = Species At Risk
SCC = Standards Council of Canada
SNB = Service New Brunswick
$SoQG_E$/$SoQG_{HH}$ = Soil Quality Guideline Environmental/Human Health
SSTL = Site-Specific Target Level
Stantec = Stantec Consulting Ltd.
UCL = Upper Confidence Limit
USCS = Unified Soil Classification System
USEPA = United States Environmental Protection Agency
UST = Underground Storage Tank
VEC = Valued Environmental Component
VOC = Volatile Organic Compound

LABORATORY RESEMBLANCE CODES

AG = Aviation Gasoline
ARO. = Aroclor
FO = Fuel Oil Fraction
FO.LO = Fuel Oil and Lube Oil Fraction
G = Gasoline Fraction
LO = Lube Oil Fraction
MIXTURE = Mix of Aroclors 1242, 1254, and 1260
ND = Not Detected
NR = No Resemblance (not petrogenic in origin)
NRFR = No Resemblance in the Fuel Oil Range ($C_{>10}$-C_{21})
NRLR = No Resemblance in the Lube Oil Range ($C_{>21}$-C_{32})

OP = One Product (unidentified)
PAH = Possible PAHs Detected
PG = Possible Gasoline Fraction
PLO = Possible Lube Oil Fraction
PWFO = Possible Weathered Fuel Oil Fraction
PWG = Possible Weathered Gasoline Fraction
TO = Transformer Oil
TR = Traces of Fuel Oil Fraction
UP = Unknown Peaks/Unidentified Compounds
WFO = Weathered Fuel Oil Fraction
WG = Weathered Gasoline Fraction

EXECUTIVE SUMMARY

Stantec Consulting Ltd. (Stantec) was retained by Saint John Development Corporation to provide site professional services at the site of the proposed Fundy Quay development (herein referred to as the “site”) located on Water Street in Saint John, New Brunswick (Drawing 1).

The Fundy Quay development site consists of a six-acre parcel of land between Water Street and the Saint John Harbour. The development will encompass the existing Water Street public parking lot and the Canadian Coast Guard base located to the south of Market Slip (Drawing 2). It is our understanding the proposed development will consist of a number of buildings, including parking structures, and that the intention of the buildings is for mixed residential and commercial use.

Previous assessment work completed on the site between 2002 and 2010 revealed environmental impacts in soil and/or groundwater associated with petroleum hydrocarbons, polycyclic aromatic hydrocarbons and trace metals. Under the proposed development concept, ground disturbance and excavations are anticipated.

Additional site assessment work was completed in 2013 to bring the Site to Closure as per the New Brunswick Department of Environment and Local Government (NBDELG) *Guideline for the Management of Contaminated Sites.*

A summary of the site information for this Closure Report is presented in Table 1.

Table 1 Site Information

Source Property	Address:	Water Street, Saint John, New Brunswick
	PID(s):	55209159, 55209167, 55006886, and 55011894
Responsible Party	Name: Phone #: Address:	City of Saint John (c/o Saint John Development Corporation) (506) 649-6066 1 Market Square, Suite 301, Saint John NB E2L 4Z6
Property Owner	Name: Address:	City of Saint John (c/o Saint John Development Corporation) PO Box 1971 Stn Main Saint John NB E2L 4L1
Source Property	Land Use: Water Use: Soil Type: Product Type:	Commercial. Future development to include mixed commercial and residential Non-Potable Coarse grained Petroleum hydrocarbons, PHCs (Diesel/#2 oil and #6/Lube oil range hydrocarbons); Polycyclic aromatic hydrocarbons, PAHs; Metals
Adjacent Property	Land Use: Water Use: Soil Type: Product Type:	Commercial Non-Potable N/A N/A
Is Site in a Wellfield or Watershed Protected Area?		The site is not located within a Wellfield or Watershed Protected Area.
Presence and Type of Potable Well(s) on Property		Potable wells were not identified on the property.

Table 1 Site Information

Type of Building on Site **Number of Buildings on Site** **Foundation Type(s)**	Current buildings include the Administration building, the Marine Emergency & Helicopter Hanger, a Shop Building, and a Buoy Shed. The buildings are anticipated to be removed during redevelopment of the site. Details of the proposed buildings are not available at this time.
Contaminant Release Type:	Petroleum hydrocarbons, PHCs (Diesel/#2 oil and #6/Lube oil range hydrocarbons); Polycyclic aromatic hydrocarbons, PAHs; Metals
Date:	Unknown
Quantity Released:	Unknown
Emergency Actions Carried Out	N/A
Environmental Assessment Activities	Environmental assessment activities included the installation of monitoring wells and boreholes, collection of surface and subsurface soil samples, groundwater samples, and soil vapour samples to assess the PHC, PAH and metals impacts.
Remediation	No remediation was required under the current site conditions.
Results of Site Assessment	Potential future use of the property may include a combination of residential and commercial facilities. As such, the current assessment has been completed using the most conservative (residential) standards. PHCs in groundwater meet the Tier I RBSLs. PHCs in soil in several areas of the site exceed the current residential Tier I RBSLs. These impacts were evaluated by assessing the potential exposure pathways. As water is supplied by the municipality, unacceptable risks to human health via the groundwater ingestion pathway are not expected. PHC concentrations in the upper 1.5 m of soil were below the PSSLs for direct contact. Potential inhalation of vapours in indoor air, derived from the PHCs in soil and groundwater, was assessed by measuring soil vapour concentrations. Predicted indoor air concentrations, calculated from the measured soil vapour concentrations were one or more orders of magnitude below human health target levels, and as such, the site is suitable for residential and commercial occupancy. The PHC impacts in soil have been delineated to the applicable adjacent property land use (commercial). Concentrations of some metals across the site, as well as PAHs in a number of the analyzed soil samples exceed the residential screening levels. These screening levels are based on direct contact with the impacted material. As the site surfaces are currently paved or beneath buildings, this is not currently an active pathway. However, this pathway will require management under the proposed redevelopment.
Ecological Screening	The built environment of the site and surrounding area is not considered suitable terrestrial habitat. As such, the only relevant ecological exposure pathway is groundwater discharging to the adjacent marine environment of the Saint John Harbour. Groundwater concentrations meet the ESLs protective of aquatic life. As such, additional assessment or remediation to address ecological concerns is not required.

Based on the results of the environmental site assessment activities, we conclude the following:

- The site assessment met the minimum site assessment requirements outlined in the most recent version of the Atlantic RBCA User Guidance documents.
- Mobile product is not present on the site.
- The groundwater and soil vapour plumes are stable to shrinking.
- PHC impacts have been delineated to the adjacent land use (commercial) and meet onsite residential Tier I, Tier II and/or Tier III criteria for soil, groundwater, and soil vapour.
- The built environment of the current site conditions and proposed future development do not represent ecological habitat. Site groundwater conditions do not represent unacceptable risks to the adjacent marine environment of the Saint John Harbour.
- Predicted indoor air concentrations for onsite and offsite receptors met the established SSTLs.
- No further environmental assessment, remediation or monitoring is required to address PHC, PAH, and metals impacts based on the current or foreseeable future residential/ commercial land use.
- This site is suitable for closure, conditional on the maintenance of suitable cover materials to restrict exposure to impacted soil.

Recommendations include:

- Once site closure has been obtained, monitoring wells must be decommissioned in accordance with NBDELG requirements.
- Site management is required with respect to the wastes that may be generated as a result of ground disturbances related to the redevelopment, potential construction worker exposure to impacted soil, and maintaining cover suitable to eliminate human exposure (residential or commercial) to impacted soil.

The statements made in this Executive Summary are subject to the same limitations included in Section 12.0 and are to be read in conjunction with the remainder of the report.

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Saint John Development Corporation to provide site professional services at the site of the proposed Fundy Quay development (herein referred to as the "site") located on Water Street in Saint John, New Brunswick (Drawing 1).

The Fundy Quay development site consists of a six-acre parcel of land between Water Street and the Saint John Harbour. The development will encompass the existing Water Street public parking lot and the Canadian Coast Guard base located to the south of Market Slip (Drawing 2). It is our understanding the proposed development will consist of a number of buildings, including parking structures, and that the intention of the buildings is for mixed residential and commercial use.

Previous assessment work completed on the site between 2002 and 2010 revealed environmental impacts in soil and/or groundwater associated with petroleum hydrocarbons, polycyclic aromatic hydrocarbons and trace metals. Under the proposed development concept, ground disturbance and excavations are anticipated. Additional work was conducted by Stantec in 2013 to further characterize the site and develop a Remedial Action Plan (RAP) under the New Brunswick Department of Environment and Local Government (NBDELG) *Guideline for the Management of Contaminated Sites*.

The purpose of this report is to summarize the work that has been conducted in accordance with the RAP and to document the environmental assessment activities conducted to bring the site to Closure.

2.0 SITE DESCRIPTION

2.1 SUBJECT AND ADJOINING PROPERTIES

The subject property or site is located to the west of Water Street and south of Market Slip. Saint John Harbour borders the site to the west. The Property Identification numbers (PID Nos.) as available from Service New Brunswick for the properties within the assessment area are summarized in Table 2. The approximate limits of the site are shown on Drawing 2, Appendix A.

Table 2 Properties in the Study Area

Current Property Owner	PID No(s).
City of Saint John	55209159, 55011894, 55209167
City of Saint John (South Market Wharf)	55006886
City of Saint John (Ward Street)	None
City of Saint John (Peter’s Wharf)	None

The site measures approximately six acres and contains a number of buildings. The buildings associated with the Canadian Coast Guard base include the Administration building, the Marine Emergency & Helicopter Hanger, a Shop Building, and a Buoy Shed. Areas surrounding the buildings are predominantly asphalt covered and used for storage of navigational buoys, emergency response equipment, anchors, bulk fuel storage, and parking.

A small Attendant Parking Booth is located at the entrance to the paved Water Street public parking lot. A landscaped area abuts the Water Street public parking lot to the north

Adjacent land use consists of commercial land use to the north, east, and south, and residential land use (upper floor apartments) to the east. Market Slip and Market Square, a large retail complex containing restaurants, retail stores, library and a museum, are located immediately to the north. Commercial properties with upper floor residential apartments are located 20 m to the east across Water Street. Another slip and a parking lot border the site to the south.

The surface of the site is relatively flat with a lower lying area in the Water Street public parking lot (along Ward Street) with surface elevations an estimated 1 m below the majority of the Canadian Coast Guard base. The landscaped area to the north of the public parking lot is slightly elevated with the ground surface an estimated 1 m higher than the Canadian Coast Guard base. Previous work on the Canadian Coast Guard base reported that the elevation of the wharf deck is 9.75 m +/- or 32 feet +/- (LWOST datum).

Water and sewer services in the local area are provided by the City of Saint John infrastructure systems. A number of catch basins located on the site intercept local drainage. Some local surface drainage is expected to discharge to the harbour.

The site is not located within a Wellfield or Watershed Protected Area or Designated Watershed.

2.2 ECOLOGICAL HABITAT

Table 3 identifies ecological habitat within 200 m of the site. The habitat was assessed by Heather Button, B.Sc. using available mapping.

Table 3 Ecological Habitat Within 200 m of the Site

Habitat Type	Is Habitat Present?	Habitat Location	Data source
Wetland	No mapped wetlands are present within 200 m.	None	GeoNB wetland mapping (http://geonb.snb.ca/geonb)
Aquatic (marine) habitat	Site lies near the mouth of Saint John River, on the edge of Saint John Harbor.	Adjacent	SNB NB Hydro NetworkGIS Servers\ArcGIS (http://geonb.snb.ca)
Forested habitats	Significant forested habitat was not identified within 200 m.	None	Aerial interpretation GeoNB Basemap Enhanced Imagery GIS Servers\ArcGIS (http://geonb.snb.ca)
Grassland habitats	Significant grassland habitat was not identified within 200 m.	None	Aerial interpretation GeoNB Basemap Enhanced Imagery GIS Servers\ArcGIS (http://geonb.snb.ca)
Provincial or National parks, or ecological reserves	Provincial or National parks, or ecological reserves were not identified within 200 m.	None	SNB Provincial Themes http://www.snb.ca/gdam-igec/e/2900e_1e_i.asp
Known rare, threatened or endangered species	Atlantic salmon (Outer Bay of Fundy Population) spawn and mature in Saint John River. This species may be found in the vicinity of the site during migration periods (spring and fall). Atlantic salmon (Outer Bay of Fundy Population) is ranked as Endangered by COSEWIC, but does not currently have a SARA schedule or status designation. No other species are known to occur within 200 m. Likelihood is low based on aerial imagery, as no unusual or rare terrestrial habitat is evident, and the area is highly developed. However, ACCDC was not consulted.	Adjacent	Aerial interpretation of habitat conditions in the vicinity of the site (http://geonb.snb.ca
Other critical or sensitive habitat	Environmentally sensitive areas are not designated in the area. The area is highly developed and sensitive habitats are not evident on imagery.	None	SNB Provincial Themes (ESAs) http://www.snb.ca/gdam-igec/e/2900e_1e_i.asp

Table 3 Ecological Habitat Within 200 m of the Site

Habitat Type	Is Habitat Present?	Habitat Location	Data source
Other local or regional receptor habitat concerns	Potential impacts appear to be localized.	None	Aerial interpretation of habitat conditions in the vicinity of the site (http://geonb.snb.ca

3.0 BACKGROUND

3.1 HISTORICAL LAND USE

Site use dates back to the early 1800s, when Water Street and the area to the east were developed through infilling of the harbour. Numerous buildings and wharves were present on the site over the years, many of which were reportedly lost to fires on more than one occasion, including the Great Fire of June 20, 1877.

The Water Street public parking lot appears to have been used exclusively as a parking lot since at least the 1980s. Additional details on the history of the site, including information on specific business enterprises (i.e., coal dealer) are contained in the report entitled Historical Review for the City of Saint John property located at 3 Water Street (deStecher Appraisals Ltd., 1999).

Environmental conditions and the presence of environmental impacts may be influenced by historical use of the lands and activities within the surrounding urban environment. In this instance, both point and non-point sources of impacts may be anticipated. Potential point sources for environmental impacts include such things as underground storage tanks. Non-point sources may include historical fires and infilling activity (i.e., source and nature of fill).

3.2 HISTORICAL ENVIRONMENTAL REPORTS (PRIOR TO 2006)

Previous environmental assessment work for the site was documented in a series of reports provided by Saint John Development Corporation. The reports included:

- Phase I Environmental Site Assessment, Coast Guard Facility, Peter's Wharf, Saint John, NB. Jacques Whitford Environment Limited for Public Works and Government Services Canada, June 18, 2001.
- Phase II Environmental Site Assessment, Saint John Coast Guard Base, Saint John, New Brunswick. Jacques Whitford Environment Limited for Public Works and Government Services Canada, March 25, 2002.
- Limited Environmental Investigation, Canadian Coast Guard Base, Saint John, New Brunswick. Dillon Consulting for Conquest Engineering Limited, April 27, 2006.

The investigations and assessment work identified a number of onsite sources of petroleum hydrocarbons related to storage and maintenance activities on the property. PAHs and PHCs were found on the Canadian Coast Guard base and Water Street public parking lot, and isolated trace metals were found across the site.

3.3 PREVIOUS ENVIRONMENTAL WORK CONDUCTED BY STANTEC (PHASE III ESA, 2013)

Stantec conducted a Phase III ESA in 2013 (*Phase III Environmental Site Assessment Report. Fundy Quay Development, Saint John, New Brunswick.* Report prepared for Saint John Development Corporation, dated March 28, 2013). This work was undertaken with the objective of assessing and mitigating potential environmental concerns previously identified in the context of the current guidelines applicable to the proposed redevelopment of the site.

Historical results were evaluated against published screening levels for the protection of both human and ecological (environmental) health prior to field implementation to confirm the assessment approach. The field sampling locations included areas of documented environmental impacts along with other areas where ground disturbance may occur.

Petroleum hydrocarbons (PHCs) were identified in soil at concentrations exceeding the screening levels for residential land use in at least three areas of former petroleum storage and/or underground oil/water separators on the Canadian Coast Guard base and in the area of the Water Street public parking lot. In many instances where elevated PHC concentrations were found, the laboratory reported the potential presence/interferences from polycyclic aromatic hydrocarbons (PAHs). The observed depths of impact across the site ranged from within 1 m to 6 m or more below ground surface.

PAH impacts in soil appeared to be widely distributed with concentrations exceeding screening levels (typically one order of magnitude or more greater than screening levels) at depths of up to 6 m or more.

Several trace metals at concentrations exceeding the screening levels (typically within one order of magnitude of screening levels) were found in soils of various depths across the site, suggesting heterogeneity within the fill layers. Metal impacts were observed in shallow (<1.5 m depth) and deeper soils on both the Canadian Coast Guard base and in the Water Street public parking lot.

4.0 SCOPE OF WORK - REMEDIAL ACTION PLAN

Based on the results of the Phase III ESA, additional site work, including limited soil sampling, groundwater monitoring and the assessment of soil vapour PHC concentrations, was recommended to assess the potential risks to human health and the environment and ensure compliance with the NBDELG *Guideline for the Management of Contaminated Sites*.

These recommendations were submitted to the NBDELG in the form of Remedial Action Plan (RAP). The scope, methodology, and results for this phase of the project are summarized in the following sections.

4.1 FIELD INVESTIGATION

Stantec personnel were on site on various dates in September and October 2013 to conduct site assessment activities including groundwater sampling, soil vapour probe installation, soil sampling and soil vapour sampling. The field methodology is summarized in Appendix B.

4.2 FIELD AND LABORATORY PROGRAM

The field and laboratory program is summarized in Table 4.

Table 4 Field and Laboratory Program

Analytes (Media)	Matrix	Type of Sampling	Samples Submitted	Sample IDs	QA/QC Samples		
					Original	Lab	Field
						Duplicates	
PHCs	Soil	Soil Vapour Probes	2	13SVP-09 and 13SVP-11	N/A	N/A	N/A
PHCs	Groundwater	Monitoring Wells	10	MW5, BH5, 13MW-01, 13MW-03, 13MW-05, 13MW-07, 13MW-08, and 13MW-10 to 13MW-12	MW5 13MW-07	MW5 LD 13MW-07 LD	N/A

Table 4 Field and Laboratory Program

Analytes (Media)	Matrix	Type of Sampling	Samples Submitted	Sample IDs	QA/QC Samples		
					Original	Lab	Field
						Duplicates	
PHCs	Soil Vapour	Soil Vapour Probe	9	13SVP-01A and 13SVP-3A to 13SVP-10A	N/A	N/A	N/A

- Soil, water, and vapour samples were analyzed by the SCC accredited Maxxam Analytics in Bedford, Nova Scotia and RPC laboratory in Fredericton, New Brunswick . The lab used various quality control procedures including analysis of blanks, surrogate recoveries, matrix spike recoveries and other activities in addition to the lab duplicates.
- McQuinn Environmental and Geotechnical drilling completed the drilling program on September 24, 2013.

5.0 FIELD OBSERVATIONS (SEPTEMBER TO OCTOBER 2013)

5.1 FREE PRODUCT

Free phase liquid petroleum product was not encountered during field work.

5.2 SOIL

Consistent with the Phase III ESA work, soil conditions encountered on site during the installation of the soil vapour probes generally consisted of asphalt underlain by either sand with gravel fill and/or heterogeneous fill comprised of sand, gravel, silt and occasional cobbles and pieces of bricks (Vapour Probe Records, Appendix C).

5.3 GROUNDWATER

Based on the groundwater elevation data collected, groundwater is influenced by the tides in the Saint John Harbour and fluctuates by a meter or more throughout the tidal cycle. Local groundwater movement is generally anticipated to flow west toward the harbour.

5.4 PREFERENTIAL PATHWAYS

Preferential pathways include buried utility corridors such as water and sewer lines associated with buildings and catch basins.

6.0 QUALITY ASSURANCE / QUALITY CONTROL (SEPTEMBER TO OCTOBER 2013)

Laboratory certificates of analysis are presented in Appendix E. All samples were submitted within prescribed hold times.

All laboratory and field QC results were within acceptable ranges. The laboratory reporting limit for each of the duplicates were classified the same (either both above or both at or below the guidelines for a residential site). Results of duplicate sampling and analysis are provided in Table 5.

Table 5 Results of Duplicate Sampling and Analysis

Analytes (media)	Duplicate Type	Range of % RPD	Number of Analytes within ±50% RPD (soil) ±30% RPD (water)	Acceptable Duplicate Correlation
PHCs (groundwater)	LD	0%	6 of 6	Yes

In general, the duplicate results agree closely with their corresponding samples and confirm the representativeness of the sampling procedures. Data quality objectives were met and the overall data quality is considered acceptable.

7.0 REGULATORY FRAMEWORK

7.1 PAHS AND METALS

Atlantic PIRI currently provides screening levels only for petroleum hydrocarbons. Evaluation of non PHC COPCs is considered a Tier III assessment under the current provincial framework. Stantec has referenced screening levels published by the following agencies, in order of preference:

- Canadian Council of Ministers of the Environment (CCME): online Soil Quality Guideline database (http://ceqg-rcqe.ccme.ca/, accessed February 2014)
- Alberta Environment: Alberta Tier 1 Soil and Groundwater Remediation Guidelines (December 2010).
- OMOE: Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario (April 2011).
- United States Environmental Protection Agency (USEPA): online database (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/, accessed February 2014.

Consistent with the Atlantic PIRI approach, screening levels were selected for the protection of both human and ecological (environmental) health.

7.2 PETROLEUM HYDROCARBONS

The Atlantic RBCA User Guidance for Petroleum Impacted Sites in Atlantic Canada, (Version 3.0, July 2012) was used to evaluate PHC concentrations.

The Site Assessment and Tier I/II Checklist presented in Appendix D indicates that the human health Tier I RBSLs are applicable to this site. Site characteristics used to select Screening Levels are presented in Table 6. Applicable ESLs within 200 m of the site are identified in Table 7.

Table 6 Screening Level Selection Based on Source, Pathways, and Receptors

Criteria	Applicable Selection	Rationale
Receptor	Residential (most sensitive future use)	Existing land use consists of commercial use only. Proposed land use will include residential occupancy. Commercial and residential properties neighbour the site, with residential use expected within 30 m of site.
Groundwater Use	Non-potable	Potable water in the area is supplied by the municipal distribution system.

Table 6 Screening Level Selection Based on Source, Pathways, and Receptors

Criteria	Applicable Selection	Rationale
Soil Type	Coarse-grained	Coarse-grained soil was observed (predominant).
Source	Diesel/#2 oil and #6/Lube oil	Laboratory resemblance indicates hydrocarbon mixtures typically in the fuel oil and/or lube oil range. Interferences from possible PAHs are common. Diesel/#2 oil RBSLs are protective.
Depth of Impacts	Varies	Some impacts within or near 1.5 m depth below ground surface, while others are deeper.
Depth of Groundwater	Varies	Water levels vary with proximity to Saint John Harbour and tidal cycle.
Distance to Nearest Surface Water Body	10 m	Minimum distance between any monitoring well sampled and the harbour.
Preferential Pathways	Underground services	Preferential pathways include buried utility corridors such as water and sewer lines associated with buildings and catch basins.

Table 7 ESL Applicability Within 200 m of the Site

Pathway	Are ESLs Applicable?	Rationale
Protection of Plants and Soil Invertebrates; Direct Soil Contact (Table 1a)*	Yes	Some soil samples were collected between surface and 1.5 mbgs.
Protection of Wildlife (mammals and birds) and Livestock; Soil and Food Ingestion (Table 1b)*	Yes	Some soil samples were collected between surface and 1.5 mbgs.
Plant and Invertebrate Direct Contact with Shallow Groundwater (Table 2)*	Yes	Groundwater is present within 3 mbgs.
Protection of Freshwater and Marine Aquatic Life from groundwater and surface water impacts (Table 3a and Table 3b)*	Yes (10 m separation distance criteria)	Saint John Harbour located a minimum of 10 m west of investigated area.
Protection of Freshwater and Marine Aquatic Life from sediment impacts (Table 4)*	Yes	Sediments are present within 200 m of the site.
In the absence of groundwater data, protection of Aquatic Life from Soil Leaching to Groundwater Pathway (Tier III)	No	Groundwater data were available and were used.

*Table references based on Atlantic RBCA Version 3 User Guidance (Appendix 2).

8.0 CHEMICAL SCREENING

8.1 PETROLEUM HYDROCARBONS

The PHC concentrations in soil (Table E.1) were below the referenced RBSLs in several samples with the exception of Modified TPH in samples recovered from the following distinct locations:

- Water Street public parking lot: BH4, BH5 13MW-01, 13MW-02 13SVP-09 (Modified TPH concentrations up to 3,400 mg/kg)
- Former UST Site (north of Buoy Shed): MW1, MW2 13MW-03, 13MW-04 (Modified TPH concentrations up to 870 mg/kg)
- Shop U/G Oil Water Separator (north end of Shop Building): 13MW-06 (Modified TPH concentration of 5,200 mg/kg)
- Marine Emergency & Helicopter Hanger U/G Oil Water Separator: MW5 (Modified TPH concentrations up to 1,100 mg/kg), and
- Northern Property Boundary adjacent to Market Slip: 13MW-12 (Modified TPH concentration of 2,900 mg/kg).

In addition, samples from BH-4 and 13MW-01 in the Water Street parking lot also contained concentrations of benzene greater than the RBSL.

Exceedances of the soil ESLs (for direct soil contact with ecological receptors) are limited and include F2 and/or F3 hydrocarbons in samples from MW1 and 13MW-01.

Impacts in soil exceeding the RBSLs in the Water Street public parking lot were identified at depths ranging from 0.6 m to 4.6 m below ground surface. Samples collected from 13MW-06 (near Shop Building) are proximal to, and resemble the impacts in the Water Street public parking lot; impacts at 13MW-06 were identified at depths ranging from 1.5 m to 5.2 m.

PHC impacts in soil exceeding the RBSLs near the former UST area (near Buoy Shed) were identified at depths ranging from 0.15 m to 6.6 m. Impacts in soil along the northern property boundary at 13MW-12 were confirmed at a depth of 5.5 m. PHC impacts near the Marine Emergency & Helicopter Hanger (MW5) were identified at a depth of approximately 2 m.

Groundwater samples collected historically and as part of this assessment contained concentrations of petroleum hydrocarbons below the RBSLs and the ESLs for direct contact (Table E.2). Concentrations of PHC in groundwater were below the ESLs protective of surface water with the exception of Modified TPH concentrations in historical samples collected from MW2, MW5, MW7 and BH-5 (Table E.3). These areas were resampled in 2013. MW7 was not available, and as such samples were collected from 13MW-05 and 13MW-06 to characterize this area. All samples collected in 2013 met the ESLs for aquatic life (10 m separation).

Predicted on site indoor air PHC concentrations, calculated from the samples collected from the soil vapour probes (with applicable dilution factors (Appendix F) are presented in Table E4. Concentrations of PHCs in soil vapour were below the laboratory detection limits with the exception of 13SVP-09, where the predicted indoor air concentration of Modified TPH was approximately two orders of magnitude below the SSTL.

8.2 POLYCYCLIC AROMATIC HYDROCARBONS

PAHs were detected in 17 of the 19 soil samples, with concentrations exceeding the human health and/or ecological screening levels in 10 samples. Interferences from possible PAHs were also noted by the analytical laboratory in a number of samples analyzed for PHCs.

The sample locations where exceedances were identified included BH-5, BH-6, MW2, MW5, 13MW-01, 13MW-03, 13MW-04, 13MW-05, 13MW-08 (ecological exceedance only), and 13MW-12. The highest concentrations (B(a)P TPE > 100 mg/kg) were measured in samples from MW5 and 13MW-05. Samples exceeding screening levels were recovered from depths ranging between 2.1 m and 6.6 m are ubiquitous across the site area. Laboratory reports of possible PAH presence in soil samples analyzed for PHCs indicates shallower PAH impacts in shallow soil cannot be ruled out.

PAH concentrations in the historical groundwater sample from MW5 were below the referenced screening levels with the exception of benzo(*g,h,i*)perlyene and chrysene, which exceeded the ecological screening level. Groundwater samples collected in 2013 using low-flow methods contained concentrations of PAHs below the laboratory detection limits.

8.3 METALS

Concentrations of metals in soil samples were below the human health screening levels with the exception of arsenic, lead, and/or vanadium in surface (<1.5 mbgs) samples from locations SS3, BH-8, BH-11, BH-14, 13MW-01 and 13MW-02, and subsurface (>1.5 mbgs) samples from 13MW-06 and 13MW-08. Exceedances of the human health guidelines were generally located in the northern portion of the site.

Exceedances of the ecological screening levels were noted in isolated samples from SS3 (zinc) and SBH7, BH-12 lab duplicate (molybdenum), while one or more of the following parameters exceeded the ecological screening levels for samples from 13MW-01 and 13MW-06: arsenic, copper, molybdenum, nickel, tin, and zinc.

9.0 INTERPRETATION

9.1 HUMAN HEALTH

Exceedances of the PHC RBSLs in soil were identified in at least three distinct areas of former petroleum storage and/or underground oil/water separators on the Canadian Coast Guard base. In many instances observations of petroleum hydrocarbons (*i.e.*, modified TPH) in soil exceeding the RBSLs were associated with the potential presence/interference from PAHs. As such, the reported concentrations of Modified TPH are not necessarily considered to be an indication of petroleum-based impacts alone, but rather a mixture or combination of PHCs and PAHs and as such the reported Modified TPH may be upwardly biased.

Nonetheless, analytical results and field observations from samples collected around the former UST site (near the Buoy Shed) are suggestive of petroleum-based impacts at depths extending to more than 6.6 m below ground surface. PHC impacts near the Shop Building, Helicopter Hanger and the Water Street public parking lot may also be associated historical petroleum storage or oily wastewater (depths up to 5.2 m, 2.7 m and 4.6 m, respectively).

PAH impacts in soil appear to be widely distributed with concentrations exceeding screening levels at depths of up to 6.6 m, and may extend deeper. Exceedances of the PAH screening levels appear to be associated with a number of sample locations in the eastern part of the site and at depth within the northern half of the Canadian Coast Guard base. These areas coincide with areas that were developed prior to the early 1800s (prior to the reported infilling to the west for the establishment of the Canadian Coast Guard base) and subsequently lost to a number of fires, including the Great Fire in 1877. It is anticipated that coal may have been a common fuel source during the early history of the site. Both coal use and the history of fire could lead to surface deposition of PAHs, while creosote timber cribwork associated with wharves could lead to localized PAH impacts. It is expected that numerous properties in this general area of Saint John would be characterized by similar PAH composition in surface soils as the effects of coal burning and the Great Fire would not be restricted to the investigated properties.

Some trace metals were also found at varying concentrations in soils of various depths across the site, suggesting heterogeneity within the fill layers. Metals concentrations at 13MW-01 and 13MW-06 (lead exceeds SQGHH), are generally consistent with lead paint impacts, and may be attributable to former structures in the Water Street parking lot area (removed prior to 1980).

The assessment of potential risks to human health requires not only a comparison of the measured concentrations to screening levels, but also an analysis of the relevant potential exposure pathways.

<u>PHCs:</u>

Potential exposure pathways for PHCs considered to be active at this site (given the proposed redevelopment for mixed residential and commercial use) are the inhalation of petroleum hydrocarbon-derived vapours in indoor air (in buildings located up to 30 m from the impacts), and direct contact with/incidental ingestion of surface soil (up to 1.5 m depth). The indoor air inhalation pathway was assessed by directly measuring the soil vapour concentrations in the areas where PHC concentrations exceeded the RBSLs (refer to Appendix C and F).

As the soil vapour probes were screened in the same zone as the observed impacts, the soil vapour concentrations are expected to be relatively stable. Soil vapour concentrations were generally below laboratory detection limits and predicted indoor air concentrations are 1 order of magnitude or more below the SSTLs for a residential receptor. As soil vapour at probe location SVP-09 does not represent unacceptable risk to potential onsite residential receptors, unacceptable risks to the neighbouring residential property (upper floor apartments located 20 m east across Water Street) can also be ruled out. As per Health Canada Guidance, under these conditions additional sampling to assess seasonal variations is not required (*Guidance Manual for Environmental Site Characterization in Support of Human Health Risk Assessment. Volume 1 Technical* Guidance, Health Canada, 2008).

All analyzed samples contained concentrations of PHCs below the Pathway Specific Screening Levels (PSSLs) for direct contact/ingestion.

<u>PAHs and metals</u>

The guidelines used for screening PAHs and metals are protective of direct contact with/incidental ingestion of impacted soil, which is relevant to the top 1.5 m of soil. Soil samples with concentrations of PAHs exceeding the screening levels were collected at depths greater than 1.5 m, while some of the noted metals exceedances were in surface soil samples. Due to the history of the site (several fires) PAH impacts in surface soil cannot be ruled out. The current site configuration (pavement and/or buildings) restricts exposure to impacted surface soil, however, the proposed redevelopment is anticipated to result in soil disturbance and as such, risk management measures must be implemented (See Section 9.3)

Based on the results of the assessment, PHC, PAH, and metal concentrations at the site do not represent unacceptable risks to human receptors given the current site configuration. Therefore, further assessment or remediation to address human health concerns is not required.

9.2 ECOLOGICAL HEALTH

Site conditions were assessed in the context of the Ecological Screening Protocol. The completed Protocol is provided in Appendix G.

The referenced ecological screening levels represent a number of exposure pathways including soil contact (invertebrates), uptake by plants, and groundwater discharge to a surface water environment. At the outset of this assessment, historical data were conservatively screened against the most stringent ecological guidelines. In the case of the PAH constituents naphthalene and phenanthrene, the most conservative guidelines for soil are protective of groundwater discharging to a freshwater body. Historical data at BH-12 exceeded these guidelines, and as such 13MW-12 was drilled in the same vicinity to confirm soil conditions and to assess groundwater conditions. It has since been confirmed that the nearby water body is considered a marine aquatic environment. As such, and as per the CCME guidance document, alternative CCME screening levels for marine receptors have been referenced; concentrations of naphthalene and phenanthrene at BH-12 meet current screening levels.

The site is anticipated to remain as a developed site, and as such, is not considered to be significant ecological habitat for animals or plants (see Results of Ecological Screening Protocol in Appendix G). Therefore, the groundwater discharging to a marine habitat is deemed to be the only complete exposure pathway. Concentrations of Modified TPH and PAHs in several historical groundwater samples exceeded the applicable screening levels. However, the reported concentrations for many parameters were also near to or greater than reported solubility values, which can be reflective of entrained sediment in the water sample. Groundwater samples for PAH analysis in 2013 were collected using low-flow methods, and yielded results below laboratory detection limits. All PHC groundwater samples collected in 2013 met the applicable screening levels, suggesting that historical sampling methodology may have upwardly biased historical results by introducing sediment into the water samples. Additionally, samples collected in 2013 from locations between the historical exceedances and the marine environment met the screening levels for the protection of surface water.

Since groundwater has been assessed in the areas of elevated soil PAH and PHC concentrations and these groundwater conditions do not indicate the presence of unacceptable risks to the marine environment, further assessment such as surface water or sediment sampling, or remediation to address ecological concerns is not required.

9.3 SITE MANAGEMENT CONSIDERATIONS FOR FUTURE CONSTRUCTION

It is our understanding the proposed development will include the construction of a number of buildings and soil disturbance is anticipated. The presence of PHCs, PAHs, and metals in soil requires consideration with respect to waste generation and disposal during construction, as well as management of potential human contact with the impacted materials.

Risk assessment has been conducted based on the current site configurations. The presence of buildings and/or asphalted surfaces, effectively restrict the potential for human receptors to be exposed to metals or PAHs in surface soil. However, if these surfaces are removed, there will be a need to implement measures to maintain this exposure barrier. Suitable options include asphalt, concrete, or landscaping that incorporates a minimum of 1.5 m of clean fill.

During construction, it is anticipated that some soil excavation will occur. Should this material not be suitable for backfill one of the following options should be considered:

- Offsite disposal at an approved disposal / treatment facility. A number of approved facilities are present in the region that may receive wastes containing PHCs. Waste characterization and consultation with facility operators should be completed in advance to confirm the acceptability of waste at the approved facility.

- Offsite disposal at an approved site. As per discussions with NBDELG, and as presented in the RAP, soil may be moved to another property under certain circumstances. The receiving property would be subjected to a remediation file number and associated assessment requirements. Material could be temporarily stored on site, and sampled to assess the appropriate disposal options.

- Onsite management. Material may remain on site provided the potential exposure pathway is eliminated, as discussed in the previous paragraph.

Owing to the presence of some petroleum related impacts and the possibility of historical fire debris, noticeable odour could be apparent in ambient air during the course of any future excavation work. Contingency planning around odour management should be considered in advance of future construction work.

Additionally, health and safety planning for this site should include considerations of the exposure of construction workers to the impacted soil.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the environmental site assessment activities, we conclude the following:

- The site assessment met the minimum site assessment requirements outlined in the most recent version of the Atlantic RBCA User Guidance documents.
- Mobile product is not present on the site.
- The groundwater and soil vapour plumes are stable to shrinking.
- PHC impacts have been delineated to the adjacent land use (commercial) and meet onsite residential Tier I, Tier II and/or Tier III criteria for soil, groundwater, and soil vapour.
- The built environment of the current site conditions and proposed future development do not represent ecological habitat. Site groundwater conditions do not represent unacceptable risks to the adjacent marine environment of the Saint John Harbour.
- Predicted indoor air concentrations for onsite and offsite receptors met the established SSTLs.
- No further environmental assessment, remediation or monitoring is required to address PHC, PAH, and metals impacts based on the current or foreseeable future residential/ commercial land use.
- This site is suitable for closure, conditional on the maintenance of suitable cover materials to restrict exposure to impacted soil.

Recommendations include:

- Once site closure has been obtained, monitoring wells must be decommissioned in accordance with NBDELG requirements.

- Site management is required with respect to the wastes that may be generated as a result of ground disturbances related to the redevelopment, potential construction worker exposure to impacted soil, and maintaining cover suitable to eliminate human exposure (residential or commercial) to impacted soil.

11.0 FILE CLOSURE REQUIREMENTS

11.1 RECORD OF SITE CONDITION

The findings of this report satisfy the guiding principles as referenced in the NBDELG *Guideline for the Management of Contaminated Sites*. A completed Record of Site Condition has been prepared and is included in Appendix H to conclude the management process.

As Closure of this site will be conditional on the maintenance of suitable cover to manage the soil direct contact pathway for human receptors, a signed stakeholder acknowledgement is also included in Appendix H.

Although the Record of Site Condition is a stand-alone document, the conclusions presented within the document in some instances rely on limitations within the referenced reports. The Record of Site Condition should be reviewed in conjunction with this Closure Report.

12.0 LIMITATIONS

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

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

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

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

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

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

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

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec requests that this information be brought to our attention. The primary author of this report was Melanie Langille, M.Env.Sc. It was reviewed by Robert S. Fiander, P.Eng.

Yours truly,

STANTEC CONSULTING LTD.

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APPENDIX A
DRAWINGS

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Path: C:\gis\121811071\drawing\3_draft_figures\mxd\rpt\fig1_20130326_site_plan.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Site Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:50,000

Project No.: 121811071

Data Sources: ESRI ArcGIS Online SNB

Dwg. No.: 1

Date: (dd/mm/yyyy) 26/03/2013

Dwn. By: JAB

Appd. By: RSF

Stantec

Map: NAD83 CSRS NB Double Stereographic

Path: C:\gis\121811071\drawing\3_draft_figures\mxd\rpt\fig2_20130326_subj_prop.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Subject and Surrounding Properties

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,500

Project No.: 121811071

Data Sources:
SNB
ArcGIS Online Bing Imagery

Dwg. No.: 2

Date: (dd/mm/yyyy): 26/03/2013

Fig. By: JAB

Appd. By: RSF

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Path: V:\01218\active\121811071\drawing\3_draft_figures\mxd\pln\fig3_20140306_sample_plan1.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Sample Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,000	Project No.: 121811071	Data Sources: SNB ArcGIS Online Bing Imagery	Dwg. No.: 3
Date: (dd/mm/yyyy): 07/03/2014	Fig. By: CP	Appd. By: RSF	

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Table E1: Hydrocarbon Concentrations in Soil

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH*	
Tier I RBSLs			0.099	77	30	8.8	N/A	N/A	N/A	N/A	270 / 1100	
Tier I ESLs - Eco Contact for Samples < 1.5 mbgs			31	75	55	95	210	150	300	2800	N/A	
ID	Date	Depth (mbgs)	Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH	Resemblance
13MW-01 SS3	30-Jan-13	0.6-1.2	[illegible]	0.33	0.034	0.41	5	34	[illegible]	N/A	[illegible]	OP(FO/LO) PAH?
13MW-01 SS3 LD	30-Jan-13	0.6-1.2	N/A	N/A	N/A	N/A	N/A	28	[illegible]	N/A	N/A	N/A
13MW-01 SS8	30-Jan-13	3.6-4.2	0.054	0.14	0.17	0.47	<2.5	100	2800	N/A	[illegible]	OP(FO/LO) PAH? F4?
13MW-02 SS2	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	47	770	N/A	[illegible]	OP(FO/LO) PAH?
13MW-02 SS2 LD	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02 SS6	30-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	10	135	N/A	140	LO
13MW-03 SS7	30-Jan-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-03 SS10	30-Jan-13	5.5-6.1	<0.025	<0.025	<0.025	<0.056	<2.5	24	340	N/A	[illegible]	OP(FO/LO) PAH?
13MW-04 SS2	31-Jan-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-04 SS10	31-Jan-13	6.0-6.6	<0.025	<0.025	<0.025	<0.052	<2.5	64	810	N/A	[illegible]	OP(FO/LO) PAH?
13MW-05 SS8	31-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	48	N/A	48	LO, UP(FO/LO)
13MW-06 SS3	1-Feb-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	51	990	N/A	[illegible]	OP(FO/LO) PAH?
13MW-06 SS8	1-Feb-13	4.6-5.2	<0.025	0.19	<0.025	<0.050	<2.5	800	4400	N/A	[illegible]	OP(FO/LO) PAH? F4?
13MW-07 SS8	1-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-08 SS6	1-Feb-13	3.3-3.9	<0.025	<0.025	<0.025	<0.050	<2.5	<10	49	N/A	49	LO
13MW-09 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	20	N/A	20	LO
13MW-09 SS3 LD	4-Feb-13	1.2-1.8	N/A	N/A	N/A	N/A	N/A	<10	25	N/A	N/A	N/A
13MW-09 SS6	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-10 SS1	4-Feb-13	0.0-0.6	<0.025	<0.025	<0.025	<0.050	<2.5	<10	52	N/A	53	OP(FO/LO), PLO
13MW-10 SS7	4-Feb-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-11 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-11 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<15	N/A	<15	N/A
13MW-12 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	17	N/A	17	LO
13MW-12 SS10	4-Feb-13	5.5-6.1	<0.025	<0.025	<0.025	0.23	<2.5	140	2740	N/A	2900	LO, PAH? F4?
13SVP-09 SS7	24-Oct-13	3.7-4.3	<0.02	<0.05	<0.02	<0.05	110	1300	920	N/A	[illegible]	WFO
13SVP-11 SS5	24-Oct-13	2.4-3.0	<0.005	<0.05	<0.01	<0.05	<2.5	<12	18	N/A	<21	ND

Most Conservative Land Use: Residential
Water Use: Non-potable
Soil Type: Coarse-grained
*Product Type: Diesel / No. 2 Fuel Oil (270 mg/kg), No. 6 Oil / Lube Oil (1100 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)
Depth of Groundwater: Unknown / Varies
Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)

Path: V:\01218\active\121811071\drawing\3_draft_figures\mxd\pln\fig4_20140306_Hydrocarbon Concentrations in Soil.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Hydrocarbon Concentrations in Soil

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,500

Project No.: 121811071

Date: (dd/mm/yyyy): 07/03/2014

Fig. By: CP

Appd. By: RSF

Data Sources:
SNB
ArcGIS Online Bing Imagery

Dwg. No.: 4

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Path: V:\01218\active\121811071\drawing\3_draft_figures\mxd\pln\fig4_20140306_Hydrocarbon Concentrations in Groundwater.mxd

Table E2: Hydrocarbon Concentrations in Groundwater

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH*	
[illegible]		2.8	20	20	20	N/A	N/A	N/A	N/A	20 / 20	
[illegible]		81	56	20	31	N/A	7.1	1.9	N/A	N/A	
ID	Date	Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH	Resemblance
BH5	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	0.07	0.09	0.2	WFO
13MW-01	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.563	0.58	LO UP(FO/LO)
13MW-01 LD	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	N/A	N/A	N/A	N/A	N/A
13MW-01	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-02	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	<0.1	<0.10	N/A
13MW-03	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.225	0.22	OP(FO/LO) UP(FO/LO)
13MW-03	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-04	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	<0.1	<0.10	N/A
13MW-05	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-06	7-Feb-13	<0.0010	0.0042	<0.0010	<0.0020	N/A	<0.010	<0.050	<0.1	<0.10	N/A
13MW-07	25-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.059	<0.12	<0.12	N/A
13MW-07	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-07 LD	5-Sep-13	N/A	N/A	N/A	N/A	N/A	N/A	<0.05	<0.1	N/A	N/A
13MW-08	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.36	0.39	OP(FO/LO) UP(FO/LO)
13MW-08	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-09	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	<0.1	<0.10	N/A
13MW-10	25-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	<0.1	<0.10	N/A
13MW-10	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-11	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A
13MW-12	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	<0.1	<0.1	N/A

Most Conservative Land Use: Residential
Water Use: Non-potable
Soil Type: Coarse-grained
*Product Type: Diesel / No. 2 Fuel Oil (20 mg/kg), No. 6 Oil / Lube Oil (20 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.2 mbgs)
Depth of Groundwater: Unknown / Varies
Distance to Nearest Surface Water Body: Approximately 12 metres from site (Marine and Freshwater)

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Hydrocarbon Concentrations in Groundwater

Saint John, N.B.

Client: Saint John Development Corporation

Scale:	Project No.:	Data Sources:	Dwg. No.:
1:1,500	121811071	SNB ArcGIS Online Bing Imagery	5

Date: (dd/mm/yyyy):	Fig. By:	Appd. By:
07/03/2014	CP	RSF

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

APPENDIX B
FIELD METHODOLOGY

B-1.0 Pre-Intrusive Investigation Site Activities

The locations of services and utilities were established prior to the drilling and sampling phases of the investigation by contacting the utility providers and persons knowledgeable with the site services. For this assessment a private underground utility locate contractor was engaged to assist in obtaining utility clearances prior to drilling.

B-2.0 Drilling

The drill was equipped with standard augers and HQ coring equipment. Soil samples were recovered from split-spoons, where feasible. Soil samples were logged by Stantec personnel at the time of the drilling. Soil classification was carried out in accordance with the procedures in the ASTM D2488 Standard (Visual-Manual Procedure).

B-3.0 Vapour Probe Installation

Soil vapour samples were collected from the selected sampling locations. A 30 cm length of 2.5 cm diameter slotted PVC pipe was installed in the hole, and connected to solid 2.5 cm diameter PVC pipe up to the surface. The PVC pipe was fitted with a soil gas sampler. A silica sand pack was installed around the screened interval and the hole was sealed with bentonite. Once the grout hardened a helium shroud test was performed to verify that ambient air was not introduced into the sampling train (a helium concentration within the probe of less than 10% is considered acceptable). Following the leak test and prior to obtaining a vapour sample from the probe, stagnant air was purged (3 probe volumes) and the level of vacuum within the probe was confirmed. If the vacuum exceeded 10 inches of water, the flow rate was reduced accordingly

B-4.0 Sample Handling

All samples were placed in laboratory supplied containers. The containers were placed in a cooler with ice packs for transport back to our office. To minimize the potential for cross-contamination, all sampling equipment was thoroughly rinsed between each sampling event.

B-5.0 Sample Selection for Laboratory Analysis

The soil samples recovered from the boreholes and excavation boundaries, were visually classified (for soil type, petroleum odours, and staining), and screened for vapours using a Mini Rae 2000 photoionization detector, calibrated to isobutylene. Based on these results, the location of sources on the property and field observations, selected samples were submitted to the laboratory for analysis.

B-6.0 Groundwater Sampling

An electronic water level meter was used to measure the groundwater elevations in the monitoring wells. The time of the sampling was recorded as well as the time of the most recent high tide. Prior to groundwater sampling, field equipment was cleaned/decontaminated. The monitoring wells were purged a minimum of 3 well volumes and allowed to recover to ensure that representative groundwater from the surrounding formation had been drawn into the monitoring well casings. Groundwater samples were then collected from the monitoring wells for laboratory analysis.

B-7.0 Quality Assurance/Quality Control

Samples were uniquely labeled and control was maintained through use of chain of custody forms. Samples were collected in laboratory supplied containers and preserved as directed by the laboratory.

APPENDIX C
VAPOUR PROBE RECORDS

Stantec

MONITORING WELL RECORD

13SVP-01

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

PROJECT No. **121811071**

LOCATION **Fundy Quay**

BOREHOLE No. **13SVP-01**

DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

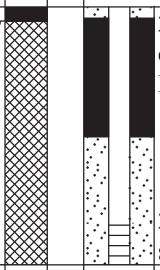
DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm)
						TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
								mm		
0		Asphalt FILL: light to dark brown sand with gravel and trace silt			25 mm diameter PVC casing in Silica sand	SS	1	330	28	0.6
1					Bentonite	SS	2	560	66	0.6
					25 mm diameter PVC slot 10 screen	SS	3	610	64	0.6
2		End of Monitoring Well								
3										
4										
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-02

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2013-09-24**
WATER LEVEL **Not Observed**
PROJECT No. **121811071**
BOREHOLE No. **13SVP-02**
DATUM



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm)
						TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
								mm		
0		Asphalt FILL: light to dark brown sand with gravel and trace silt			25 mm diameter PVC casing in Silica sand Bentonite	SS	1	430	42	1.3
1						SS	2	100	30	1.7
					25 mm diameter PVC slot 10 screen	SS	3	330	39	0.7
2		End of Monitoring Well								
3										
4										
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-03

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

PROJECT No. **121811071**

BOREHOLE No. **13SVP-03**

DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm)
0		Asphalt FILL: light to dark brown sand with gravel and trace silt			25 mm diameter PVC casing in Silica sand Bentonite	SS	1	305	32	0.6
1						SS	2	230	30	2.9
					25 mm diameter PVC slot 10 screen	SS	3	0	19	
2		End of Monitoring Well								
3										
4										
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-04

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
PROJECT No. **121811071**
LOCATION **Fundy Quay**
BOREHOLE No. **13SVP-04**
DATES: BORING **2013-09-24**
WATER LEVEL **Not Observed**
DATUM

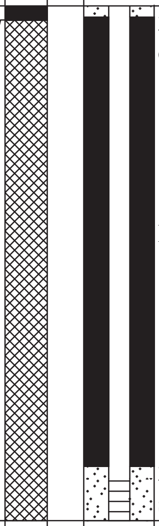
DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm)
						TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
								mm		
0		Asphalt			25 mm diameter PVC casing in Silica sand					
		FILL: dark brown sand with gravel and trace silt			Bentonite	SS	1	560	48	0.7
1		- traces of brick at 0.9 m			25 mm diameter PVC slot 10 screen	SS	2	280	28	0.8
		End of Monitoring Well								
2										
3										
4										
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-05

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
PROJECT No. **121811071**
LOCATION **Fundy Quay**
BOREHOLE No. **13SVP-05**
DATES: BORING **2013-09-24**
WATER LEVEL **Not Observed**
DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0		Asphalt
		FILL: light brown sand with gravel and trace silt
3.65		End of Monitoring Well



WELL CONSTRUCTION

25 mm diameter PVC casing in Silica sand

Bentonite

25 mm diameter PVC slot 10 screen

SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
SS	1	150	46	1.6
SS	2	255	15	1.3
SS	3	380	17	1.5
SS	4	255	28	1.6
SS	5	50	7	
SS	6	100	45	

Stantec

MONITORING WELL RECORD

13SVP-06

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

PROJECT No. **121811071**

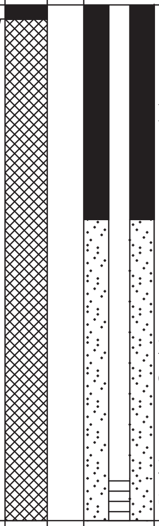
LOCATION **Fundy Quay**

BOREHOLE No. **13SVP-06**

DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

DATUM



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm)
0		Asphalt FILL: grey to brown sand with gravel and trace silt - occasional cobbles below 0.6 m				SS	1	305	32	1.0
1		- occasional bricks from 1.2 m to 2.4 m			Bentonite	SS	2	330	36	0.7
						SS	3	430	20	0.9
2						SS	4	305	26	1.0
					25 mm diameter PVC casing in Silica sand	SS	5	380	13	0.9
3					25 mm diameter PVC slot 10 screen	SS	6	255	15	0.6
4		End of Monitoring Well								
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-07

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

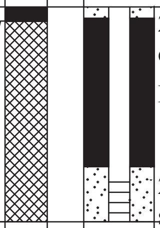
DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

PROJECT No. **121811071**

BOREHOLE No. **13SVP-07**

DATUM



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm)
0		Asphalt	25 mm diameter PVC casing in Silica sand					
		FILL: black sand with gravel and trace silt	Bentonite	SS	1	510	49	0.7
1			25 mm diameter PVC slot 10 screen	SS	2	150	45	1.3
		End of Monitoring Well						
2								
3								
4								
5								
6								
7								
8								
9								
10								

Stantec

MONITORING WELL RECORD

13SVP-08

CLIENT SAINT JOHN DEVELOPMENT CORPORATION

LOCATION Fundy Quay

DATES: BORING 2013-09-24

WATER LEVEL Not Observed

PROJECT No. 121811071

BOREHOLE No. 13SVP-08

DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
0		Asphalt FILL: black sand with silt and gravel - pieces of brick throughout			25 mm diameter PVC casing in Silica sand Bentonite	SS	1	610	24	1.0
1						SS	2	150	6	
					25 mm diameter PVC slot 10 screen	SS	3	180	6	0.9
2		End of Monitoring Well								
3										
4										
5										
6										
7										
8										
9										
10										

MONITORING WELL RECORD

13SVP-09

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

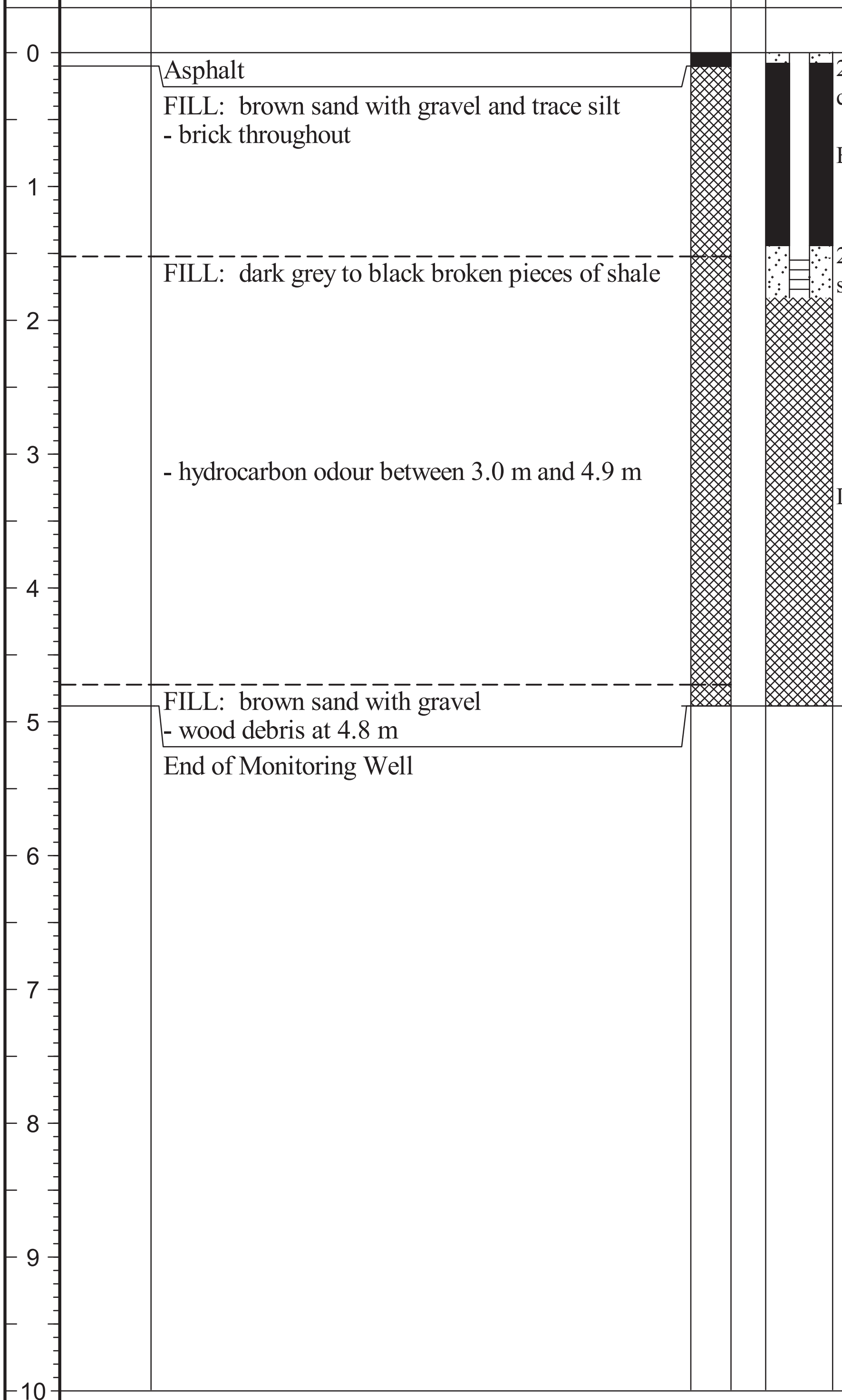
DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

PROJECT No. **121811071**

BOREHOLE No. **13SVP-09**

DATUM



SOIL DESCRIPTION

Asphalt

FILL: brown sand with gravel and trace silt
- brick throughout

FILL: dark grey to black broken pieces of shale

- hydrocarbon odour between 3.0 m and 4.9 m

FILL: brown sand with gravel
- wood debris at 4.8 m

End of Monitoring Well

WELL CONSTRUCTION

25 mm diameter PVC casing in Silica sand

Bentonite

25 mm diameter PVC slot 10 screen

Drill cuttings backfill

SAMPLES

TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm)
SS	1	305	16	0.9
SS	2	50	10	
SS	3	510	11	0.9
SS	4	230	31	0.7
SS	5	305	25	0.8
SS	6	405	54	
SS	7	50	8	
SS	8	610	10	

MONITORING WELL RECORD

13SVP-10

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
PROJECT No. **121811071**
LOCATION **Fundy Quay**
BOREHOLE No. **13SVP-10**
DATES: BORING **2013-09-24**
WATER LEVEL **Not Observed**
DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES				VOC CONCENTRATION (ppm)
						TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	
								mm		
0		Asphalt			25 mm diameter PVC casing in Silica sand					
		FILL: dark grey to black crushed rock			Bentonite	SS	1	305	7	0.7
1		FILL: brown sand with gravel and trace silt - brick throughout			25 mm diameter PVC slot 10 screen	SS	2	100	4	1.0
		End of Monitoring Well								
2										
3										
4										
5										
6										
7										
8										
9										
10										

Stantec

MONITORING WELL RECORD

13SVP-11

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

PROJECT No. **121811071**

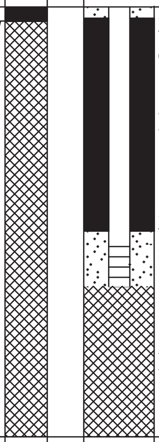
LOCATION **Fundy Quay**

BOREHOLE No. **13SVP-11**

DATES: BORING **2013-09-24**

WATER LEVEL **Not Observed**

DATUM



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm)
0		Asphalt FILL: brown sand with gravel and trace silt - bricks throughout	25 mm diameter PVC casing in Silica sand	SS	1	280	12	0.8
			Bentonite	SS	2	75	25	
1			25 mm diameter PVC slot 10 screen	SS	3	125	5	0.6
2				SS	4	150	8	
			Drill cuttings backfill	SS	5	150	22	
3		End of Monitoring Well						
4								
5								
6								
7								
8								
9								
10								

APPENDIX D

SITE ASSESSMENT & TIER I/II TABLE CHECKLIST

Method Used
☒ Tier I RBSL, ESL
☒ Tier II PSSL
☐ Tier II SSTL
☒ Other (Tier III)

SITE ASSESSMENT & TIER I/II TABLE CHECKLIST

Site Location:	Fundy Quay, Saint John, NB
Site Professional:	Robert S. Fiander, P.Eng.
Date:	March 7, 2014

Minimum Site Assessment Requirements

Issue	Yes or No*	Comment
PID, owner, location identified	Yes	
Current and anticipated future land use identified	Yes	
Review of underground services as conduits	Yes	
Historical review completed	Yes	
Local groundwater use identified	Yes	
Adjacent land uses and receptors identified	Yes	
Ecological screening completed	Yes	
Soil and groundwater samples from all source areas obtained	Yes	
Soil and groundwater impacts delineated to Tier I RBSLs for potential receptor (adjacent property receptor may be lower Tier I RBSLs)	Yes	
Groundwater flow direction and gradient established	Yes	
Combination of surface and sub-surface soil samples analysed	Yes	
Free product observations made in soil and groundwater	Yes	None observed.
Low lab detection level for benzene in soil if potable water area	N/A	
Grain size and organic carbon analysis completed on soil	No	Visual-Manual Procedure (ASTM D2488-00) used.
TPH fractionation done on soil and water if calculating Tier II SSTL	N/A	
Scaled site plan showing all relevant site features	Yes	
Receptor building characteristics obtained (stories, floor condition, ceiling height, *etc.*)	No	Anticipated future mixed commercial/residential development. Residential screening levels deemed appropriate and conservative.

Mandatory Conditions

Issue	Yes or No*	Comment
Non-aqueous phase liquids not present in groundwater	Yes	
Potable water free of objectionable taste and odour	Yes	Non-Potable Site
Soils do not contain liquid and/or free petroleum product	Yes	
Residual hydrocarbons do not create objectionable odours	Yes	

From Appendix 6, Atlantic RBCA Version 3, July 2012

Method Used
☒ Tier I RBSL, ESL
☒ Tier II PSSL
☐ Tier II SSTL
☒ Other (Tier III)

SITE ASSESSMENT & TIER I/II TABLE CHECKLIST

Site Location:	Fundy Quay, Saint John, NB
Site Professional:	Robert S. Fiander, P.Eng.
Date:	March 7, 2014

or explosive conditions in indoor or outdoor air		
Surface soils are not stained	Yes	
No dirt basement floors, sumps with dirt bottoms, *etc*.	Yes	
Confirmed that correct TPH type selected in RBSL or PSSL Table	Yes	
Confirmed that correct soil type selected in RBSL or PSSL Table	Yes	
Default Site Characteristics and Exposure Scenarios		
Issue	**Yes or No***	**Comment**
Depth to groundwater approximately 3.0 m	No	Variable. Influenced by tides.
Impacted soil thickness is less than 3.0 m	No	Impacts measured as deep as 6.6 m. Assessed through Tier III (Soil vapour sampling)
Default foundation crack fraction is appropriate	Yes	Assumed that future development will be generally consistent with default assumptions, or more conservative
Default foundation thickness is appropriate	Yes	Assumed that future development will be generally consistent with default assumptions, or more conservative
Two floors exist if using a residential scenario	Yes	Assumed that future development will be generally consistent with default assumptions, or more conservative
Hydrocarbon impacts above RBSL or PSSL Table soil values are not within 0.3 m of foundation walls or floor slab	Yes	Assumed that future development will include introducing structural fill material within 0.3 m of new buildings.
Confirmed that RBSL or PSSL Table values are correct for adjacent property receptors (*i.e.* use residential at property line if adjacent property is residential)	Yes	
Where exposure pathways have been eliminated at Tier II, detailed explanation is provided in the report to explain why pathways are not relevant	Yes	
Where PSSL tables are used based on elimination or control of a pathway that could be reopened by changes in site use, this condition is specified as a limitation in the report	N/A	

From Appendix 6, Atlantic RBCA Version 3, July 2012

Method Used
☒ Tier I RBSL, ESL
☒ Tier II PSSL
☐ Tier II SSTL
☒ Other (Tier III)

SITE ASSESSMENT & TIER I/II TABLE CHECKLIST

Site Location:	Fundy Quay, Saint John, NB
Site Professional:	Robert S. Fiander, P.Eng.
Date:	March 7, 2014

Where Tier II SSTLs have been calculated by changing default values, the report includes the parameter changed, the default value, the site-specific value used, and the rationale and/or detailed written justification	N/A	

* If No, indicate in comment section if and where in report the issue is addressed.

Consult the Best Management Practices (Appendix 2) for additional details

.

APPENDIX E

ANALYTICAL TABLES AND LABORATORY CERTIFICATES

Table E1: Hydrocarbon Concentrations in Soil

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH*	
Tier I RBSLs			0.099	77	30	8.8	N/A	N/A	N/A	N/A	270 / 1100	
Tier I ESLs - Soil Contact for Samples < 1.5 mbgs			31	75	55	95	210	150	300	2800	N/A	
ID	**Date**	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
MW1 SA1	2002	0.15-0.75	nd	0.032	0.237	0.651	22	**280**	**350**	N/A	650	FO.LO
MW1 SA7	2002	4.0-4.3	nd	nd	nd	nd	nd	nd	19	N/A	nd	LO
MW2 SA1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW2 SA9	2002	5.2-5.8	nd	nd	nd	nd	nd	120	280	N/A	400	LO. PAH?
MW3 SA2	2002	0.75-1.0	nd	nd	nd	nd	nd	51	220	N/A	270	FO/LO
MW3 SA6	2002	3.4-4.0	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW4 SA10	2002	5.5-6.1	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW4 SA2	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	40	N/A	40	LO
MW4 SA2 FD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	34	N/A	34	-
MW4 SA2 LD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	36	N/A	36	-
MW5 SA2	2002	0.75-1.1	nd	nd	nd	nd	nd	35	86	N/A	120	FO.LO
MW5 SA4A	2002	2.1-2.7	nd	0.115	nd	0.242	7.1	390	670	N/A	1100	G.LO.PAH?
MW6 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	18	N/A	nd	LO
MW6 SA1 LD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	20	N/A	nd	LO
MW6 SA8	2002	4.6-5.2	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
MW7 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	35	N/A	35	LO
MW7 SA1 FD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	29	N/A	nd	-
MW7 SA6	2002	3.3-3.9	nd	nd	nd	nd	nd	nd	39	N/A	39	LO
BH1 Sa1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
BH1 Sa3	2002	2.1-2.7	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
BH4 SA9	5-Apr-06	1.8-2.4	0.1	0.46	1.6	7.2	36	1100	1100	N/A	2200	PAH?
BH5 SS7	31-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	4	460	220	N/A	680	FO. PAH?
BH7 SS7	30-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
BH9 SA10	28-Mar-06	6.4-7.0	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
BH12 SA9	22-Mar-06	5.2-5.8	<0.005	<0.05	<0.01	<0.05	<2.5	<15	19	N/A	<21	PAH?
BH13 SA10	28-Mar-06	5.8-6.4	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
13MW-01 SS3	30-Jan-13	0.6-1.2	0.11	0.33	0.034	0.41	5	34	**570**	N/A	600	OP(FO/LO) PAH?
13MW-01 SS3 LD	30-Jan-13	0.6-1.2	N/A	N/A	N/A	N/A	N/A	28	**630**	N/A	N/A	N/A
13MW-01 SS8	30-Jan-13	3.6-4.2	0.054	0.14	0.17	0.47	<2.5	530	2800	N/A	3400	OP(FO/LO) PAH? F4?
13MW-02 SS2	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	47	770	N/A	820	OP(FO/LO) PAH?
13MW-02 SS2 LD	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02 SS6	30-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	10	135	N/A	140	LO

Table E1: Hydrocarbon Concentrations in Soil

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH*	
Tier I RBSLs			0.099	77	30	8.8	N/A	N/A	N/A	N/A	270 / 1100	
Tier I ESLs - Soil Contact for Samples < 1.5 mbgs			31	75	55	95	210	150	300	2800	N/A	
ID	**Date**	**Depth (mbgs)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
13MW-03 SS7	30-Jan-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-03 SS10	30-Jan-13	5.5-6.1	<0.025	<0.025	<0.025	<0.050	<2.5	24	340	N/A	360	OP(FO/LO) PAH?
13MW-04 SS2	31-Jan-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-04 SS10	31-Jan-13	6.0-6.6	<0.025	<0.025	<0.025	<0.050	<2.5	64	810	N/A	870	OP(FO/LO) PAH?
13MW-05 SS8	31-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	48	N/A	48	LO. UP(FO/LO)
13MW-06 SS3	1-Feb-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	51	990	N/A	1000	OP(FO/LO) PAH?
13MW-06 SS8	1-Feb-13	4.6-5.2	<0.025	0.19	<0.025	<0.050	<2.5	800	4400	N/A	5200	OP(FO/LO) PAH? F4?
13MW-07 SS8	1-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-08 SS6	1-Feb-13	3.3-3.9	<0.025	<0.025	<0.025	<0.050	<2.5	<10	49	N/A	49	LO
13MW-09 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	20	N/A	20	LO
13MW-09 SS3 LD	4-Feb-13	1.2-1.8	N/A	N/A	N/A	N/A	N/A	<10	25	N/A	N/A	N/A
13MW-09 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-10 SS1	4-Feb-13	0.0-0.6	<0.025	<0.025	<0.025	<0.050	<2.5	<10	52	N/A	52	OP(FO/LO). PLO
13MW-10 SS7	4-Feb-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-12 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	17	N/A	17	LO
13MW-12 SS10	4-Feb-13	5.5-6.1	<0.025	<0.025	<0.025	0.23	<2.5	140	2740	N/A	2900	LO. PAH? F4?
13SVP-09 SS7	24-Oct-13	3.7-4.3	<0.02	<0.05	<0.02	<0.05	110	1300	920	N/A	2300	WFO
13SVP-11 SS5	24-Oct-13	2.4-3.0	<0.005	<0.05	<0.01	<0.05	<2.5	<12	18	N/A	<21	ND

Most Conservative Land Use: Residential

Water Use: Non-potable

Soil Type: Coarse-grained

*Product Type: Diesel / No. 2 Fuel Oil (270 mg/kg), No. 6 Oil / Lube Oil (1100 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)

Depth of Groundwater: Unknown / Varies

Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)

Table E2: Hydrocarbon Concentrations in Groundwater

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH***	
Tier I RBSLs		2.6	20	20	20	N/A	N/A	N/A	N/A	20 / 20	
Tier I ESLs - Shallow Groundwater Contact		61	59	20	31	N/A	7.1	1.8	N/A	N/A	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
MW1	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW2	2002	nd	nd	nd	nd	N/A	nd	0.36	0.5	0.9	OP(FO/LO) PAH?
MW2	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW3	2002	nd	nd	nd	nd	N/A	nd	0.14	0.2	0.3	LO. PAH?
MW4	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW4	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW5	2002	nd	nd	nd	nd	N/A	nd	0.45	0.6	1	OP(FO/LO) PAH?
MW5	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
MW5 LD	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	N/A	N/A	N/A	N/A
MW6	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW7	2002	nd	0.003	nd	nd	N/A	0.01	0.29	1.1	1.4	G. LO.
MW7 FD	2002	nd	nd	nd	nd	N/A	nd	0.48	0.5	1	OP(FO/LO) PAH?
MW7 FD(LD)	2002	nd	nd	nd	nd	N/A	nd	0.34	0.4	0.7	OP(FO/LO) PAH?
BH5	3-Apr-06	<0.001	<0.001	<0.001	<0.001	N/A	<0.1	0.92	0.1	1.1	FO
BH5	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	0.07	0.09	0.2	WFO
13MW-01	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.383	0.38	LO. UP(FO/LO)
13MW-01 LD	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	N/A	N/A	N/A	N/A	N/A
13MW-01	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.06	< 0.1	<0.1	N/A
13MW-02	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-03	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.226	0.22	OP(FO/LO). UP(FO/LO)
13MW-03	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.06	< 0.1	<0.1	N/A
13MW-04	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-05	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-06	7-Feb-13	<0.0010	0.0042	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-07	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.058	< 0.12	<0.12	N/A
13MW-07	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-07 LD	5-Sep-13	N/A	N/A	N/A	N/A	N/A	N/A	<0.05	<0.1	N/A	N/A
13MW-08	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.36	0.36	OP(FO/LO). UP(FO/LO)
13MW-08	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-09	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-10	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A

Table E2: Hydrocarbon Concentrations in Groundwater

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH***	
Tier I RBSLs		2.6	20	20	20	N/A	N/A	N/A	N/A	20 / 20	
Tier I ESLs - Shallow Groundwater Contact		61	59	20	31	N/A	7.1	1.8	N/A	N/A	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
13MW-10	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-11	6-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-12	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A

Most Conservative Land Use: Residential
Water Use: Non-potable
Soil Type: Coarse-grained
*Product Type: Diesel / No. 2 Fuel Oil (20 mg/kg), No. 6 Oil / Lube Oil (20 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)
Depth of Groundwater: Unknown / Varies
Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)

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Table E3: Hydrocarbon Concentrations in Water Protective of Aquatic Life

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH*	
Tier I ESLs - Surface Water		2.1	0.77	0.32	0.33	5	N/A	N/A	N/A	0.1 / 0.1	
Tier I ESLs - Groundwater		4.6	4.2	3.2	2.8	N/A	N/A	N/A	N/A	0.84 / 0.48	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
Groundwater Samples											
MW1	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW2	2002	nd	nd	nd	nd	N/A	nd	0.36	0.5	**0.9**	OP(FO/LO) PAH?
MW2	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW3	2002	nd	nd	nd	nd	N/A	nd	0.14	0.2	0.3	LO. PAH?
MW4	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW4	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
MW5	2002	nd	nd	nd	nd	N/A	nd	0.45	0.6	**1**	OP(FO/LO) PAH?
MW5	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
MW5 LD	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	N/A	N/A	N/A	N/A
MW6	2002	nd	nd	nd	nd	N/A	nd	nd	nd	nd	-
MW7	2002	nd	0.003	nd	nd	N/A	0.01	0.29	1.1	**1.4**	G. LO.
MW7 FD	2002	nd	nd	nd	nd	N/A	nd	0.48	0.5	**1**	OP(FO/LO) PAH?
MW7 FD(LD)	2002	nd	nd	nd	nd	N/A	nd	0.34	0.4	**0.7**	OP(FO/LO) PAH?
BH5	3-Apr-06	<0.001	<0.001	<0.001	<0.001	N/A	<0.1	0.92	0.1	**1.1**	FO
BH5	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	0.07	0.09	0.2	WFO
13MW-01	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.383	0.38	LO. UP(FO/LO)
13MW-01 LD	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	N/A	N/A	N/A	N/A	N/A
13MW-01	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.06	< 0.1	<0.1	N/A
13MW-02	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-03	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.226	0.22	OP(FO/LO). UP(FO/LO)
13MW-03	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.06	< 0.1	<0.1	N/A
13MW-04	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-05	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-06	7-Feb-13	<0.0010	0.0042	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-07	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.058	< 0.12	<0.12	N/A
13MW-07	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-07 LD	5-Sep-13	N/A	N/A	N/A	N/A	N/A	N/A	<0.05	<0.1	N/A	N/A
13MW-08	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	0.36	0.36	OP(FO/LO). UP(FO/LO)
13MW-08	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-09	7-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A
13MW-10	23-Feb-13	<0.0010	<0.0010	<0.0010	<0.0020	N/A	<0.010	<0.050	< 0.1	<0.10	N/A

Table E3: Hydrocarbon Concentrations in Water Protective of Aquatic Life

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	F1	F2	F3	mTPH*	
Tier I ESLs - Surface Water		2.1	0.77	0.32	0.33	5	N/A	N/A	N/A	0.1 / 0.1	
Tier I ESLs - Groundwater		4.6	4.2	3.2	2.8	N/A	N/A	N/A	N/A	0.84 / 0.48	
ID	**Date**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
13MW-10	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-11	6-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-12	5-Sep-13	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A

Distance to Nearest Surface Water Body: Approximately 10 metres from site (Marine and Freshwater)
Fuel Type: Diesel / No. 2 Fuel Oil
Soil Type: Coarse-grained

*Product Type (Surface Water ESLs): Diesel / No. 2 Fuel Oil (0.1 mg/kg), No. 6 Oil / Lube Oil (0.1 mg/kg)

*Product Type (Groundwater ESLs): Diesel / No. 2 Fuel Oil (0.84 mg/kg), No. 6 Oil / Lube Oil (0.48 mg/kg)

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Table E4: Predicted Indoor Air Hydrocarbon Concentrations

Guideline and Sample Information		Indoor Air Concentrations (µg/m^3)						
		Benzene	Toluene	Ethylbenzene	Xylenes	mTPH		
Tier III SSTL - Predicted Indoor Air Concentration		3	1900	500	90	200		
ID	Date (dd-mmm-yr)	Benzene	Toluene	Ethylbenzene	Xylenes	mTPH	Dilution Factor	Separation Distance (m)
Predicted Indoor Air Concentrations								
SVP-01A	22-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-03A	22-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-04A	23-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-05A	24-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-06A	23-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-07A	24-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-08A	24-Oct-13	<0.16	<0.16	<0.16	<0.4	<4.2	50	<1
SVP-09A	25-Oct-13	<0.16	<0.16	<0.16	<0.4	5.4	50	<1
SVP-10A	25-Oct-13	<0.18	<0.18	<0.18	<0.4	<4.2	50	<1
On-site Land Use:	Residential							
Soil Type:	Coarse							

Table E5: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	Concentration (mg/kg)														
		SQG$_{HH}$ Residential		SQG$_{E}$ Residential		Sample Identification										
						BH6 SS5	BH5 SS7	BH8 SS8	BH12 SA9	BH13 SA10	MW2 SA9	MW5 SA4A	13MW-01 SS8	13MW-02 SS6	13MW-02 SS6 LD	13MW-03 SS10
Non-Carcinogenic PAHs																
Acenaphthene	--	3900	AE	--		0.74	1.4	<0.01	0.08	<0.01	0.9	3.9	16	0.030	0.046	1.8
Acenaphthylene	--	--		--		0.06	0.02	<0.01	<0.01	<0.01	0.65	2.40	0.45	0.017	0.024	1.1
Anthracene	--	24000	AE	2.5	CCME	1.7	**3.4**	<0.01	0.17	<0.01	**4.7**	**11**	**15**	0.086	0.13	**9.9**
Fluoranthene	--	3500	AE	50	CCME	7.4	17	0.02	0.72	<0.01	13	**67**	43	0.32	0.4	37
Fluorene	--	2700	AE	--		0.82	1.3	<0.01	0.09	<0.01	1.2	4.7	11	0.033	0.047	2.3
Naphthalene	--	2.2	AE	0.6	CCME	0.25	0.42	<0.01	0.06	<0.01	0.32	**1.9**	**5.2**	0.029	0.044	0.53
Phenanthrene	--	--		5	CCME	**6.7**	**17**	0.02	0.61	<0.01	**11**	**51**	**93**	0.42	0.36	**19**
Pyrene	--	2100	AE	10	CCME	6.8	**15**	0.02	0.63	<0.01	**11**	**52**	**53**	0.25	0.27	**28**
Perylene	--	--		--		na	na	na	na	na	1.1	6.2	2.8	0.032	0.043	3.0
1-Methylnaphthalene	--	--		--		na	na	na	na	na	0.21	1.6	11	0.043	0.036	0.34
2-Methylnaphthalene	--	--		--		na	na	na	na	na	0.24	1.9	12	0.042	0.046	0.39
Carcinogenic PAHs																
Benzo[a]anthracene	0.1	--		1	CCME	**3.5**	**7**	0.01	0.27	<0.01	**4.6**	**27**	**22**	0.2	0.23	**15**
Benzo[a]pyrene	1	--		20	CCME	3.5	6.4	<0.01	0.24	<0.01	4.3	**25**	14	1.2	0.15	12
Benzo[b]fluoranthene	0.1	--		1^{2}	CCME	**3.6**	**7.2**	0.01	0.22	<0.01	**3.2**	**20**	**11**	0.099	0.12	**9.2**
Benzo[ghi]perylene	0.01	--		--		2.1	3.8	<0.01	0.14	<0.01	2.1	11	7.0	0.10	0.10	6.0
Benzo[j]fluoranthene	0.1	--		1^{2}	CCME	na	na	na	na	na	na	na	**7.1**	0.068	0.084	**5.9**
Benzo[k]fluoranthene	0.1	--		1^{2}	CCME	**1.9**	**4**	0.01	0.18	<0.01	**3.2**	**20**	**6**	0.053	0.066	**5.6**
Chrysene	0.01	--		--		3.3	6.8	<0.01	0.28	<0.01	4.6	26	24	0.19	0.2	13
Dibenz[a,h]anthracene	1	--		1	CCME	0.48	**1.1**	<0.01	0.03	<0.01	0.4	**3.1**	**2.1**	0.019	0.023	**1.9**
Indeno[1,2,3-cd]pyrene	0.1	--		1	CCME	**2.2**	**4.2**	<0.01	0.14	<0.01	**2.5**	**13**	**5.9**	0.063	0.079	**5.3**
B(a)P TPE	-	5.3	CCME	--		**15.46**	**29.54**	0.04	1.07	0.04	**18.35**	**109.41**	**64.83**	3.81	0.70	**54.57**
Sample Depth (mbgs)						3.00	4.30	2.40	5.50	6.10	5.2-5.8	2.1-2.7	3.6-4.2	4.2-4.8	4.2-4.8	5.5-6.1
Sample Date						2006	2006	2006	2006	2006	2002	2002	1/30/2013	1/30/2013	1/30/2013	1/30/2013

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

CCME = Canadian Council of Ministers of the Environment Soil Quality Guidelines.

Accessed online March 2013

AE = Alberta Environment Tier 1 Soil & Groundwater Remediation

Guidelines (AE, 2010)

1/2 the detection limit was used in B(a)P TPE calculations.

Table E5: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Residential	SQG_E Residential	Concentration (mg/kg)								
				Sample Identification								
				13MW-04 SS10	**13MW-05 SS8**	**13MW-06 SS8**	**13MW-07 SS8**	**13MW-08 SS6**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**13MW-12 SS10**
Non-Carcinogenic PAHs												
Acenaphthene	--	3900 AE	--	9.1	31	0.032	<0.010	0.24	0.020	<0.010	<0.010	6.0
Acenaphthylene	--	--	--	1.3	0.54	0.017	<0.010	0.075	0.016	<0.010	<0.010	1.1
Anthracene	--	24000 AE	2.5 CCME	**23**	**68**	0.055	<0.010	0.40	0.051	<0.010	<0.010	**10**
Fluoranthene	--	3500 AE	50 CCME	**77**	**200**	0.29	<0.010	2.9	0.31	0.032	<0.010	**53**
Fluorene	--	2700 AE	--	10	28	0.040	<0.010	0.25	0.022	<0.010	<0.010	7.7
Naphthalene	--	2.2 AE	0.6 CCME	**6.9**	**6.1**	0.062	<0.010	0.25	0.016	<0.010	<0.010	**10**
Phenanthrene	--	--	5 CCME	**87**	**250**	0.22	<0.010	2.2	0.22	0.024	<0.010	**52**
Pyrene	--	2100 AE	10 CCME	**56**	**160**	0.30	<0.010	2.5	0.27	0.028	<0.010	**43**
Perylene	--	--	--	5.2	15	0.043	<0.010	0.26	0.033	<0.010	<0.010	3.9
1-Methylnaphthalene	--	--	--	2.0	3.7	0.040	<0.010	0.075	<0.010	0.011	<0.010	1.8
2-Methylnaphthalene	--	--	--	2.9	4.8	0.042	<0.010	0.11	<0.010	0.017	<0.010	2.1
Carcinogenic PAHs												
Benzo[a]anthracene	0.1	--	1 CCME	**27**	**60**	0.14	<0.010	**1.3**	0.16	0.017	<0.010	**22**
Benzo[a]pyrene	1	--	20 CCME	**21**	**55**	0.13	<0.010	0.96	0.12	0.012	<0.010	13
Benzo[b]fluoranthene	0.1	--	1[2] CCME	**15**	**44**	0.12	<0.010	**0.76**	0.096	0.011	<0.010	**10**
Benzo[ghi]perylene	0.01	--	--	11	32	0.090	<0.010	0.60	0.083	<0.010	<0.010	7.6
Benzo[j]fluoranthene	0.1	--	1[2] CCME	**9.3**	**27**	0.061	<0.010	**0.41**	0.054	<0.010	<0.010	**5.9**
Benzo[k]fluoranthene	0.1	--	1[2] CCME	**9**	**26**	0.064	<0.010	**0.41**	0.054	<0.010	<0.010	**5.8**
Chrysene	0.01	--	--	25	58	0.16	<0.010	1.2	0.16	0.022	<0.010	21
Dibenz[a,h]anthracene	1	--	1 CCME	**2.8**	**7.7**	0.023	<0.010	0.14	0.021	<0.010	<0.010	**2.1**
Indeno[1,2,3-cd]pyrene	0.1	--	1 CCME	**10**	**29**	0.072	<0.010	0.50	0.073	<0.010	<0.010	**6.7**
B(a)P TPE	-	5.3 CCME	--	**93.57**	**246.60**	0.60	0.04	4.37	0.56	0.06	0.04	**61.28**
			Sample Depth (mbgs)	6.0-6.6	4.2-4.8	4.6-5.2	4.2-4.8	3.3-3.9	1.2-1.8	0-0.6	1.2-1.8	5.5-6.1
			Sample Date	1/31/2013	1/31/2013	2/1/2013	2/1/2013	2/1/2013	2/4/2013	2/4/2013	2/4/2013	2/4/2013

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

CCME = Canadian Council of Ministers of the Environment Soil Quality Guidelines.

Accessed online March 2013

AE = Alberta Environment Tier 1 Soil & Groundwater Remediation

Guidelines (AE, 2010)

1/2 the detection limit was used in B(a)P TPE calculations.

Table E6 - Polycyclic Aromatic Hydrocarbons in Groundwater

					Concentration (µg/L)					
					Sample Identification					
Parameter (µg/L)	**WQG_{HH} Residential**		**WQG_E [1]**		**MW5**	**13-MW-07***	**13-MW-10***	**13-MW-05***	**13-MW-11***	**13-MW-12***
1-Methylnaphthalene	62000	OMOE	1500	OMOE	0.23	<0.050	<0.060	<0.05	<0.05	<0.05
2-Methylnaphthalene			1500	OMOE	0.27	<0.050	<0.060	<0.05	<0.05	<0.05
Acenaphthene	600	OMOE	5200	OMOE	0.5	<0.010	<0.020	<0.01	<0.01	<0.01
Acenaphthylene	36	OMOE	1.4	OMOE	0.2	<0.010	<0.020	<0.01	<0.01	<0.01
Anthracene	--		1	OMOE	0.72	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(a)anthracene	70	OMOE	1.8	OMOE	1.4	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(a)pyrene	130	OMOE	2.1	OMOE	1.4	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	1100	OMOE	4.2	OMOE	1.1	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	--		0.2	OMOE	**0.82**	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(j)fluoranthene	--		--		na	<0.010	<0.020	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	1300	OMOE	1.4	OMOE	1.1	<0.010	<0.020	<0.01	<0.01	<0.01
Chrysene	2400	OMOE	0.7	OMOE	**1.4**	<0.010	<0.020	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	1300	OMOE	0.4	OMOE	0.19	<0.010	<0.020	<0.01	<0.01	<0.01
Fluoranthene	1100	OMOE	73	OMOE	4.6	<0.010	<0.020	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	2200	OMOE	1.4	OMOE	0.74	<0.010	<0.020	<0.01	<0.01	<0.01
Naphthalene	1400	OMOE	6200	OMOE	0.3	<0.20	<0.30	<0.2	<0.2	<0.2
Perylene	--		--		0.42	<0.010	<0.020	<0.01	<0.01	<0.01
Phenanthrene	--		380	OMOE	3.5	<0.010	<0.020	<0.01	<0.01	<0.01
Pyrene	9300	OMOE	5.7	OMOE	3.8	<0.010	<0.020	<0.01	<0.01	<0.01
				Sampling Date	2002	23-Feb-13	23-Feb-13	5-Sep-13	6-Sep-13	5-Sep-13

Notes:

WQGHH = Water Quality Guideline protective of Human Health (Industrial receptor)

WQGE = Water Quality Guideline protective of ecological receptors

OMOE = Ontario Ministry of Environment. Rationale for the Development of Soil and Groundwater Quality Standards for Use at Contaminated Sites in Ontario. 2009, updated April 2011. (Appendix A3 - Groundwater components non-potable water scenario, coarse textured soil)

water body have been referenced, and represent 10 x the aquatic protection value

na = not appliable

* indicates sample collected using low-flow methods

Table E7: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SHG$_{HH}$ Residential**		**SQG$_{E}$ Residential**		**SS1A**	**SS2A**	**SS3A**	**SS3B**	**SS3C**	**SBH1A**	**SBH2A**	**SBH2A FD (SBHX A)**	**SBH3A**	**SBH4A**	**SBH4A LD**	**SBH5A**
Aluminum	--		--		9000	10000	9400	na	na	10000	9400	9700	9500	8900	8800	8300
Antimony	7.5	OMOE	20	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Arsenic	31	CCME	17	CCME	5	6	7	na	na	5	6	6	4	5	5	5
Barium	3800	OMOE	500	AE	46	60	42	na	na	32	37	35	33	37	38	30
Beryllium	38	OMOE	5	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Bismuth	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Boron	4300	OMOE	120	OMOE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Cadmium	14	CCME	10	CCME	nd	nd	0.4	na	na	0.3	nd	nd	nd	nd	nd	nd
Chromium	220	CCME	64	CCME	17	19	20	na	na	22	19	16	13	15	20	13
Cobalt	22	OMOE	20	AE	8	9	9	na	na	10	9	9	7	9	9	8
Copper	1100	CCME	63	CCME	30	41	51	na	na	33	27	27	24	26	24	30
Iron	--		--		16000	18000	19000	na	na	19000	18000	19000	15000	18000	18000	16000
Lead	140	CCME	300	CCME	24	38	80	na	na	25	14	13	9.1	32	22	12
Lithium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Manganese	--		--		480	570	490	na	na	510	450	430	510	510	510	400
Mercury	6.6	CCME	12		0.04	0.06	0.04	na	na	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Molybdenum	110	OMOE	4	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Nickel	330	OMOE	50	CCME	14	15	22	na	na	16	15	16	11	14	14	12
Rubidium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Selenium	80	CCME	1	CCME	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Silver	77	OMOE	20	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Strontium	--		--		8	6	10	na	na	11	10	10	10	12	12	11
Thallium	1	CCME	1.4	CCME	nd	0.1	0.1	na	na	nd	nd	nd	nd	0.1	0.1	nd
Tin	9400	USEPA	5	AE	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	23	CCME	500	CCME	0.5	0.8	0.9	na	na	0.5	0.4	0.4	0.4	0.9	0.8	0.4
Vanadium	39	OMOE	130	CCME	25	35	**44**	na	na	34	24	25	22	26	27	25
Zinc	5600	OMOE	200	CCME	69	97	**1300**	**520**	**1000**	130	59	58	44	52	50	48
Sampling Depth (m bgs)					0-0.15	0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002

Notes:

SQG$_{HH}$ = Soil Quality Guideline for the protection of Human Health (Residential)

SQG$_{E}$ = Soil Quality Guideline for the protection of Ecological receptors.

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CCME = Canadian Council of Ministers of the Environment Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Residential Land Use. Accessed online, March 2013

OMOE = Ontario Ministry of the Environment Guidelines (OMOE, 2011) – Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition – Residential/Parkland Land Use, Coarse-grained Soil.

USEPA = United States Environmental Protection Agency, Generic Tables. Accessed online, February 2014. (Value is adjusted by a factor of 0.2 to account for multiple exposure sources, as per Health Canada PQRA guidance, 2012)

"-"/na = Not applicable

mbgs = meters below ground surface

Table E7: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SHG_{HH} Residential**		**SQG_E Residential**		**SBH6A**	**SBH7A**	**SBH8A**	**SBH9A**	**SBH10A**	**SBH10A FD (SBHY A)**	**SBH11A**	**SBH12A**	**SBH12A LD**	**BH8 SA1**	**BH8 SA1 LD**	**BH10 SA1**
Aluminum	--		--		9000	8200	10000	8800	8800	9100	10000	9500	10000	14400	14600	12500
Antimony	7.5	OMOE	20	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Arsenic	31	CCME	17	CCME	6	< 2	5	6	5	5	6	4	5	5	5	5
Barium	3800	OMOE	500	AE	34	5	34	33	33	33	41	31	33	48	47	34
Beryllium	38	OMOE	5	AE	nd	**29**	nd	nd	nd	nd	nd	nd	nd	0.7	0.7	0.5
Bismuth	--		--		na	na	na	na	na	na	na	na	na	<1	<1	<1
Boron	4300	OMOE	120	OMOE	nd	nd	nd	nd	nd	nd	nd	nd	nd	4	3	3
Cadmium	14	CCME	10	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	0	<0.1
Chromium	220	CCME	64	CCME	15	nd	21	18	16	15	19	17	20	29	28	15
Cobalt	22	OMOE	20	AE	9	8	10	8	8	8	10	8	10	10.4	10.8	9
Copper	1100	CCME	63	CCME	25	24	27	30	24	24	27	28	28	33	33	28
Iron	--		--		17000	16000	20000	21000	17000	17000	20000	17000	18000	24400	25100	18500
Lead	140	CCME	300	CCME	10	10	26	46	21	19	13	9.7	21	19.3	17.7	10.5
Lithium	--		--		na	na	na	na	na	na	na	na	na	18.2	18.4	17.8
Manganese	--		--		460	480	490	540	430	450	480	450	490	553	571	406
Mercury	6.6	CCME	12		0.01	0.01	0.06	0.2	0.01	0.01	0.01	0.03	0.02	na	na	na
Molybdenum	110	OMOE	4	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.9	0.8	0.4
Nickel	330	OMOE	50	CCME	13	13	17	15	14	14	17	14	16	19	19	14
Rubidium	--		--		na	na	na	na	na	na	na	na	na	10.6	10.2	7.1
Selenium	80	CCME	1	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<1	<1	<1
Silver	77	OMOE	20	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Strontium	--		--		8	9	11	17	22	20	15	5	5	35	36	23
Thallium	1	CCME	1.4	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Tin	9400	USEPA	5	AE	na	na	na	na	na	na	na	na	na	2	1	<1
Uranium	23	CCME	500	CCME	0.6	1.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Vanadium	39	OMOE	130	CCME	24	23	29	29	25	26	26	24	28	**44**	**46**	34
Zinc	5600	OMOE	200	CCME	84	42	61	53	50	52	58	46	51	68	67	52
Sampling Depth (m bgs)					0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0-0.6	0-0.6	0-0.6
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	20-Mar-06	29-Mar-06	23-Mar-06

Notes:

SQG_{HH} = Soil Quality Guideline for the protection of Human Health (Residential)

SQG_E = Soil Quality Guideline for the protection of Ecological receptors.

AE = Alberta Environment Tier 1 Soil &Groundwater Remediation Guidelines (AE, 2010)

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"-"/na = Not applicable

mbgs = meters below ground surface

Table E7: Metals in Soil

					Concentration (mg/kg)									
					Sample Identification									
Elements (mg/kg)	**SHG_{HH} Residential**		**SQG_E Residential**		**BH 11 SA1**	**BH11 SA1 LD**	**BH12 SA2**	**BH12 SA2 LD**	**BH13 SA1**	**BH14 SA1**	**13MW-01 SS3**	**13MW-01 SS3 LD**	**13MW-02 SS2**	**13MW-03 SS3**
Aluminum	--		--		1400	14300	13600	13500	12000	14400	8400	8900	15000	11000
Antimony	7.5	OMOE	20	AE	<0.1	0.1	0.1	0.1	0.2	<0.1	3.0	3.0	2.1	<2.0
Arsenic	31	CCME	17	CCME	10	5	5	6	5	4	**61**	**63**	6.3	4.5
Barium	3800	OMOE	500	AE	56	49	53	53	51	52	110	110	150	30
Beryllium	38	OMOE	5	AE	0.8	0.7	0.8	0.8	1	0.7	<2.0	<2.0	<2.0	<2.0
Bismuth	--		--		<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0
Boron	4300	OMOE	120	OMOE	3	3	3	4	3	3	11	10	<5.0	<5.0
Cadmium	14	CCME	10	CCME	0.2	0.2	0.2	0.2	0.2	0.1	0.62	0.7	<0.30	<0.30
Chromium	220	CCME	64	CCME	26	27	22	42	23	21	22	22	20	17
Cobalt	22	OMOE	20	AE	11.5	11.4	11.2	11	9.9	11.6	19	20	9.7	9.1
Copper	1100	CCME	63	CCME	32	32	31	33	37	31	**130**	**130**	47	26
Iron	--		--		24100	24400	24300	26400	23300	25800	47000	49000	25000	23000
Lead	140	CCME	300	CCME	17.3	15.8	20.1	23.4	21.4	18.4	110	100	**270**	10
Lithium	--		--		21.7	21.7	19.8	20.9	18.7	20.9	17	17	16	14
Manganese	--		--		614	615	566	578	585	566	300	320	510	520
Mercury	6.6	CCME	12		na	na	na	na	na	na	0.28	0.3	0.23	<0.10
Molybdenum	110	OMOE	4	AE	0.8	0.7	1.1	**5.4**	2.2	0.7	**44**	**44**	<2.0	<2.0
Nickel	330	OMOE	50	CCME	18	18	16	18	17	16	**89**	**110**	15	13
Rubidium	--		--		11	10.6	10.5	11.3	10.8	10.2	4.6	4.9	6.0	4.7
Selenium	80	CCME	1	CCME	<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0
Silver	77	OMOE	20	AE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.50	<0.50	<0.50	<0.50
Strontium	--		--		30	28	23	23	14	19	92	96	27	12
Thallium	1	CCME	1.4	CCME	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.56	0.58	<0.10	<0.10
Tin	9400	USEPA	5	AE	1	1	1	2	2	2	3.5	2.8	2.6	<2.0
Uranium	23	CCME	500	CCME	0.9	0.9	0.8	0.8	0.9	0.8	23	23	0.54	0.56
Vanadium	39	OMOE	130	CCME	**42**	**43**	36	36	35	**44**	**280**	**370**	**54**	37
Zinc	5600	OMOE	200	CCME	86	85	71	77	77	82	**210**	190	170	52
Sampling Depth (m bgs)					0-0.6	0-0.6	0.6-1.2	0.6-1.2	0-0.6	0-0.6	0.6-1.2	0.6-1.2	1.5-2.1	1.2-1.8
Sampling Date					25-Mar-03	25-Mar-06	22-Mar-06	22-Mar-06	26-Mar-06	27-Mar-06	30-Jan-13	30-Jan-13	30-Jan-13	30-Jan-13

Notes:

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SQG_E = Soil Quality Guideline for the protection of Ecological receptors.

AE = Alberta Environment Tier 1 Soil &Groundwater Remediation Guidelines (AE, 2010)

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mbgs = meters below ground surface

Table E7: Metals in Soil

					Concentration (mg/kg)								
					Sample Identification								
Elements (mg/kg)	**SHG$_{HH}$ Residential**		**SQG$_E$ Residential**		**13MW-05 SS3**	**13MW-06 SS3**	**13MW-07 SS3**	**13MW-08 SS3**	**13MW-08 SS3 LD**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**13MW-12 SS3**
Aluminum	--		--		11000	15000	11000	11000	11000	11000	11000	12000	11000
Antimony	7.5	OMOE	20	AE	<2.0	2.9	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	31	CCME	17	CCME	4.8	**20**	2.8	5.4	5.4	5.3	4.1	5.3	4.9
Barium	3800	OMOE	500	AE	30	340	20	23	23	32	33	33	31
Beryllium	38	OMOE	5	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	--		--		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	4300	OMOE	120	OMOE	<5.0	9.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium	14	CCME	10	CCME	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium	220	CCME	64	CCME	23	25	15	23	23	17	33	21	25
Cobalt	22	OMOE	20	AE	9.7	14	7.3	8.9	8.9	8.3	8.6	10	9.2
Copper	1100	CCME	63	CCME	27	**140**	22	31	31	27	28	33	25
Iron	--		--		24000	37000	18000	23000	23000	20000	20000	25000	22000
Lead	140	CCME	300	CCME	14	**1500**	6.1	12	12	24	25	12	15
Lithium	--		--		17	27	15	18	18	17	16	20	16
Manganese	--		--		490	810	360	530	530	520	440	480	500
Mercury	6.6	CCME	12		<0.10	1.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	110	OMOE	4	AE	<2.0	3.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nickel	330	OMOE	50	CCME	17	25	11	15	13	13	13	17	15
Rubidium	--		--		6.1	10	4.3	7.1	6.2	6.2	5.7	6.4	5.2
Selenium	80	CCME	1	CCME	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Silver	77	OMOE	20	AE	<0.50	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Strontium	--		--		11	93	20	16	13	58	27	17	18
Thallium	1	CCME	1.4	CCME	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tin	9400	USEPA	5	AE	<2.0	**36**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	23	CCME	500	CCME	0.51	1.3	0.32	0.75	0.64	0.56	0.71	0.59	0.73
Vanadium	39	OMOE	130	CCME	36	35	31	**41**	37	28	35	34	33
Zinc	5600	OMOE	200	CCME	57	**350**	37	52	49	64	74	57	55
Sampling Depth (m bgs)					1.2-1.8	1.5-2.1	1.2-1.8	1.5-2.1	1.5-2.1	1.2-1.8	0-0.6	1.2-1.8	1.2-1.8
Sampling Date					30-Jan-13	30-Jan-13	30-Jan-13	1-Feb-13	1-Feb-13	4-Feb-13	4-Feb-13	4-Feb-13	4-Feb-13

Notes:

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"-"/na = Not applicable mbgs = meters below ground surface

Your P.O. #: 16300R-20
Your Project #: 121811071
Site Location: SAINT JOHN WATERFRONT DEVELOPMENT-FUNDY QUAY
Your C.O.C. #: ES778013

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/09/16

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3F1010
Received: 2013/09/10, 11:39

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	10	2013/09/11	2013/09/11	ATL SOP 00113	Based on Atl. PIRI
PAH in Water by GC/MS (SIM)	3	2013/09/11	2013/09/13	ATL SOP 00103	Based on EPA 8270C
VPH in Water (PIRI)	9	2013/09/12	2013/09/12	ATL SOP 00118	Based on Atl. PIRI
VPH in Water (PIRI)	1	2013/09/12	2013/09/13	ATL SOP 00118	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	9	N/A	2013/09/13	N/A	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	1	N/A	2013/09/16	N/A	Based on Atl. PIRI

Remarks:

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

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

Encryption Key

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

Marie (McNair) Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

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

Total cover pages: 1

Maxxam Job #: B3F1010
Report Date: 2013/09/16

Stantec Consulting Ltd
Client Project #: 121811071
Site Location: SAINT JOHN WATERFRONT DEVELOPMENT-FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: RA

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		SZ4426	SZ4426	SZ4427	SZ4427	SZ4428	SZ4429		
Sampling Date		2013/09/05	2013/09/05	2013/09/05	2013/09/05	2013/09/05	2013/09/05		
COC Number		ES778013	ES778013	ES778013	ES778013	ES778013	ES778013		
	Units	**MW-05**	**MW-05 Lab-Dup**	**13MW-07**	**13MW-07 Lab-Dup**	**13MW-08**	**13MW-10**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	3346847
Toluene	mg/L	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	3346847
Ethylbenzene	mg/L	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	3346847
Xylene (Total)	mg/L	<0.002	<0.002	<0.002		<0.002	<0.002	0.002	3346847
C6 - C10 (less BTEX)	mg/L	<0.01	<0.01	<0.01		<0.01	<0.01	0.01	3346847
>C10-C16 Hydrocarbons	mg/L	<0.05		<0.05	<0.05	<0.05	<0.05	0.05	3344991
>C16-C21 Hydrocarbons	mg/L	<0.05		<0.05	<0.05	<0.05	<0.05	0.05	3344991
>C21-<C32 Hydrocarbons	mg/L	<0.1		<0.1	<0.1	<0.1	<0.1	0.1	3344991
Modified TPH (Tier1)	mg/L	<0.1		<0.1		<0.1	<0.1	0.1	3343698
Reached Baseline at C32	mg/L	NA		NA		NA	NA	N/A	3344991
Hydrocarbon Resemblance	mg/L	NA		NA		NA	NA	N/A	3344991
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	110		98	97	94	111		3344991
n-Dotriacontane - Extractable	%	112		103	100	100	117		3344991
Isobutylbenzene - Volatile	%	91 (1)	93 (1)	96		99	96 (1)		3346847

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) VPH sample contained sediment.

Maxxam Job #: B3F1010
Report Date: 2013/09/16

Stantec Consulting Ltd
Client Project #: 121811071
Site Location: SAINT JOHN WATERFRONT DEVELOPMENT-FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: RA

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		SZ4430		SZ4431		SZ4432		SZ4433		
Sampling Date		2013/09/05		2013/09/05		2013/09/05		2013/09/05		
COC Number		ES778013		ES778013		ES778013		ES778013		
	Units	**13MW-01**	**RDL**	**BH-05**	**RDL**	**13MW-03**	**RDL**	**13MW-05**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/L	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	3346847
Toluene	mg/L	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	3346847
Ethylbenzene	mg/L	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	3346847
Xylene (Total)	mg/L	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	3346847
C6 - C10 (less BTEX)	mg/L	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	3346847
>C10-C16 Hydrocarbons	mg/L	<0.06 (1)	0.06	0.07	0.05	<0.06 (1)	0.06	<0.05	0.05	3344991
>C16-C21 Hydrocarbons	mg/L	<0.06 (1)	0.06	0.09	0.05	<0.06 (1)	0.06	<0.05	0.05	3344991
>C21-<C32 Hydrocarbons	mg/L	<0.1 (1)	0.1	<0.1	0.1	<0.1 (1)	0.1	<0.1	0.1	3344991
Modified TPH (Tier1)	mg/L	<0.1	0.1	0.2	0.1	<0.1	0.1	<0.1	0.1	3343698
Reached Baseline at C32	mg/L	NA	N/A	Yes	N/A	NA	N/A	NA	N/A	3344991
Hydrocarbon Resemblance	mg/L	NA	N/A	COMMENT (2)	N/A	NA	N/A	NA	N/A	3344991
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	103		100		115		104		3344991
n-Dotriacontane - Extractable	%	107 (3)		102		119 (3)		109		3344991
Isobutylbenzene - Volatile	%	99 (4)		98		93 (4)		97		3346847

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated TEH RDL(s) due to limited sample.
(2) Weathered fuel oil fraction.
(3) TEH sample decanted due to sediment.
(4) VPH sample contained sediment.

Maxxam Job #: B3F1010
Report Date: 2013/09/16

Stantec Consulting Ltd
Client Project #: 121811071
Site Location: SAINT JOHN WATERFRONT DEVELOPMENT-FUNDY QUAY
Your P.O. #: 16300R-20
Sampler Initials: RA

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		SZ4434	SZ4435		
Sampling Date		2013/09/06	2013/09/05		
COC Number		ES778013	ES778013		
	Units	**13MW-11**	**13MW-12**	**RDL**	**QC Batch**
Petroleum Hydrocarbons					
Benzene	mg/L	<0.001	<0.001	0.001	3346847
Toluene	mg/L	<0.001	<0.001	0.001	3346847
Ethylbenzene	mg/L	<0.001	<0.001	0.001	3346847
Xylene (Total)	mg/L	<0.002	<0.002	0.002	3346847
C6 - C10 (less BTEX)	mg/L	<0.01	<0.01	0.01	3346847
>C10-C16 Hydrocarbons	mg/L	<0.05	<0.05	0.05	3344991
>C16-C21 Hydrocarbons	mg/L	<0.05	<0.05	0.05	3344991
>C21-<C32 Hydrocarbons	mg/L	<0.1	<0.1	0.1	3344991
Modified TPH (Tier1)	mg/L	<0.1	<0.1	0.1	3343698
Reached Baseline at C32	mg/L	NA	NA	N/A	3344991
Hydrocarbon Resemblance	mg/L	NA	NA	N/A	3344991
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%	107	103		3344991
n-Dotriacontane - Extractable	%	105	106		3344991
Isobutylbenzene - Volatile	%	95	95		3346847

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		SZ4433	SZ4434	SZ4435		
Sampling Date		2013/09/05	2013/09/06	2013/09/05		
COC Number		ES778013	ES778013	ES778013		
	Units	**13MW-05**	**13MW-11**	**13MW-12**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons						
1-Methylnaphthalene	ug/L	<0.05	<0.05	<0.05	0.05	3345028
2-Methylnaphthalene	ug/L	<0.05	<0.05	<0.05	0.05	3345028
Acenaphthene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Acenaphthylene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Anthracene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(a)anthracene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(a)pyrene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(b)fluoranthene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(g,h,i)perylene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(j)fluoranthene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Benzo(k)fluoranthene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Chrysene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Dibenz(a,h)anthracene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Fluoranthene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Fluorene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Indeno(1,2,3-cd)pyrene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Naphthalene	ug/L	<0.2	<0.2	<0.2	0.2	3345028
Perylene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Phenanthrene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Pyrene	ug/L	<0.01	<0.01	<0.01	0.01	3345028
Surrogate Recovery (%)						
D10-Anthracene	%	92	95	97		3345028
D14-Terphenyl	%	100	100	109		3345028
D8-Acenaphthylene	%	101	89	99		3345028

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Package 1	9.0°C

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

GENERAL COMMENTS

Results relate only to the items tested.

Stantec Consulting Ltd
Attention: ROB FIANDER
Client Project #: 121811071
P.O. #: 16300R-20
Site Location: SAINT JOHN WATERFRONT DEVELOPMENT-FUNDY QUAY

Quality Assurance Report

Maxxam Job Number: DB3F1010

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3344991 CMI	Matrix Spike [SZ4434-02]	Isobutylbenzene - Extractable	2013/09/11		107	%	30 - 130
		n-Dotriacontane - Extractable	2013/09/11		102	%	30 - 130
		>C10-C16 Hydrocarbons	2013/09/11		85	%	30 - 130
		>C16-C21 Hydrocarbons	2013/09/11		94	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/09/11		97	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2013/09/11		92	%	30 - 130
		n-Dotriacontane - Extractable	2013/09/11		92	%	30 - 130
		>C10-C16 Hydrocarbons	2013/09/11		84	%	30 - 130
		>C16-C21 Hydrocarbons	2013/09/11		93	%	30 - 130
		>C21-<C32 Hydrocarbons	2013/09/11		101	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/09/11		98	%	30 - 130
		n-Dotriacontane - Extractable	2013/09/11		97	%	30 - 130
		>C10-C16 Hydrocarbons	2013/09/11	<0.05		mg/L	
		>C16-C21 Hydrocarbons	2013/09/11	<0.05		mg/L	
		>C21-<C32 Hydrocarbons	2013/09/11	<0.1		mg/L	
	RPD [SZ4427-01]	>C10-C16 Hydrocarbons	2013/09/12	NC		%	40
		>C16-C21 Hydrocarbons	2013/09/12	NC		%	40
		>C21-<C32 Hydrocarbons	2013/09/12	NC		%	40
3345028 GTH	Matrix Spike	D10-Anthracene	2013/09/12		91	%	30 - 130
		D14-Terphenyl	2013/09/12		99	%	30 - 130
		D8-Acenaphthylene	2013/09/12		99	%	30 - 130
		1-Methylnaphthalene	2013/09/12		106	%	30 - 130
		2-Methylnaphthalene	2013/09/12		107	%	30 - 130
		Acenaphthene	2013/09/12		111	%	30 - 130
		Acenaphthylene	2013/09/12		108	%	30 - 130
		Anthracene	2013/09/12		92	%	30 - 130
		Benzo(a)anthracene	2013/09/12		107	%	30 - 130
		Benzo(a)pyrene	2013/09/12		94	%	30 - 130
		Benzo(b)fluoranthene	2013/09/12		99	%	30 - 130
		Benzo(g,h,i)perylene	2013/09/12		108	%	30 - 130
		Benzo(j)fluoranthene	2013/09/12		92	%	30 - 130
		Benzo(k)fluoranthene	2013/09/12		92	%	30 - 130
		Chrysene	2013/09/12		103	%	30 - 130
		Dibenz(a,h)anthracene	2013/09/12		91	%	30 - 130
		Fluoranthene	2013/09/12		103	%	30 - 130
		Fluorene	2013/09/12		111	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/09/12		97	%	30 - 130
		Naphthalene	2013/09/12		112	%	30 - 130
		Perylene	2013/09/12		96	%	30 - 130
		Phenanthrene	2013/09/12		99	%	30 - 130
		Pyrene	2013/09/12		99	%	30 - 130
	Spiked Blank	D10-Anthracene	2013/09/12		97	%	30 - 130
		D14-Terphenyl	2013/09/12		99	%	30 - 130
		D8-Acenaphthylene	2013/09/12		101	%	30 - 130
		1-Methylnaphthalene	2013/09/12		110	%	30 - 130
		2-Methylnaphthalene	2013/09/12		111	%	30 - 130
		Acenaphthene	2013/09/12		111	%	30 - 130
		Acenaphthylene	2013/09/12		110	%	30 - 130
		Anthracene	2013/09/12		102	%	30 - 130
		Benzo(a)anthracene	2013/09/12		100	%	30 - 130
		Benzo(a)pyrene	2013/09/12		93	%	30 - 130
		Benzo(b)fluoranthene	2013/09/12		93	%	30 - 130
		Benzo(g,h,i)perylene	2013/09/12		106	%	30 - 130
		Benzo(j)fluoranthene	2013/09/12		92	%	30 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: DB3F1010

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3345028 GTH	Spiked Blank	Benzo(k)fluoranthene	2013/09/12		95	%	30 - 130
		Chrysene	2013/09/12		97	%	30 - 130
		Dibenz(a,h)anthracene	2013/09/12		90	%	30 - 130
		Fluoranthene	2013/09/12		105	%	30 - 130
		Fluorene	2013/09/12		112	%	30 - 130
		Indeno(1,2,3-cd)pyrene	2013/09/12		95	%	30 - 130
		Naphthalene	2013/09/12		114	%	30 - 130
		Perylene	2013/09/12		96	%	30 - 130
		Phenanthrene	2013/09/12		109	%	30 - 130
		Pyrene	2013/09/12		99	%	30 - 130
	Method Blank	D10-Anthracene	2013/09/12		103	%	30 - 130
		D14-Terphenyl	2013/09/12		104	%	30 - 130
		D8-Acenaphthylene	2013/09/12		100	%	30 - 130
		1-Methylnaphthalene	2013/09/12	<0.05		ug/L	
		2-Methylnaphthalene	2013/09/12	<0.05		ug/L	
		Acenaphthene	2013/09/12	<0.01		ug/L	
		Acenaphthylene	2013/09/12	<0.01		ug/L	
		Anthracene	2013/09/12	<0.01		ug/L	
		Benzo(a)anthracene	2013/09/12	<0.01		ug/L	
		Benzo(a)pyrene	2013/09/12	<0.01		ug/L	
		Benzo(b)fluoranthene	2013/09/12	<0.01		ug/L	
		Benzo(g,h,i)perylene	2013/09/12	<0.01		ug/L	
		Benzo(j)fluoranthene	2013/09/12	<0.01		ug/L	
		Benzo(k)fluoranthene	2013/09/12	<0.01		ug/L	
		Chrysene	2013/09/12	<0.01		ug/L	
		Dibenz(a,h)anthracene	2013/09/12	<0.01		ug/L	
		Fluoranthene	2013/09/12	<0.01		ug/L	
		Fluorene	2013/09/12	<0.01		ug/L	
		Indeno(1,2,3-cd)pyrene	2013/09/12	<0.01		ug/L	
		Naphthalene	2013/09/12	<0.2		ug/L	
		Perylene	2013/09/12	<0.01		ug/L	
		Phenanthrene	2013/09/12	<0.01		ug/L	
		Pyrene	2013/09/12	<0.01		ug/L	
	RPD	1-Methylnaphthalene	2013/09/12	45.6 (1)		%	40
		2-Methylnaphthalene	2013/09/12	147 (1)		%	40
		Acenaphthene	2013/09/12	11.7		%	40
		Acenaphthylene	2013/09/12	94.0 (1)		%	40
		Anthracene	2013/09/12	12.9		%	40
		Benzo(a)anthracene	2013/09/12	NC		%	40
		Benzo(a)pyrene	2013/09/12	NC		%	40
		Benzo(b)fluoranthene	2013/09/12	NC		%	40
		Benzo(g,h,i)perylene	2013/09/12	NC		%	40
		Benzo(j)fluoranthene	2013/09/12	NC		%	40
		Benzo(k)fluoranthene	2013/09/12	NC		%	40
		Chrysene	2013/09/12	NC		%	40
		Dibenz(a,h)anthracene	2013/09/12	NC		%	40
		Fluoranthene	2013/09/12	5.0		%	40
		Fluorene	2013/09/12	6.7		%	40
		Indeno(1,2,3-cd)pyrene	2013/09/12	NC		%	40
		Naphthalene	2013/09/12	NC (1)		%	40
		Perylene	2013/09/12	NC		%	40
		Phenanthrene	2013/09/12	71.2 (1)		%	40
		Pyrene	2013/09/12	5.7		%	40
3346847 CHH	Matrix Spike [SZ4427-02]	Isobutylbenzene - Volatile	2013/09/12		98	%	70 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: DB3F1010

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3346847 CHH	Matrix Spike [SZ4427-02]	Benzene	2013/09/12		102	%	70 - 130
		Toluene	2013/09/12		105	%	70 - 130
		Ethylbenzene	2013/09/12		107	%	70 - 130
		Xylene (Total)	2013/09/12		106	%	70 - 130
	Spiked Blank	Isobutylbenzene - Volatile	2013/09/12		100	%	70 - 130
		Benzene	2013/09/12		103	%	70 - 130
		Toluene	2013/09/12		104	%	70 - 130
		Ethylbenzene	2013/09/12		108	%	70 - 130
		Xylene (Total)	2013/09/12		106	%	70 - 130
	Method Blank	Isobutylbenzene - Volatile	2013/09/12		100	%	70 - 130
		Benzene	2013/09/12	<0.001		mg/L	
		Toluene	2013/09/12	<0.001		mg/L	
		Ethylbenzene	2013/09/12	<0.001		mg/L	
		Xylene (Total)	2013/09/12	<0.002		mg/L	
		C6 - C10 (less BTEX)	2013/09/12	<0.01		mg/L	
	RPD [SZ4426-02]	Benzene	2013/09/12	NC		%	40
		Toluene	2013/09/12	NC		%	40
		Ethylbenzene	2013/09/12	NC		%	40
		Xylene (Total)	2013/09/12	NC		%	40
		C6 - C10 (less BTEX)	2013/09/12	NC		%	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix 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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Duplicate: results are outside acceptance limit. Insufficient sample for repeat analysis.

Validation Signature Page

Maxxam Job #: B3F1010

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

Rosemarie MacDonald

Rose MacDonald, Scientific Specialist (Organics)

==

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

Report ID: 161189-OAS
Report Date: 04-Oct-13
Date Received: 01-Oct-13

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
130 Somerset Street
Saint John, NB E2K 2X4

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Rob Fiander

Project #: 121811071.203

Location: Saint John

Hydrocarbon Analysis in Soil (Atlantic MUST)

RPC Sample ID:			161189-2	161189-4
Client Sample ID:			13SVP-09 SS7 3.7m	13SVP-11 SS5 2.4m
Date Sampled:				
Matrix:			soil	soil
Analytes	Units	RL		
Benzene	mg/kg	0.005	< 0.02	< 0.005
Toluene	mg/kg	0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg	0.01	< 0.02	< 0.01
Xylenes	mg/kg	0.05	< 0.05	< 0.05
VPH C6-C10 (Less BTEX)	mg/kg	2.5	110	< 2.5
EPH >C10-C16	mg/kg	12	1300	< 12
EPH >C16-C21	mg/kg	12	830	< 12
EPH >C21-C32	mg/kg	12	92	18
EPH (>C16-C32)	mg/kg	12	920	18
Modified TPH Tier 1	mg/kg	21	2300	< 21
VPH Surrogate (IBB)	%		158	103
EPH Surrogate (IBB)	%		126	102
EPH Surrogate (C32)	%		114	129
Resemblance			WFO	ND
Return to Baseline at C32			Yes	No
Moisture Content	%		17	23

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit; Soil results are expressed on a dry weight basis.

Bruce Phillips

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 161189-OAS
Report Date: 04-Oct-13
Date Received: 01-Oct-13

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
130 Somerset Street
Saint John, NB E2K 2X4

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Method Summary

OAS-HC03:The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Soil (VPH)
OAS-HC03: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Soil (EPH)

Resemblance Legend

Resemblance Code	Resemblance	Resemblance Code	Resemblance
AG	Aviation Gasoline	PAH	Possible PAHs Detected
COMMENT	See General Report Comments	PG	Possible Gasoline Fraction
FO	Fuel Oil Fraction	PLO	Possible Lube Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction	PWFO	Possible Weathered Fuel Oil Fraction
G	Gasoline Fraction	PWG	Possible Weathered Gasoline Fraction
LO	Lube Oil Fraction	TO	Tranformer Oil
ND	Not Detected	UP	Unknown Peaks
NR	No Resemblance (not-petrogenic in origin)	WFO	Weathered Fuel Oil Fraction
NRLR	No Resemblance in the lube oil range (>C21-C32).	WG	Weathered Gasoline Fraction
OP	One Product (unidentified)		

General Report Comments

Elevated VPH RL's due to sample dilution.
Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
130 Somerset Street
Saint John, NB E2K 2X4

921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121811071.203
Location: Saint John
QA/QC Report

RPC Sample ID:			BLANKB2662	BLANKB2664	SPIKEB2635	SPIKEB2637
Type: Matrix:			VPH soil	EPH soil	VPH soil	EPH soil
Analytes	Units	RL			% Recovery	% Recovery
Benzene	mg/kg	0.005	< 0.005	-	104%	-
Toluene	mg/kg	0.05	< 0.05	-	110%	-
Ethylbenzene	mg/kg	0.01	< 0.01	-	110%	-
Xylenes	mg/kg	0.05	< 0.05	-	107%	-
VPH C6-C10 (Less BTEX)	mg/kg	2.5	< 2.5	-	106%	-
EPH >C10-C16	mg/kg	12	-	< 12	-	-
EPH >C16-C21	mg/kg	12	-	< 12	-	-
EPH >C21-C32	mg/kg	12	-	< 12	-	-
EPH >C10-C32	mg/kg	21	-	-	-	103%

RL = Reporting Limit

CERTIFICATE OF ANALYSIS

for
Stantec Consulting Ltd
130 Somerset Street
Saint John, NB E2K 2X4

921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 121811071.203

Summary of Date Analyzed

	VPH		EPH	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
161189-2	2-Oct-13	3-Oct-13	2-Oct-13	2-Oct-13
161189-4	2-Oct-13	3-Oct-13	2-Oct-13	2-Oct-13

Your P.O. #: 16300R-20
Your Project #: 121811071.203
Site Location: FUNDY QUAY
Your C.O.C. #: ES800113

Attention: ROB FIANDER
Stantec Consulting Ltd
Saint John - Standing Offer
130 Somerset Street
Saint John, NB
E2K 2X4

Report Date: 2013/11/13

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3I7028
Received: 2013/10/29, 9:32

Sample Matrix: Filter
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TPH in carbon tubes by GC-FID	6	2013/11/05	2013/11/05	ATL SOP-00126	Based on ATL PIRI
TPH in carbon tubes by GC-FID	12	2013/11/05	2013/11/06	ATL SOP-00126	Based on ATL PIRI
TPH in carbon tubes by GC-FID (ug/m3)	18	2013/11/06	2013/11/07	ATL SOP-00126	Based on ATL PIRI
ModTPH (T1) Calc. for Filters (ug/m3)	18	N/A	2013/11/07		Based on Atl. PIRI
ModTPH (T1) Calc. for Filters	18	N/A	2013/11/07		Based on Atl. PIRI
Carbon Tube Volume	18	2013/11/01	2013/11/01		
Carbon Tube Volume Details	18	N/A	2013/11/01		

Remarks:

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

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

Encryption Key

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

Marie Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902) 420-0203 Ext:253

==

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

Total cover pages: 1

ATLANTIC RBCA HYDROCARBONS (FILTER)

Maxxam ID		TS1282	TS1283	TS1286	TS1287	TS1290		
Sampling Date		2013/10/22	2013/10/22	2013/10/22	2013/10/22	2013/10/23		
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113		
	Units	**SVP-01A FRONT**	**SVP-01A BACK**	**SVP-03A FRONT**	**SVP-03A BACK**	**SVP-04A FRONT**	**RDL**	**QC Batch**

Calculated Parameters								
Benzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Toluene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Ethylbenzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Total Xylenes	ug/m3	<20	<20	<20	<20	<20	20	3413302
C6 - C10 (less BTEX)	ug/m3	<40	<40	<40	<40	<40	40	3413302
>C10-C16 Hydrocarbons	ug/m3	<200	<200	<200	<200	<200	200	3413302
Modified TPH (Tier1)	ug/m3	<210	<210	<210	<210	<210	210	3413303
Petroleum Hydrocarbons								
Benzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Toluene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Ethylbenzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Total Xylenes	ug	<0.8	<0.8	<0.8	<0.8	<0.8	0.8	3414113
C6 - C10 (less BTEX)	ug	<2	<2	<2	<2	<2	2	3414113
>C10-C16 Hydrocarbons	ug	<10	<10	<10	<10	<10	10	3414113
Modified TPH (Tier1)	ug	<10	<10	<10	<10	<10	10	3413304
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	101	96	104	95	95		3414113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ATLANTIC RBCA HYDROCARBONS (FILTER)

Maxxam ID		TS1291	TS1294	TS1295	TS1298	TS1299		
Sampling Date		2013/10/23	2013/10/24	2013/10/24	2013/10/23	2013/10/23		
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113		
	Units	**SVP-04A BACK**	**SVP-05A FRONT**	**SVP-05A BACK**	**SVP-06A FRONT**	**SVP-06A BACK**	**RDL**	**QC Batch**
Calculated Parameters								
Benzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Toluene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Ethylbenzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Total Xylenes	ug/m3	<20	<20	<20	<20	<20	20	3413302
C6 - C10 (less BTEX)	ug/m3	<40	<40	<40	<40	<40	40	3413302
>C10-C16 Hydrocarbons	ug/m3	<200	<200	<200	<200	<200	200	3413302
Modified TPH (Tier1)	ug/m3	<210	<210	<210	<210	<210	210	3413303
Petroleum Hydrocarbons								
Benzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Toluene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Ethylbenzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Total Xylenes	ug	<0.8	<0.8	<0.8	<0.8	<0.8	0.8	3414113
C6 - C10 (less BTEX)	ug	<2	<2	<2	<2	<2	2	3414113
>C10-C16 Hydrocarbons	ug	<10	<10	<10	<10	<10	10	3414113
Modified TPH (Tier1)	ug	<10	<10	<10	<10	<10	10	3413304
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	100	95	94	101	92		3414113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ATLANTIC RBCA HYDROCARBONS (FILTER)

Maxxam ID		TS1302	TS1303	TS1306	TS1307	TS1310		
Sampling Date		2013/10/24	2013/10/24	2013/10/24	2013/10/24	2013/10/25		
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113		
	Units	**SVP-07A FRONT**	**SVP-07A BACK**	**SVP-08A FRONT**	**SVP-08A BACK**	**SVP-09A FRONT**	**RDL**	**QC Batch**
Calculated Parameters								
Benzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Toluene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Ethylbenzene	ug/m3	<8	<8	<8	<8	<8	8	3413302
Total Xylenes	ug/m3	<20	<20	<20	<20	<20	20	3413302
C6 - C10 (less BTEX)	ug/m3	<40	<40	51	<40	<40	40	3413302
>C10-C16 Hydrocarbons	ug/m3	<200	<200	<200	<200	<200	200	3413302
Modified TPH (Tier1)	ug/m3	<210	<210	<210	<210	<210	210	3413303
Petroleum Hydrocarbons								
Benzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Toluene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Ethylbenzene	ug	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	3414113
Total Xylenes	ug	<0.8	<0.8	<0.8	<0.8	<0.8	0.8	3414113
C6 - C10 (less BTEX)	ug	<2	<2	2	<2	<2	2	3414113
>C10-C16 Hydrocarbons	ug	<10	<10	<10	<10	<10	10	3414113
Modified TPH (Tier1)	ug	<10	<10	<10	<10	<10	10	3413304
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	106	95	104	94	104		3414113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ATLANTIC RBCA HYDROCARBONS (FILTER)

Maxxam ID		TS1311		TS1314	TS1315		
Sampling Date		2013/10/25		2013/10/25	2013/10/25		
COC Number		ES800113		ES800113	ES800113		
	Units	**SVP-09A BACK**	**RDL**	**SVP-10A FRONT**	**SVP-10A BACK**	**RDL**	**QC Batch**
Calculated Parameters							
Benzene	ug/m3	<8	8	<9	<9	9	3413302
Toluene	ug/m3	<8	8	<9	<9	9	3413302
Ethylbenzene	ug/m3	<8	8	<9	<9	9	3413302
Total Xylenes	ug/m3	<20	20	<20	<20	20	3413302
C6 - C10 (less BTEX)	ug/m3	<40	40	<40	<40	40	3413302
>C10-C16 Hydrocarbons	ug/m3	270	200	<200	<200	200	3413302
Modified TPH (Tier1)	ug/m3	270	210	<210	<210	210	3413303
Petroleum Hydrocarbons							
Benzene	ug	<0.4	0.4	<0.4	<0.4	0.4	3414113
Toluene	ug	<0.4	0.4	<0.4	<0.4	0.4	3414113
Ethylbenzene	ug	<0.4	0.4	<0.4	<0.4	0.4	3414113
Total Xylenes	ug	<0.8	0.8	<0.8	<0.8	0.8	3414113
C6 - C10 (less BTEX)	ug	<2	2	<2	<2	2	3414113
>C10-C16 Hydrocarbons	ug	13	10	<10	<10	10	3414113
Modified TPH (Tier1)	ug	13	10	<10	<10	10	3413304
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	99		102	102		3414113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

CALCULATED PARAMETERS (FILTER)

Maxxam ID		TS1282	TS1283	TS1286	TS1287	TS1290	
Sampling Date		2013/10/22	2013/10/22	2013/10/22	2013/10/22	2013/10/23	
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113	
	Units	**SVP-01A FRONT**	**SVP-01A BACK**	**SVP-03A FRONT**	**SVP-03A BACK**	**SVP-04A FRONT**	**QC Batch**
Field Measurements							
Flow Rate(mL/min)	N/A	200	200	200	200	200	ONSITE
Duration(min)	N/A	240	240	240	240	240	ONSITE
Volatile Organics							
Volume	L	49	49	47	47	48	3407057

QC Batch = Quality Control Batch

Maxxam ID		TS1291	TS1294	TS1295	TS1298	TS1299	
Sampling Date		2013/10/23	2013/10/24	2013/10/24	2013/10/23	2013/10/23	
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113	
	Units	**SVP-04A BACK**	**SVP-05A FRONT**	**SVP-05A BACK**	**SVP-06A FRONT**	**SVP-06A BACK**	**QC Batch**
Field Measurements							
Flow Rate(mL/min)	N/A	200	200	200	200	200	ONSITE
Duration(min)	N/A	240	240	240	240	240	ONSITE
Volatile Organics							
Volume	L	48	47	47	48	48	3407057

QC Batch = Quality Control Batch

CALCULATED PARAMETERS (FILTER)

Maxxam ID		TS1302	TS1303	TS1306	TS1307	TS1310	
Sampling Date		2013/10/24	2013/10/24	2013/10/24	2013/10/24	2013/10/25	
COC Number		ES800113	ES800113	ES800113	ES800113	ES800113	
	Units	**SVP-07A FRONT**	**SVP-07A BACK**	**SVP-08A FRONT**	**SVP-08A BACK**	**SVP-09A FRONT**	**QC Batch**
Field Measurements							
Flow Rate(mL/min)	N/A	200	200	200	200	200	ONSITE
Duration(min)	N/A	240	240	240	240	240	ONSITE
Volatile Organics							
Volume	L	47	47	48	48	48	3407057

QC Batch = Quality Control Batch

Maxxam ID		TS1311	TS1314	TS1315	
Sampling Date		2013/10/25	2013/10/25	2013/10/25	
COC Number		ES800113	ES800113	ES800113	
	Units	**SVP-09A BACK**	**SVP-10A FRONT**	**SVP-10A BACK**	**QC Batch**
Field Measurements					
Flow Rate(mL/min)	N/A	200	200	200	ONSITE
Duration(min)	N/A	240	240	240	ONSITE
Volatile Organics					
Volume	L	48	47	47	3407057

QC Batch = Quality Control Batch

Package 1	7.0°C

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

GENERAL COMMENTS

Volumes have been submitted by the client.

Results relate only to the items tested.

Stantec Consulting Ltd
Attention: ROB FIANDER
Client Project #: 121811071.203
P.O. #: 16300R-20
Site Location: FUNDY QUAY

Quality Assurance Report

Maxxam Job Number: DB3I7028

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3414113 SHF	Spiked Blank	Isobutylbenzene - Extractable	2013/11/05		96	%	30 - 130
		Benzene	2013/11/05		103	%	30 - 130
		Toluene	2013/11/05		98	%	30 - 130
		Ethylbenzene	2013/11/05		101	%	30 - 130
		>C10-C16 Hydrocarbons	2013/11/05		104	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2013/11/05		100	%	30 - 130
		Benzene	2013/11/05	<0.4		ug	
		Toluene	2013/11/05	<0.4		ug	
		Ethylbenzene	2013/11/05	<0.4		ug	
		Total Xylenes	2013/11/05	<0.8		ug	
		C6 - C10 (less BTEX)	2013/11/05	<2		ug	
		>C10-C16 Hydrocarbons	2013/11/05	<10		ug	

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.

Validation Signature Page

Maxxam Job #: B3I7028

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

RoseMarie MacDonald

Rose MacDonald, Scientific Specialist (Organics)

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

APPENDIX F
AIR SAMPLING INTERPRETATION

F-1.0 Vapour Sampling Program

The sampling program consisted of soil vapour testing as described in Appendix B. Samples were collected using dedicated air pumps with in-series sorbent tubes.

The vapour source for this site is impacted soil. Groundwater concentrations are below the RBSLs. As the site groundwater is influenced by the tidal cycle, sampling was conducted during low tide to maximize the exposure to impacted soil.

The details of the sampling program are provided in Table F1.

Table F1 Site Specific Vapour Sampling Details

Sample ID	Sample Location	Sampling Details			Probe Construction Details	
		Date	Calibrated flow rate (L/min)	Sampling time (minutes)	Sample volume (m³)	Screened Interval (mbgs)
13SVP-01	Near helicopter hangar	22-Oct-2013	0.20237	240	0.0486	1.55-1.85
13SVP-03	Near southern property boundary	22-Oct-2013	0.19737	240	0.0474	1.55-1.85
13SVP-04	Near former USTs next to buoy shed	23-Oct-2013	0.20058	240	0.0481	1.2-1.5
13SVP-05	West of shop building	24-Oct-2013	0.19674	240	0.0472	3.35-3.65
13SVP-06	Near northern property boundary,	23-Oct-2013	0.20084	240	0.0482	3.35-3.65
13SVP-07	Adjacent to east wall of shop building, near underground oil/water separator	24-Oct-2013	0.19674	240	0.0472	1.2-1.5
13SVP-08	Water Street public parking lot	24-Oct-2013	0.19958	240	0.0479	1.5-1.8
13SVP-09		25-Oct-2013	0.19898	240	0.0478	1.5-1.8
13SVP-10		25-Oct-2013	0.19608	240	0.0471	1.2-1.5

F-2.0 Assessment of Potential Health Risk

Soil vapour concentrations were used to predict concentrations of petroleum hydrocarbons in indoor air, following methodology described in the Atlantic RBCA User Guidance for Soil Vapour and Indoor Air Monitoring Assessments (2006) herein referred to as the "Guidance Document". The Guidance Document contains technical options and requirements for the assessment of the indoor air exposure pathway. As indicated in the Guidance Document, the chemicals of concern are BTEX and modified TPH. Calculated indoor air concentrations have been compared to the risk specific concentration (RSC) for the carcinogenic benzene component (based on a target risk of 10^{-5}) and inhalation reference concentrations (RfCi) for non-carcinogens provided in the chemical database of the Atlantic RBCA Toolkit, version 3.2. For non-carcinogenic parameters, the predicted concentration is considered acceptable if:

Predicted Indoor Air Concentration $\leq$ Target HQ x RfC_i

Where the Target HQ is 0.5 for toluene, ethylbenzene, and xylenes, and 1.0 for modified TPH.

As site-specific fractionation data were not available, modified TPH concentrations were compared to the most conservative SSTL for any individual TPH fraction..

The resulting SSTLs are summarized in Table F3.

Table F3 Predicted Indoor Air Tier III SSTLs

Component	RfC_i (µg/m³)	Source	Soil Vapour	
			Target HQ	SSTL (µg/m³)
Benzene	3	Atlantic RBCA Toolkit	n/a	3
Toluene	3,800	Atlantic RBCA Toolkit	0.5	1,900
Ethylbenzene	1,000	Atlantic RBCA Toolkit	0.5	500
Xylenes	180	Atlantic RBCA Toolkit	0.5	90
Modified TPH	200	Atlantic RBCA Toolkit	1	200

The laboratory provided results expressed as a concentration. This soil vapour concentration was used to predict a concentration in indoor air using the applicable dilution factors.

For the assessment of potential risk to on-site or off-site receptors, the APIRI default dilution factor of 50 was used. This dilution factor is protective of indoor air for any building construction type, and as such, does not restrict potential future development.

APPENDIX G
SUMMARY OF THE ECOLOGICAL SCREENING PROTOCOL

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

Ecological Screening Component	**Yes or No**	**Report Name(s): Closure Report**
		Location of details and explanations
Part I - Identification of petroleum hydrocarbons in media		
1. Do site characterization data indicate the presence of PHC in site surface soil (depth from surface to 1.5 mbgs) above the appropriate screening levels in Atlantic RBCA Version 3 Tables 1a and 1b?	Yes	Table E1
2. Do site characterization data indicate the presence of PHC in shallow site groundwater (depth from surface to 3.0 mbgs) above appropriate ecological screening levels that were derived for the protection of terrestrial plants and soil invertebrates in contact with site groundwater in Atlantic RBCA Version 3 Table 2?	No	Table E2
3. Do existing site characterization data indicate the presence of PHC in site groundwater above appropriate ecological screening levels derived for the protection of aquatic receptors in Table 3a/3b?	No	Table E3
4. Do site characterization data indicate the presence of PHC in site surface water above the appropriate screening levels in Atlantic RBCA Version 3 Table 3a?	No	Section 9.2
5. Do site characterization data indicate the presence of PHC in on-site or adjacent sediments above “typical” or “other” screening levels in Atlantic RBCA Version 3 Table 4?	No	Section 9.2
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 within 200 m of the site?		Section 2.2, Table 3
• wetland habitats	N	
• aquatic habitats	Y	
• forested habitats	N	
• grassland habitats	N	
• provincial/national parks or ecological reserves	N	
• known rare, threatened or endangered species	N	
• other known critical or sensitive habitat	N	
• other local or regional receptor or habitat concerns	N	
2a. Are there visible indications of stressed vegetation on the site?	N	Section 9.2
2b. Is there evidence that the site vegetation community differs from what would be expected?	N	Section 9.2
2c. Are there indications that the site soil cannot support a soil invertebrate community?	N	Section 9.2
3. Is there evidence that terrestrial plants in the habitats above are likely to be in root contact with site groundwater above screening levels?	N	Section 9.2
4. Would wildlife receptors be expected to forage on or near the contaminated areas of the site?	N	Section 9.2

From Appendix 2, Atlantic RBCA Version 3, July 2012

Ecological Screening Component	**Yes or No**	**Report Name(s): Closure Report** **Location of details and explanations**
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	Section 9.2
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 a suitable habitat?	No	Section 9.2
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	Section 9.2
3. Is it reasonable to conclude that dissolved hydrocarbons in site groundwater with concentrations exceeding applicable screening levels will come into contact with aquatic receptors or aquatic receptor habitat?	No	Section 9.2
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 runoff (*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	Section 9.2
5. Are there site specific conditions present, which were not considered in any section above that should require further ecological assessment?	No	Section 9.2
IF ALL ANSWERS IN PART III ARE"NO" THEN NO FURTHER ACTION IS REQUIRED		

From Appendix 2, Atlantic RBCA Version 3, July 2012

APPENDIX H

RECORD OF SITE CONDITION

Record of Site Condition

Version 2.1

July 2006

Site Address: Fundy Quay Development, Water Street, Saint John

Site PID: 55209159, 55011894, 55209167, and 55006886

DENV File Number: 6515-4-1221

Date: March 7, 2014

Department of Environment

ATLANTIC HARMONIZATION

Record of Site Condition Form

New Brunswick Department of Environment

This form is provided by the New Brunswick Department of Environment (ENV) to facilitate the preparation of the Record of Site Condition in the final stages of remediation of a contaminated site, as presented in the ***Guidelines for the Management of Contaminated Sites*** (ENV, November 2003).

- This form contains macros. The security level in Word should be set to enable macros to execute. In the **Tools/Options** dialogue box, choose the **Security** tab, click on the **Macros Security** button and choose **Medium**. Following this, you will be invited to activate macros in this and other documents. If your security level is already set to enable macros, you may not see any message.
- Each part of the form, including the cover, contains shaded boxes where information can be entered. The shaded boxes expand as information is added, to a maximum of one page of information. Get help filling out any of the information entry boxes by clicking on the box and then pressing the F1 key.
- You can navigate through the form using the Tab key.
- The **Site Address** or **Project Name** *(entered on a single line with no returns)*, the principal project **PID** (Property Identification) number, the **ENV File Number** and the final **Date** of your report, should be entered in the shaded box in Part 1 of the report. This information will appear in the header at the top of each page. The page headers update automatically when new information is entered in the shaded box in Part 1. The same information should be entered on the cover of this report.
- More information about how to fill out any of the Parts of the form can be obtained in the ENV *Instructions for Completing the Record of Site Condition found* on the Atlantic RBCA website www.atlanticrbca.com

If you would like to re-use this form, it is advised that you save your work with a new filename before exiting.

This form can be downloaded from the Atlantic RBCA web site at:
www.atlanticrbca.com.

Hard copies of this form are available by mail from:

Remediation Branch - Environmental Management Division
NB Department of Environment
P.O. Box 6000,
Fredericton N.B.
E3B 5H1

or phone:

(506) 444-5119.

RECORD OF SITE CONDITION

Part 1 of 7: Source Property Information

Data entered in this box will appear in the header at the top of subsequent pages.

Site Address / Project Name: Fundy Quay Development, Water Street, Saint John

PID Number: 55209159, 55011894, 55209167, and 55006886

ENV File no: 6515-4-1221 Submission Date: March 7, 2014

Additional PIDs

Responsible Party: City of Saint John

Current Owner: City of Saint John

GPS Co-ordinates: (When only a portion of a PID is addressed)
Attach a site plan showing coordinates and boundaries of portion. ☐

Part 2 of 7: List of Environmental Documentation

A. The following documentation, **prepared by others** (including peer review reports, if any), pertain to the Source Property cited in Part 1 and/or any other impacted Third Party properties:

Title	Company	Date
Limited Environmental Investigation, Canadian Coast Guard Base, Saint John, New Brunswick	Dillon Consulting for Conquest Engineering Limited	April 27, 2006
Additional documentation prepared by others:		

B. The following documentation, including closure documents, pertaining to the Source Property cited in Part 1 and/or other related impacted properties has been **prepared by and/or overseen by the Site Professional:**

Document Title	**Date**
Phase I Environmental Site Assessment, Coast Guard Facility, Peter's Wharf, Saint John, NB.	June 18, 2001
Phase II Environmental Site Assessment, Saint John Coast Guard Base, Saint John, New Brunswick.	March 25, 2002
Phase III Environmental Site Assessment Report. Fundy Quay Development, Saint John, New Brunswick.	March 28, 2013
Closure Report. Fundy Quay Development. PID Nos. 55209159, 55011894, 55209167, and 55006886	March 7, 2014

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886*
Date: *March 7, 2014*

Additional documentation prepared by/overseen by Site Professional :	

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886*
Date: *March 7, 2014*

Part 3 of 7: Tier I-III Environmental Criteria: Source Property

Products/contaminants
(e.g. gasoline, lead, waste oil, etc.) that have been identified at the Source Property:

☐ Gasoline ☒ Diesel /#2 ☒#6 Oil ☒ Other (Specify) PAHs, metals

Current land use:

☐ Residential ☒ Commercial ☒ Other (Specify) Proposed mixed residential/commercial development

Drinking water use:

☐ On-site potable water ☐ Within a wellfield or watershed protected area ☒ Non-potable water

Affected soil composition:

☒ Coarse-grained ☐ Fine-grained ☐ Bedrock (Specify)

Site closure criteria (Check all that apply):

☒ Tier I Risk Based Screening Level Criteria

☒ Tier II Site Specific Target Level Criteria

☒ Tier III Site Specific Target Level Criteria

Description of methodology and comments:

Historical data were screened in the context of the current regulatory framework. The 2013 site investigation program included the assessment of previously identified areas of impacts to assess the potential risks to ecological receptors (Saint John Harbour is adjacent to the site) as well as residential receptors for the proposed redevelopment land use scenario. Investigation included boreholes, monitoring wells, and soil vapour probes to assess the petroleum hydrocarbons, PAHs and metals impacts at the site. Petroleum hydrocarbon impacts appear to originate from both point (on-site hydrocarbon storage) and non-point sources (originating from PAH interferences), while PAHs and metals generally appear to be related to historical background influences such as infilling and several fires over the course of the area's history.

Part 3 of 7 (continued): Tier I-III Environmental Criteria: Source Property

Tier I-II Criteria

Chemicals of Concern (COC)	**Tier I-II Criteria Applied for Soil**	**Units**	*** Reference**	**Tier I-II Criteria Applied for Groundwater**	**Units**	*** Reference**
Benzene	0.099/66	mg/kg	ARBCA V3 RBSLs/PSSLs for direct contact (Residential)	2.6	mg/L	ARBCA V3 RBSLs (Residential)
Toluene	77/20,000	mg/kg	ARBCA V3 RBSLs/PSSLs for direct contact (Residential)	20	mg/L	ARBCA V3 RBSLs (Residential)
Ethylbenzene	30/9,300	mg/kg	ARBCA V3 RBSLs/PSSLs for direct contact (Residential)	20	mg/L	ARBCA V3 RBSLs (Residential)
Xylenes	8.8/140,000	mg/kg	ARBCA V3 RBSLs/PSSLs for direct contact (Residential)	20	mg/L	ARBCA V3 RBSLs (Residential)
Modified TPH (diesel/lube oil, depending on laboratory resemblance)	270, 1100 / 8,600, 14,000	mg/kg	ARBCA V3 RBSLs/PSSLs for direct contact (Residential)	20	mg/L	ARBCA V3 RBSLs (Residential)
Other Chemicals evaluated with criteria for Tiers I and II : BTEX, F1,F2,F3 and/or modified TPH assessed for ecological receptors using ARBCA V3 Tier I ESLs.						

** Provide reference for Screening Level criteria and/or Tier I-II Site Specific Target Level criteria developed using Atlantic RBCA v. 2.1.*

Tier III Criteria

Chemicals of concern (COC)	Medium to which criteria apply	Tier III criteria applied	Units	* Reference
Benzene	predicted indoor air	3	µg/m3	ARBCA Version 3 Toolkit
Toluene	predicted indoor air	1,900	µg/m3	ARBCA Version 3 Toolkit, adjusted for a target Hazard Quotient of 0.5
Ethylbenzene	predicted indoor air	500	µg/m3	ARBCA Version 3 Toolkit adjusted for a target Hazard Quotient of 0.5
Xylenes	predicted indoor air	90	µg/m3	ARBCA Version 3 Toolkit adjusted for a target Hazard Quotient of 0.5
Modified TPH	predicted indoor air	200	µg/m3	ARBCA Version 3 Toolkit
Other Chemicals evaluated with criteria for Tiers III : metals and PAHs				

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886*
Date: *March 7, 2014*

** Provide reference for Tier III criteria (when using criteria other than Risk-Based Screening Level criteria or Tier II Atlantic RBCA V.2.1 Site Specific Target Level criteria.)*

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886*
Date: *March 7, 2014*

Part 4 of 7: Tier I-III Environmental Criteria - Third Party Property(s)

Based on the work completed, the following Third Party properties (identified by PID number) were identified as being affected at any concentration by the products/contaminants of the Source Property:

PID Number	Chemicals of Concern (COC)	Land use	Potable or Non-potable	Affected soil type
N/A				
Other Third Party properties :				

Site closure criteria (check all that apply)

☐ Tier I Risk Based Screening Level Criteria

☐ Tier II Site Specific Target Level Criteria

☐ Tier III Site Specific Target Level Criteria

Description of methodology and comments

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886* Date: *March 7, 2014*

Part 4 of 7 (continued): Tier I-III Environmental Criteria - Third Party Property(s)

Summary of Clean-up Criteria

PID of Third Party Property(s)

List all PID numbers : N/A

Tier I-II Criteria						
Chemicals of Concern (COC)	**Tier I-II Criteria Applied for Soil**	**Units**	*** Reference**	**Tier I-II Criteria Applied for Groundwater**	**Units**	*** Reference**
Other Chemicals evaluated with criteria for Tiers I and II :						

** Provide reference for Screening Level criteria and/or Tier I-II Site Specific Target Level criteria developed using Atlantic RBCA v. 2.1.*

Tier III Criteria

Chemicals of concern (COC)	Medium to which criteria apply	Tier III criteria applied	Units	* Reference
Other Chemicals evaluated with criteria for Tier III :				

** Provide reference for Tier III criteria (when using criteria other than Risk-Based Screening Level criteria or Tier II Atlantic RBCA V.2.1 Site Specific Target Level criteria.)*

Part 5 of 7: Corrective Actions

SOURCE PROPERTY

Describe the <u>remedial objectives</u> and the <u>basic corrective actions</u> of the Remedial Action Plan employed for the Source Property.

The objectives of the site work were to evaluate the areas of known impacts in the context of the current regulatory framework (including human health and ecological receptors) and based on the proposed change in land use (commercial to mixed commercial/residential). The work included an assessment of operable exposure pathways and determination of what conditions, if any, would be required to mitigate risk to human health and the environment related to the proposed development.

Metals and PAHs in soil represent a potential risk to human health via the direct contact pathway. This pathway is effectively mitigated under the current site configuration as site surfaces are paved or covered with buildings.

Describe the current use of the Source Property (buildings, operations, etc.).

Current use inculdes Canada Coast Guard Based and public parking lot. Proposed redevelopment to include parking structures and mixed commercial/residential buildings.

Other comments

Based on the work completed, the Source Property (cited in Part 1) is suitable for the following current, or reasonably foreseeable future, site activity(s).

☒ Residential

☐ Commercial

Conditional closure

If site closure is **conditional**, list site-specific engineered or institutional controls that apply to the Source Property complete with a description of the objectives of each control. Attach written agreements to the control(s) from all affected stakeholders and a site plan indicating the limits of the control(s).

Suitable cover must be maintained to restrict direct contact with impacted soil.

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886* *Date:* *March 7, 2014*

Part 5 of 7 (continued): Corrective Actions

THIRD PARTY PROPERTIES

Describe the remedial objectives and the basic corrective actions of the Remedial Action Plan employed for each of the Third Party Properties.

N/A

Other comments

Describe the current use of the Third Party Property(s) (buildings, operations, etc.)

Based on the work completed, the Third Party properties (cited in Part 4) are suitable for the following current or reasonably foreseeable future site activity(s).

☐ Residential (list PID numbers)
☐ Commercial (list PID numbers)

Conditional Closure

If site closure is **conditional**, list site-specific engineered or institutional controls that apply to the Third Party Property(s) complete with description of the purpose of each control. Attach written agreements to the control(s) from all affected stakeholders and a site plan indicating the limits of the control(s).

Site Address / Project Name: *Fundy Quay Development, Water Street, Saint John*
PID #: *55209159, 55011894, 55209167, and 55006886* Date: *March 7, 2014*

Part 6 of 7: Summary Statement of Site Professional

The Minister considers the pre-checked statements below to be mandatory for acknowledging receipt of the Record of Site Condition. The signature of the Site Professional on this form indicates the fulfillment of these mandatory requirements as well as the requirements of all other checked statements.

Please check appropriate statements:

Mandatory Statements

☑ 1. All work on which this Record of Site Condition is based was prepared, overseen and/or reviewed by the Site Professional.

☑ 2. The site was managed in accordance with the current version of the New Brunswick Department of Environment *Guideline for the Management of Contaminated Sites*.

☑ 3. *This Record of Site Condition form is identical to the one provided by the ENV and the content of the form has not been altered*.

LRA Statement *(if LRA process used)*

☐ 4. The Limited Remedial Action Process was applicable for this site as per the current version of the Limited Remedial Action Reference Documentation for Site Professionals.

Source Property Statements

☐ 5. Based on the results of the environmental site assessment, the applicable Tier I Risk Based Screening Level criteria or Tier II/Tier III Site Specific Target Level criteria were not exceeded on the Source Property (as described in Part I) and therefore, remedial action and/or site-specific engineered or institutional controls are not required for the current or reasonably foreseeable future site activities (as cited in Part 5).

☐ 6. The Source Property (as described in Part I) has been remediated to an acceptable level for the current or reasonably foreseeable future site activities (as cited in Part 5) and therefore, *unconditional closure* is recommended.

☒ 7. The Source Property (as described in Part I) requires site-specific engineered or institutional controls to satisfy the current or reasonably foreseeable future site activities (as cited in Part 5) and therefore, *conditional closure* is recommended.

Third-Party Property Statements

☐ 8. Based on the results of the environmental site assessment, the applicable Tier I Risk Based Screening Level criteria or Tier II/Tier III Site Specific Target Level criteria were not exceeded on the Third Party properties (as cited in Part 4) and therefore, remedial action and/or site-specific engineered or institutional controls are not required for the current or reasonably foreseeable future site activities (as cited in Part 5).

☐ 9. Third Party properties (as cited in Part 4) affected by the contamination of the Source Property (as described in Part I) have been remediated to an acceptable level for the current or reasonably foreseeable future site activities (as cited in Part 5) and therefore, *unconditional closure* is recommended.

☐ 10. Third Party properties (as cited in Part 4) affected by the contamination of the Source Property (as described in Part I) require site-specific engineered or institutional controls to satisfy the current or reasonably foreseeable future site activities (as cited in Part 5) and therefore, *conditional closure* is recommended.

Company: Stantec Consulting Ltd.
Address: 130 Somerset Street, Saint John, NB
Tel: 506-634-2185
Fax: 506-634-8104
E-mail: rob.fiander@stantec.com

Professional Seal Here

Part 7 of 7: New Brunswick Department of the Environment - Acknowledgement of Receipt

The Minister acknowledges receipt of this Record of Site Condition. The Minister has processed the report(s) cited in Part 2 of this Record of Site Condition for the purpose of ensuring the site has been managed in accordance with the current version of the New Brunswick Department of the Environment *Guideline for the Management of Contaminated Sites.*

Based upon the reports cited in Part 2 and conclusions of the Site Professional stated in Part 6 of this Record of Site Condition, the Site Professional is of the opinion that the stated level of contamination remaining on the property will not adversely affect the quality of the environment. Notwithstanding this, the Minister reserves the right to evaluate the site should site activities change, or should circumstances change, which result in an increase in contamination or changes in site conditions which may pose a risk to the quality of the environment.

The Minister has not supervised the work undertaken at the site and does not assume any responsibility or liability for this work, or for notifying future owners, or present or future occupants of the property, of the work completed. Any persons intending to purchase or occupy the property should make their own independent determination of the environmental condition of the property and the extent of responsibility and liability, if any, which may arise from taking ownership or occupancy.

Unconditional Closure

☐ It is understood from the information provided that the site has been managed in accordance with the current version of the New Brunswick Department of Environment *Guideline for the Management of Contaminated Sites* and that **further remedial action and/or site-specific engineered or institutional controls are not required** to ensure compatibility with the current or reasonably foreseeable future site activities (as cited in Part 5).

Conditional Closure

☐ It is understood from the information provided that the site has been managed in accordance with the current version of the New Brunswick Department of Environment *Guideline for the Management of Contaminated Sites* and that **site-specific engineered or institutional controls are required** to ensure compatibility with the current or reasonably foreseeable future site activities (as cited in Part 5).

Minister of Environment Date

Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4
Tel: (506) 634-2185
Fax: (506) 634-8104

March 5, 2014
File: 121811071_205

Attention: Mr. Kent MacIntyre, General Manager
Saint John Waterfront Development
1 Market Square, Suite 301
Saint John, NB E2L 4Z6

Dear Mr. MacIntyre,

Reference: Fundy Quay Development, Conditional Closure of NBDELG File No. 6515-4-1221

Stantec is preparing the documentation required to request closure of the above-noted file with the New Brunswick Department of Environment and Local Government (NBDELG). Based on the impacts encountered at the site, risks to human health cannot be ruled out, and as such a management approach is required. The impacts of concern include PAHs and metals, which may cause adverse human health effects to those in direct contact with the impacts. This exposure pathway can be mitigated by the maintenance of suitable cover to minimize direct contact. Examples of suitable cover include asphalt and buildings, and as such, the current site configuration does not represent unacceptable risks. However, under the proposed redevelopment, suitable cover will be required.

Under the NBDELG *Guideline for the Management of Contaminated Sites*, implementation of engineered controls to mitigate human health risk, such as suitable cover, requires signed documentation from stakeholders. Please sign and return this correspondence in acknowledgement of the conditions that will be applied in the Closure of this file.

A site management plan can be prepared for you at your request, providing additional details of options for “suitable cover”.

Regards,

STANTEC CONSULTING LTD.

Robert S. Fiander, P.Eng.
Environmental Services
Phone: (506) 636-9325
Fax: (506) 634-8104
Rob.Fiander@stantec.com

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Reference: Fundy Quay Development, Conditional Closure of NBDELG File No. 6515-4-1221

I, ______________________________, an agent of the City of Saint John, understand and acknowledge that Stantec is preparing Closure documentation for the NBDELG File No. 6515-4-1221 that is conditional on the maintenance of suitable cover at the site to reduce the risks to human health through the exposure pathway of direct contact with impacted soil.

______________________________ Signature

______________________________ Date

Appendix 5: Remediation Summary Plan by Stantec 2015

SAINT JOHN
DEVELOPMENT CORPORATION
CONSEIL DE DÉVELOPPEMENT
DE SAINT JOHN

Environmental Executive Summary

SAINT JOHN DEVELOPMENT CORPORATION

Submitted by:

Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4

June 2013

One Team. Integrated Solutions.

Stantec

Environmental Executive Summary
Phase III Environmental Site Assessment and Preliminary Remedial Action Plan
Fundy Quay Development

Introduction

Stantec Consulting Ltd. (Stantec) was retained by Saint John Development Corporation to conduct a Phase III Environmental Site Assessment (ESA) at the site of the proposed Fundy Quay development located on Water Street in Saint John, NB. The environmental assessment work was intended to evaluate the suitability of the site for the proposed redevelopment and to support a determination of potential remediation costs. Additional assessments on potential requirements for environmental approvals and permits, and potential remediation costs were presented in supplemental reports.

Key Points

The available information indicates that federal or provincial environmental impact assessments are not likely to be required for the proposed redevelopment. Furthermore, provided there is no in-water work associated with the redevelopment, no federal or provincial approvals, permits or other forms of authorization are anticipated. Provincial authorities have recommended that applicable mitigation identified in a previous CEAA screening report should be properly implemented to address any potential environmental effects.

The results of the Phase III ESA indicate that further action will be required to effectively manage the observed environmental impacts under the proposed redevelopment concept. Potential actions include remediation of the impacts to meet the prescribed screening levels or alternatively, further assessment to define appropriate risk management options. Remediation of all impacts is likely to be both impractical and very expensive, and as such, a number of risk management recommendations were provided.

Background and History

The Fundy Quay site consists of a 2.4 hectare (6 acre) parcel of land intended for mixed residential and commercial land use. The redevelopment will encompass the existing Water Street public parking lot and the Canadian Coast Guard base south of Market Slip. Under the proposed redevelopment concept, ground disturbance and excavations are anticipated in connection with the construction.

Redevelopment of the site is expected to occur in phases over a number of years with the initial phase of the redevelopment occurring in the northwestern part of the Canadian Coast Guard base. The new building in the first phase would have an underground parking structure and would require relatively deep excavations for its construction. Excavations would also be required at three other building sites; however, no additional deep excavations are anticipated.

Environmental conditions and the presence of environmental impacts are often influenced by historical use of land and activities within the surrounding environment. For this site, historical use and a history of fires dating back to the 1800s appear to have resulted in some environmental impacts.

Highlights of Phase III ESA

For the Phase III ESA field investigation, twelve sample sites were selected for testing to provide coverage in areas where impacts had previously been identified and in other areas where ground disturbance may occur. Previous environmental assessment work revealed environmental impacts in soil and groundwater from petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and trace metals.

Boreholes and monitoring wells were advanced at each sample site to depths ranging from 6 to 9 m below ground surface. Soil and groundwater testing results from the Phase III ESA and historical sample results were evaluated against published screening levels (sometimes referred to as "environmental quality criteria") for the protection of both human and ecological health, considering the proposed mixed residential and commercial land use. The results of the testing confirmed the following:

- Petroleum hydrocarbons are present in soil at concentrations exceeding the screening levels for residential land use in at least three areas on the Canadian Coast Guard base and in the Water Street public parking lot. The highest concentrations were observed in the area of the Shop Building and the Water Street public parking lot, with the observed depths of impact across the site ranging from within 1 to 6 m or more below ground surface.

- PAHs in soil appear to be distributed across the site with concentrations exceeding screening levels at depths of up to 6 m or more. Exceedences of the PAH screening levels appear to be associated with a number of sample locations in the eastern part of the site and at depth within the northern half of the Canadian Coast Guard base. These areas coincide with areas that were developed prior to the early 1800s and subsequently lost to a number of fires, including the Great Fire in 1877.

- Several trace metals at concentrations exceeding the screening levels were found in soil at various depths across the site. Metal impacts were observed in shallow and deeper soils on both the Canadian Coast Guard base and in the Water Street public parking lot.

From the Phase III ESA work it was concluded that remediation of all impacts is likely to be both impractical and very expensive, and as such, a number of risk management recommendations were provided. The recommendations included:

- Further assessment of the potential for intrusion of petroleum hydrocarbon vapours into buildings (*i.e.*, soil vapour intrusion assessment).

- Developing risk management plans to manage PAH and trace metal impacts (*i.e.*, prevent direct contact).

- Developing management plans for construction related waste (*i.e.*, proper disposal of waste soil, groundwater, timbers, debris, *etc.*).

Full details of the environmental assessment are available in the Stantec Phase III ESA report (March 2013).

Preliminary Remedial Action Plan and Potential Remediation Costs

The results of the Phase III ESA indicate that petroleum hydrocarbons, PAHs and selected trace metals are present at concentrations exceeding relevant screening levels. The exceedences of screening levels for the proposed future residential land use indicate further action will be required to effectively manage the observed environmental impacts.

Under the current redevelopment concept, it is anticipated that the most significant remediation related costs are likely to be associated with excavations for new buildings and handling of construction wastes (*i.e.*, waste soil, groundwater, timbers, debris*, etc.*). Owing to the potential presence of environmental impacts in the waste, restrictions may be placed on re-use or disposal of waste that originate from some excavation areas. Soils within the Water Street public parking lot and some areas of the Canadian Coast Guard base are impacted above screening levels and as such, may be considered "impacted" or "contaminated waste".

Considering the historical timeline for development of the site and an understanding that shallow fill material on the base appears to consist of more recent "good quality" granular fill, there is a strong possibility that some excavation waste will be suitable for re-use and remediation cost reductions can be realized. As well, remediation cost reductions can reasonably be anticipated with additional testing of potential waste materials and more detailed evaluation of excavation volumes and disposal options. It is our opinion that a portion of the waste can be managed as “impacted waste” rather than “contaminated waste”, with an appropriate waste disposal site identified, and as such the remediation effort (and associated cost) may be reduced.

Without detailed knowledge of available city-owned land disposal opportunities or other appropriate options, the waste soil volume calculations were based on the assumption that excavation volumes for the proposed buildings are approximately 25,000 m^3 with a potential unit disposal cost in the range of $50 per metric tonne as it relates to a commercial treatment facility. Based on those and other assumptions, preliminary estimates for the cost to dispose of soil are in the range of <$1,000,000 to $2,500,000.

It should be noted that the upper range of this estimate assumes a worst-case disposal scenario. The actual remediation costs are more likely to end up near the lower range of cost where the waste is a mixture of “impacted” and “contaminated” material. Remediation cost estimates will need to be refined as more testing and design details become available. Reduced excavation volumes associated with a decision to eliminate deep excavations for an underground parking structure would be expected to result in reduced remediation costs.

Next Steps

The province should be consulted to obtain guidance on a site management approach under the provincial Contaminated Sites Management Process (discussion in progress). A formal Remedial Action Plan (RAP) should be prepared and submitted to the province for their acknowledgement.

More detailed testing of new building sites is recommended to assist in preparing environmental management plans for the observed environmental impacts and in refining preliminary remediation cost estimates. Cost allowances should be identified for work that is required to develop and effectively implement the environmental management plans.

Regulatory and environmental management requirements should be revisited as more details on the proposed redevelopment become available.

Closure

The information contained in this Executive Summary represents a consolidation of information from a number of documents. The statements made in this Executive Summary are subject to the same limitations included in the source documents, and are to be read in conjunction with those documents.

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Appendix 6: Remediation Plan-Fundy Quay Redevelopment by Stantec 2016

Remediation Plan – Fundy Quay Redevelopment Site

Prepared for:
Saint John Development Corporation
1 Market Square, Suite 301
Saint John, NB
E2L 4Z6

Prepared by:
Stantec Consulting Ltd.
130 Somerset Street
Saint John, NB
E2K 2X4

121811071.206

Revision A

December 15, 2015

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LIST OF DRAWINGS

Executive Summary

Stantec Consulting Ltd. (Stantec) was commissioned by Saint John Development Corporation to prepare a Remediation Plan for the proposed Fundy Quay redevelopment project in support of an application for funding through the Federation of Canadian Municipalities (FCM) Green Municipal Fund. The Remediation Plan contains descriptions of the remediation work and outlines a series of risk management measures to address contamination associated with the site.

Saint John Development Corporation is responsible for the remediation work associated with the Fundy Quay redevelopment project. The redevelopment project will be carried out by a private developer under agreement with the Saint John Development Corporation. Some of the remediation work will occur prior to the launch of construction for the redevelopment project, while some of the remediation work will occur as construction for the redevelopment gets underway. Available concepts indicate plans to construct a number of buildings and to create public walkways and natural areas over a significant portion of the site.

A history of fires along with historical use of the land has resulted in contamination. Remedial measures will be required to protect the environment and to effectively manage the contamination under the current and foreseeable future land use. The Remediation Plan identifies measures to protect the environment and to manage the contamination in accordance with provincial standards.

Remedial repairs to the existing marine structures on the perimeter of the redevelopment site will extend their useful life and will reduce the potential for loss of backfill and subsidence. The recommended repairs provide critical infrastructure that also serves to limit the release of potentially contaminated backfill into the surrounding marine environment.

Excavations for the proposed buildings are expected to generate significant quantities of waste soil. The majority of the waste soil will be removed from the site and as such, suitable receiving facilities will need to be identified. Detailed testing and modeling are expected to provide information critical to the effective management of waste.

Available information indicates that the redevelopment work will commence in late 2016 or early 2017. Design work for the redevelopment project will take place within the year leading up to the start of construction. Construction for the redevelopment project is expected to occur over a 3 to 5 year time frame. It is understood that the time frame for construction could be shorter depending on market conditions. The remediation work will be initiated in advance of the redevelopment project with a tentative start in early 2016.

The statements made in this Executive Summary are subject to the same limitations included in the Closing and are to be read in conjunction with the remainder of the report.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was commissioned by Saint John Development Corporation to prepare a Remediation Plan for the proposed Fundy Quay redevelopment project in support of an application for funding through the Federation of Canadian Municipalities (FCM) Green Municipal Fund. The Remediation Plan contains descriptions of the remediation work and outlines a series of risk management measures to address contamination associated with the site.

> ***"The Remediation Plan contains descriptions of the remediation work and outlines a series of risk management measures..."***

Background information and details of the Remediation Plan are described herein. A summary listing of available reference materials used in the preparation of the Remediation Plan are included in Appendix A.

1.1 PURPOSE OF REPORT

The Remediation Plan report includes the following information:

- A description of the remediation project including a conceptual description of the proposed redevelopment project.
- A description of the remediation work schedule.
- A description of additional studies, design related work and environmental approvals or permits required for the remediation work.
- Opinions of probable cost (cost estimates) for planning, engineering design and construction of the remediation work.

The Remediation Plan report is based on information that is largely available from previous reports.

Saint John Development Corporation is responsible for the remediation work associated with the Fundy Quay redevelopment project. The redevelopment project will be carried out by a private developer under agreement with the Saint John Development Corporation. Some of the remediation work will occur prior to the launch of construction for the redevelopment project, while some of the remediation work will occur as construction for the redevelopment gets underway.

1.2 BACKGROUND

Saint John Development Corporation acquired the lands for the Fundy Quay redevelopment with the purpose of promoting high quality development and improving public access to the waterfront.

The Fundy Quay redevelopment site consists of a 2.4 Hectare parcel of land intended for mixed residential and commercial land use on the eastern side of the Saint John Harbour (Figure 1, Appendix B). The redevelopment will encompass the existing Water Street public parking lot and the Canadian Coast Guard (CCG) base located to the south of Market Slip (Figure 2, Appendix B).

Use of the land on which the redevelopment will occur dates back to the early 1800s when the area was infilled and wharves extended into the harbor. A number of buildings and other structures were lost to fires on more than one occasion only to be re-established. The CCG base was built in the late 1950s with construction of new wharf structures along its perimeter and infilling. While some buildings remained on the Water Street public parking lot site all buildings had been removed and parking lot improvements made by the early 1980s. The CCG base remains in operation albeit at reduced capacity due to operational changes.

> ***"Use of the land on which the redevelopment will occur dates back to the early 1800s..."***

2.0 PROJECT DESCRIPTION

2.1 CONCEPTUAL REDEVELOPMENT PLAN

Details for the redevelopment are restricted due to the confidential nature of the project at this stage in the redevelopment process. Available concepts indicate plans to construct a number of buildings and to create public walkways and natural areas over a significant portion of the site (Figure 3, Appendix A).

It is anticipated that a hotel will be constructed in the northwest corner of the site. The high-rise building will have large foundation loads that will need to be supported on deep foundations (i.e., piling). Multiple buildings that contain retail and commercial tenants will front on Water Street with some residential occupancy on upper floors. Parking for the occupants will be available within underground and above ground parking structures with access from Water Street.

"Available concepts indicate plans to construct a number of buildings and to create public walkways and natural areas…"

Redevelopment is expected to occur in a number of phases over a period of three to five years. The existing CCG buildings will be demolished in advance of the construction. Ground disturbance and excavation will be required and will be most significant where new buildings are proposed. Infilling to create relief through elevated walkways and natural areas is also anticipated.

The redevelopment is expected to improve public access and create walkways and natural areas over a large portion of the redevelopment site.

2.2 EXISTING CONDITIONS

At the present time, more than 75% of the site is covered by asphalt pavement with the majority of the remaining area being occupied by a number of CCG buildings. Public access is restricted to the Water Street public parking lot and the northern portion of the CCG Base which has been opened up for long-term public parking.

A history of fires along with historical use of the land has resulted in contamination. In some instances, spills associated with storage tanks have led to contamination.

"A history of fires along with historical use of the land has resulted in contamination…"

Petroleum contamination originating from spills of petroleum products was identified in the course of previous environmental assessment work. Petroleum hydrocarbon (PHC) contamination was found in both surface soils (<1.5 m depth) and in subsurface soils at depths ranging up to 6 m or more. In many cases, PHC concentrations appeared elevated as a result of interferences from polycyclic aromatic hydrocarbons (PAHs) with the highest PHC concentrations measured in the Water Street public parking lot. Screening of PHC concentrations against human health based screening levels revealed a number of samples exceeding criteria. Soil vapour sampling showed that the potential for intrusion of significant PHC vapour into buildings is limited under current site conditions. Relatively low PHC concentrations were identified in groundwater.

Polycyclic aromatic hydrocarbon (PAH) contamination in soil appears to be widely distributed with concentrations exceeding screening levels at depths of up to 6.6 m or more. Screening of PAH concentrations against human health based screening levels revealed a number of samples exceeding criteria. The affected areas coincide with areas that were developed prior to the early 1800s and subsequently lost to a number of fires. Both coal use and the history of fire may have led to deposition of PAHs, while creosote timber cribwork associated with wharves may also be a factor. It is expected that other properties in this area of Saint John would be characterized by similar PAH contamination as the effects of coal burning and fires would not be restricted to the Fundy Quay site alone.

"...other properties in this area of Saint John would be characterized by similar contamination ..."

Selected trace metals were also detected at concentrations exceeding screening criteria in both surface and subsurface soils, suggesting heterogeneity within the underlying soil. While specific sources of the metals cannot be confirmed, historical use of the site appears to be a contributing factor.

The presence of contamination poses potential human health and environmental risks. Human health risks can originate from exposures by direct contact and through inhalation of contaminants. Potential risks to the surrounding environment can be mitigated by restricting direct contact and discharge of contaminants.

3.0 REMEDIATION PLAN

Remedial measures will be required to protect the environment and to effectively manage the contamination under the current and foreseeable future land use. The measures will include remedial repairs to marine structures and the management of contaminated materials during redevelopment of the site.

> ***"...measures will be required to protect the environment and to effectively manage the contamination ..."***

Some of the measures will be implemented during the planning and design phases of the redevelopment project, whereas others will be implemented during construction of new buildings and other infrastructure associated with the redevelopment.

3.1 MARINE STRUCTURES REMEDIAL WORKS

The condition of the existing wharf structures on the perimeter of the CCG base varies. The structures include steel sheet piling, a concrete gravity wall and concrete cribs, all of which are more than 50 years old. Some repairs have been completed since their original installations.

Remedial repairs to the structures have been recommended to prevent further loss of backfill material and to extend their useful life (Drawing 4, Appendix A). Failure to make repairs could result in the loss of backfill, subsidence, and release of contaminants into the surrounding marine environment.

> ***"...remedial repairs to the structures have been recommended to prevent further loss of backfill material and to extend their useful life ..."***

The recommended remedial work for the existing wharf structures can be summarized as follows:

- **Construction of a new steel sheet pile (SSP) wall in front of the existing 33 m long SSP wall on the north margin.** The existing SSP wall components are corroded and the stability of the existing structure is in question.

- **Construction of a concrete (or steel sheet pile) overlay from deck level to 1 m below low water on the face of the 34 m long concrete gravity wall and crib on the north margin.** The existing shotcrete wall covering is showing signs of deterioration at construction joints and at interfaces with adjoining structures.

- **Construction of concrete overlays from deck level to 300 mm below the copewall along approximately 263 m of cribs on the west and south margins.** The existing copewall has deteriorated along the copewall/crib interfaces and at expansion joints.

- **Other repairs using formed concrete to repair crib corners, keyways and other local deterioration in concrete cribs.**

Additional repairs and longer term maintenance will be required once the immediate repairs are completed. Longer term maintenance has been identified for the 5 to 50 year time horizon but is not included in this Remediation Plan.

Detailed design and specifications have been completed tor the repairs and the intention is to complete the repairs prior to the start of the redevelopment project. The detailed design illustrates two options for the repair of the concrete gravity wall. The first option involves a concrete overlay while the second option consists ot a steel sheet pile overlay. The concrete overlay will require excavation and side casting ot sediments at the base of the existing wall whereas the steel sheet pile overlay does not.

3.2 SITE REMEDIATION

The existing contamination is not expected to pose unacceptable human health risks under the current land use and exposure conditions. Remedial measures will however be required to manage contamination under the proposed redevelopment scheme.

> ***"...remediation of all contamination is considered to be impractical and cost prohibitive..."***

The remediation of all contamination is considered to be impractical and cost prohibitive. In this instance, risk management measures are recommended and will include:

- **Development and implementation of a Waste Management Plan (WMP) for the management of excavated contaminated soil and dewatering operations during construction.** The excavations for the buildings are expected to generate significant quantities of waste. Waste materials may be contaminated with PHCs, PAHs and metals. Testing in advance of construction will assist in identifying opportunities for re-use, disposal, treatment or recycling.

- **Maintenance of surface cover during the lifecycle of the proposed redevelopment.** Maintenance of cover over residual contamination is required pursuant to the "conditional closure" for the New Brunswick Department of Environment and Local Government (NBDELG) remediation file. Temporary cover may be required during construction. Designs for new buildings and other infrastructure will need to maintain cover over contaminated material to restrict direct contact.

3.2.1 Waste Management Plan

Ground disturbance and excavations for the construction of buildings and other infrastructure will be completed during the redevelopment project. The excavations for the buildings are expected to generate in the range of 38,000 cubic metres of waste soil. Demolition of existing buildings will generate additional waste which has not been included in this Remediation Plan.

> ***"…excavations for the buildings are expected to generate in the range of 38,000 cubic metres of waste…"***

A Waste Management Plan (WMP) will be developed for the management of excavated contaminated soil and dewatering operations during construction. It is anticipated that the plan will assist in classifying the waste in advance of the construction. Once classified, opportunities for on-site re-use and off-site disposal, treatment or recycling can be identified.

The WMP can be integrated into specifications and contract documents that the developer will prepare for the redevelopment project.

3.2.1.1 Waste Characterization

The remediation plan contemplates detailed sampling and testing of soil and groundwater contamination in advance of construction. An opportunity also exists to complete the testing before design work has been completed with a view to facilitate sustainable design (i.e., diversion or reduction of waste).

Sampling and testing of soil and groundwater contamination would involve intrusive investigation through drilling of boreholes and installation of monitoring wells (Table 1). The depths of investigations are influenced by the depths of the excavations for the proposed buildings. In this case extending boreholes to depths up to 6 m is contemplated. Considering the scale of excavations for buildings, a relatively large number of boreholes are recommended.

Table 1 Sampling Locations

Item	Area (m^2)	Coverage (boreholes / wells per unit area)	Approximate Number of Sample Locations
Buildings	12,500	1 borehole / 625 m^2	20
Walkways and Natural Areas	12,000	1 borehole / 1,250 m^2	10

Sampling and testing of the areas proposed for construction of walkways and natural areas has been included. The coverage of testing in these areas is reduced relative to areas where buildings are proposed. The analytical program proposed in connection with the Waste Management Plan is summarized in Table 2. The analytical program makes provision for analysis of approximately 50% of the samples recovered from intrusive investigations.

Table 2 Analytical Program

Media	Number of Samples – Analytical Parameters				
	PHC	PAH	Metals	PCB	VOC
Soil	150	150	150	15	15
Groundwater	40	0	0	0	0

Notes:
PHC – Petroleum hydrocarbons
PAH – Polycyclic aromatic hydrocarbons
PCB – Polychlorinated biphenyls
VOC – Volatile organic compounds

The results of the testing are expected to provide information necessary to characterize soil and groundwater that will be uncovered in future excavations. The results will be used to establish plans for waste management, environmental protection and construction monitoring.

The scale of the sampling and testing program is expected to provide a reasonable understanding of the range of conditions and the potential for variability.

3.2.1.2 Waste Modeling

The results of the detailed testing for soil will be assembled into a block model to illustrate the results in 3D and to apportion excavation wastes into waste classifications for the purposes of re-use, disposal, treatment or recycling. The 3D model can be used to visualize the areas with higher concentrations of contaminants, both in the soil that is to remain at the site, as well as in the areas to be excavated. Visual animations and figures that illustrate the distribution of contaminants in the subsurface will be prepared.

> ***"…results of the testing will be used to establish plans for waste management…"***

3.2.1.3 Waste Contaminated Soil

Excavations for the construction of buildings will be completed in four distinct areas (Drawing 4, Appendix B). Preliminary estimates on the excavation volumes required to construct foundations and underground structures are summarized in Table 3. Excavation volumes will need to be revisited as design information for the redevelopment project becomes available.

> ***"Excavations for the construction of buildings will be completed in four distinct areas …"***

Table 3 Building Areas and Excavation Volumes

Item	Building Area (m²)	Excavation Depth (m)[1]	Excavation Volume (m³)
Buildings	Area #1 = 3,200 (northwest)	1.8	6,000
	Area #2 = 2,400 (north Water Street)	3.3	8,200
	Area #3 = 3,900 (central Water Street)	3.3	13,300
	Area #4 = 3,000 (south Water Street)	3.3	10,300
Total	12,500	-	37,800

Notes:
1 – Excavation depths include provision for placement of 0.3 m thick layer of clean granular fill material below new buildings.

A nominal depth of excavation of 1.8 m has been identified for building area #1 as no plans for underground structures have been identified. A 3.3 m depth of excavation was identified for building areas #2, #3 and #4 on the basis that underground parking structures will be incorporated into the buildings that front on Water Street. It is understood that the parking structures may remain partially above grade with some infilling for the walkways and natural areas located to the west. Re-use of some excavated material as infill could result in an overall reduction in waste soil volumes. Some of the excavation material from the Water Street public parking lot may not be suitable for re-use based on the heterogeneity and presence of debris.

Due to a relatively shallow water table, excavations below 3 m depth in the area of Water Street may require dewatering. Precipitation, tides, storm surge and sea level rise could result in shallower water levels and require dewatering.

> ***"…contamination and debris in excavated soil could limit or restrict on-site re-use and off-site disposal …"***

The presence of contamination and debris in excavated soil could limit or restrict on-site re-use and off-site disposal of soil generated from the excavation activity. Bricks, wood and other debris and timber cribbing may require separation at source and off-site disposal at approved waste disposal facilities. Shallow soils on the CCG base appear to consist of more recent "good quality" granular fill and as such, may offer the best opportunity for re-use.

Controls may be required for re-use of excavated material on-site whereby these controls limit direct contact with contamination (i.e., clean soil cover, asphalt pavement, etc.).

3.2.1.4 Waste Contaminated Groundwater

No specific requirements have been identified for the management of contaminated groundwater. Petroleum hydrocarbons have been observed in groundwater albeit at relatively low concentrations.

On the assumption that excavations will not be deep enough to intersect the water table, storage and handling of large quantities of contaminated groundwater, such as may be associated with dewatering, is not anticipated. Underground storage tanks and other structures may contain water and other liquids that will need to be handled appropriately as these facilities are decommissioned.

There is an opportunity to review groundwater contamination in more detail as results for the sampling and testing become available. Further review of groundwater conditions and dewatering will be required as the design evolves.

"Further review of groundwater conditions and dewatering will be required..."

Controls may be needed to manage groundwater that is removed from any excavation during construction. Discharge of groundwater from excavations into sewers or the marine environment may not be acceptable given the potential for contamination of groundwater.

3.2.1.5 Underground Storage Tank Sites

Four existing and former underground storage tank sites have been identified on the CCG base (Drawing 2, Appendix B). Although other storage tanks are believed to have been associated with historical use of the properties located within the Water Street public parking lot, no tanks are known to remain.

Available information for the storage tank sites on the CCG base revealed limited information on contamination. Some contamination near the tank sites appears to be deep and may be associated with contamination from fires or other sources. Preliminary estimates on potential excavation volumes associated with removal of soil surrounding the tank sites are summarized in Table 4.

Table 4 Storage Tank Sites and Excavation Volumes

Item	Area (m^2)	Excavation Depth (m)	Excavation Volume (m^3)
Shop Building (O/W separator)	100	3	300
Buoy Shed (former USTs)	225	3	675
Helicopter Pad (former UST)	None identified	None identified	None identified
Emergency Hangar (O/W separator and former UST)	100	3	300
Total	-	-	**1,275**

The storage tank site for the Emergency Hangar is within the footprint of the excavation for building Area #4. The remaining storage tank sites are located within the area planned for public walkways and natural areas. Excavation of contaminated soil from active tank sites could be completed during decommissioning of the tanks.

Provided there are no changes from the current exposure conditions, no requirements for remediation have been identified for the individual storage tank sites. In any event, the potential excavation volumes of soil for each tank site are small relative to the excavation volumes being considered for the construction of new buildings.

"…no requirements for remediation have been identified for the individual storage tank sites …"

3.2.2 Maintenance of Surface Cover

Removal of the existing surface cover and other structures during the construction could uncover soil contaminated with PHCs, PAHs and metals. Worker protection and temporary cover may be required to restrict direct contact with contaminated soils during construction.

Final surface cover for the redevelopment project may include asphalt and concrete pavements, other hard surfaces and landscaping. Cover details will need to be confirmed as design information for the redevelopment project becomes available. Suitable cover will need to be maintained over contaminated soil over the lifecycle of the redevelopment project.

"A layer of clean granular soil will provide a suitable barrier …"

3.2.2.1 Soil Cover

A layer of clean granular soil will provide a suitable barrier to restrict direct contact with contaminated soils. Other materials can also be used for cover. Soil cover may be placed as a temporary measure during construction and ultimately integrated into the final construction. Future building sites may also require limited cover and are included in Table 5.

Table 5 Soil Cover Areas and Volumes

Item	Area (m^2)	Cover Thickness (m)	Cover Volume (m^3)
Buildings^1	12,500	0.5	6,250
Walkways and Natural Areas^2	12,000	1	12,000

Notes:
1 – Foundations constructed on soil contaminated with petroleum hydrocarbons should have a minimum of 0.3 m thick layer of clean granular fill material below the foundation.
2 – Requirements for cover material may be established based on results of testing and design.

The inclusion of soil cover material in the Remediation Plan is provisional and will need to be confirmed as design information for the redevelopment project becomes available.

Specifications for soil cover or other alternatives can be integrated into the Environmental Protection Plan or other contract documents that the developer will prepare for the redevelopment project.

3.2.2.2 Dust and Vapour Suppression

Vapour suppressing foam may be used to reduce dust and vapour emissions associated with excavations during construction. Vapours or odours may be apparent in ambient air during excavation work given the occurrence of petroleum contamination, creosoted timbers and fire debris. Vapour suppressing foams have been used to provide short and long term control for dust and vapour emissions in remediation and waste management applications.

"Vapour suppressing foam may be used to reduce dust and vapour emissions …"

The principal areas where dust and vapour suppression techniques may be used coincide with the locations of new buildings where relatively large excavations are anticipated (Table 6). Deeper excavations in the area of the Water Street public parking lot have a higher potential to uncover contamination and debris than shallow excavations within the limits of the CCG base.

The inclusion of vapour-suppression foam in the Remediation Plan is provisional. Requirements and any benefits for use will need to be confirmed as design information for the redevelopment project becomes available. Air monitoring results during construction could influence the use of vapour-suppression foam.

Table 6 Dust and Vapour Suppression Zones

Item	Area (m^2)	Equivalent Excavation Area (m^2)
Buildings	12,500	25,000[1]
Walkways and Natural Areas	None identified	None identified

Notes:
1 – Includes coverage for side slopes and repeat applications.

Specifications for vapour-suppression foam or other alternatives can be integrated into the Environmental Protection Plan or other contract documents that the developer will prepare for the redevelopment project.

3.3 ENVIRONMENTAL PROTECTION PLAN

An Environmental Protection Plan (EPP) will be prepared to establish environmental protection measures and operational procedures to be implemented for the project. Implementation of the EPP will serve to mitigate potential environmental effects during construction. Procedures will promote regulatory compliance and be based on best management practice in providing environmental protection. Contingency plans will be required to address non-compliance and unplanned events.

"…the EPP will serve to mitigate potential environmental effects during construction."

The EPP will include:

- Environmental protection procedures and mitigation measures;
- Environmental monitoring and inspection requirements including schedules;
- Contingency plans; and,
- Environmental approvals and permits including regulatory conditions.

Construction oversight and environmental monitoring will ensure that procedures and mitigation measures are effective. Moreover, changes in anticipated conditions can be recognized early and mitigated in a timely fashion.

The EPP can be integrated into specifications and contract documents that the developer will prepare for the redevelopment project.

3.3.1 Monitoring and Health & Safety Plans

A monitoring plan will be included in the EPP. The plan will be designed to assess the effectiveness of the prescribed mitigation and to demonstrate regulatory compliance. The plan may include monitoring of soil, groundwater, surface water and air.

Health and safety plans will also be prepared to describe potential on-site safety and health hazards, along with operational procedures to be implemented for the project. The responsibilities for health and safety plans will rest with those that are contracted to complete work.

3.4 BENEFITS & RISKS

The Remediation Plan identifies measures to protect the environment and to manage the contamination in accordance with provincial standards. The measures will include remedial repairs to marine structures prior to commencement of the redevelopment project. Implementation of the remediation measures and the Environmental Protection Plan will ensure that appropriate management plans are in place and remediation goals will be met.

"The Remediation Plan identifies measures to... manage the contamination in accordance with provincial standards."

3.4.1 Environmental Benefits

Redevelopment of the site for the proposed mixed commercial and residential use will transform the property relative to its current condition. Large areas of the site that are currently paved will be landscaped and the public will have access to walkways and natural areas.

Remedial repairs to marine structures on the perimeter will extend their useful life and will reduce the potential for loss of backfill and subsidence. The recommended repairs provide critical infrastructure that also serves to limit the release of potentially contaminated backfill into the surrounding marine environment.

Soil and groundwater contamination will be managed using risk management measures rather than remediating to generic screening levels. Remediation to generic screening levels would be impractical as well as cost prohibitive.

Excavations for the proposed buildings are expected to generate significant quantities of waste soil (Table 7). The majority of the waste soil will be removed from the site and as such, suitable receiving facilities will need to be identified. Detailed testing and modeling are expected to provide information critical to the effective management of waste. Subject to the results of the detailed testing, the following waste management measures are anticipated:

- Off-site management of excavated soils by either disposal, treatment or recycling at approved facilities; or
- On-site re-use of some soils as part of infilling for the raised "natural areas".

"On-site re-use of some of the excavated soil presents a potential opportunity for cost savings"

On-site re-use of some of the excavated soil presents a potential opportunity for cost savings. The potential for this type of opportunity to be realized will be supported once detailed soil testing results are available.

Table 7 Soil Remediation Summary

Contamination Zone	Surface Area of Zone (m²)	Pollutant of Concern	Anticipated Volume of Contamination (m³)	Level of Remediation Required	Type of Remediation Activity
Building Area #1 (northwest)	3,200	Petroleum hydrocarbons (PHC) Polycyclic aromatic hydrocarbons (PAH) Metals	6,000	PHC – Atlantic PIRI RBCA RBSLs/PSSLs/ SSTLs/ESLs PAH – CCME SQG, Alberta ENV Tier I SQG, Ontario MOE WQG Metals – CCME SQG, Ontario MOE SQG, Alberta ENV Tier 1 SQG, USEPA SQG	Off-site management of excavated soils (disposal, treatment or recycling) Note: On-site re-use of some soils may be possible, if integrated into the design of the raised "natural areas" Maintenance of surface cover required to restrict direct contact (per Conditional Closure).
Building Area #2 (north Water Street)	2,400		8,200		
Building Area #3 (central Water Street)	3,900		13,300		
Building Area #4 (south Water Street)	3,000		10,300		
Shop Building (O/W separator)	100		300		
Buoy Shed (former USTs)	225		675		
Emergency Hanger (O/W separator / former UST)	100		300		

Notes:
Atlantic PIRI – Atlantic Partners in RBCA Implementation
CCME – Canadian Council of Ministers of the Environment
Alberta ENV – Alberta Environment
Ontario MOE – Ontario Ministry of Environment
USEPA – United States Environmental Protection Agency

Due to the presence of contamination, some restrictions for re-use and off-site disposal are anticipated. It is expected that a large percentage of the waste soil will be transported off-site for disposal, treatment or recycling at one or more provincially approved facilities in the region.

3.4.2 Environmental Risks

Redevelopment of the site has the potential to cause interactions between construction activities and the surrounding environment. Repairs to the wharf structures and other remediation work have the potential to affect project workers and the surrounding environment. Potential adverse effects could originate from:

- Contact with contamination that may be uncovered in the course of construction activities; and,
- Escape or release of contaminants to land, water and/or air.

Environmental protection procedures along with construction oversight and monitoring will be used to reduce the likelihood and severity of any effects. The health and safety of workers will be managed through health and safety programs established for the construction.

3.4.3 Other Risks

The scope and estimated costs for the remediation work have been derived from the available information, including available conceptual details for the proposed redevelopment project. There is an expectation that the Remediation Plan will evolve as progress is made and more details on the redevelopment project become available.

The scope of the remedial repairs to the marine structures has been defined and this work will be completed in advance of the redevelopment project. There is a need to ensure coordination of other remediation work within the broader redevelopment project.

Potential risks for successful implementation of the remediation work include:

- The redevelopment project schedule is advanced by the developer and as a result, the remediation work must be fast-tracked.
- Changes to the building locations and resulting excavations require additional testing be completed for the purposes of classifying waste.
- Larger buildings or deeper excavations generate larger quantities of waste that will need to be managed.
- Market conditions and bidding impact pricing and the overall cost of the remediation work.
- Unanticipated conditions are observed during construction resulting in time delays.

- Construction activity causes adverse effects and additional mitigation is required.

3.5 REGULATORY REQUIREMENTS

3.5.1 Contaminated Site Management

A Remediation Sites Management System (RSMS) file was opened by the New Brunswick Department of Environment and Local Government (NBDELG) in May 2013 following the submission of the Phase III Environmental Site Assessment report. A Closure Report was prepared following completion of additional assessment work and was submitted to NBDELG in September 2015 to fulfill requirements under the New Brunswick *Guideline for the Management of Contaminated Sites* (NB Guideline). NBDELG has since processed the closure submission and provided an Acknowledgement of Receipt in November 2015 (refer to Appendix C).

3.5.2 Environmental Approvals and Permits

The Environmental Assessment Section of NBDELG has concluded that the proposed redevelopment project does not require an Environmental Impact Assessment (EIA) Registration and review pursuant to the NB EIA Regulation (refer to correspondence from D. Maguire, NBDELG in Appendix C). Similarly, no Watercourse and Wetland Alteration (WAWA) permit would be required as the location of the project is downstream of the Reversing Falls.

The Fisheries Protection Program with the Department of Fisheries and Oceans (DFO) has reviewed the proposed repairs to the marine structures to determine whether the work is likely to result in serious harm to fish. They recommended a number of mitigation measures to avoid serious harm to fish and their habitat. Notification of project commencement is required at least 48 hours before the start of the work (refer to Request for Review and correspondence from F. Plante, DFO in Appendix C).

The Environmental Stewardship Branch of Environment Canada has also considered the proposed remedial repairs under the Disposal at Sea Regulations given the potential excavation of sediments for repairs to the marine structures. Environment Canada concluded that provided side casting of sediment is completed by equipment located on the wharf, the proposed excavation activities are considered to be land-based and as such, Disposal at Sea Regulations do not apply (refer to correspondence from J. Roma, EC in Appendix C).

The Canadian Environmental Assessment Agency (CEAA) reviewed the proposed repairs to the marine structures and reported that the repair project is not a designated physical activity under the *Canadian Environmental Assessment Act* (2012). As a result, there is no requirement to submit a Project Description to CEAA (refer to correspondence from J. Vigder, CEAA in Appendix C).

A Notice of Works Form under the Navigation Protection Act has been submitted to Transport Canada for review of the proposed repairs to the marine structures. The proposed repairs are not expected to have any impact on navigation within Saint John Harbour. Transport Canada had confirmed receipt and was reviewing the submission at the time of this report (refer to Notice of Works Form in Appendix C).

3.6 CONSTRUCTION COSTS

Our opinions of probable cost for the remediation work, in 2015 dollars (excluding applicable taxes), are shown in Table 8.

Table 8 Opinions of Probable Cost

Item	Description	Opinion of Probable Cost (excluding HST)
1	**Marine Structures Remedial Repairs**	**$3,700,000**
	Construction (including 20% contingency)[1]	$3,500,000
	Project management, engineering & construction management[2]	$200,000
2	**Site Remediation**	**$8,500,000**
	Construction (including 10% contingency)[3]	$7,600,000
	Project management, engineering & construction management[4]	$900,000
Total Remediation Plan Cost (excluding HST)		**$12,200,000**

Notes:

1 – Construction cost presented in *Canadian Coast Guard Base Wharf - Saint John, Visual Assessment of Structural Integrity Report*, **exp** Services Inc., 2012.

2 – Includes cost allowances for Project management, tendering administration, and engineering and construction oversight.

3 – Includes cost allowances for transport & disposal of contaminated soil (~$75/tonne), supply & placement of clean cover soil ($15/tonne), supply & application of vapour suppressing foam ($15/m²), and other miscellaneous work items.

4 – Includes cost allowances for Project management, engineering services for the Waste Management Plan & Environmental Protection Plan, engineering & construction oversight, and monitoring.

The basis for the estimate has been described in the preceding sections of the Remediation Plan. Additional details are available on request.

The estimated cost of a project is based on a specific scope of work and on known or assumed conditions at the time of estimate development. Changes in scope or deviations from these assumptions may reduce the accuracy of the estimate or render the estimate invalid. The basis of the estimate is dynamic and generally evolves over the course of the project.

4.0 RECOMMENDATIONS

4.1 IMPLEMENTATION

Available information indicates that the redevelopment work will commence in late 2016 or early 2017. Design work for the redevelopment project will take place within the year leading up to the start of construction. Construction for the redevelopment project is expected to occur over a 3 to 5 year time frame. It is understood that the time frame for construction could be shorter depending on market conditions.

The remediation work will be initiated in advance of the redevelopment project with a tentative start in Q1 2016. Given the nature of the remedial repairs for the marine structures and the advanced state of design, it is expected that the work can be initiated with a relatively short lead time. Planning for the site remediation work, including the development of the Waste Management Plan and the Environmental Protection Plan can also be implemented with limited lead time.

4.2 SCHEDULE & PHASING

The phasing and scheduling for the site remediation work is presented in Tables 9 and 10.

Table 9 Schedule - Wharf Structure Remedial Repairs

Phase		**Schedule**								
		2016				**2017**	**2018**	**2019**	**2020**	**2021**
		Q1	**Q2**	**Q3**	**Q4**					
Planning	Tendering & award	√								
Construction	Construction (wharf repairs)		√	√	√					
	Construction oversight / monitoring		√	√	√					

Table 10 Schedule - Site Remediation

Phase		Schedule								
		2016				2017	2018	2019	2020	2021
		Q1	Q2	Q3	Q4					
Planning	Waste characterization	√								
	Waste modeling		√							
	Waste Management Plan		√	√	√					
	Environmental Protection Plan	√	√	√	√					
Construction	Construction (excavations)					√	√	√	√	√
	Construction oversight / monitoring				√	√	√	√	√	√

4.3 ADDITIONAL STUDIES

4.3.1 Marine Structures Remedial Works

The method of repair for the concrete gravity wall will need to be selected once bids are received for the repair work. The steel sheet pile overlay option appears attractive relative to the concrete overlay option as no excavation and side casting of sediments is expected to be required. Excavation and side casting of sediments could have a short term impact on water quality.

4.3.2 Site Remediation

The following studies or plans will be required in connection with the remediation work:

- Sampling and testing of soil and groundwater for the purpose of characterizing potential wastes.
- Development of a Waste Management Plan for the purpose of classifying potential wastes and identifying opportunities for re-use, disposal, treatment or recycling.

- Development of an Environmental Protection Plan, including environmental monitoring and contingency plans.
- Decommissioning of monitoring wells at the point in time when the monitoring wells are no longer required.

4.3.3 Permits and Approvals

The following permits, approvals and notifications will be required in connection with the remediation work:

- A building permit from the City of Saint John for the proposed remedial repairs to the wharf structures.
- Implementation of mitigation pursuant to the DFO recommendations for the remedial repairs to the wharf structures. Notification of project commencement is also required at least 48 hours before the start of the remedial work.
- Permits as may be required from the Port of Saint John. The Port of Saint John has been notified of the proposed remedial repairs to the wharf structures and was reviewing the work with Transport Canada at the time of this report.
- Engagement of NBDELG's Remediation and Materials Management Section as the remediation and redevelopment project evolves.

5.0 CLOSING

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

This report provides a limited evaluation and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

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

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

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec requests that this information be brought to our attention.

Appendix A

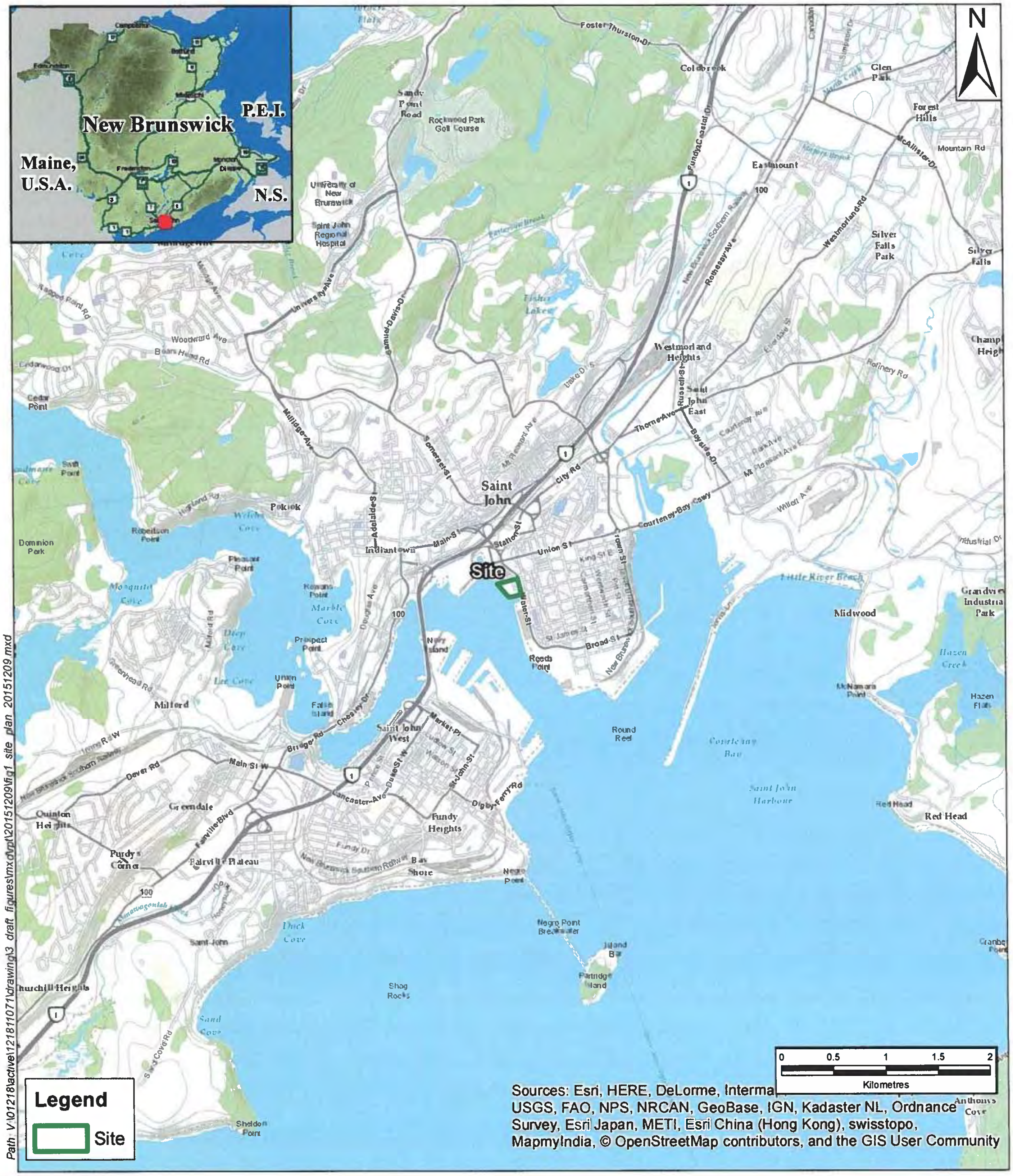
List of References

List of References

1. Phase I Environmental Site Assessment, Coast Guard Facility, Peter's Wharf, Saint John, NB. Jacques Whitford Environment Limited for Public Works and Government Services Canada, June 18, 2001.
2. Phase II Environmental Site Assessment, Saint John Coast Guard Base, Saint John, New Brunswick. Jacques Whitford Environment Limited for Public Works and Government Services Canada, March 25, 2002.
3. Limited Environmental Investigation, Canadian Coast Guard Base, Saint John, New Brunswick. Dillon Consulting for Conquest Engineering Limited, April 27, 2006.
4. Phase I Environmental Site Assessment, Canadian Coast Guard Terminal Commercial Parking Lot Site, 2 Peter's Wharf, Saint John, NB. Stantec Consulting Ltd. for Saint John Development Corporation, September 20, 2010.
5. Visual Assessment of Structural Integrity Report, Canadian Coast Guard Base Wharf - Saint John. **exp** Services Inc. for Saint John Development Corporation, 2012.
6. Phase III Environmental Site Assessment Report. Fundy Quay Development, Saint John, New Brunswick, Stantec Consulting Ltd. for Saint John Development Corporation, March 28, 2013.
7. Marine Structures Remedial Works Drawings, Fundy Quay, Saint John, NB. **exp** Services Inc. for Saint John Development Corporation, 2014.
8. Closure Report, Fundy Quay Development Site, Saint John, New Brunswick, Stantec Consulting Ltd. for Saint John Development Corporation, July 28, 2015.

Appendix B

Drawings



Sources: Esri, HERE, DeLorme, Intermap, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Path: V:\01218\active\121811071\drawing\3_draft_figures\mxd\rpt\20151209\fig1_site_plan_20151209.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Site Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:50,000

Project No.: 121811071

Date: (dd/mm/yyyy) 09/12/2015

Dwn. By: JAB

Appd. By: RSF

Data Sources: ESRI ArcGIS Online SNB

Dwg. No.: 1

Stantec

Stantec Consulting Ltd. © 2015

Map: NAD83 CSRS NB Double Stereographic

Path: V:\01218\active\121811071\drawing\ draft figures\mxd\ \20151209\Fi 2 Subject Surrounding Properties.mxd

NOTE THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Subject and Surrounding Properties Saint John, N.B.	Scale: 1:1,500	Project No.: 121811071		Data Sources: SNB ArcGIS Online Bing Imagery	Dwg. No.: 2
	Date: (dd/mm/yyyy): 09/12/2015	Fig. By: JAB	Appd. By: RSF		Stantec
Client: Saint John Development Corporation					

Stantec Consulting Ltd. © 2015

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Conceptual Redevelopment Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale	Project No.	Data Sources	Dwg. No.
1:1,000	121811071	SNB ArcGIS Online Bing Imagery Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation	3

Date (dd/mm/yyyy)	Fig. By	Appd. By
09/12/2015	CP	RSF

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Path: V:\01\18\active\121811071\drawing\3 draft figures\mxd\p\20151209\f Site Remediation Plan.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Site Remediation Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,000	Project No. 121811071		Data Sources: SNB ArcGIS Online Bing Imagery Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation	Dwg. No. 4
Date (dd/mm/yyyy) 09/12/2015	Fig. By CP	Appd. By RSF		

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

Appendix C

Environmental Approvals and Permits

New Nouveau
Brunswick
CANADA

November 16, 2015

DELG File # 6515-4-1221

Kent MacIntyre
City of Saint John
c/o Saint John Development Corporation
PO Box 1971 Stn Main
Saint John, NB E2L 4L1

Mr. MacIntyre:

Subject: Acknowledgment of Receipt, Fundy Quay Development Site, Water Street, Saint John, NB (PIDs #55209159, 55209167, 55011894, 55221881, 55221907 and 55221899)

The purpose of this letter is to inform you, the Responsible Party, that the revised Closure Report and Record of Site Condition (dated July 28th, 2015), as prepared by Robert S. Fiander of Stantec Consulting Ltd., on your behalf, have been received by the Department of Environment and Local Government (DELG).

These documents have been processed to ensure consistency with the Management Process as outlined in the current version of the ***Guideline for the Management of Contaminated Sites*** and have been found to meet requirements. The site has been evaluated and/or remediated to a degree acceptable to the Minister based upon the conclusions and opinions of the Site Professional, as stated in the Closure Report and Record of Site Condition. Notwithstanding this, the Minister reserves the right to reevaluate the site should there be an increase in contamination or a change in site conditions, activities, or circumstances which may pose a risk to human health or the environment.

The Minister has not supervised the work undertaken at the site and therefore does not assume any responsibility or liability for this work. Furthermore, the Minister is not responsible for notifying present or future site owners/occupants of the work completed. Any persons intending to purchase or occupy property should make their own independent determination of the environmental condition and the extent of liability, which may arise from taking ownership or occupancy.

This Acknowledgement of Receipt officially completes the Management Process.

As the Responsible Party, you are required to ensure that the Site Professional decommissions any monitoring wells, if present, as per DELG requirements. The Site Professional must also submit written confirmation to this Department upon completion of this action.

Should you require further assistance, please contact the Department at (506) 658-2558.

Minister
Environment and Local Government

C. Samantha Sutherland, DELG Remediation Administrator, Impact Management Branch
Robert S. Fiander, P.Eng., Stantec Consulting Ltd., Saint John, NB
City of Saint John (c/o Commissioner, Transportation & Environment)

Enc. (Record of Site Condition)

RECORD OF SITE CONDITION

File: 6515 - 4 - 1221

Site Information

Site Address: Water Street, Saint John, New Brunswick

	PID(s)	GPS Coordinates of center: (deg/min/sec)	Lat.		Long.	
Source Area PID(s):	55221881		45 ° 16 ' 20.7 "		66 ° 3 ' 47.9 "	
	55011894		45 ° 16 ' 19.3 "		66 ° 3 ' 47.3 "	
	55221907		45.0 ° 16.0 ' 17.9 "		66 ° 3 ' 47.0 "	
3rd Party PID(s):	55174775		45 ° 16 ' 19.5 "		66 ° 3 ' 46.1 "	
			° ' "		° ' "	
			° ' "		° ' "	
			° ' "		° ' "	

☑ Check box for additional PIDs and complete Page 2 of the form

Site Plan

Check the appropriate boxes and attach a site plan* (8 ½" x 11") showing:

- ☑ the entire site (any property that has been assessed for the purposes of site closure)
- ☑ the portion of the site (any portion of any property that has been assessed for the purposes of site closure)
- ☑ the limits of any required controls for conditional site closure

** Refer to "Instructions for completing the Record of Site Condition (RSC) Version 3.0"*

Closure Documentation

The following Closure Report pertaining to the site referenced above has been prepared by and/or overseen by the Site Professional:

Title: Closure Report, Fundy Quay Development Site

Company Name: Stantec Consulting Ltd.

Date: 28/07/2015 (dd/mm/yyyy)

Land Use

Based on the results of the site assessment, the following properties (or portions thereof) are suitable for the following current or reasonably foreseeable future site activities:

Source PID(s)	Land Use:		If site closure is conditional, check box and describe site specific engineered or institutional controls
55221881	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
55011894	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
55221907	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
3rd Party PID(s)			
55174775	Commercial	☐	
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	

Summary Statement of Site Professional

By signing, dating, and affixing a Professional Seal, I certify that the site as described in this Record of Site Condition and the referenced Closure Report was managed in accordance with the current version of the New Brunswick Department of Environment and Local Government Guideline for the Management of Contaminated Sites, and that the level of impacts remaining on the site will not adversely affect human health or the environment.

Company: Stantec Consulting Ltd.

Address: 130 Somerset Street, Saint John, NB E2K 2X4

Date: 28/07/2015

REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
#3627
R. S. Fiander
Signature
28 JULY 2015
Date
Province du Nouveau-Brunswick
INGÉNIEUR IMMATRICULÉ

Professional Seal

Version 3.0 May 2015

RECORD OF SITE CONDITION

File: 6515 - 4 - 1221

Site Information

Source Area PID(s):	GPS Coordinates of center: (deg/min/sec)	Lat. °	'	"	Long. °	'	"
55209167		45	16	17.2	66	3	49.4
55221899		45	16	19.1	66	3	48.5
55209159		45.0	16.0	19.2	66	3	52.7

3rd Party PID(s):

GPS Coordinates of center: (deg/min/sec) Lat. ° ' " Long. ° ' "

Land Use

If site closure is conditional, check box and describe site specific engineered or institutional controls

Source PID(s)	Land Use:		
55209167	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
55221899	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
55209159	Residential	☑	Maintain cover suitable to restrict direct contact with impacted soil
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	

3rd Party PID(s)			
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	
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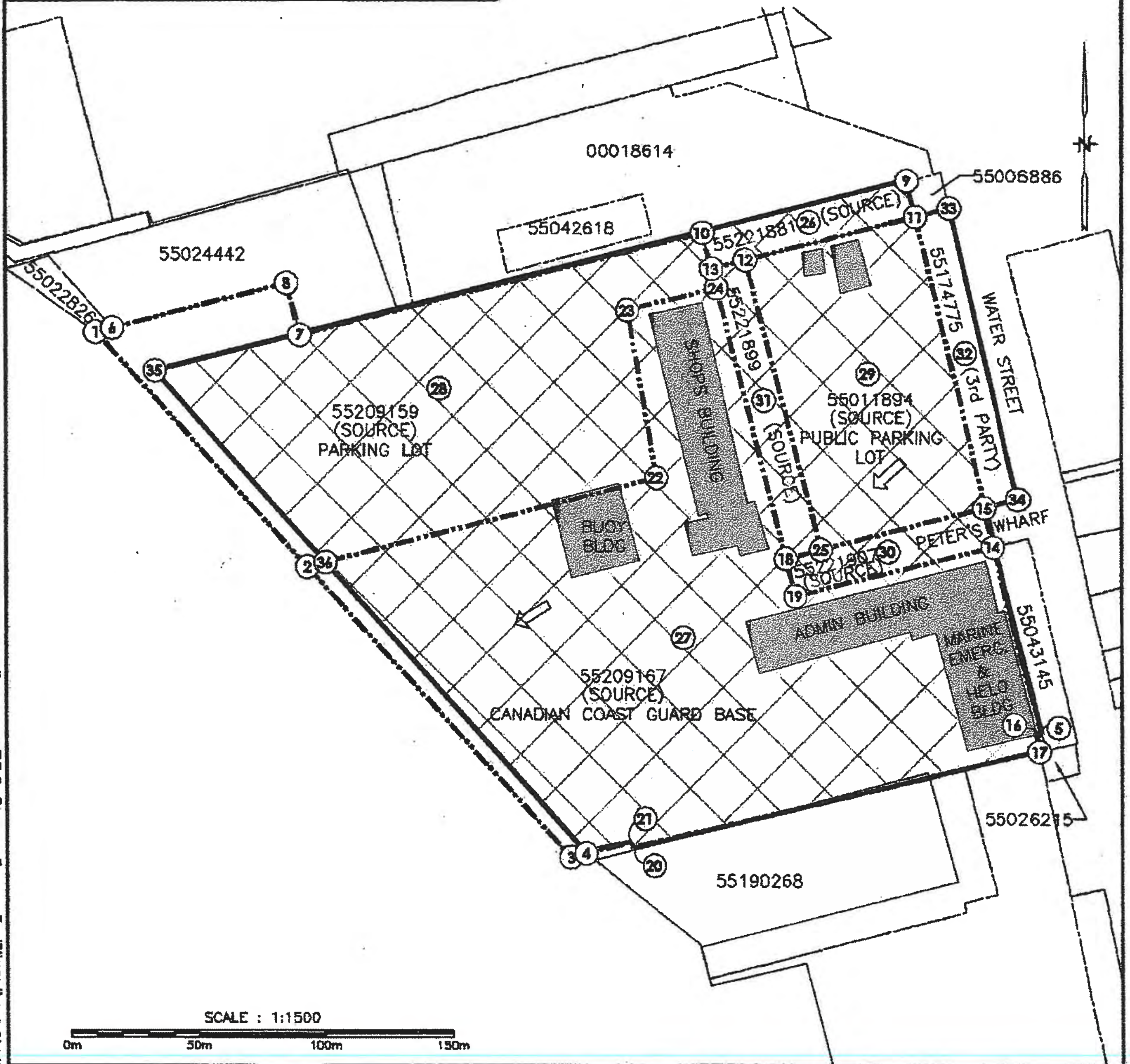
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	
	- Select One -	☐	

LEGEND

- —··— SUBJECT PROPERTY BOUNDARY AND ASSESSED AREA
- ━━ ASSESSED AREA
- —— OTHER PROPERTY BOUNDARY
- ▨ LIMITS OF CONTROL (MAINTAIN COVER SUITABLE TO RESTRICT DIRECT CONTACT WITH IMPACTED SOIL)
- ⇦ SURFACE SLOPE DIRECTION

NOTES:

1. PROPERTY BOUNDARIES ARE FROM SNB's REAL PROPERTY MAP DATABASE AND ARE APPROXIMATE.



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

SITE PLAN
CLOSURE REPORT
FUNDY QUAY DEVELOPMENT SITE
NBDELG FILE: 6515-4-1221

Client: SAINT JOHN DEVELOPMENT CORPORATION

Job No.: 121811071
Scale: 1 : 1500
Date: 22-JUL-2015
Dwn. By: JCB
App'd By: RSF

Dwg. No.: 11

Stantec

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Coordinate System Used: NAD83 (CSRS)		
Point #	**Latitude**	**Longitude**
1	45° 16' 19.269" N	66° 3' 56.597" W
8	45° 16' 17.860" N	66° 3' 54.064" W
8	45° 16' 15.391" N	66° 3' 50.932' W
4	45° 16' 15.423" N	66° 3' 50.746" W
6	45° 16' 16.265" N	66° 3' 45.282" W
6	45° 16' 19.892" N	66° 3' 56.397" W
7	45° 16' 19.820" N	66° 3' 54.132' W
8	45° 16' 20.262" N	66° 3' 54.286" W
8	45° 16' 21.359" N	66° 3' 46.564" W
10	45° 16' 20.668" N	66° 3' 49.281" W
11	45° 16' 20.794" N	66° 3' 46.715' W
12	45° 16' 20.436" N	66° 3' 48.771" W
17	45° 16' 20.367" N	66° 3' 49.175' W
14	45° 16' 17.999" N	66° 3' 45.810" W
15	45° 16' 18.331" N	66° 3' 45.915" W
16	45° 16' 16.414" N	66° 3' 45.258" W
17	45° 16' 16.278" N	66° 3' 45.211" W
18	45° 16' 17.909" N	66° 3' 48.311" W
16	45° 16' 17.593" N	66° 3' 48.201" W
20	45° 16' 15.473" N	66° 3' 50.176" W
28	45° 16' 15.513" N	66° 3' 50.224' W
22	45° 16' 18.601" N	66° 3' 49.858' W
23	45° 16' 20.016" N	66° 3' 50.192' W
24	45° 16' 20.203" N	66° 3' 49.117" W
25	45° 16' 17.984" N	66° 3' 47.886" W
26	45° 16' 20.732" N	66° 3' 47.995' W
27	45° 16' 17.265" N	66° 3' 49.477' W
28	45° 16' 19.269" N	66° 3' 52.722' W
29	45° 16' 19.395' N	66° 3' 47.325" W
30	45° 16' 17.960" N	66° 3' 47.050" W
31	45° 16' 19.163" N	66° 3' 48.532' W
32	45° 16' 19.598" N	66° 3' 46.111" W
33	45° 16' 20.866" N	66° 3' 46.306' W
34	45° 16' 18.402' N	66° 3' 45.507" W
35	45° 16' 19.526" N	66° 3' 55.887" W
36	45° 16' 17.899" N	66° 3' 53.843" W

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

COORDINATES TABLE

CLOSURE REPORT
FUNDY QUAY DEVELOPMENT SITE
NBDELG FILE: 6515-4-1221

Client: SAINT JOHN DEVELOPMENT CORPORATION

Job No.: 121811071
Scale: N.T.S.
Date: 23-JUL-2015
Dwn. By: JCB
App'd By: RSF
Dwg. No.: 12

Stantec

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Stantec

Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4
Tel: (506) 634-2185
Fax: (506) 634-8104

July 2, 2015
File: 121811071_205

Attention: Mr. Kent MacIntyre, General Manager
Saint John Waterfront Development
1 Market Square, Suite 301
Saint John, NB E2L 4Z6

Dear Mr. MacIntyre,

Reference: Fundy Quay Development, Conditional Closure of NBDELG File No. 6515-4-1221

Stantec is preparing the documentation required to request closure of the above-noted file with the New Brunswick Department of Environment and Local Government (NBDELG). Based on the impacts encountered at the site, risks to human health cannot be ruled out, and as such a management approach is required. The impacts of concern include PAHs and metals, which may cause adverse human health effects to those in direct contact with the impacts. This exposure pathway can be mitigated by the maintenance of suitable cover to minimize direct contact. Examples of suitable cover include asphalt and buildings, and as such, the current site configuration does not represent unacceptable risks. However, under the proposed redevelopment, suitable cover will be required.

Under the NBDELG *Guideline for the Management of Contaminated Sites*, implementation of engineered controls to mitigate human health risk, such as suitable cover, requires signed documentation from stakeholders. Please sign and return this correspondence in acknowledgement of the conditions that will be applied in the Closure of this file.

A site management plan can be prepared for you at your request, providing additional details of options for "suitable cover".

Regards,

STANTEC CONSULTING LTD.

Robert S. Flander, P.Eng.
Environmental Services
Phone: (506) 636-9325
Fax: (506) 634-8104
Rob.Flander@stantec.com

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Reference: Fundy Quay Development, Conditional Closure of NBDELG File No. 6515-4-1221

I, KENT MAC INTYRE, an authorized manager of the Fundy Quay development, on behalf of the City of Saint John, understand and acknowledge that Stantec is preparing Closure documentation for the NBDELG File No. 6515-4-1221 that is conditional on the maintenance of suitable cover at the site to reduce the risks to human health through the exposure pathway of direct contact with impacted soil.

Signature

July 2/2015
Date

From: Maguire, David (ELG/EGL)
To: Vickers, Tim
Cc: Fiander, Rob
Subject: RE: Fundy Quay Project: Advice Regarding Potential EIA Trigger
Date: August-13-15 12:04:54 PM
Attachments: RE_Fundy_Quay__Advice_regarding_potential_EIA_Trigger[1].pdf

---

Hi Tim,

Good speaking with you this morning. Based on the information previously provided and on your update provided below, the proposed project does **not** require an environmental impact assessment (EIA) registration and review as per the NB *EIA Regulation*. My understanding is that the project will adhere to all other applicable regulatory requirements, and that you are currently working with DFO and TC to ensure any requirements they have are satisfied. Please let me know if you require any additional information...thanks, and have a great week/weekend!

D

David E. Maguire, B.Sc., MRM
Manager, Environmental Assessment Section
NB Department of Environment and Local Government
tel: (506) 453-8944
fax: (506) 453-2627
email: david.maguire@gnb.ca

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]
Sent: Thursday, August 13, 2015 11:04 AM
To: Maguire, David (ELG/EGL)
Cc: Fiander, Rob
Subject: RE: Fundy Quay Project: Advice Regarding Potential EIA Trigger

Dave,

Further to our discussions this morning, I am providing an update on the proposed Fundy Quay project (the 'Project')as per the instructions provided in your original (February 15, 2013) response '*RE Fundy Quay Advice regarding potential EIA Trigger*' (see attached) which stated;

"Based on the information provided the proposed project does not require an EIA registration and review as per the NB EIA Regulation. Please note that if details of the project change they would need to be resubmitted to confirm if an EIA trigger exists."

Details of the Project have changed and now include in-water works to repair and maintain the integrity of the property's seawall. Specifically, the Project will involve;

- Temporarily side casting an estimated 130m^3 of sediments in the Port of Saint John.
- Installing and maintaining silt curtains until side cast materials have been replaced at the base of the seawall.
- Resurfacing up to 316.5 m of an existing seawall in the Port of Saint John, of which only 65m will require interaction (side casting of sediments) with the base of the seawall.
- Removing (and subsequently replacing) ancillary structures (wall anchors, float guides, ladders, fenders, etc.) to enable resurfacing.
- All repairs being conducting on properties owned by the Saint John Development Corporation.

The Project, including the in-water work, will **not** result in;

- An increase in the footprint of Port Saint John.
- An increase in the throughput of Port Saint John (no change in navigation or vessel traffic volumes).
- An increase in emissions of Port Saint John.

Please note that your response to me on this matter will become an attachment to a report to our client, the Saint John Development Corporation (SJDC), which identifies the potential requirements for provincial environmental approvals and permits that a development as proposed may require. SJDC has been designated by the City of Saint John, current owners of the property, to act on its behalf in the management of the redevelopment of the property.

Regards,

Tim Vickers, MBA, M.Sc. B.Sc.
Senior Environmental Scientist
Stantec
Phone: 1-506-674-9147
Cell: 1-506-651-8359
Fax: 1-506-634-8104
tim.vickers@stantec.com

From: Maguire, David (ELG/EGL) [mailto:David.Maguire@gnb.ca]
Sent: August-12-15 2:00 PM
To: Vickers, Tim
Subject: RE: Fundy Quay Project: Advice Regarding Potential EIA Trigger

Hi Tim,

I did receive your email and voice message – I hope to give you a call to discuss hopefully tomorrow or Friday.....thanks!

D

David E. Maguire, B.Sc., MRM
Manager, Environmental Assessment Section
NB Department of Environment and Local Government
tel: (506) 453-8944
fax: (506) 453-2627
email: david.maguire@gnb.ca

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]
Sent: Tuesday, July 28, 2015 9:27 AM
To: Maguire, David (ELG/EGL)
Cc: Fiander, Rob
Subject: Fundy Quay Project: Advice Regarding Potential EIA Trigger

Dave,

In 2013, my colleague Greg Johnson contacted you about clarification on a potential EIA trigger for the Fundy Quay project on the Saint John Harbour (see details in attached document). The project, which is a mix of commercial and residential development, is looking to move forward. As such, I am assisting the proponent (SJ Development) with their regulatory requirements. The project as previously described remains virtually the same, except that there is now a marine component. The sea wall will be re-surfaced with steel sheet piling (SSP), anchored top and bottom, and a concrete coping wall affixed to the top. To accomplish this, the sediment at the base of the sea wall will be side cast and replaced once the SSP is anchored. Silt curtains will be established to control TSS and will be maintained until TSS levels meet DFO requirements. The project will not impede marine navigation as the Quay is not used to berth large vessels and the project will not extent into the navigation channel of the Saint John Harbour/River.

I have contacted Jayne Roma of Environment Canada's Ocean Disposal Program and the Port of Saint John (for the temporary side casting) and we are discussing the permit requirements and conditions. Similarly I have contacted Melanie LeBlanc of Transport Canada and we are discussing the details of a Minor Works Order. The project has been self-screened and determined that a DFO authorization will not be required.

Schedule A of the NBEIA Regulation indicates that any modifications to or rehabilitation of *(q) all ports, harbours, railroads or airports* are undertakings for the purposes of the *EIA Regulation* and must be registered with the Sustainable Development, Planning and Impact Evaluation Branch, Department of Environment and Local Government. The sea wall of the Fundy Quay project occurs within the Port of SJ, but is not part of the transportation infrastructure of Port SJ operations.

I am looking for your assistance in determining if the status of this project is still such that it will not require an EIA registration and review as per NB EIA Regulation.

Regards

Tim Vickers, MBA, M.Sc. B.Sc.
Senior Environmental Scientist
Stantec
Phone: 1-506-674-9147
Cell: 1-506-651-8359
Fax: 1-506-634-8104
tim.vickers@stantec.com

Johnson, Greg

From: Maguire, David (ELG/EGL) <David.Maguire@gnb.ca>
Sent: Friday, February 15, 2013 3:50 PM
To: Johnson, Greg
Cc: Doucet, Pierre (ELG/EGL); Vanderlaan, Paul (ELG/EGL)
Subject: RE: Fundy Quay: Advice regarding potential EIA Trigger

Hi Greg,

Thank you for your email and providing some details regarding the proposed project. Our understanding is that the proposed project is a residential/commercial redevelopment that is part of the current City of Saint John Municipal Plan; will be hooked to municipal services; and will not involve a marine component or have a significant impact on shipping or boat traffic in the harbour. We also note that the site is currently undergoing a Phase III environmental site assessment to address any contamination issues. Based on the information provided the proposed project does **not** require an EIA registration and review as per the NB EIA Regulation. Please note that if details of the project change they would need to be resubmitted to confirm if an EIA trigger exists. Also applicable mitigation identified in the federal CEAA screening report should be properly implemented to address any potential environmental effects. Thanks, and please do not hesitate to contact me should you have additional questions/require further clarification.

Have a great weekend!
D

David E. Maguire, B.Sc., MRM
Manager, Environmental Assessment Section
NB Department of Environment and Local Government
tel: (506) 453-8944
fax: (506) 453-2627
email: david.maguire@gnb.ca

From: Johnson, Greg [mailto:Greg.Johnson@stantec.com]
Sent: Thursday, February 14, 2013 3:39 PM
To: Maguire, David (ELG/EGL)
Subject: RE: Fundy Quay: Advice regarding potential EIA Trigger

Hello Dave,

As a follow-up to our conversation this afternoon on the subject of Fundy Quay, I offer the following information regarding the site and proposed redevelopment:

1. At this time it is assumed that the development will not involve a marine component that would result in a substantive increase in shipping or other boat traffic in the harbour.
2. The future land use plan for the site, as outlined in the current Saint John Municipal Plan (PlanSJ; January 2012), is Primary Centre, or the same as the adjacent commercial land. The site was recently (2012) re-zoned as "Integrated Development – Waterfront" (residential, retail, commercial/office and/or hospitality). Both the current zoning and future land use plan are consistent with the proposed redevelopment of the site. Conditions associated with the re-zoning application ensure that development plans for the site require approval by the Planning Advisory Committee and Common Council, which involves the opportunity for the public to provide feedback on the development (Planning Advisory Committee Minutes, April 17, 2012).
3. The transfer of land from the Canadian Coast Guard to the City of Saint John in 2010 underwent a screening-level Environmental Assessment under the *Canadian Environmental Assessment Act, 1992*. See attached from the CEA Registry Archives. Information on the past operation of the Coast Guard site is available from the screening report.
4. The site is currently undergoing a Phase III Environmental Site Assessment by Stantec Consulting Ltd.

Your response to me on this matter will become an attachment to a report to our client, the Saint John Development Corporation (SJDC), which identifies the potential requirements for provincial environmental approvals and permits that a development as proposed may require. SJDC has been designated by the City of Saint John, current owners of the property, to act on its behalf in the management of the redevelopment of the property.

Please don't hesitate to contact me if you have any further questions.

Best regards,

Greg A. M. Johnson, M.Sc.
Associate, Project Manager, Environmental Services
Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4
Ph: (506) 636-9635
Fx: (506) 634-8104
Cell: (506) 333-1448
greg.johnson@stantec.com
stantec.com

From: Johnson, Greg
Sent: Monday, February 11, 2013 11:48 AM
To: 'Dave Maguire (david.maguire@gnb.ca)'
Subject: Fundy Quay: Advice regarding potential EIA Trigger

Hello Dave,

I am looking for confirmation regarding a potential trigger for EIA registration, for a potential project. Saint John Waterfront Development issued an RFP for development proposals for Fundy Quay, formerly known as the Canadian Coast Guard site on the Saint John waterfront. The land is now owned by the City of Saint John. Details on the site and potential residential and commercial development can be reviewed at: http://www.sjwaterfront.com/documents/FundyQuayRFP-FINAL.pdf . Attached is a possible concept drawing of the site from the RFP document. Also attached is Appendix C of the RFP which identifies the property and dimensions in aerial view.

At this time, based on the conceptual project, the only potential trigger identified in Schedule A is *q).all ports, harbours, railroads or airports* due to the location of the project on the Saint John waterfront. I am seeking confirmation that the type of project planned for the site (residential and commercial, hooked up to the city water and sanitary sewer system), will not require registration under the *EIA Regulation*. At this time there are no other Schedule A trigger that we believe could potentially apply to such a development at this site.

Please advise.

With thanks,

Greg A. M. Johnson, M.Sc.
Associate, Project Manager, Environmental Services
Stantec Consulting Ltd.
130 Somerset Street
Saint John NB E2K 2X4
Ph: (506) 636-9635
Fx: (506) 634-8104
Cell: (506) 333-1448
greg.johnson@stantec.com

stantec.com

Fisheries and Oceans Canada / Pêches et Océans Canada

Canada

Request for Review

A) Contact information

Name of Business/Company:

Saint John Development Corporation

Name of Proponent:

Mr. Kent MacIntyre

Mailing address:

One Market Square, Suite 301

City/Town:

Saint John

Province/Territory:

New Brunswick

Postal Code:

E2L 4Z6

Tel. No. :

1-506-674-4152

Fax No.:

Email:

info@sjwaterfront.com

Select additional contact:
Contractor/Agency/Consultant *(if applicable)*:

Mr. Tim Vickers
Stantec Consulting Ltd.

Mailing address:

130 Somerset Street

City/Town:

Saint John

Province/Territory:

New Brunswick

Postal Code:

E2K 2X4

Tel. No. :

1-506-674-9147

Fax No.:

1-506-634-8104

Email:

tim.vickers@stantec.com

Is the Proponent the main/primary contact? ○ Yes ● No

If no, please enter information for the primary contact or any additional contact.

Please contact Mr. Tim Vickers of Stantec Consulting Ltd. for additional project information. Details provided above.

B) Description of Project

If your project has a title, please provide it.

Fundy Quay

Is the project in response to an emergency circumstance*? ○ Yes ● No

Does your project involve work in water? ● Yes ○ No

If yes, is the work below the High Water Mark*? ● Yes ○ No

What are you planning to do? Briefly describe all project components you are proposing in or near water.

This project involves the resurfacing of up to 360m of sea wall in the Port of Saint John, New Brunswick. The project will include the temporary side casting of sediments at the base of the sea wall, which will be replaced upon completion of sea wall maintenance. The construction phase will include the implementation of environmental mitigation measures (silt curtains, booms, silt fencing) and the establishment of temporary structures including safety lighting, barriers, and signage. The excavation of sediments, physical removal and subsequent replacement of sea wall surfaces will follow. The completion of construction will include the removal of all heavy equipment, except for that needed to remove the silt curtains and silt booms and temporary structures. There will be no operational or closure/decommissioning phases of the project relevant to the marine environment.

How are you planning to do it? Briefly describe the construction materials, methods and equipment that you plan to use.

Temporary side casting of sediments will be achieved with a mechanical dredge or excavator.
Spalling/deteriorated concrete will be physically removed where new overlay is required. The tools required will be determined upon final site inspection, but could include hand tools, and mechanized breakers and cutters.
Old wall anchors, ladders, fender chains, timbers, float guides, etc. that may interfere with resurfacing will be removed. Cutting torches may be employed here.
The sea wall sections will be resurfaced with concrete overlay and/or steel sheet piling (SSP) with the SSP sections being anchored into the subsurface of the quay. A concrete cope wall will be affixed near the top of the wall. Concrete forms will be in place for the pouring and setting of the cope wall.
Ancillary structures (float guides, ladders, fenders, etc) will be re-attached upon completion and inspection of the sea wall resurfacing. Welders and drills may be used.
Silt curtains will be removed either via a barge with hydraulic winch, or via heavy equipment (excavator or crane)

Include a site plan (figure/drawing) showing all project components in and near water.

Are details attached? ● Yes ○ No

Identify which work categories apply to your project.

- ☐ Aquaculture Operations
- ☐ Aquatic Vegetation Removal
- ☐ Beaches
- ☐ Berms
- ☐ Blasting / Explosives
- ☐ Boat Houses
- ☐ Boat Launches / Ramps
- ☐ Breakwaters
- ☐ Bridges
- ☐ Cable Crossings
- ☐ Causeways
- ☐ Culverts
- ☐ Dams
- ☐ Dewatering / Pumping
- ☐ Log Handling / Dumps
- ☐ Log Removal
- ☐ Moorings
- ☐ Open Water Disposal
- ☐ Piers
- ☐ Riparian Vegetation Removal
- ☐ Seismic Work
- ☐ Shoreline Protection
- ☐ Stormwater Management Facilities
- ☐ Surface Water Taking
- ☐ Tailings Impoundment Areas
- ☐ Temporary Structures
- ☐ Turbines
- ☐ Water Control Structures

☐ Docks
☒ Dredging / Excavation
☐ Dykes
☐ Fishways / Ladders
☐ Flow Modification (hydro)
☐ Groundwater Extraction
☐ Groynes
☐ Habitat Restoration
☐ Ice Bridges

☐ Water Intakes / Fish Screens
☐ Water Outfalls
☐ Watercourse Realignment
☐ Weirs
☒ Wharves
☐ Wind Power Structures

☐ Other Please Specify ☐

Was your project submitted for review to another federal or provincial department or agency? ● Yes ○ No

If yes, indicate to whom and associated file number(s).

Environment Canada: Disposal at Sea Program. Jayne Roma. Ongoing discussions about permitting for side casting of sediments.
Transport Canada: Melanie LeBlanc. Ongoing discussions about Minor Works Order.
New Brunswick Department of Environment and Local Government: Sustainable Development, Planning and Impact Evaluation Branch: David Maguire. Request to re-affirm previous (2013) determination that an Environmental Impact Assessment was not required.

C) Location of the Project

Coordinates of the proposed project Latitude 45°16'18.19"N N Longitude 66° 3'51.17"W W

OR UTM zone ; Easting

Northing

Include a map clearly indicating the location of the project as well as surrounding features.

Name of Nearest Community (City, Town, Village): Saint John

Municipality, District, Township, County, Province: New Brunswick

Name of watershed (if applicable): Saint John River

Name of watercourse(s) or waterbody(ies) near the proposed project: Saint John Harbour

Provide detailed directions to access the project site:

The project site is located on the eastern side of the Port of Saint John on the former Canada Coast Guard property and DFO office. The site can be accessed from Ward Street off of Water Street.

D) Description of the Aquatic Environment

Identify the predominant type of aquatic habitat where the project will take place.

● Estuary (Estuarine)
○ Lake (Lacustrine)
○ On the bank/shore at the interface between land and water (Riparian)

○ River or stream (Riverine)

○ Salt water (Marine)

○ Wetlands (Palustrine)

Provide a detailed description of biological and physical characteristics of the proposed project site.

Physical: The seawall exists in an estuary currently used largely for the shipping bulk goods. Bottom substrates consist of fine deposited sediments that have been transported from the Saint John River and the Bay of Fundy. Areas immediately adjacent to project site are dredged annually by Port SJ to maintain suitable vessel draught. The water/shoreline interface is entirely one of man-made (concrete and steel) quay structures interacting at a 90 degree angle.

Biological: There are few benthic fishes (sculpin and tomcod) in this area of the Harbour. Migratory fishes include rainbow smelt, gaspereau, shad, outer bay of Fundy Atlantic salmon, American eel and striped bass, which occur in the harbour mostly between March and May. The bottom substrates are of poor to marginal fish habitat quality, being flat and depositional with little vertical or interstitial structure, and offering no reported value to fish for spawning, egg deposition, rearing or feeding. However, water quality is not limiting to fish, and may be increasingly suitable for some resident fish species following the completion of the Harbour Cleanup municipal wastewater treatment project in 2014. Overall, the occurrence of fishes in the project area would best be described as incidental and transient.

The benthic invertebrate community is impoverished, consistent with a highly disturbed environment, and is dominated by invasive Green crabs. Harbour seals frequent the open channel areas of the harbour, especially during the peak spring migration of fishes. Some marine macro-algae may reside on the sea wall surface.

Include representative photos of affected area (including upstream and downstream area) and clearly identify the location of the project.

E) Potential Effects of the Proposed Project

Have you reviewed the Pathways of Effects (PoE) diagrams (http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html) that describe the type of cause-effect relationships that apply to your project?

● Yes ○ No

If yes, select the PoEs that apply to your project.

☐ Addition or removal of aquatic vegetation
☐ Change in timing, duration and frequency of flow
☐ Cleaning or maintenance of bridges or other structures
☒ Dredging
☐ Excavation
☐ Fish passage issues
☐ Grading
☐ Marine seismic surveys
☐ Organic debris management
☐ Placement of marine finfish aquaculture site
☐ Placement of material or structures in water
☐ Riparian Planting
☐ Streamside livestock grazing
☐ Structure removal
☐ Use of explosives
☒ Use of industrial equipment
☐ Vegetation Clearing
☐ Wastewater management
☐ Water extraction

Will there be changes (i.e., alteration) in the fish habitat*? ● Yes ○ No ○ Unknown

If yes, provide description.

Sediments at the base of the sea wall will be temporarily side cast. Silt curtains will prevent the release suspended solids into the estuary by isolating the area until the project is completed and suspended sediments have settled. The duration of the effects will be short-lived (3-5 months) and localized to those areas immediately adjacent to the sea wall. Few (< 50) fish will be affected by this temporary alteration as it will not impede passage, interfere with spawning or egg deposition, and will have little influence of the forage abilities of resident and migratory fishes.

Will the fish habitat alteration be permanent*? ○ Yes ● No ○ Unknown

Is there likely to be destruction or loss of habitat used by fish? ○ Yes ● No ○ Unknown

What is the footprint (area in square meters) of your project that will take place below the high water mark*?

≤ 600 square metres

Is your project likely to change water flows or water levels? ○ Yes ● No ○ Unknown

If your project includes withdrawing water, provide source, volume, rate and duration.

Not applicable

If your project includes water control structure, provide the % of flow reduction.

Not applicable

If your project includes discharge of water, provide source, volume and rate.

Not applicable

Will your project cause death of fish? ○ Yes ● No ○ Unknown

If yes, how many fish will be killed (for multi-year project, provide average)? What species and lifestages?

Not applicable

Are there aquatic species at risk (http://www.sararegistry.gc.ca/species/aquatic_e.cfm) present? If yes, which ones?

No.

What is the time frame of your project?

The construction will start on 05/01/2016 and end by 11/31/2016

If applicable, the operation will start on Not applicable and end by Not applicable

If applicable, provide schedule for the maintenance

Not applicable

If applicable, provide schedule for decommissioning

Not applicable

Are there additional effects to fish and fish habitat that will happen outside of the time periods identified above? ○ Yes ● No

(If yes, provide details)

Have you considered and incorporated all options for redesigning and relocating your project to avoid negative effects to fish and fish habitat?

● Yes ○ No

If yes, describe.

The Fundy Quay project exists on a permanent hard structure that is in need of repair to the sea wall. Relocation is not an option. Redesign is not applicable as the sea wall is in need of repair regardless of the development mix on the quay surface.

Have you consulted DFO's Measures to Avoid Harm to Fish and Fish Habitat (http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html) to determine which measures apply to your project?

● Yes ○ No

Will you be incorporating applicable measures into your project? ● Yes ○ No

If yes, identify which ones. If No, Identify which ones and provide reasons.

Timing- while the project does not apply to In-stream (freshwater) habitats, and the development or emergence of fish larvae, there are migratory fish that pass through the Saint John Harbour largely between March and May. Efforts will be made to work outside of this time frame.
Fish Protection - Silt curtains will be placed initially against the side of the sea wall and moved outward Into position to avoid entrainment of fish
Erosion and Sediment Control - the establishment of silt curtains and a silt boom prior to side casting, and their retention until TSS levels in the water column decrease to DFO requirements
Operation of Machinery - machinery will be cleaned prior to arriving on site, and will be maintained in good working condition at all times
Contaminant and Spill Management - Spill response kits will be kept on site, and a spill/contaminant response plan will be developed

Have you considered and incorporated additional best practices and mitigation measures recommended in relevant guidelines to avoid negative effects to fish and fish habitat?

● No ○ Yes

If Yes, include a list of the guidelines being used to avoid negative effects to fish and fish habitat.

Are there any relevant best practices or mitigation measures that you are unable to incorporate? ○ Yes ● No

(If yes, identify which ones.)

Can you follow appropriate Timing Windows (http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html) for all your project activities below the High Water Mark*?

● Yes ○ No

(If no, provide explanations.)

The low flow period (June 1 to September 30) is not applicable to this project as it is a marine/estuarine environment; however, peak migration of adult anadromous fishes and juvenile catadromous American eels through the Saint John Harbour occurs between March and May. Efforts will be made to avoid in-water work during this period.

What residual effects to fish and fish habitat do you foresee after taking into account the avoidance and mitigation measures described above?

There will be no residual effects to fish or fish habitat resulting from the activities of this project. Suspended sediments from the side casting will be contained with the silt curtains, and side cast sediments will be returned to their original location upon completion of the construction phase for the project. The fish habitat will quickly return to its pre-project state as the deposition of marine and river-borne sediments will re-commence immediately upon the removal of the silt curtain.

F) Signature

I, Tim Vickers (print name) certify that the information given on this form is to the best of my knowledge, correct and completed.

Signature

28/07/2015

Date

Information about the above-noted proposed work or undertaking is collected by DFO under the authority of the *Fisheries Act* for the purpose of administering the fisheries protection provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank DFO-PPU-680. Under the *Privacy Act*, Individuals have a right to, and on request shall be given access to any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at www.infosource.gc.ca or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provision of the *Access to Information Act*.

**All definitions are provided in Section G of the Guidance on Submitting a Request for Review*

Fisheries and Oceans Canada | Pêches et Océans Canada

Fisheries Protection Program
343 Université Avenue
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6

AOUT
AUG 18 2015

Our file
15-HGLF-00254

Mr. Kent MacIntyre
Saint John Development Corporation
1 Market Square, Suite 301
Saint John, NB
E2L 4Z6

Dear Mr. MacIntyre:

Subject: Implementation of mitigation measures to avoid and mitigate serious harm to fish

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal for the resurfacing of a seawall at the Fundy Quay in the Port of Saint John, New Brunswick, on August 13, 2015.

The proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

Our review consisted of the following:

- The *Request for Review* form and attached plans and pictures, prepared by Stantec Consulting Ltd., dated August 13, 2015.

We understand that the Saint John Development Corporation (SJDC) is proposing to resurface up to 316.5 m of an existing sea wall in the Port of Saint John, New Brunswick. Resurfacing will include removing and replacing 33m of steel sheet piling, constructing a concrete overlay to a depth of 1.0m below the low water mark along 20.5 m of an existing gravity wall, constructing a concrete overlay to a depth of 0.3 m below an existing cope wall along approximately 2.63 m of cribs, and using concrete to repair crib corners, keyways and other local deterioration in the concrete cribs. The project will also include the temporary side casting of sediments at the base of the sea wall, which will be replaced upon completion of sea wall maintenance.

A total 1,708 square meters of work will occur below the high water mark, of which 130 square meters will be side cast sediments and 1,578 square meters will be resurfacing of the vertical concrete and steel sheet pile seawall.

To avoid the potential of serious harm to fish and their habitat, we are recommending that the following mitigation measures be included into your plans.

- A floating silt curtain (*i.e.*: turbidity curtain or silt boom) should be installed around the work areas to avoid any suspended solids to enter into the Saint John Harbour. The floating silt curtain fence should be installed before any work activity. The proponent should monitor, on a daily basis, the stability (anchorage) of the structure and ensure proper working order of the silt curtain.
- Visual monitoring for suspended solids shall occur daily. If any changes occur in the turbidity of the water in the vicinity of the work area a result of construction activities, the work should immediately stop to determine if further mitigation measures are required.
- All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction.
- All rock material that will be used for the project should be free of excessive fines.
- Any construction debris/material that enters the marine environment should be removed immediately and be disposed of in a provincially approved manner.
- Machinery will not be allowed in the water.

Provided that these mitigation measures are incorporated into the plans, the Program is of the view that your proposal will not result in serious harm to fish. No formal approval is required from the Program under the *Fisheries Act* in order to proceed with the proposal.

If the plans have changed or if the description of the proposal is incomplete, or changes in the future, you should consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review is required by the Program.

Please notify this office at least 48 hours before starting your project. A copy of this letter should be kept on site while the work is in progress.

If you have any questions please contact Mr. Jean-François Mallet directly by telephone at (506) 851-2913 or by email at Jean-Francois.Mallet@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

François Plante
A/ Regulatory Reviews Manager
Fisheries Protection Program

Cc. Tim Vickers (Stantec Consulting Ltd.)
Jayne Roma (Environment Canada)

From: Roma,Jayne [Dartmouth]
To: Vickers, Tim
Subject: RE: Fundy Quay Sidecasting
Date: August-28-15 2:23:43 PM

Tim:

Based on this understanding, we consider the proposed activities to be land-based and therefore Disposal at Sea does not apply. There is still the need to comply with section 36(3) of the *Fisheries Act,* and implementing those measures recommended by DFO in their August 18, 2015 letter of advice (e.g. use of a silt curtain) is one step towards achieving such compliance.

Jayne Roma

Marine Disposal Program Officer, Environmental Stewardship Branch
Environment Canada / Government of Canada
Jayne.roma@ec.gc.ca / Tel: 902-426-3649

Agente de programme, immersion en mer, Direction générale de l'intendance environnementale
Environnement Canada / Gouvernement du Canada
Jayne.roma@ec.gc.ca / Tél. : 902-426-3649

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]
Sent: August 28, 2015 8:50 AM
To: Roma,Jayne [Dartmouth]
Subject: RE: Fundy Quay Sidecasting

Jayne,

It is likely that the temporary sidecasting and the subsequent replacement will be done by equipment on the wharf.

Tim

From: Roma,Jayne [Dartmouth] [mailto:Jayne.Roma@EC.GC.CA]
Sent: August-27-15 12:35 PM
To: Vickers, Tim
Subject: RE: Fundy Quay Sidecasting

Tim:

Will, or could the sidecasting activities be conducted by equipment located on the wharf? Or will the work have to be done from the water (i.e. floating equipment)?

Jayne

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]

Sent: August 25, 2015 11:04 AM
To: Roma,Jayne [Dartmouth]
Subject: RE: Fundy Quay Sidecasting

Jayne,

Yes the side cast material will be returned to the base of the wall to provide protection.

Tim

From: Roma,Jayne [Dartmouth] [mailto:Jayne.Roma@EC.GC.CA]
Sent: August-25-15 10:50 AM
To: Vickers, Tim
Subject: RE: Fundy Quay Sidecasting

Tim:

To answer your question – no, a permitting decision cannot be reached before characterization has been completed.

I was copied on DFO's letter of advice dated Aug 18, 2015, and that letter referred to the proposed activity as *temporary* sidecasting - presumably meaning the material would then be returned to offer some support/protection for the base of the seawall.

Is this still the case?

Jayne Roma

Marine Disposal Program Officer, Environmental Stewardship Branch
Environment Canada / Government of Canada
Jayne.roma@ec.gc.ca / Tel: 902-426-3649

Agente de programme, immersion en mer, Direction générale de l'intendance environnementale
Environnement Canada / Gouvernement du Canada
Jayne.roma@ec.gc.ca / Tél. : 902-426-3649

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]
Sent: August 24, 2015 10:35 AM
To: Roma,Jayne [Dartmouth]
Cc: Fiander, Rob
Subject: Fundy Quay Sidecasting

Jayne,

This inquiry relates to the Fundy Quay project in Saint John Harbour. The Project involves the resurfacing of approximately 331m of seawall to maintain its structural integrity for the purpose of a future development. Associated with the sea wall resurfacing, which is mostly from the deck to 1m below the low water mark, is the need to access the base of approximately 45 m of the sea wall within Market Slip. Accessing the base will require the side cast dredging of less than 300 cubic metres of sediment.

Our previous discussion lead to the possibility of partnering with the existing annual dredging program conducted by Port Saint John; however, discussions with the Port have concluded that this option is not feasible as the side cast dredging is outside of the area that they typically test and dredge. While I recognize that the amount of material to be side cast is miniscule relative to the harbour dredging volumes, I believe it is the best interest of the project proponent to consider options for formal permitting request for the work. The maximum potential depth of the sediment disturbance is 7.6 m (see attached figure) although it is suspected that this includes larger materials as there is an armour stone embankment that extends from the land in Market Slip to below the low water mark (within 60m of the site).

There is one aspect of the permitting process that I would ask you for some direction on: Can a permit be issued with the condition that the sediment testing be conducted prior to the side casting (and that any subsequent disposal conditions be addressed before work begins), or must the sediment testing be conducted before a permit can be issued?

Thanks again for your assistance with this matter.

Tim Vickers, MBA, M.Sc. B.Sc.
Senior Environmental Scientist
Stantec
Phone: 1-506-674-9147
Cell: 1-506-651-8359
Fax: 1-506-634-8104
tim.vickers@stantec.com

Transport Canada Transports Canada

PROTECTED A (WHEN COMPLETED)

Navigation Protection Act (NPA)
Notice of Works Form

PRIOR TO COMPLETING THIS FORM:
1. Determine if your project is on a navigable water listed on the schedule to the NPA. Notice to the Minister is required for works on scheduled navigable waters . Works on non-scheduled navigable waters may be eligible to Opt-in; if requesting Opt-in, the Opt-In Request annex must be included with your Notice to the Minister.
2. Self assess your project against the *Minor Works Order* and *Minor Repairs Order* (as appropriate) to determine if a Notice to the Minister is required.

Links to the NPA schedule and orders can be accessed through the NPP website at http://www.tc.gc.ca/eng/programs-621.html.

PURPOSE

This "Notice of Works" form and its attachments (as well as other relevant information which may be required for a review by TC), once completed and submitted, comprise the Notice to the Minister as required under the *Navigation Protection Act*. For assistance in completing your submission, refer to the guidance provided on the NPP website under "Apply to the NPP" including the *Guide to the NPP's Notification, Application and Review Requirements*.

This form, its attachments and all supporting documentation will be reviewed by a person designated under the NPA. Any false or misleading statement(s) on this form or relating to any document in support of this Notice to the Minister, including concealment of material facts, may lead to refusal to issue Approval or cancellation of an Approval

SUPPORTING DOCUMENTATION REQUIREMENTS

Failure to complete all mandatory fields on this form and to provide mandatory supporting documentation, along with a signed copy of this form, will result in your Notice to the Minister being returned with no further action. Mandatory fields are identified with a "*".

The following mandatory supporting documentation must be provided.

Completed and signed "Notice of Works" form with all mandatory fields completed:
- Confirmation of Riparian Ownership
- Owner Contact Information
- Project Information
- Body of Water Name
- Work Site Information

Related Maps and Drawings:
- Map Showing Location of Project
- Side/Profile View Drawings with Dimensions
- Top/Plan View Drawings with Dimensions

When submitting a Notice to the Minister, owners should note:
- All plans and drawings must be legible when printed on 11" x 17" paper
- For e-mail submissions, provide a scan of all relevant Supporting Documentation
- For hard copy submissions, provide a copy of all relevant Supporting Documentation along with six (6) copies of each map, top/plan view and side/profile view drawing printed on 11" x 17" paper
- Notice of Works should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGAM REGIONAL OFFICE LOCATIONS

Pacific Region Pacific Regional Office 820-800 Burrard Street Vancouver, BC V6Z 2J8 Telephone: 604-775-8867 Email: NPPPAC-PPNPAC@tc.gc.ca	**Prairie and Northern Region** Canada Place 1100-9700 Jasper Ave Edmonton, AB T5J 4E6 Telephone: 780-495-8215 Email: NPPPNR-PPNRPN@tc.gc.ca	**Ontario Region** 100 South Front Street, 1st Floor Sarnia, ON N7T 2M4 Telephone: 519-383-1863 Email: NPPONT-PPNONT@tc.gc.ca
(For info on the NPP and NPA ONLY) Notices not processed at this office **Headquarters** Tower C, 330 Sparks Street, 10th Floor Ottawa, ON K1A 0N5 Telephone: 613-990-1036 Email: oep@tc.gc.ca	**Quebec Region** 401-1550 d'Estimeauville Ave, 4th Floor Quebec, QC G1J 0C8 Telephone: 418-648-4549 Email: PPNQUE-NPPQUE@tc.gc.ca	**Atlantic Region** 95 Foundry Street, 6th Floor P.O. Box 42 Moncton, NB E1C 8K6 Telephone: 506-851-3113 Email: NPPATL-PPNATL@tc.gc.ca

Transport Canada Transports Canada

PROTECTED A (WHEN COMPLETED)

Navigation Protection Act
Notice of Works Form

TC File no. (if known):
Are you the riparian property owner? ☒ Yes ☐ No

1. General Information	
Saint John River (Saint John Harbour)	Is body of water on the schedule to the NPA? ☒ Yes ☐ No ☐ Unknown
Are you also requesting an Approval, if required? ☒ Yes ☐ No	Is this an Opt-in Request? ☐ Yes ☒ No
Are you representing an Aboriginal group? ☐ Yes ☒ No	Is the work near/on First Nations reserve or land claim? ☐ Yes ☒ No
Does this project involve throwing or depositing materials in water? ☐ Yes ☒ No	Does this project involve dewatering a body of water? ☐ Yes ☒ No

2. Owner[a] Contact Information			
Saint John Development Corporation		Contact Name: Mr. Kent MacIntyre	
1 Market Square, Suite 301			
Saint John		New Brunswick	E2L 4Z6
(506) 674-4152	(506) 649-6066	kent.macintyre@sjwaterfront.com	
Owner's Agent (Contractor/Consultant/Representative/Co-Proponent, if any)			
Stantec Consulting Ltd.		Mr. Tim Vickers	
130 Somerset Street			
Saint John		New Brunswick	E2K 2X4
(506) 674-9147	(506) 651-8359	Tim.Vickers@stantec.com	

3. Work Site Information	
City of Saint John	New Brunswick
The site is located along the north-eastern side of the Port of Saint John, south of Market Slip, on the former Canada Coast Guard base, off of Ward Street (Figure 1 attached). The proposed in-water work includes PID #'s 55209159 and 55209167. All structural repairs and side-casting of sediments will be conducted on properties owned by the Saint John Development Corporation (see attached Figure 1).	
*Site Position Latitude North Degrees 45 ° Minutes 16 ' Seconds 18.19 "	*Site Position Longitude West Degrees 66 ° Minutes 3 ' Seconds 51.17 "
☒ Hydro Chart #: LC4117	☐ Topo Map #:
Body of water details, such as characteristics, bank/bottom features, biological components, flows/tides, etc. The Saint John Harbour is a tidal estuary with highly disturbed bottom substrates consisting of fine sediments	

transported from the Saint John River and the Bay of Fundy. The maximum tidal range is approximately 8.97m. Areas near the site are dredged annually by Port of Saint John to maintain suitable vessel draught. There are few benthic fish species (e.g., sculpin (*Myoxocephalus spp.*), tomcod (*Microgodus tomcod*)) in this area of the harbour. Migratory fish species that frequent the Saint John River include rainbow smelt (*Osmerus mordox*), gaspereau (*Alosa pseudoharengus*), shad (*Alosa sapidissimo*), outer bay of Fundy Atlantic salmon (*Solmo salar*), American eel (*Anguillo rostrata*) and striped bass (*Morone saxatilis*), which pass through the harbour mostly between March and May. The macro-invertebrate community is impoverished, and dominated by invasive Green crabs. Harbour seals frequent the open channel areas of the harbour, particularly in the spring during the runs of migratory fishes.

Potential Obstructions, such as natural/man-made, other works, navigation aids, etc.

There is only one potential obstruction to the work along the northern sea wall; a temporary floating wharf that is placed in Market Slip during the summer months (see attached Figure 2). The floating wharf, which is accessed from the North Market Wharf on the north side of Market Slip, enables up to four small recreational boats to temporarily dock for passengers to access the uptown Saint John commercial district.

Land Use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

The seawall exists adjacent to the Port of Saint John channel that is used for shipping bulk goods, receiving cruise ships, and enabling commercial fishers and recreational boaters to pass through the harbour. The site was historically used for the landing of commercial fisheries and bulk goods, with extended wharves constructed and in-filled in the early 1800's. The site was later (1950s) developed into a Canada Coast Guard (CCG) base and Fisheries and Oceans Canada office through the construction of permanent wharves. The site was acquired by the Saint John Development Corporation (SJDC) between 2011 and 2012 for the Fundy Quay development, which proposes high quality development and increased public access to the waterfront. The site is still currently used by CGG for helicopter landings, and for some office and storage resources through a lease agreement with SJDC that expires in 2017.

4. Body of Water Use Information

Navigation Types (check all that apply)
☒ Commercial ☒ Recreational ☒ Aboriginal

Max Vessel Size
Length 360 metres Width n/a Draft 9.45 metres

Traffic Direction (check one)
☐ One-Way ☒ Two-Way

Manoeuvrability (check all that apply)
☐ Poor ☐ Good ☒ Excellent

Day/Night (check one)
☐ Day ☐ Night ☒ Both

Volume (check one)
☐ Low ☒ Med ☐ High

Navigation Season(s) (check all that apply)
☒ Winter ☒ Spring ☒ Summer ☒ Fall

Other Uses such as cottagers, special events, fishing, etc.

There are no other notable uses of this site as it is closed to public access.

5. Project Information

*Type of Work such as bridge, dam, marina, etc.
Wharf

*Related Activities (check all that apply)
☐ Construct ☐ Place ☐ Alter ☐ Rebuild
☒ Repair ☐ Decommission ☐ Remove
☐ Permanent ☒ Temporary

*Brief Project Description (or attach) such as status, structures, operation, etc.

The Fundy Quay Marine Structures Remedial Works project involves the resurfacing of up to 331 m of an existing sea wall in the Port of Saint John, New Brunswick. Resurfacing will include removing and replacing 33 m of steel sheet piling, constructing a concrete overlay to a depth of 1.0 m below the low water mark along 34 m of an existing gravity wall, constructing a concrete overlay to a depth of 0.3 m below an existing cope wall along approximately 263 m of cribs, and using concrete to repair crib corners, keyways and other local deterioration in concrete cribs.

*Method of Construction such as temporary works, activities, etc.

The construction phase will include the implementation of environmental mitigation measures (silt curtains, booms,) and the establishment of temporary structures including safety lighting, barriers, and signage. The project will temporarily side cast an estimated 210 m^3 of sediments at the base (7.62 m below Low Water Ordinary Spring Tide (L.W.O.S.T.)) of approximately 45 m of sea wall along the northern face (see attached Figure 3 and supporting files (included with the submission). The sidecast sediments will be replaced upon completion of sea wall maintenance. Old wall anchors, ladders, fender chains, timbers float guides, etc. that may interfere with resurfacing will be removed. The sea wall sections will be resurfaced with steel sheet piling (SSP) or concrete overlay with the SSP wall section being anchored into the subsurface of the wharf.

Ancillary structures (float guides, ladders, fenders, etc.) will be re-attached. Silt curtains will be removed either via a barge with hydraulic winch, or via heavy equipment (excavator or crane).

Anticipated Impacts, such as source, severity, mitigation, marking, waste/debris mgmt, use, cumulative, etc.

Navigation: The project is not anticipated to have any impacts on navigation within the harbour. The wharf is currently not used for berthing commercial vessels, and the work will not extend into the navigation channel.

Erosion and Sediment Control: The establishment of silt curtains and a silt boom prior to side casting will mitigate the release of suspended solids into the water column. The curtains will remain in place until the associated project work has been completed.

Operation of Machinery: Machinery will be cleaned prior to arriving on site, and will be maintained in good working condition at all times to prevent the leakage of fluids (hydraulic fluid, lubricants, fuel).

Contaminant and Spill Management: Spill response kits will be kept on site, and a spill/contaminant response plan will be developed.

*Expected Start Date in yyyy/mm/dd	*Expected Completion Date in yyyy/mm/dd
2016/01/01	2016/12/31

6. Environmental Review Information

Is work located on federal lands?	Is project a Designated Project under CEAA 2012 Regs?
☐ Yes ☒ No ☐ Unknown	☐ Yes ☒ No ☐ Unknown
Is project subject to Northern EA Regime(s)?	If yes, which review process(es) are required?
☐ Yes ☒ No ☐ Unknown	☐ IFA ☐ MVRMA ☐ NLCA ☐ YESSA

Other Federal Organizations Involved

☒ Canadian Environmental Assessment Agency (CEAA)
☒ Fisheries and Oceans (DFO)
☐ Major Projects Management Office (MPMO)
☐ Aboriginal Affairs & Northern Development (AANDC)
☒ Environment Canada (EC)
☐ Natural Resources Canada (NRCan)
☐ Northern Projects Management Office (NPMO)
☐ Other: Port Saint John

7. Supporting Documentation Requirements

Mandatory Information Checklist

(incomplete information will be returned with no action)

☐ Completed and Signed "Notice of Works" form

- *All mandatory fields completed:*
  - ☒ Confirmation of Riparian Ownership
  - ☒ Body of Water Name
  - ☒ Owner Contact Information
  - ☒ Work Site Information
  - ☒ Project Information

☒ Map showing location of project *

☒ Top/Plan Drawing with Dimensions *

☒ Side/Profile Drawing with Dimensions *

* *6 copies if submitting hard copy submission*

Recommended Information

(may expedite your review)

☒ Body of Water Details

☒ Land Use/Ownership information

☒ Body of Water Use Information

☒ Impacts, Obstructions and Mitigation Plans

☒ Environmental Review & Settings Information

☐ Operation, Maintenance and Marking Plans

☐ Photographs of Work Site and Body of Water

☐ Aboriginal Consultation Results

☒ Other Government Agencies Contacted

☐ Water Lot Lease Information

☐ Opt-in Request Annex (non-scheduled waters only)

8. Owner Authorization and Certification

I hereby authorize Tim Vickers, located at Stantec Consulting Ltd. to act on my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this application.

I hereby certify the information contained herein is complete, true and accurate to the best of my knowledge and I am authorized to submit this application.

*Signature:

*Date (yyyy/mm/dd): Sept. 9/2015

For office use only:

Date Stamp:

The personal information provided on this form is protected under the provisions of the *Access to Information Act* and the *Privacy Act*.

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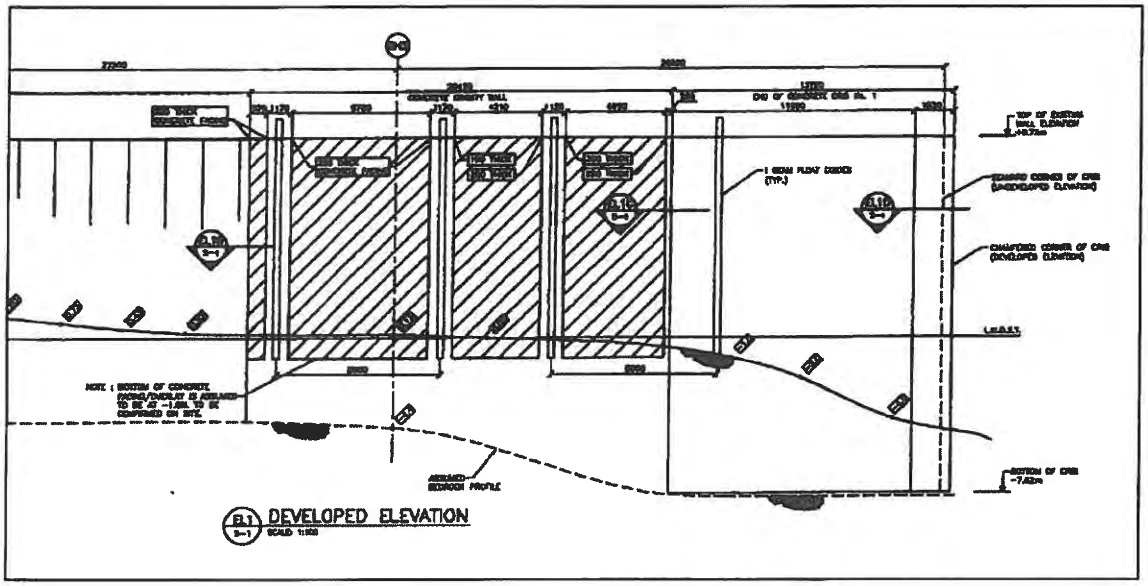
[a] "Owner", in relation to a work, means the actual or reputed owner of the work or that owner's agent or mandatory. It includes a person who is in possession or claiming ownership of the work and a person who is authorizing or otherwise responsible for the construction, placement, alteration, repair, rebuilding, removal, decommissioning, maintenance, operation, safety or use of the work. It also includes a person who proposes to construct or place a work.

Figure 1. Location of the proposed Fundy Quay Marine Structures Remedial Works project in the Saint John Harbour, New Brunswick.

Figure 2. Site location, property boundaries, in-water work, and potential obstructions associated with the proposed Fundy Quay Marine Structures Remedial Works project in the Saint John Harbour, New Brunswick.

Figure 3. Side view of temporary sidecast dredging associated with the proposed Fundy Quay Marine Structures Remedial Works project in the Saint John Harbour, New Brunswick.



From: Vigder,Joseph [CEAA]
To: Vickers, Tim
Cc: friederike.kirstein@ceaa-acee.gc.ca
Subject: RE: Clarification of CEA - Fundy Quay Project
Date: October-01-15 2:01:38 PM

Hi Tim,

Based on the information provided in your email below and the attached documentation, the proposed Fundy Quay Project is not a designated physical activity under the *Canadian Environmental Assessment Act, 2012*. The proponent is therefore not required to submit a project description to the Canadian Environmental Assessment Agency.

If you require any additional information, or if you have any furthers questions or concerns, do not hesitate to get in touch.

Take care,

Joseph Vigder, MREM

Environmental Assessment Officer, Atlantic Region
Canadian Environmental Assessment Agency / Government of Canada
joseph.vigder@ceaa-acee.gc.ca / Tel : 902-426-4951

Agente d'évaluation environnementale, région atlantique
Agence canadienne d'évaluation environnementale / Gouvernement du Canada
joseph.vigder@ceaa-acee.gc.ca / Tél : 902-426-4951

Government of Canada Gouvernement du Canada

Canada

From: Vickers, Tim [mailto:Tim.Vickers@stantec.com]
Sent: September 30, 2015 9:57 AM
To: Vigder,Joseph [CEAA]
Subject: Clarification of CEA - Fundy Quay Project

Joseph,

I am looking for confirmation on a proposed maintenance Project (Fundy Quay Marine Structures Remedial Works) that would be conducted in the Saint John Harbour, in Saint John, New Brunswick. The Project involves the re-surfacing of up to 331m of an existing sea wall to repair deterioration of concrete and steel sheet piling. A portion of the work (~ 45 m) will involve the temporary sidecasting of an estimated 210 cubic metres of sediment at the base of the seawall, which will be replaced upon completion of the work. My review of the *Canadian Environmental Assessment Act, 2012* and associated guidelines indicates that the project does not meet the requirements for a CEA assessment; however, I would appreciate your direction on this matter. The follow outlines information that may be pertinent to your evaluation; specifically, the Project:

- Would not occur on federal lands
- Would occur on lands owned entirely by the Project proponent, the Saint John Development Corporation (SJDC)
- Is not a designated physical activity listed in Schedule of *Canadian Environmental Assessment Act, 2012*
- Does not require a New Brunswick Environmental Impact Assessment (confirmation from David Maguire, NB Dept. of Environment, August 13, 2015)
- Does not require a Disposal at Sea Permit (confirmation from Jayne Roma, Environment Canada, August 28, 2015)
- Does not require formal approval from the Fisheries Protection Program (confirmation from François Plante, Fisheries and Oceans Canada, August 18, 2015)
- Has submitted a Notice of Works to Transport Canada (as per discussions with Melanie LeBlanc, submitted September 10, 2015)

I have attached a copy of the Notice of Works form which includes a description of the Project and mitigation measures, as well as relevant marine drawings.

If you require any additional information , please let me know at your earliest convenience.

Regards.

Tim Vickers, MBA, M.Sc. B.Sc.
Senior Environmental Scientist
Stantec
Phone: 1-506-674-9147
Cell: 1-506-651-8359
Fax: 1-506-634-8104
tim.vickers@stantec.com

Appendix 7: Waste Characterization Program for Waste Management Plan by Stantec 2017

Stantec Consulting Ltd.
130 Somerset Street, Saint John NB E2K 2X4

January 20, 2017
File: 121811071.207

Attention: Kent MacIntyre, General Manager
Saint John Development Corporation,
1 Market Square, Suite 301,
Saint John, NB, E2L 4Z6

Dear Mr. MacIntyre,

Reference: Waste Characterization Program for Waste Management Plan – Fundy Quay Redevelopment Site

Further to our proposal dated July 13, 2016, Stantec Consulting Ltd. (Stantec) is pleased to provide information necessary to classify waste that may be generated during development at the area of interest identified by the Saint John Development Corporation.

Background information, a description of the work, results and summaries of disposal issues are presented herein. A Glossary of Terms is provided in Appendix A.

BACKGROUND

As detailed in the Draft Remediation Plan for the Fundy Quay Redevelopment Site dated December 15, 2015, a Waste Management Plan was proposed. Excavations for the proposed buildings are expected to generate significant quantities of waste soil and these wastes may be contaminated with petroleum hydrocarbons, polycyclic aromatic hydrocarbons, metals and other contaminants. Sampling and testing in advance of construction will assist in identifying opportunities for re-use, disposal, treatment and recycling.

SCOPE OF WORK

The scope of the Waste Characterization Program presented in the Draft Remediation Plan proposed the advancement of an estimated 30 boreholes across the site. Greater coverage was contemplated for proposed building locations on the understanding that more waste soil would be generated relative to the walkway and natural areas. The proposed scope of work was modified as follows:

- The proposed sampling and testing program would be limited to approximately one-half of the site. The area of interest would focus on the eastern half of the site adjacent to Water Street where the majority of the excavation waste will be generated from Building Area #2, Area #3 and Area #4 as shown on Drawing 1 (Appendix B).
- The proposed coverage would be reduced to 1 borehole / 900 square metres, from the original coverage of 1 borehole / 625 square metres, thereby reducing associated expenditures. Fewer monitoring wells would also be included, thereby also reducing cost.

A series of 15 boreholes were drilled across the eastern half of the site in August 2016 in order to characterize subsurface conditions in the proposed building excavation areas (Area #2, Area #3 and Area#4). The borehole locations, designated 16BH-01 through 16BH-15, were positioned within a 30 m grid pattern that extended over an area measuring approximately 90 m by 150 m adjacent to Water Street (refer to Sample Location Plan, Drawing 2 Appendix B). The boreholes were advanced to depths of approximately 6 m below grade on the expectation that excavations for new buildings would not exceed this depth in this area of the site. Groundwater monitoring wells were installed in 10 of 15 boreholes to facilitate groundwater sampling.

Groundwater samples were collected from 7 existing monitoring wells and each of the 10 wells installed in 2016 and tested for petroleum hydrocarbons (PHC) in order to characterize groundwater conditions.

Chemical analyses were also completed on soil samples collected in August 2016. The soil sampling program included the collection of an estimated 150 samples, with selected samples being submitted for analysis of one or more of the following analytical constituents:

- Petroleum hydrocarbons (PHCs);
- Polycyclic aromatic hydrocarbons (PAHs);
- Metals;
- Metals Leachate;
- Lead Leachate;
- Polychlorinated biphenyls (PCBs); and,
- Volatile organic compounds (VOCs).

On completion of the drilling program, a survey was completed to establish the surface elevations at the borehole locations (refer to Ground Elevation Survey, Appendix C). The surface topography information was integrated into a 3-dimensional model along with the chemical analysis data. These data were used to generate 3-dimensional visualizations of selected chemical constituents in soil to assist with waste management decision making.

RESULTS

Subsurface Conditions

Well construction details and subsurface conditions observed from the drilling are shown on the Borehole and Monitoring Records (Appendix D). Conditions observed revealed that a layer of granular fill overlies a layer of heterogeneous fill over the Canadian Coast Guard (CCG) base. The heterogeneous fill often contains debris including bricks, wood, concrete, and coal. The heterogeneous fill is apparent throughout the Water Street public parking lot.

Grain size analyses were completed on shallow soil (0 to 2.1 mbgs) and deep soil (3.9 to 5.7 mbgs) in the CCG base (16BH-02, 16BH-09 and 16BH-12) and Water Street public parking lot areas (16BH-07, 16BH-08, 16BH-10 and 16BH-14). The grain size analyses are included in Appendix D.

From observations made during drilling, remnants of historical wooden cribwork are suspected across the majority of the site, while being at generally greater depths on the CCG base. In some cases, the presence of suspected cribwork resulted in poor sample recovery and limited depth penetration.

Based on the field observations and the grain size analyses, suitability for re-use of the soil on site would be limited to non-structural fill in the proposed walkway and natural areas. Environmental risks would need to be managed appropriately should the fill be impacted.

Groundwater elevation data collected during the August 23rd and 24th, 2016 monitoring event is presented in Appendix D. Based on the August 2016 groundwater elevations, shallow groundwater flow appears to be toward the southwest. It appears that groundwater is influenced by the tides in the Saint John Harbour. Water table depths ranged from 2.846 to 5.762 mbgs.

Regulatory Framework

The Atlantic RBCA User Guidance for Petroleum Impacted Sites in Atlantic Canada, (January 2015) were used to evaluate PHC concentrations. Tier I RBSLs for a commercial property with non-potable groundwater and coarse-grained soil with diesel/no.2 fuel oil and lube oil were used to screen human health risks. Tier I ESLs for direct contact with soil and groundwater were used to screen ecological risks.

Atlantic PIRI currently provides screening levels only for petroleum hydrocarbons. As such, for other chemicals of potential concern (COPCs) the following guidelines were referenced (in order of preference):

- Canadian Council of Ministers of the Environment (CCME): online Soil Quality Guideline database (http://ceqg-rcqe.ccme.ca/ (accessed September 2016);
- Alberta Environment: Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AE, 2016);
- OMOE: Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario (OMOE, 2011);
- United States Environmental Protection Agency (USEPA): online database (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/ (accessed September 2016); and,
- Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (current 2016).

Consistent with the Atlantic PIRI approach, screening levels have been selected for the protection of both human and ecological receptors.

In this report soil and groundwater concentrations were compared to commercial guidelines for disposal of impacted material from building excavation purposes. It should be noted that the intended land use for the site includes residential and commercial use. Residential guidelines will need to be evaluated should any impacts remain in areas of proposed residential land use to ensure the site is safe for future land use.

Chemical Analysis and Screening

The results of the analyses are compiled in Tables E1 through E7 along with the August 2016 certificates of analysis in Appendix E. The results include historical analysis results obtained between 2002 and 2013. Laboratory resemblance codes are included in the Glossary of Terms (Appendix A).

Groundwater

Petroleum hydrocarbons groundwater results are presented in Table E1. PHCs were detected in 9 of the 17 most recent submitted groundwater samples. BTEX parameters were not detected in groundwater other than toluene in 2 samples. Modified TPH concentrations resembling fuel oil or lube oil had a maximum concentration of 0.7 mg/L compared to the commercial guideline of 20 mg/L.

Soil

Petroleum hydrocarbon soil results are presented in Table E2. PHCs were detected in 74% of the submitted soil samples. PHC concentrations exceed the commercial guidelines at 02MW01 (SA1), 13MW-06 SS8 and 16BH-08.

Polycyclic aromatic hydrocarbon (PAH) soil results are presented in Table E3. PAHs were detected in 79 of the 85 (93 %) submitted samples. 23 of the 85 samples analysed for PAHs exceeded the referenced commercial guidelines.

Polychlorinated biphenyl (PCB) soil results are presented in Table E4. PCBs were detected in one of the six submitted samples. The PCB concentrations from all six of the soil samples sent from the 2016 boreholes met the commercial guidelines.

Volatile organic compound (VOC) soil results are presented in Table E5. VOCs were detected in 2 of the 6 submitted soil samples. The VOC concentrations from all six of the soil samples sent from the 2016 boreholes met the commercial guidelines.

Metal soil results are presented in Table E6. Metals impacts were observed in soil from the August 2016 boreholes with concentrations that exceed the commercial guidelines for antimony, arsenic, chromium, copper, lead, molybdenum, nickel, selenium, tin and zinc. Metals exceeded the commercial guidelines referenced in 37 of the 101 samples analysed at depths ranging from 0 to 6 mbgs. Metal leachate results are presented in Table E7. Two samples with elevated metal concentrations (16BH10(2.4-3.0) and 16BH11(1.8-2.4)) were submitted to the laboratory for analysis of metal leachate. The metal leachate concentrations from both the samples met the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations except for lead in 16BH11. Two additional samples with elevated lead concentrations (16BH06(0.6-1.2) and 16BH08(1.8-2.4)) were submitted to the laboratory for lead leachate analysis. Both of the additional samples met the referenced guideline. One of the four samples submitted exceeded the referenced guideline for lead leachate. The four analysed samples would have the highest expected lead leachate concentrations due to their elevated lead concentrations in soil.

Summary for Waste Disposal

PHCs were detected in about one-half of the groundwater samples but at concentrations below applicable commercial guidelines. If water is encountered during construction, this will have to be managed as PHC-impacted water.

Maintenance of cover over impacted material is required as per the “conditional closure” for the NBDELG remediation file. Temporary cover may be required during construction. Designs for new buildings and other infrastructure will need to maintain cover over contaminated material to restrict direct contact. Specifications for soil cover or other alternatives can be integrated into the Environmental Protection Plan or other contract documents that the developer will prepare for the redevelopment project.

Preliminary 3D visualizations and quantity take-offs for antimony, arsenic, copper, lead, vanadium, B(a)P TPE, Benzo(a)pyrene, benzene and modified TPH are included in Appendix F. The area of interest used for the calculations is shown on Drawings 1 and 2 in Appendix B. An excavation depth of 3.3 mbgs was used for the calculations as described in the Draft Remediation Plan (December, 2015). Excavation volumes will need to be revisited as design information for the redevelopment project becomes available. Impacts present in other areas of the property or associated with placing geotechnical caissons are not included in the volumes or costs associated with removal of impacted material described in this report.

The 3-D visualizations of the Building Areas 2, 3 and 4 indicate:

- PHC concentrations above the laboratory detection limits are present across the site. Modified TPH impacts are spread across the site but at concentrations below the human health commercial guidelines in the area of interest. PAHs and metal impacts often co-occur with PHC impacts.
- Lead impacts are spread across the site at varying depths with a volume of approximately 10,480 m^3 above the human health commercial guideline within the area of interest.
- B(a)P TPE impacts are spread across the site but are limited to a volume of approximately 244 m^3 above the human health commercial guideline in the area of interest.
- Benzo(a)pyrene impacts are spread across the site but are limited to low concentrations (<0.7 mg/kg) in the area of interest.
- Arsenic impacts are spread across the site but are predominately located in the southeastern area of the site at concentrations above commercial guidelines. There is approximately 2,300 m^3 of arsenic impacted soil above the human health commercial guideline located at varying depths within the area of interest. Benzene and antimony impacts are spread across the site but at concentrations below the human health commercial guidelines in the area of interest. Copper and vanadium impacts are spread across the site but are limited to a volume of approximately 105 m^3 above the human health commercial guidelines in the area of interest.

In summary, PAHs and/or PHCs were detected in all soil samples from the area of interest. This, in conjunction with elevated metals, some detectable PCBs and some detectable VOCs essentially means that all soil removed from this site (in Building Area #2, Area #3 and Area #4) will be impacted and will need to be disposed of as such.

IMPACTED MATERIAL DISPOSAL

Preliminary discussions on impacted material disposal from the site were held with waste disposal companies in the province. In order to dispose of non-petroleum hydrocarbon waste, the waste disposal company would need to obtain approval from the New Brunswick Department of Environment and Local Government (NBDELG). Examples of the information required for the approval would consist of the type of impacts present in the soil, degree of impacts in soil and historical use of the site. Calculating the average expected concentrations for disposal and specifying removal processes such as blending the soil during removal may assist with obtaining the approval. Once the construction excavation areas are finalized, we can assist with submitting the approval for impacted material disposal. Impacted material that does not obtain approval for disposal, such as soil with lead leachate concentrations above the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations, may require out of province disposal. Based on the limited amount of material expected to exceed the referenced lead leachate guidelines, it is anticipated that approval for disposal in province is likely to be obtained.

Costs and Assumptions Associated with Transportation and Disposal of Soil from Building Areas 2, 3 and 4

The following assumptions have been made in order to estimate the cost of impacted material transportation and disposal solely for the proposed buildings excavation area on Drawing 2:

1. The density of the soil was assumed to be 2.5 tonnes/m³;
2. An estimated volume of 30,000 m³ (75,000 tonnes) of excavated material would need to be removed from Building Area #2, Area #3 and Area #4;
3. These costs assume a regional soil disposal facility will be able to dispose of the material as received (i.e. NBDELG approvals are obtained);
4. The disposal cost at a NBDELG-approved PHC impacted soil disposal facility is $25/tonne;
5. The cost to transport the impacted soil is assumed to be $15/tonne; and
6. The disposal cost of construction debris such as bricks, concrete, wood and debris is $25/tonne.

The rates described above are preliminary in nature and could be negotiated once design information and quantities for the redevelopment project become available.

Estimated Cost of Trucking and Disposal of Soil from Building Area #2, Area #3 and Area #4

Item	Quantity	Unit Cost	Total Cost (excluding taxes)
Trucking	75,000 tonnes	$25/tonne	$1,875,000
Disposal	75,000 tonnes	$15/tonne	$1,125,000
Trucking and Disposal Subtotal	75,000 tonnes	$40/tonne	**$3,000,000**
Contingency for unknowns	1	25% of total cost	$750,000
Total			**$3,750,000**

Based on the above assumptions, the cost to dispose of impacted material in the area of interest would be $3,750,000 (excluding taxes).

Impacts present on other areas of the property or associated with placing geotechnical caissons are not included in the volumes or costs associated with removal of impacted material described in this report. Also, design, engineering, project management, testing, excavation, groundwater handling and backfilling were not included in the cost as they are required for normal construction activities.

Reference: Waste Characterization Program for Waste Management Plan – Fundy Quay Redevelopment Site

CLOSURE

We trust that the above proposal meets with your requirements at this time. If you have any questions or would like to discuss changes, please don’t hesitate to contact us.

Regards,

STANTEC CONSULTING LTD.

Marilou Toole

Marilou Toole, P.Eng.
Environmental Engineer
Phone: 506-648-1224
Fax: 506-634-8104
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Attachments:	Appendix A	Glossary of Terms
	Appendix B	Drawings
	Appendix C	Ground Elevation Survey
	Appendix D	Field Methodology, Borehole and Monitoring Well Records & Grain Size Analyses
	Appendix E	Analytical Tables and Laboratory Certificates
	Appendix F	Preliminary 3D Visualization and Quantity Take Off

MKT/CDB/jmb

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January 20, 2017

Appendix A

Glossary of Terms

GLOSSARY OF TERMS

(updated January 19, 2017)

Screening Levels: Atlantic RBCA for PHC Impacted Sites in Atlantic Canada Version 3 User Guidance, January 2015

Tier I ESLs: Appendix 2, Tier I RBSLs: Appendix 3, Tier II PSSLs: Appendix 4, Tier II SSTLs: Atlantic RBCA Tool Kit Version 3

Petroleum Hydrocarbons and Fraction Codes

BTEX/mTPH = Benzene, Toluene, Ethylbenzene, Xylenes/Modified Total Petroleum Hydrocarbons; F1 = C6-C10 less BTEX; F2=C10-C16; in Atlantic Canada, F3 = $C_{>16}$ – C_{32}. F3 is the sum of 2 fractions. If only 1 of the fractions is <RL, F3 equals the concentration of the other fraction. If both fractions are below their RLs, F3 = < the higher RL. F4= C32-C50

General Abbreviations

AC CDC = Atlantic Canada Conservation Data Centre
AE = Alberta Environment
AST = Aboveground Storage Tank
ASTM = American Standards for Testing of Materials
B[a]P PEF = Benzo(a)pyrene Potency Equivalence Factor
B[a]P TPE = Benzo(a)pyrene Total Potency Equivalents
CCME = Canadian Council of Ministers of the Environment
COPC = Chemical of Potential Concern
CSA = Canadian Standards Association
CWS = Canada Wide Standards
DELG = Dept. of Environment and Local Government
EPC = Exposure Point Concentration
ERA = Ecological Risk Assessment
ESA = Environmental Site Assessment
ESL = Ecological Screening Level
F4? = Did not return to baseline at C_{32}, F4 may be present
FD = Field Duplicate
GPS = Global Positioning System
HAL = Health Advisory Limit
HHRA = Human Health Risk Assessment
HQ = Hazard Quotient
IACR = Index of Additive Cancer Risk
LD = Laboratory Duplicate
LRA = Limited Remedial Action
mbgs = Metres Below Ground Surface
MtBE = Methyl Tertiary Butyl Ether
N/A = Not Applicable
NAD83 = North American Datum of 1983
NB = New Brunswick
NBDH = New Brunswick Department of Health
NBHN = New Brunswick Hydrographic Network
OMOE = Ontario Ministry of Environment
PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
PHC = Petroleum Hydrocarbon
PID = Property Identification
PIRI = Partnership in RBCA Implementation
ppm = Parts Per Million
QA/QC = Quality Assurance / Quality Control
RBCA = Risk Based Corrective Action
RBSLs = Risk Based Screening Levels
RDL/RL = Reporting Detection Limit/ Reporting Limit
RfC = Reference Concentration
RPC = Research and Productivity Council
RPD = Relative Percent Difference from the mean
RSC = Risk Specific Concentration
SAR = Species At Risk
SCC = Standards Council of Canada
SNB = Service New Brunswick
SQG_E/SQG_{HH} = Soil Quality Guideline Env'tl/Human Health
SSTL = Site-Specific Target Level
Stantec = Stantec Consulting Ltd.
UCL = Upper Confidence Limit
USCS = Unified Soil Classification System
USEPA = United States Environmental Protection Agency
UST = Underground Storage Tank
VEC = Valued Environmental Component
VISLs = Vapour Intrusion Screening Levels
VOC = Volatile Organic Compound

GLOSSARY OF TERMS

(updated July 4, 2016)

LABORATORY RESEMBLANCE CODES

AG = Aviation Gasoline
ARO. = Aroclor
FO = Fuel Oil Fraction
FO.LO = Fuel Oil and Lube Oil Fraction
G = Gasoline Fraction
LO = Lube Oil Fraction
MIXTURE = Mix of Aroclors 1242, 1254, and 1260
ND = Not Detected
NR = No Resemblance (not petrogenic in origin)
NRFR = No Resemblance in the Fuel Oil Range ($C_{>10}$-C_{21})
NRLR = No Resemblance in the Lube Oil Range ($C_{>21}$-C_{32})
OP = One Product (unidentified)
PAH = Possible PAHs Detected
PG = Possible Gasoline Fraction
PLO = Possible Lube Oil Fraction
PWFO = Possible Weathered Fuel Oil Fraction
PWG = Possible Weathered Gasoline Fraction
TO = Transformer Oil
TR = Traces of Fuel Oil Fraction
UP = Unknown Peaks/Unidentified Compounds
WFO = Weathered Fuel Oil Fraction
WG = Weathered Gasoline Fraction

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Appendix B

Drawings

Path: V:\01218\active\121811071\task 207 waste characterization program\03 data\3 gis cad\2 gis\figures\report\121811071-207-001 Fig 1 Site Remediation Plan.mxd

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Site Location Plan

Saint John, N.B.

Client: Saint John Development Corporation

Scale: 1:1,000

Project No.: 121811071.207

Date: (dd/mm/yyyy): 18/01/2017

Fig. By: JAB

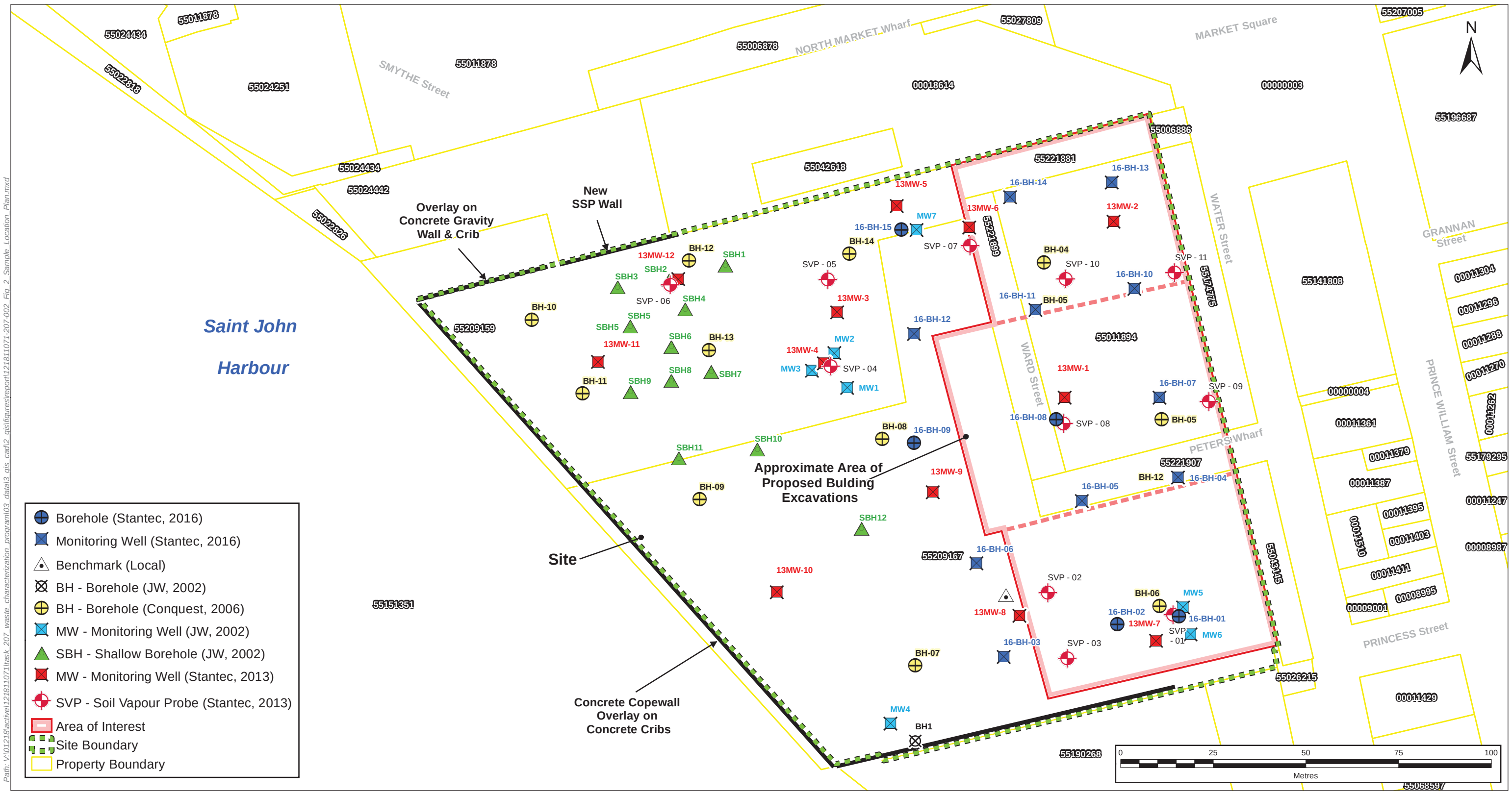
Appd. By: MT

Data Sources:
SNB
ArcGIS Online Bing Imagery
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Dwg. No.: 1

Stantec

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic



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NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC PROJECT AND SHOULD NOT BE USED FOR OTHER PURPOSES.

Sample Location Plan

Saint John, N.B.

Client:	Saint John Development Corporation
Scale:	1:1,000
Project No.:	121811071.207
Date: (dd/mm/yyyy):	17/01/2017
Fig. By:	JAB
Appd. By:	MT
Dwg. No.:	2

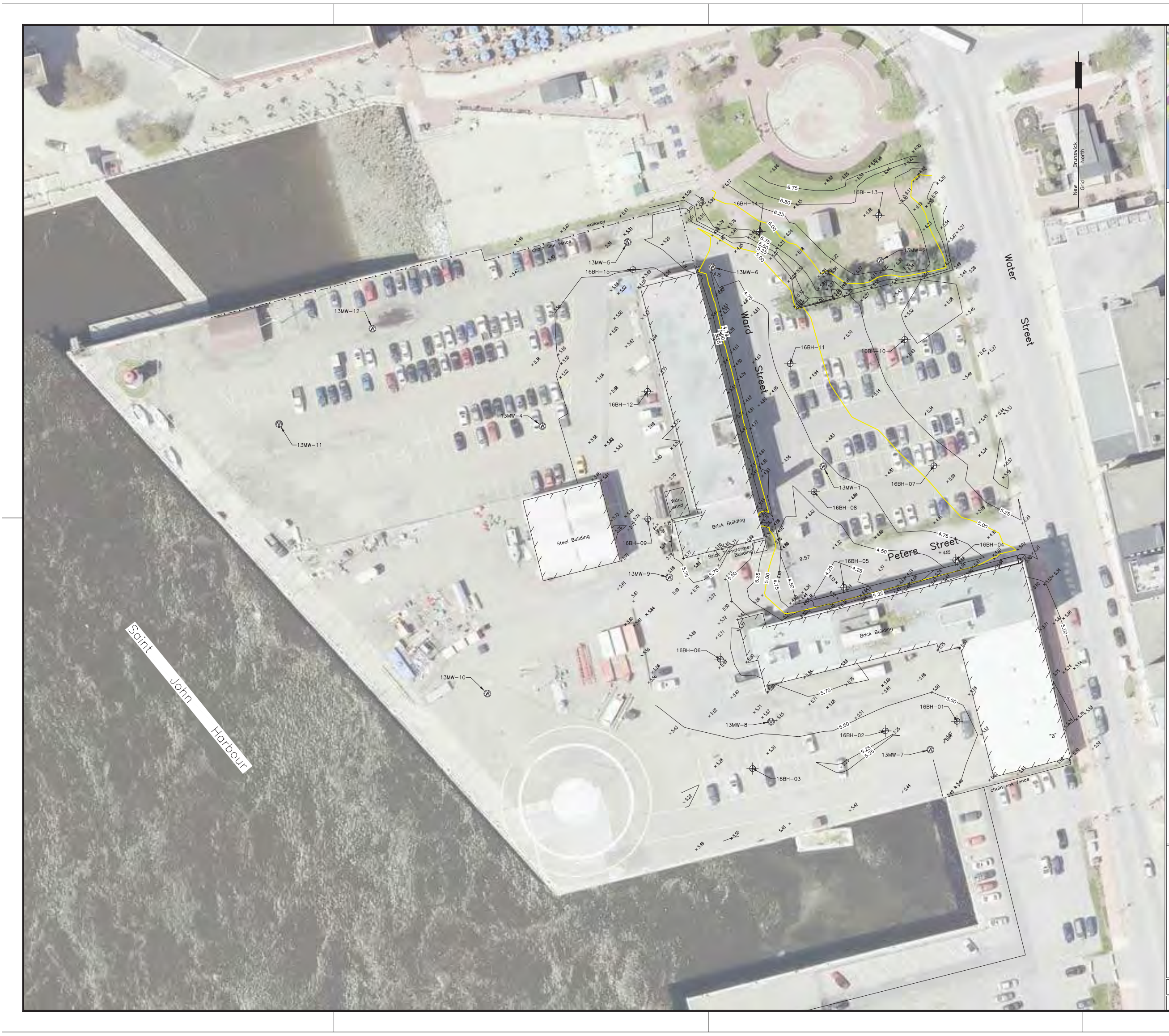
Data Sources:
SNB
ArcGIS Online Bing Imagery
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Coordinate System: NAD 1983 CSRS New Brunswick Stereographic

January 20, 2017

Appendix C

Ground Elevation Survey



© 2010 NAVTEQ © AND © 2016 Microsoft Corporation

Scale 1:10,000

NOTES

1. Field survey completed on Sept 12, 2016.
2. Elevations are Geodetic Datum in metres referred to New Brunswick Grid Monument Number 28160 having an elevation of 20.758 metres and are shown thus:

×5.31 Surveyed Point

LEGEND

Ⓦ	Monitoring Well
⌖	Bore Hole
▨	Building

COAST GUARD SITE, SAINT JOHN, NB

BOREHOLE AS-DRILLED LOCATIONS

NAD83 COORDINATES BASED ON NB HPN GRID

Prepared by Hughes Surveys & Consultants Inc. Date of Survey: Aug 24, 2016

Hughes Reference File: Y16-262

BOREHOLE	NORTHING	EASTING	TOP PVC	GROUND	PT NUMBER
16-BH-01	7363533.0	2534300.6	-	5.40	4027
16-BH-02	7363530.8	2534284.0	-	5.30	4028
16-BH-03	7363522.0	2534253.3	5.07	5.23	4029
16-BH-04	7363570.4	2534300.3	4.52	4.63	4024
16-BH-05	7363564.1	2534274.4	4.10	4.21	4022
16-BH-06	7363547.2	2534246.0	5.62	5.74	4033
16-BH-07	7363592.0	2534295.3	4.95	5.09	4045
16-BH-08	7362586.1	2534267.5	-	4.63	4042
16-BH-09	7363579.8	2534229.1	-	5.71	4039
16-BH-10	7363621.3	2534288.6	5.35	5.46	4047
16-BH-11	7363615.6	2534261.9	4.73	4.85	4049
16-BH-12	7363609.2	2534229.1	5.63	5.73	4040
16-BH-13	7363650.0	2534282.5	6.14	6.27	4053
16-BH-14	7363646.1	2534255.0	5.82	5.90	4055
16-BH-15	7363637.4	2534225.7		5.52	4061

COAST GUARD SITE, SAINT JOHN, NB

MONITORING WELL AS-DRILLED LOCATIONS

NAD83 COORDINATES BASED ON NB HPN GRID

Prepared by Hughes Surveys & Consultants Inc. Date of Survey: Aug 24, 2016

Hughes Reference File: Y16-262

WELL	NORTHING	EASTING	TOP PVC	GROUND	PT NUMBER
13-MW-1	7363592.0	2534269.8	4.71	4.79	4043
13-MW-2	7363639.5	2534283.0	6.26	6.32	4051
13-MW-4	7363601.2	2534204.8	5.35	5.46	4062
13-MW-5	7363643.7	2534224.5	5.27	5.34	4059
13-MW-6	7363637.9	2534244.0	4.69	4.77	4057
13-MW-7	7363526.3	2534294.4	5.15	5.25	4031
13-MW-8	7363533.1	2534257.6	5.54	5.65	4035
13-MW-9	7363566.4	2534234.2	5.57	5.69	4037
13-MW-10	7363639.5	2534192.1	5.47	5.54	4069
13-MW-11	7363601.6	2534143.9	5.30	5.50	4064
13-MW-12	7363623.9	2534165.5	5.46	5.54	4066

Ground Elevation Survey

Coast Guard Site,
Water Street,
Saint John, New Brunswick

Prepared By

HUGHES SURVEYS & CONSULTANTS INC.

Aug 31, 2016

8 0 8 16 24 32

1 : 400

meters

Dwg. No. S16262	Disk No. 2016	Topos 16262-0825-NRT	Disk No. 2016
Dwn. by B.E.S.	Job No. Y16262	Rev. No.	Map Ref. G/08-T2C,SW(2)

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January 20, 2017

Appendix D

Field Methodology, Borehole and Monitoring Well Records & Grain Size Analyses

D-1.0 Pre-Intrusive Investigation Site Activities

The locations of services and utilities were established prior to the remedial activities, drilling and sampling phases of the investigation. The locations of underground utilities were confirmed by contacting the utility providers and the landowners.

D-2.0 Drilling

The drill was equipped with standard augers, hollow stem augers or HQ coring equipment. Soil samples were recovered from split-spoons, where feasible. Soil samples were logged by Stantec personnel at the time of the drilling. Soil classification was carried out in accordance with the procedures in the ASTM D2488 Standard (Visual-Manual Procedure).

D-3.0 Monitoring Wells

Monitoring wells were completed to the following general specifications:

- 50 mm ID, 10 slot, PVC Screen;
- 50 mm ID PVC riser pipe to the surface;
- No. 2 silica sand filter pack 0.3 m above the well screen;
- Minimum 0.3 m thick bentonite seal above the filter pack; and,
- Flush mount or above-ground protective casings.

The monitoring wells were fitted with caps and well casings with covers to protect them from accidental damage and accidental or intentional contamination. Completion details for the wells are included on the Monitoring Well Records.

D-4.0 Determining Elevations and Sample Locations

Soil sampling locations and important site features were tied in relative to a known reference point(s), using a measuring tape or taking GPS measurements using a hand held GPS.

The ground surface and monitoring well casings (top of PVC pipe) were surveyed to geodetic datum.

D-5.0 Sample Handling

All samples were placed in laboratory supplied clean glass jars. The jars were placed in a cooler with ice packs for transport back to our office. To minimize the potential for cross-contamination, all sampling equipment was thoroughly rinsed between each sampling event or samples were obtained from soil that never contacted the excavation equipment.

D-6.0 Sample Selection for Laboratory Analysis

The soil samples recovered from the boreholes and excavation boundaries, were visually classified (for soil type, petroleum odours, and staining), and screened for vapours using a Mini Rae 2000 photoionization detector, calibrated to isobutylene. Based on these results, the location of sources on the property and field observations, selected samples were submitted to the laboratory for analysis.

D-7.0 Groundwater Sampling

An interface probe or disposable bailer was used to confirm the presence or absence of free phase liquid petroleum product in the monitoring wells.

An electronic water level meter was used to measure the groundwater elevations in the monitoring wells. Groundwater elevation data collected during the August 23 and 24, 2016 monitoring event is presented in Table D1.

Prior to groundwater sampling, field equipment was cleaned and decontaminated. The monitoring wells were purged a minimum of 3 well volumes and allowed to recover to ensure that representative groundwater from the surrounding formation had been drawn into the monitoring well casings. Groundwater samples were then collected from the monitoring wells for laboratory analysis.

Table D1 Groundwater Elevations

Location	Depth of Well (m)	Top of PVC Casing Elevation (m)	Water Depth to Top of PVC Casing (m)	Groundwater Elevation (m)
			16-August-23 & 24	16-August-23 & 24
MW5	6.2	8.73	4.718	4.012
MW6	5.8	8.84	3.67	5.17
13MW-01	6.1	8.18	3.217	4.963
13MW-02	9.1	9.72	4.644	5.076
13MW-05	7.3	8.76	3.687	5.073
13MW-06	6.4	8.19	2.899	5.291
13MW-07	7.9	8.61	5.762	2.848
16BH-03	5.7	5.07	4.098	0.972
16BH-04	6.1	4.52	2.887	1.633
16BH-05	6.1	4.10	2.846	1.254
16BH-06	5.5	5.62	5.055	0.565
16BH-07	6.1	4.95	3.105	1.845
16BH-10	6.1	5.35	3.425	1.925
16BH-11	6.1	4.73	3.264	1.466
16BH-12	6.1	5.63	4.199	1.431
16BH-13	6.1	6.14	3.897	2.243
16BH-14	6.1	5.82	4.016	1.804

D-8.0 Quality Assurance/Quality Control

Samples were uniquely labeled and control was maintained through use of chain of custody forms. Samples were collected in laboratory supplied containers and preserved as directed by the laboratory.

Stantec

BOREHOLE RECORD

16 BH-01

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

DATES: BORING **2016/08/16**

WATER LEVEL **2.4 m on 2016-08-16**

PROJECT No. **121811071.207**

BOREHOLE No. **16 BH-01**

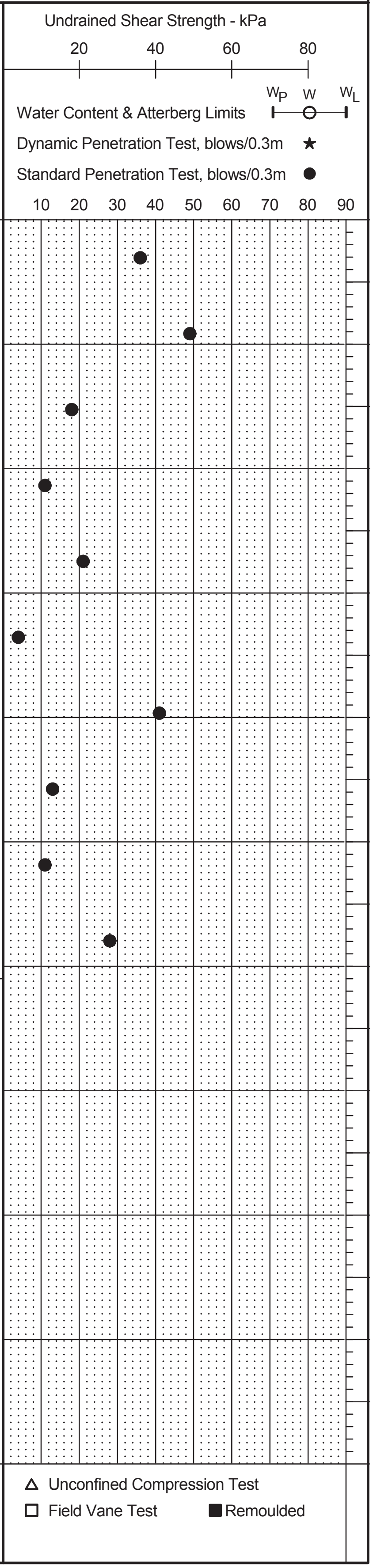
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0	5.40	
	5.3	Asphalt
		FILL: grey to brown sand with gravel, trace to some silt
	1.6	FILL: sand and gravel, trace silt with wood layers throughout - unidentified odor from 4.9 to 5.5 m
	-0.7	End of Borehole

WATER LEVEL: ▽ 2.4 m

TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
SS	1	50	36
SS	2	180	49
SS	3	280	18
SS	4	100	11
SS	5	230	21
SS	6	100	4
SS	7	355	41
SS	8	0	13
SS	9	405	11
SS	10	585	28

VOC CONCENTRATION (ppm OR %LEL)

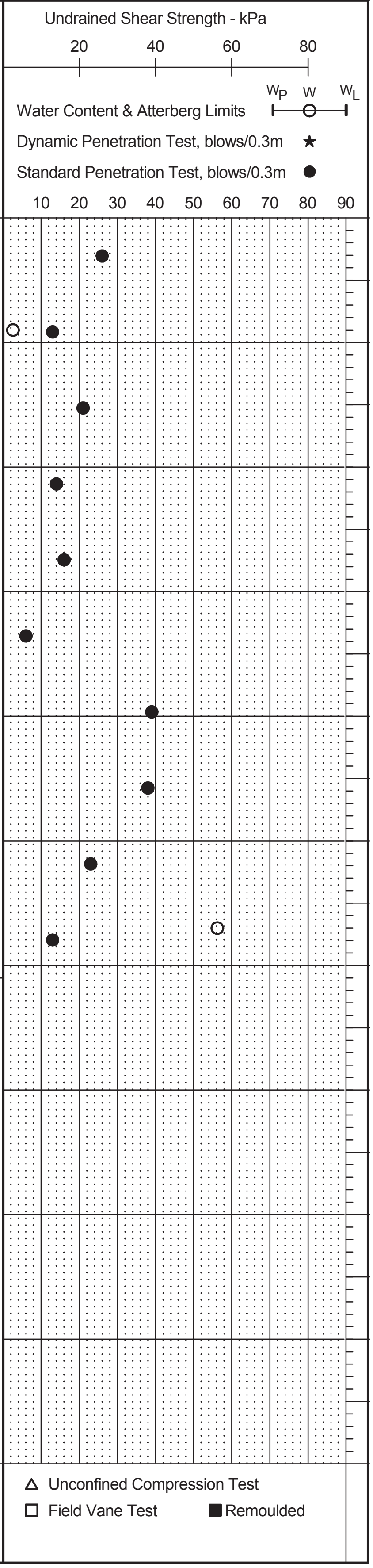


BOREHOLE RECORD

16 BH-02

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2016/08/16**
WATER LEVEL **3.0 m on 2016-08-16**
PROJECT No. **121811071.207**
BOREHOLE No. **16 BH-02**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm OR %LEL)
0	5.30								
	5.2	Asphalt							
		FILL: brown poorly graded sand with silt and gravel			SS	1	330	26	
1					SS	2	305	13	
					SS	3	280	21	
2					SS	4	280	14	
					SS	5	455	16	
3	2.3	FILL: brown poorly graded sand with silt and gravel, with wood chips and wood layers throughout - red brick pieces from 3.0 to 3.3 m		∇	SS	6	75	6	
4					SS	7	455	39	
					SS	8	330	38	
5					SS	9	180	23	
		- unidentified odor from 5.5 to 6.1 m			SS	10		13	
6	-0.8	End of Borehole							
7									
8									
9									
10									



Stantec

MONITORING WELL RECORD

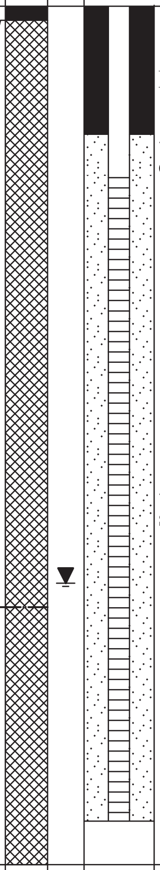
16 BH-03

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2016-08-16**
WATER LEVEL **4.1 m on 2016-08-24**
PROJECT No. **121811071.207**
BOREHOLE No. **16 BH-03**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
	5.23	
0	5.1	Asphalt FILL: brown sand with gravel, trace silt
4.2	1.0	FILL: brown to grey sand with gravel, trace silt - red brick pieces from 4.2 to 4.8 m - pieces of broken stone from 5.2 to 6.0 m
6.1	-0.9	End of Monitoring Well

WATER LEVEL: ▼ 4.1

WELL CONSTRUCTION



Top of PVC = 5.07

Bentonite

50 mm diameter PVC casing in Silica Sand

50 mm diameter PVC slot 10 screen

SAMPLES

TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	380	26	
SS	2	330	16	
SS	3	150	6	
SS	4	255	11	
SS	5	125	10	
SS	6	305	14	
SS	7	230	16	
SS	8	180	9	
SS	9	200	27	
SS	10	150	23	

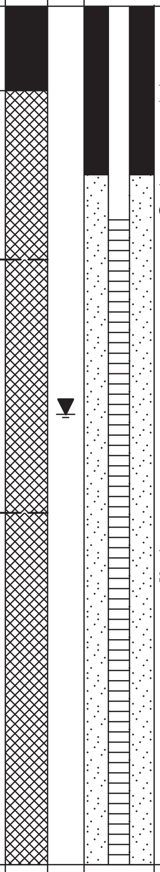
Stantec

MONITORING WELL RECORD

16 BH-04

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
PROJECT No. **121811071.207**
LOCATION **Fundy Quay**
BOREHOLE No. **16 BH-04**
DATES: BORING **2016-08-18**
WATER LEVEL **2.9 m on 2016-08-23**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WELL CONSTRUCTION
	4.63		Top of PVC = 4.52
0	4.0	ASPHALT	Bentonite
	2.8	FILL: dark brown to black sand with gravel, trace silt to silty sand with gravel	50 mm diameter PVC casing in Silica Sand
	1.0	FILL: dark brown to black silty sand with gravel to silt with sand and gravel with wood and broken stone pieces throughout	
	-1.5	FILL: dark brown to black silt, trace sand and gravel with shale bedrock pieces throughout	50 mm diameter PVC slot 10 screen
		End of Monitoring Well	



SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	100	15	
SS	2	280	3	
SS	3	180	5	
SS	4	280	5	
SS	5	100	5	
SS	6	255	5	
SS	7	255	2	
SS	8	150	10	
SS	9	280	15	

MONITORING WELL RECORD

16 BH-05

CLIENT SAINT JOHN DEVELOPMENT CORPORATION

PROJECT No. 121811071.207

LOCATION Fundy Quay

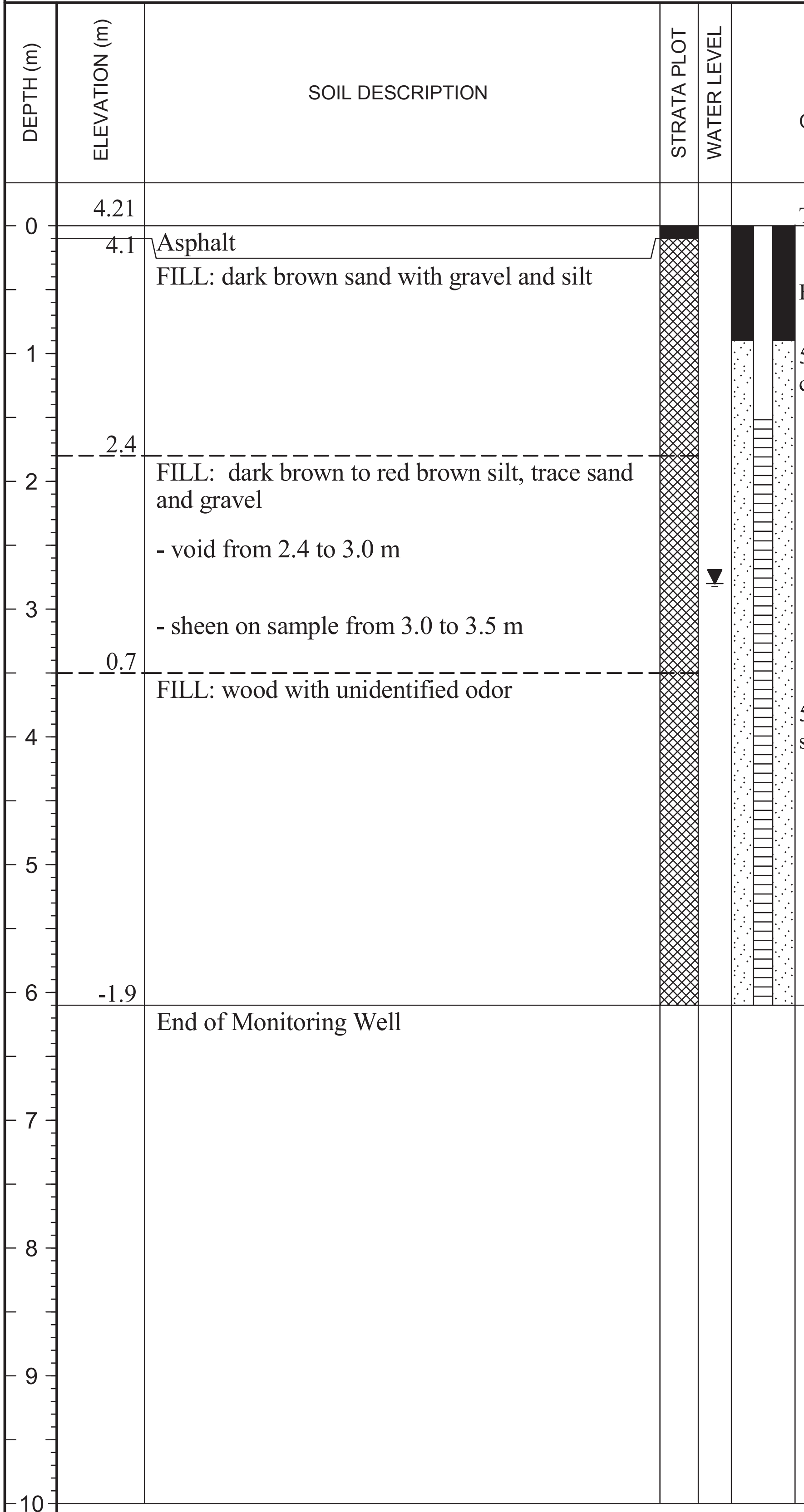
BOREHOLE No. 16 BH-05

DATES: BORING 2016-08-19

WATER LEVEL 2.8 m on 2016-08-23

DATUM Geodetic

ELEVATION (m)	SOIL DESCRIPTION
4.21	
4.1	Asphalt FILL: dark brown sand with gravel and silt
2.4	FILL: dark brown to red brown silt, trace sand and gravel - void from 2.4 to 3.0 m - sheen on sample from 3.0 to 3.5 m
0.7	FILL: wood with unidentified odor
-1.9	End of Monitoring Well



SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	180	19	
SS	2	150	15	
SS	3	75	15	
SS	4	405	5	
SS	5	200	16	
SS	6	255	75/280	
SS	7	230	74/280	
SS	8	230	9	

MONITORING WELL RECORD

16 BH-06

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

PROJECT No. **121811071.207**

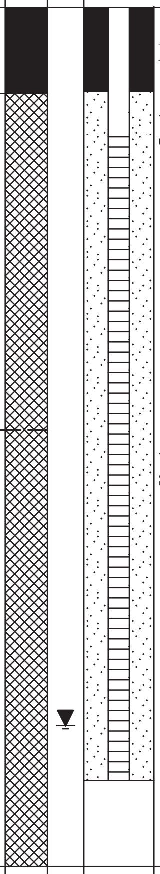
LOCATION **Fundy Quay**

BOREHOLE No. **16 BH-06**

DATES: BORING **2016-08-22**

WATER LEVEL **5.1 m on 2016-08-23**

DATUM **Geodetic**

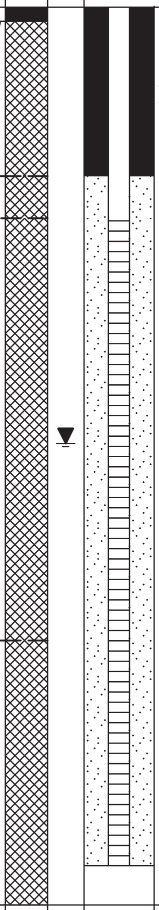


DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	5.74				Top of PVC = 5.62			mm		
0		ASPHALT and CONCRETE SLAB			Bentonite					
	5.1	FILL: brown sand with gravel, trace silt			50 mm diameter PVC casing in Silica Sand	SS	1	330	41	
1						SS	2	180	19	
2						SS	3	380	50	
						SS	4	100	50/100	
		- refusal to further penetration of split spoon at 2.5 m, augered to 3.0 m; no sampling								
3	2.7	FILL: brown sand with gravel, trace silt with red brick pieces throughout			50 mm diameter PVC slot 10 screen	SS	5	200	17	
4						SS	6	180	20	
						SS	7	100	23	
5				▼		SS	8	125	23	
6	-0.4					SS	9	305	26	
		End of Monitoring Well								
7										
8										
9										
10										

MONITORING WELL RECORD

16 BH-07

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
LOCATION Fundy Quay
DATES: BORING 2016-08-17
WATER LEVEL 3.1 m on 2016-08-23
PROJECT No. 121811071.207
BOREHOLE No. 16 BH-07
DATUM Geodetic



DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	5.09			Top of PVC = 4.95			mm		
0	5.0	Asphalt							
		FILL: brown sand with gravel, trace silt - concrete and brick from 0.0 m to 1.2 m		Bentonite	SS	1	405	48	
					SS	2	150	8	
	3.9	FILL: grey concrete and red brick, augered through, no sampling		50 mm diameter PVC casing in Silica Sand					
	3.6	FILL: brown to grey silty sand, trace gravel with wood throughout			SS	3	50	7	
					SS	4	200	2	
		- wood from 3.0 to 3.9 m	▼		SS	5	125	9	
				50 mm diameter PVC slot 10 screen	SS	6	180	10	
		- frequent red brick pieces from 3.9 to 4.5 m			SS	7	100	10	
	0.6	FILL: dark brown to black sand with silt, trace gravel with wood throughout			SS	8	355	4	
					SS	9	430	13	
					SS	10	405	18	
	-1.3	End of Monitoring Well							

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BOREHOLE RECORD

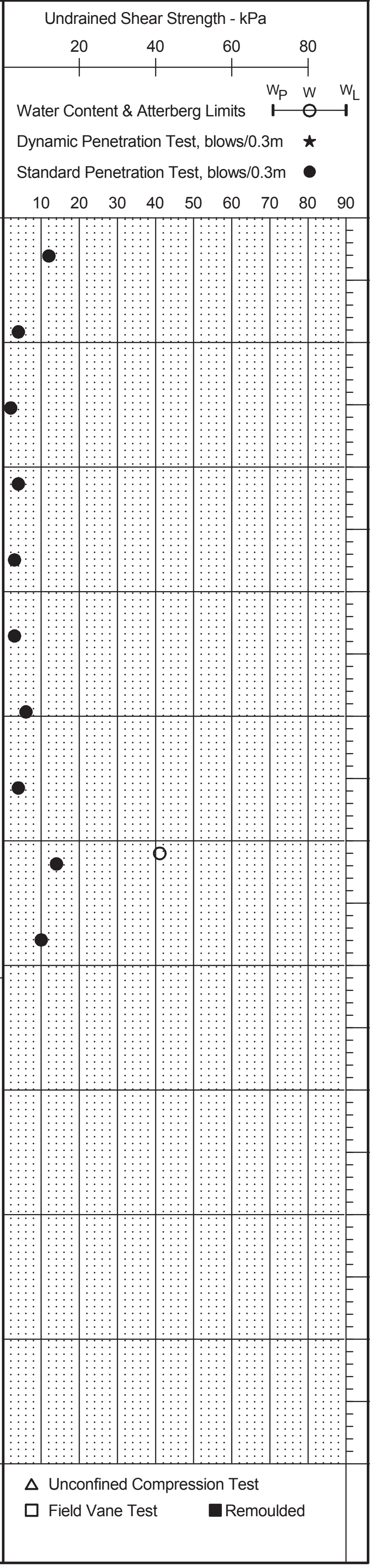
16 BH-08

CLIENT	SAINT JOHN DEVELOPMENT CORPORATION	PROJECT No.	121811071.207
LOCATION	Fundy Quay	BOREHOLE No.	16 BH-08
DATES: BORING	2016/08/18	DATUM	Geodetic
WATER LEVEL	3.6 m on 2016-08-18		

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0	4.63	
	4.5	Asphalt
		FILL: dark brown sand with silt and gravel to silt with sand and gravel with red brick and stone pieces throughout - coal pieces from 1.8 to 2.4 m
	0.4	FILL: black silt with sand and gravel to silty sand with gravel - creosote odor and sheen throughout
	-1.5	End of Borehole

WATER LEVEL: ▽ at 3.6 m

TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm OR %LEL)
SS	1	125	12	
SS	2	330	4	
SS	3	100	2	
SS	4	150	4	
SS	5	75	3	
SS	6	180	3	
SS	7	430	6	
SS	8	100	4	
SS	9	560	14	
SS	10	180	10	



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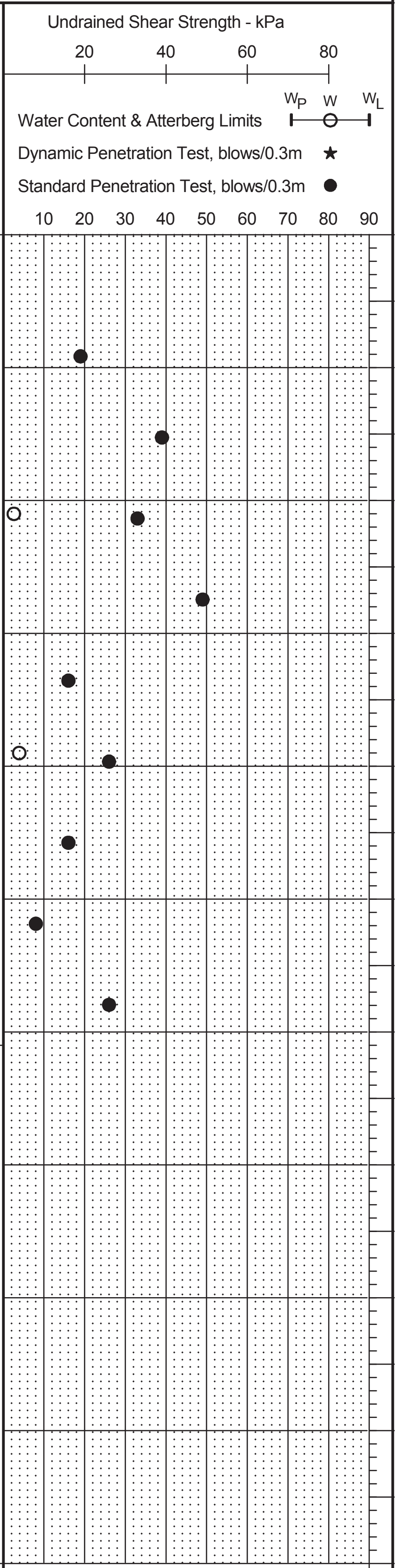
BOREHOLE RECORD

16 BH-09

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
PROJECT No. **121811071.207**
LOCATION **Fundy Quay**
BOREHOLE No. **16 BH-09**
DATES: BORING **2016/08/19**
WATER LEVEL **Not Observed**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm OR %LEL)
0	5.71	ASPHALT and CONCRETE SLAB							
	5.1	FILL: brown well graded gravel with silt and sand to poorly graded sand with silt and gravel			SS	1	280	19	
					SS	2	255	39	
					SS	3	330	33	
					SS	4	405	49	
					SS	5	355	16	
					SS	6	610	26	
					SS	7	560	16	
					SS	8	585	8	
		- wood with unidentified odor from 6.0 to 6.1 m			SS	9	255	26	
	-0.4	End of Borehole							



△ Unconfined Compression Test
☐ Field Vane Test ■ Remoulded

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MONITORING WELL RECORD

16 BH-10

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

DATES: BORING **2016-08-17**

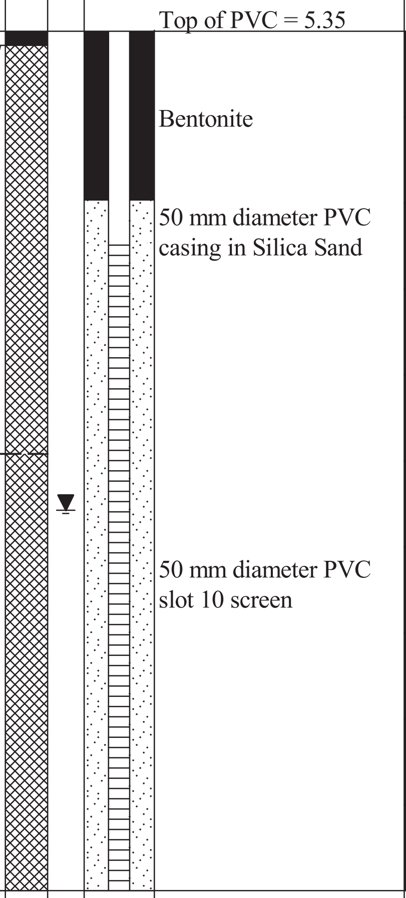
WATER LEVEL **3.4 m on 2016-08-23**

PROJECT No. **121811071.207**

BOREHOLE No. **16 BH-10**

DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION
0	5.46	
	5.4	Asphalt
		FILL: brown to black well graded sand with silt and gravel with frequent red brick pieces throughout - wood from 0.45 to 0.6 m - shattered stone from 1.5 to 1.8 m
3	2.5	FILL: brown silty sand with gravel with red brick and wood pieces throughout - wood from 3.9 to 4.8 m - dark grey below 4.8 m
6	-0.6	End of Monitoring Well



SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	405	7	
SS	2	200	12	
SS	3	255	17	
SS	4	75	6	
SS	5	200	9	
SS	6	180	11	
SS	7	100	44	
SS	8	75	9	
SS	9	455	31	
SS	10	610	19	

MONITORING WELL RECORD

16 BH-11

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**

LOCATION **Fundy Quay**

DATES: BORING **2016-08-17**

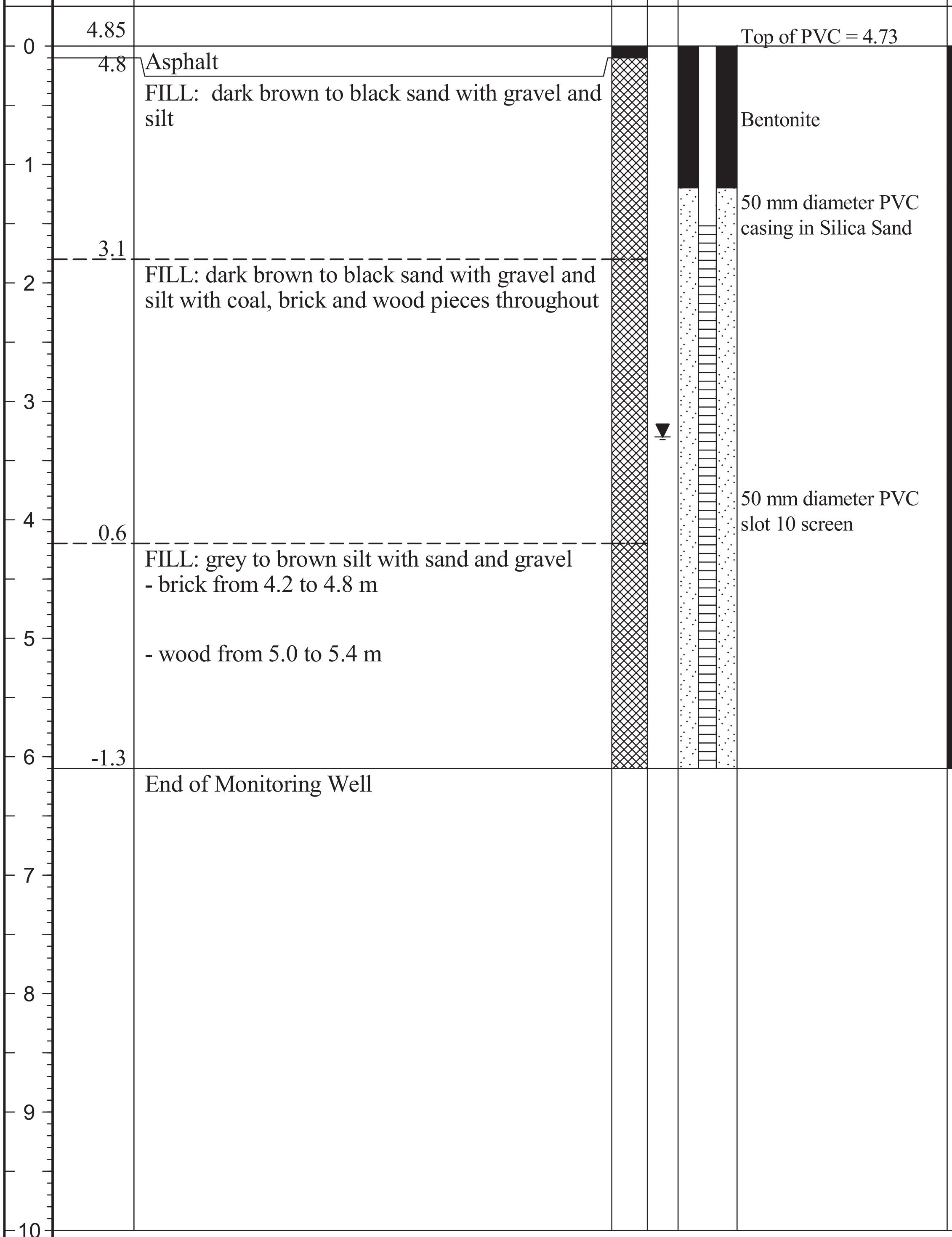
WATER LEVEL **3.3 m on 2016-08-23**

PROJECT No. **121811071.207**

BOREHOLE No. **16 BH-11**

DATUM **Geodetic**

ELEVATION (m)	SOIL DESCRIPTION
4.85	
4.8	Asphalt
	FILL: dark brown to black sand with gravel and silt
3.1	FILL: dark brown to black sand with gravel and silt with coal, brick and wood pieces throughout
0.6	FILL: grey to brown silt with sand and gravel - brick from 4.2 to 4.8 m - wood from 5.0 to 5.4 m
-1.3	End of Monitoring Well



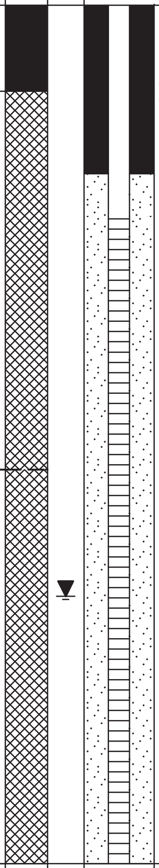
SAMPLES				VOC CONCENTRATION (ppm or % LEL)
TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	
SS	1	380	23	
SS	2	255	17	
SS	3	125	1	
SS	4	255	1	
SS	5	255	9	
SS	6	180	8	
SS	7	125	7	
SS	8	430	8	
SS	9	200	44	
SS	10	75	10	

MONITORING WELL RECORD

16 BH-12

CLIENT SAINT JOHN DEVELOPMENT CORPORATION
LOCATION Fundy Quay
DATES: BORING 2016-08-19
WATER LEVEL 4.2 m on 2016-08-23
PROJECT No. 121811071.207
BOREHOLE No. 16 BH-12
DATUM Geodetic

ELEVATION (m)	SOIL DESCRIPTION
5.73	
	ASPHALT and CONCRETE SLAB
5.1	FILL: light brown silty sand with gravel
2.4	FILL: brown sand with gravel, trace to some silt with dark grey shale pieces throughout
-0.4	End of Monitoring Well



WELL CONSTRUCTION

Top of PVC = 5.63

Bentonite

50 mm diameter PVC casing in Silica Sand

50 mm diameter PVC slot 10 screen

TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	255	26	
SS	2	180	35	
SS	3	200	36	
SS	4	100	21	
SS	5	230	10	
SS	6	280	17	
SS	7	380	13	
SS	8	305	23	
SS	9	535	14	

DEPTH (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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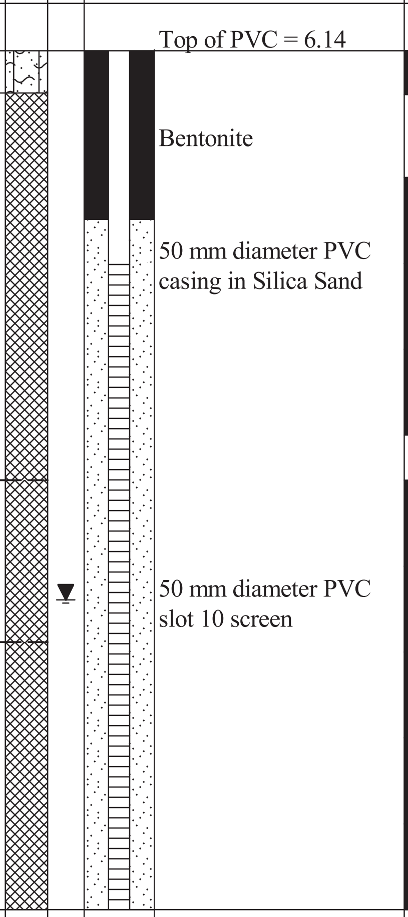
MONITORING WELL RECORD

16 BH-13

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2016-08-18**
WATER LEVEL **3.9 m on 2016-08-24**
PROJECT No. **121811071.207**
BOREHOLE No. **16 BH-13**
DATUM **Geodetic**

ELEVATION (m)	SOIL DESCRIPTION
6.27	
6.0	TOPSOIL: brown silty sand with gravel
	FILL: brown to black sand with gravel, trace silt with red brick and broken stone throughout - augered to 0.9 m, no sampling
3.2	FILL: brown to black silty sand wth gravel with wood and brick throughout
2.1	FILL: dark brown to black silt with sand and gravel with wood throughout
0.2	End of Monitoring Well

DEPTH (m) 0 1 2 3 4 5 6 7 8 9 10



SAMPLES

TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	180	62/330	
SS	2	15	14	
SS	3	125	40	
SS	4	430	14	
SS	5	180	5	
SS	6	455	4	
SS	7	200	5	
SS	8	330	5	
SS	9	200	11	

MONITORING WELL RECORD

16 BH-14

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2016-08-18**
WATER LEVEL **4.0 m on 2016-08-24**
PROJECT No. **121811071.207**
BOREHOLE No. **16 BH-14**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION
	5.90				Top of PVC = 5.82
0		TOPSOIL: brown silty sand with gravel, trace organics			Bentonite
	5.3	FILL: brown to grey silty sand with gravel with red brick pieces throughout			50 mm diameter PVC casing in Silica Sand
	3.3	FILL: wood			
4				▼	50 mm diameter PVC slot 10 screen
		- unidentified odor below 4.5 m			
	0.8	FILL: dark brown to black silt, trace sand and gravel with wood pieces throughout			
	-0.4	End of Monitoring Well			

SAMPLES

TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
SS	1	485	21	
SS	2	125	27	
SS	3	380	57	
SS	4	150	10	
SS	5	150	7	
SS	6	50	11	
SS	7	50	1	
SS	8	125	14	
SS	9	330	7	

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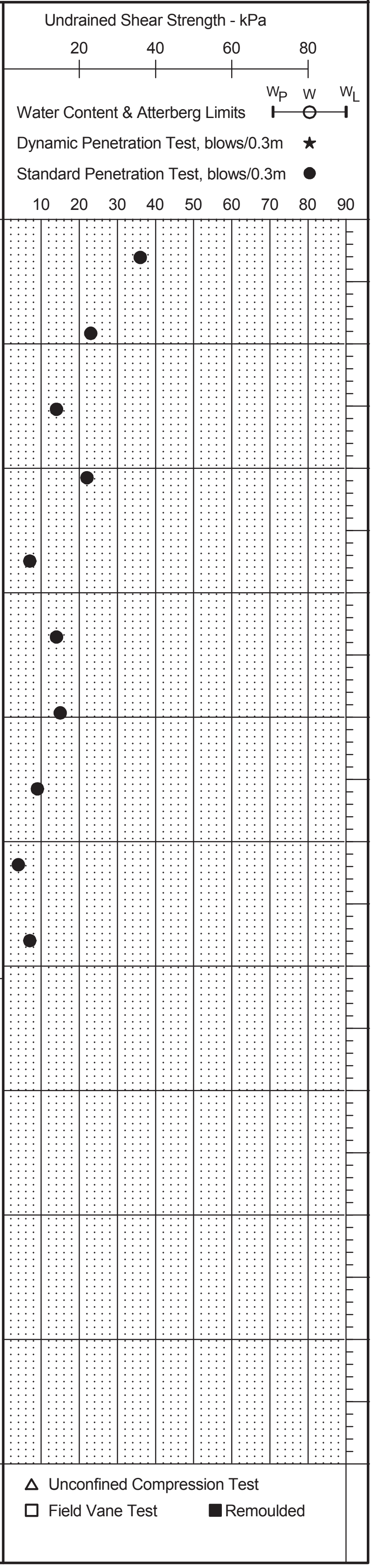
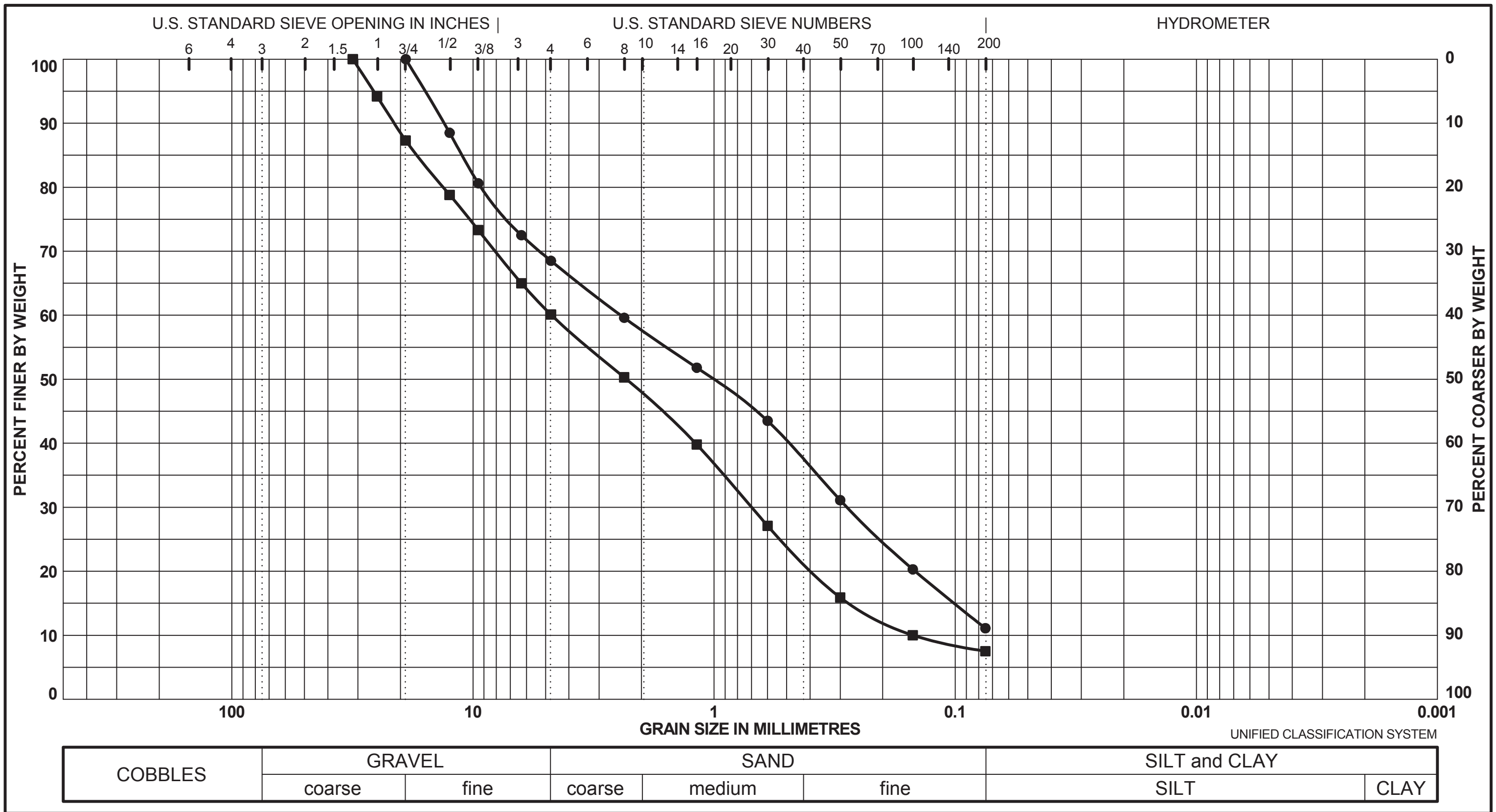
BOREHOLE RECORD

16 BH-15

CLIENT **SAINT JOHN DEVELOPMENT CORPORATION**
LOCATION **Fundy Quay**
DATES: BORING **2016/08/18**
WATER LEVEL **4.2 m on 2016-08-18**
PROJECT No. **121811071.207**
BOREHOLE No. **16 BH-15**
DATUM **Geodetic**

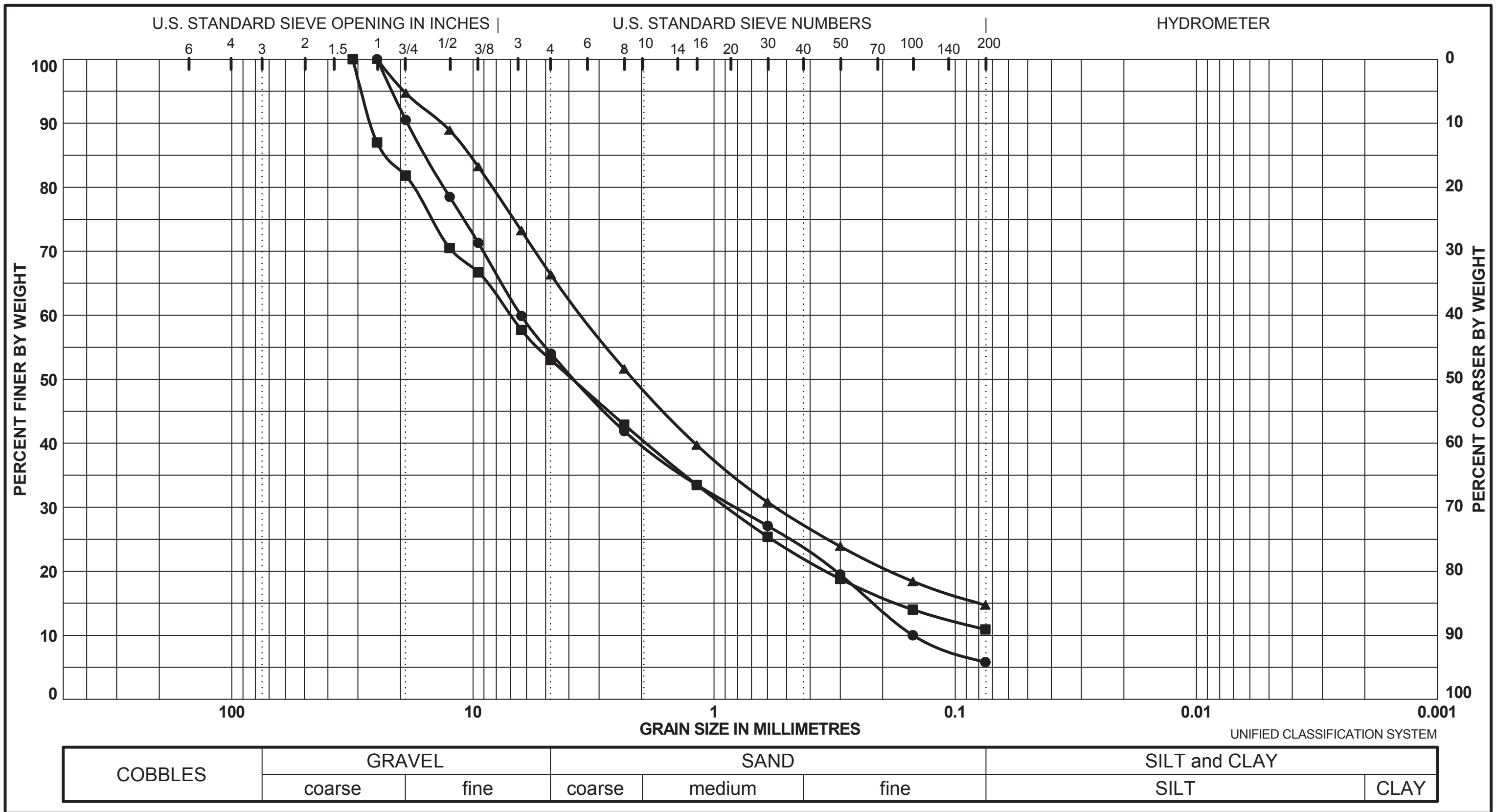
DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD	VOC CONCENTRATION (ppm OR %LEL)
0	5.52								
	5.4	Asphalt							
		FILL: brown sand with gravel, trace silt			SS	1	305	36	
1					SS	2	255	23	
					SS	3	180	14	
2					SS	4	200	22	
					SS	5	230	7	
3					SS	6	230	14	
4	1.4				SS	7	535	15	
		FILL: dark brown to black silt, trace sand and gravel with brick pieces throughout - wood from 4.1 to 4.2 m		∇	SS	8	125	9	
5					SS	9	535	4	
					SS	10	100	7	
6	-0.6	End of Borehole							
7									
8									
9									
10									





	Source	Depth	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	16 BH-02	5.7	Poorly graded SAND (SP-SM) with silt and gravel	56.2				31.5	57.4	11.1	
■	16 BH-09	3.9	Poorly graded SAND (SP-SM) with silt and gravel	3.9				39.9	52.6	7.5	

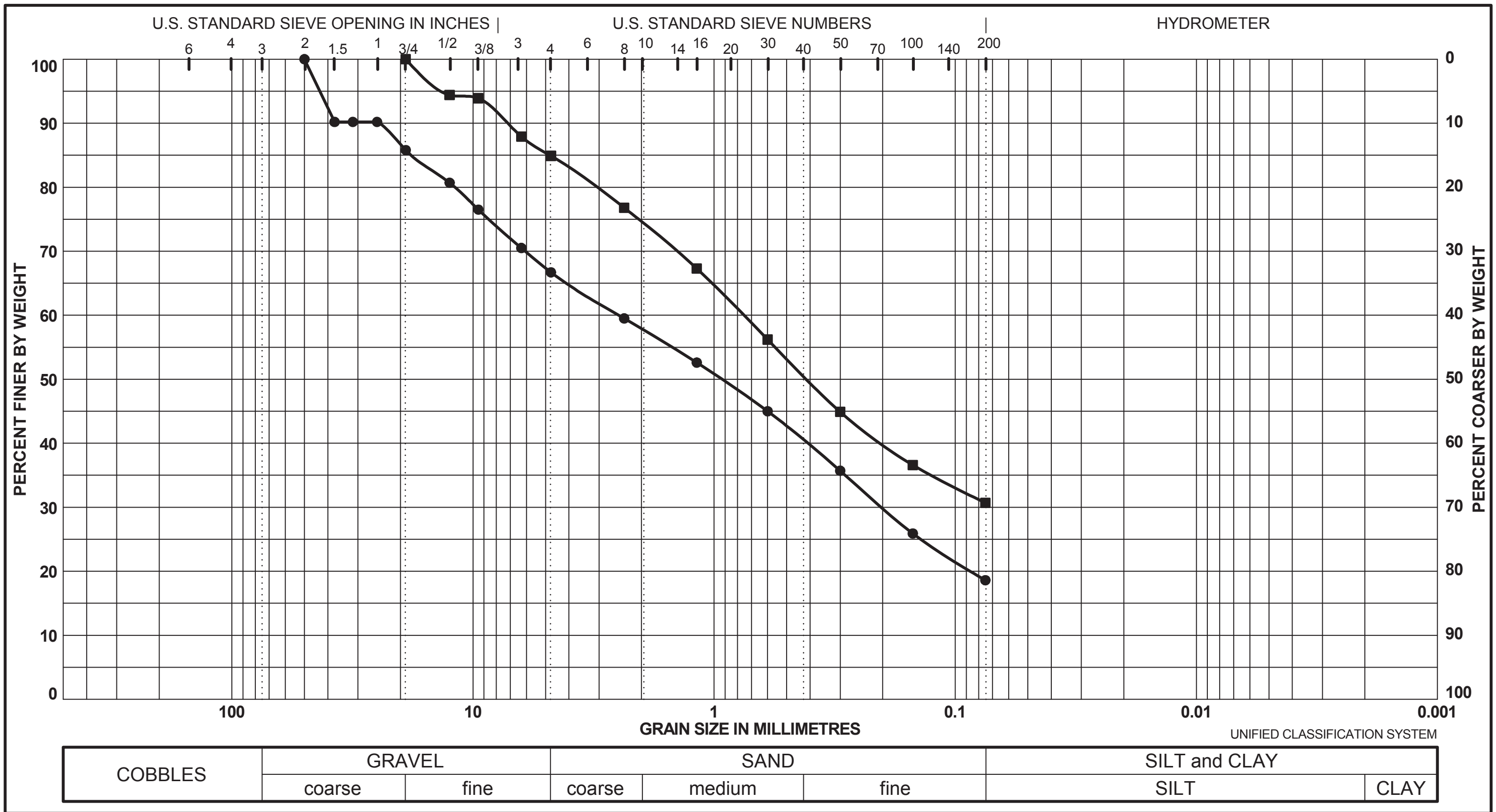
Project: **Fundy Quay**	Location:
Job No.: **121811071.207**	Notes:
Date: **October 3. 2016**	**GRADATION CURVES**



Source	Depth	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
● 16 BH-02	0.9	Poorly graded SAND (SP-SM) with silt and gravel	2.6				46.0	48.2	5.8	
■ 16 BH-09	2.1	Well graded GRAVEL (GW-GM) with silt and sand	2.6				47.0	42.1	10.9	
▲ 16 BH-12	0.9	Silty SAND (SM) with gravel	4.0				33.7	51.6	14.7	

Project: **Fundy Quay**
Job No.: **121811071.207**
Date: **October 3. 2016**
Location:
Notes:

GRADATION CURVES

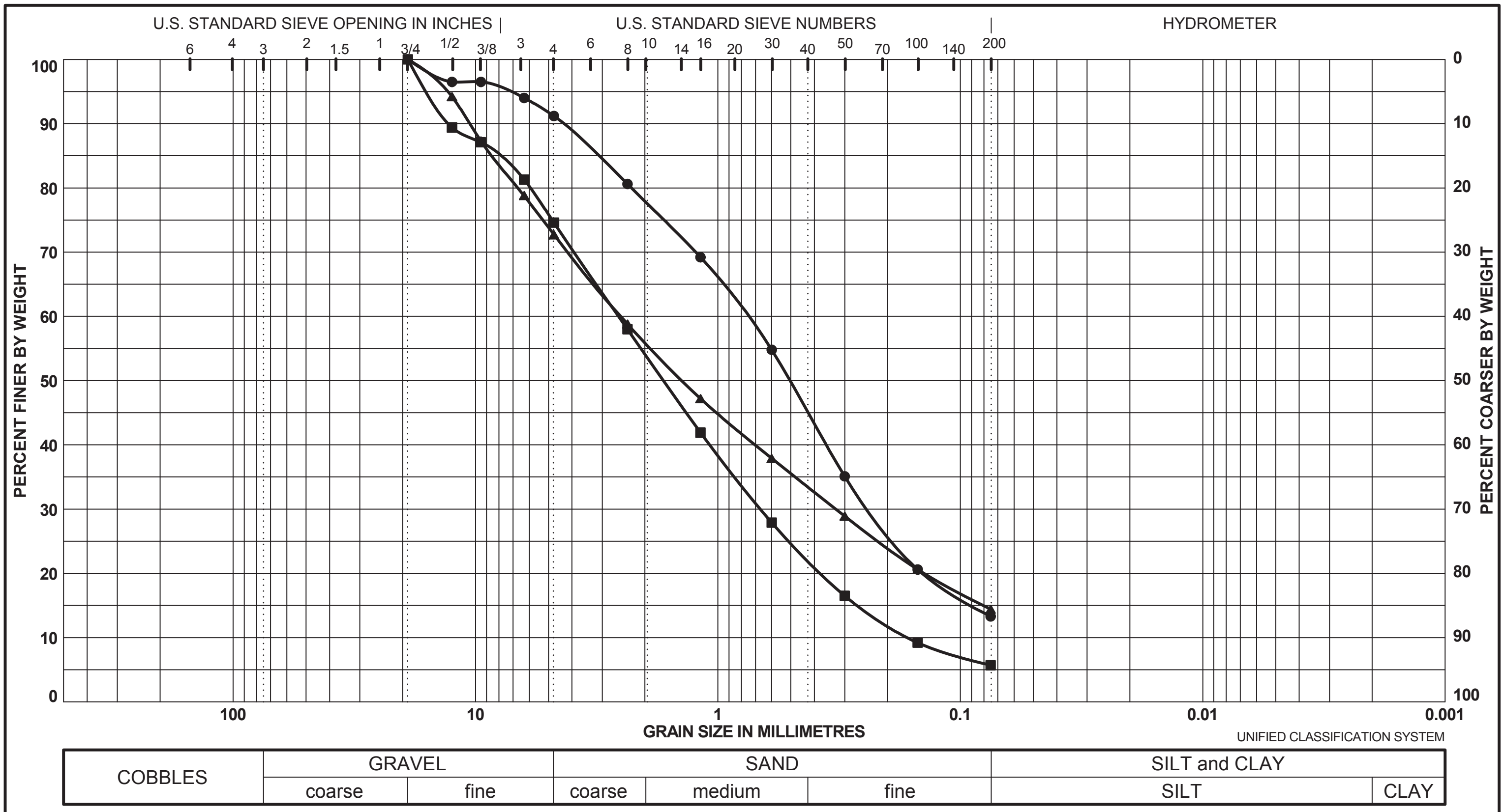


Source		Depth	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	16 BH-08	5.1	Silty SAND (SM) with gravel	41.1				33.3	48.1	18.6	
■	16 BH-10	5.7	Silty SAND (SM) with gravel	43.3				15.1	54.2	30.7	

Project: **Fundy Quay**
Job No.: **121811071.207**
Date: **October 3. 2016**

Location:
Notes:

GRADATION CURVES



Source	Depth	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
● 16 BH-07	1.8	Silty SAND (SM)	7.0				8.8	77.9	13.3	
■ 16 BH-10	0.3	Well graded SAND (SW-SM) with silt and gravel	5.7				25.4	68.9	5.7	
▲ 16 BH-14	1.5	Silty SAND (SM) with gravel	5.9				27.3	58.3	14.4	

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Project: **Fundy Quay**	Location:
Job No.: **121811071.207**	Notes:
Date: **October 3. 2016**	**GRADATION CURVES**

January 20, 2017

Appendix E

Analytical Tables and Laboratory Certificates

Table E1: PHC Concentrations in Groundwater for Onsite Property Conditions

Guidelines and Sample Information		BTEX and MtBE Concentrations (mg/L)					Hydrocarbon Fraction Concentration (mg/L)				
		Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH***	
Tier I RBSLs		20	20	20	20	N/A	N/A	N/A	N/A	20 / 20	
Tier I ESLs - Shallow Groundwater Contact		350	200	110	120	N/A	11	3.1	N/A	N/A	
ID	**Date** (dd-mmm-yr)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**MtBE**	**F1**	**F2**	**F3**	**mTPH**	**Resemblance**
02MW-06	24-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
02MW-06 LD	24-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	N/A	N/A	N/A	N/A
13MW-01	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-02	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-05	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.27	0.3	LO
13MW-06	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-07	24-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
13MW-09	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.06	<0.1	N/A
16BH-03	24-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
16BH-04	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.4	0.4	OP FO.LO
16BH-05	25-Aug-16	<0.001	0.001	<0.001	<0.002	N/A	<0.01	0.06	0.22	0.3	UP FO UP LO
16BH-06	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.12	0.1	UP FO
16BH-06 LD	25-Aug-16	N/A	N/A	N/A	N/A	N/A	N/A	<0.05	0.09	N/A	N/A
16BH-07	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.17	0.2	UP FO
16BH-10	25-Aug-16	<0.001	0.005	<0.001	<0.002	N/A	<0.01	0.27	0.3	0.6	UP FO UP LO
16BH-11 LD	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	N/A	N/A	N/A	N/A
16BH-11	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	0.06	0.6	0.7	UP FO.LO
16BH-12	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	0.11	0.1	UP FO
16BH-13	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A
16BH-14	25-Aug-16	<0.001	<0.001	<0.001	<0.002	N/A	<0.01	<0.05	< 0.1	<0.1	N/A

Most Conservative Adjacent Property Land Use: Commercial

Water Use: Non-potable

Soil Type: Coarse-grained

*Product Type: Diesel / No. 2 Fuel Oil (20 mg/L), No. 6 Oil / Lube Oil (20 mg/L)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)

Depth of Groundwater: Unknown / Varies

Distance to Nearest Surface Water Body: Within 10 metres of the site (Marine and Freshwater)

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Table E2: PHC Concentrations in Soil for Onsite Property Conditions

Guidelines and Sample Information			**BTEX Concentration (mg/kg)**				**Hydrocarbon Fraction Concentration (mg/kg)**					
			Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH***	
Tier I RBSLs			2.5	10000	10000	110	N/A	N/A	N/A	N/A	4000 / 10000	
Tier I ESLs - for Samples < 1.5 mbgs			18	250	300	350	320	260	1700	3300	N/A	
ID	**Date** (dd-mmm-yr)	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
02BH-01 SA1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02BH-01 SA3	2002	2.1-2.7	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02MW-01 SA1	2002	0.15-0.75	nd	0.032	0.237	0.651	22	**280**	350	N/A	650	FO.LO
02MW-01 SA7	2002	4.0-4.3	nd	nd	nd	nd	nd	nd	19	N/A	nd	LO
02MW-02 SA1	2002	0.15-0.75	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02MW-02 SA9	2002	5.2-5.8	nd	nd	nd	nd	nd	120	280	N/A	400	LO. PAH?
02MW-03 SA2	2002	0.75-1.0	nd	nd	nd	nd	nd	51	220	N/A	270	FO/LO
02MW-03 SA6	2002	3.4-4.0	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02MW-04 SA10	2002	5.5-6.1	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02MW-04 SA2 FD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	34	N/A	34	-
02MW-04 SA2 LD	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	36	N/A	36	-
02MW-04 SA2	2002	0.45-1.0	nd	nd	nd	nd	nd	nd	40	N/A	40	LO
02MW-05 SA2	2002	0.75-1.1	nd	nd	nd	nd	nd	35	86	N/A	120	-
02MW-05 SA4A	2002	2.1-2.7	nd	0.115	nd	0.242	7.1	390	670	N/A	1100	G.LO.PAH?
02MW-06 SA1 LD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	20	N/A	nd	-
02MW-06 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	18	N/A	nd	LO
02MW-06 SA8	2002	4.6-5.2	nd	nd	nd	nd	nd	nd	nd	N/A	nd	-
02MW-07 SA1 FD	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	29	N/A	nd	-
02MW-07 SA1	2002	0.3-0.9	nd	nd	nd	nd	nd	nd	35	N/A	35	-
02MW-07 SA6	2002	3.3-3.9	nd	nd	nd	nd	nd	nd	39	N/A	39	-
06BH-04 SA9	5-Apr-06	1.8-2.4	0.1	0.46	1.6	7.2	36	1100	1100	N/A	2200	-
06BH-05 SS7	31-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	4	460	220	N/A	680	-
06BH-07 SS7	30-Mar-06	4.0-4.6	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
06BH-09 SA10	28-Mar-06	6.4-7.0	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
06BH-12 SA9	22-Mar-06	5.2-5.8	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
06BH-13 SA10	28-Mar-06	5.8-6.4	<0.005	<0.05	<0.01	<0.05	<2.5	<15	<15	N/A	<21	-
13MW-01 SS3 LD	30-Jan-13	0.6-1.2	N/A	N/A	N/A	N/A	N/A	28	630	N/A	N/A	N/A
13MW-01 SS3	30-Jan-13	0.6-1.2	0.11	0.33	0.034	0.41	5	34	570	N/A	600	OP(FO/LO) PAH?
13MW-01 SS8	30-Jan-13	3.6-4.2	0.054	0.14	0.17	0.47	<2.5	530	2800	N/A	3400	OP(FO/LO) PAH? F4?
13MW-02 SS2 LD	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	N/A	N/A	N/A	N/A	N/A	N/A
13MW-02 SS2	30-Jan-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	47	770	N/A	820	OP(FO/LO) PAH?
13MW-02 SS6	30-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	10	135	N/A	140	LO

Table E2: PHC Concentrations in Soil for Onsite Property Conditions

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH***	
Tier I RBSLs			2.5	10000	10000	110	N/A	N/A	N/A	N/A	4000 / 10000	
Tier I ESLs - for Samples < 1.5 mbgs			18	250	300	350	320	260	1700	3300	N/A	
ID	**Date** (dd-mmm-yr)	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
13MW-03 SS10	30-Jan-13	5.5-6.1	<0.025	<0.025	<0.025	<0.050	<2.5	24	340	N/A	360	OP(FO/LO) PAH?
13MW-03 SS7	30-Jan-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-04 SS10	31-Jan-13	6.0-6.6	<0.025	<0.025	<0.025	<0.050	<2.5	64	810	N/A	870	OP(FO/LO) PAH?
13MW-04 SS2	31-Jan-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-05 SS8	31-Jan-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	48	N/A	48	LO. UP(FO/LO)
13MW-06 SS3	1-Feb-13	1.5-2.1	<0.025	<0.025	<0.025	<0.050	<2.5	51	990	N/A	1000	OP(FO/LO) PAH?
13MW-06 SS8	1-Feb-13	4.6-5.2	<0.025	0.19	<0.025	<0.050	<2.5	800	4400	N/A	5200	OP(FO/LO) PAH? F4?
13MW-07 SS8	1-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-08 SS6	1-Feb-13	3.3-3.9	<0.025	<0.025	<0.025	<0.050	<2.5	<10	49	N/A	49	LO
13MW-09 SS3 LD	4-Feb-13	1.2-1.8	N/A	N/A	N/A	N/A	N/A	<10	25	N/A	N/A	N/A
13MW-09 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	20	N/A	20	LO
13MW-09 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-10 SS1	4-Feb-13	0.0-0.6	<0.025	<0.025	<0.025	<0.050	<2.5	<10	52	N/A	52	OP(FO/LO). PLO
13MW-10 SS7	4-Feb-13	3.6-4.2	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-11 SS8	4-Feb-13	4.2-4.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	< 15	N/A	<15	N/A
13MW-12 SS10	4-Feb-13	5.5-6.1	<0.025	<0.025	<0.025	0.23	<2.5	140	2740	N/A	2900	LO. PAH? F4?
13MW-12 SS3	4-Feb-13	1.2-1.8	<0.025	<0.025	<0.025	<0.050	<2.5	<10	17	N/A	17	LO
13SVP-09 SS7	24-Sep-13	3.70	<0.02	<0.05	<0.02	<0.05	110	1300	920	N/A	2300	WFO
13SVP-11 SS5	24-Sep-13	2.40	<0.005	<0.05	<0.01	<0.05	<2.5	<12	18	N/A	<21	ND
16BH-01	16-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	20	191	N/A	210	OP FO.LR, F4?
16BH-01	16-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	26	N/A	26	LO
16BH-01	16-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	24	N/A	24	PLO
16BH-01 LD	16-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	25	N/A	N/A	N/A
16BH-01	16-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	53	N/A	53	LO, F4?
16BH-01	16-Aug-16	4.80-5.40	<0.03	<0.03	<0.03	<0.05	12	760	520	N/A	1300	WFO UP FO.LO PLO
16BH-02	16-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-02	16-Aug-16	1.20-1.80	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-02	16-Aug-16	2.40-3.00	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-02	16-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	20	440	N/A	460	PLO. PAH
16BH-02	16-Aug-16	4.80-5.40	<0.03	0.09	<0.03	<0.05	<3	<10	89	N/A	90	UP.FO. PLO
16BH-03 LD	16-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	N/A	N/A

Table E2: PHC Concentrations in Soil for Onsite Property Conditions

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH***	
Tier I RBSLs			2.5	10000	10000	110	N/A	N/A	N/A	N/A	4000 / 10000	
Tier I ESLs - for Samples < 1.5 mbgs			18	250	300	350	320	260	1700	3300	N/A	
ID	**Date** (dd-mmm-yr)	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
16BH-03	16-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-03	16-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-03	16-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-03	16-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-03	16-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-04	18-Aug-16	0.60-1.20	0.07	0.23	0.05	0.54	4	<50	718	N/A	720	LO, F4?
16BH-04	18-Aug-16	1.20-1.80	<0.03	0.05	<0.03	0.11	<3	45	310	N/A	350	OP FO.LO PAH F4?
16BH-04	18-Aug-16	2.40-3.00	<0.03	<0.03	<0.03	<0.05	<3	31	460	N/A	490	OP FO.LO PAH F4?
16BH-04	18-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	48	N/A	48	PLO
16BH-04	18-Aug-16	4.80-5.40	<0.03	<0.03	<0.03	<0.05	<3	<10	130	N/A	130	UP FO.LO
16BH-04 LD	18-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	240	N/A	N/A	N/A
16BH-04	18-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	280	N/A	280	OP UP FO.LO
16BH-05	19-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	25	896	N/A	920	LO, F4?
16BH-05	19-Aug-16	0.60-1.20	0.04	0.05	<0.03	0.1	<3	30	700	N/A	730	LO, F4?
16BH-05	19-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	190	N/A	190	LO, F4?
16BH-05	19-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	140	N/A	140	LO PAHs
16BH-06	22-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	68	N/A	68	LO PAHs
16BH-06	22-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-06	22-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-06	22-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	<10	26	N/A	26	PLO PAHs
16BH-06	22-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-07	17-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	<10	25	N/A	25	PLO
16BH-07	17-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	87	N/A	87	PLO UP FO.LO
16BH-07	17-Aug-16	2.10-2.70	<0.03	<0.03	<0.03	<0.05	<3	<10	52	N/A	52	LO
16BH-07	17-Aug-16	3.90-4.50	<0.03	<0.03	<0.03	<0.05	<3	<10	42	N/A	42	LO
16BH-07	17-Aug-16	5.10-5.70	<0.03	<0.03	<0.03	<0.05	<3	<10	71	N/A	71	LO UP FO.LO
16BH-08	18-Aug-16	0-0.60	0.08	0.21	0.03	0.32	8	73	715	N/A	790	UP FO.LO LO F4?
16BH-08	18-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	0.06	<3	160	**3230**	N/A	3400	OP FO.LO PAH F4?
16BH-08	18-Aug-16	1.80-2.40	<0.03	0.07	<0.03	0.14	4	96	1310	N/A	1400	OP FO.LO PAH F4?
16BH-08	18-Aug-16	2.40-3.00	<0.03	<0.03	<0.03	<0.05	<3	<10	41	N/A	41	LO
16BH-08	18-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	21	N/A	21	PLO
16BH-08	18-Aug-16	4.20-4.80	8.3	17	6.1	39	78	540	1800	N/A	2400	OP FO.LO PAH F4?

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Table E2: PHC Concentrations in Soil for Onsite Property Conditions

Guidelines and Sample Information			BTEX Concentration (mg/kg)				Hydrocarbon Fraction Concentration (mg/kg)					
			Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	mTPH*	
Tier I RBSLs			2.5	10000	10000	110	N/A	N/A	N/A	N/A	4000 / 10000	
Tier I ESLs - for Samples < 1.5 mbgs			18	250	300	350	320	260	1700	3300	N/A	
ID	**Date** (dd-mmm-yr)	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
16BH-08	18-Aug-16	5.40-6.00	0.14	0.2	0.15	0.69	<3	130	500	N/A	630	OP FO.LO PAH F4?
16BH-09	19-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-09	19-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-09	19-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-09 LD	19-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	N/A	N/A
16BH-09	19-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-09 LD	19-Aug-16	5.40-6.00	N/A	N/A	N/A	N/A	N/A	<10	< 20	N/A	N/A	N/A
16BH-09	19-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-10	17-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	<10	266	N/A	270	LO UP FO.LO
16BH-10	17-Aug-16	1.20-1.80	<0.03	<0.03	<0.03	<0.05	<3	<10	177	N/A	180	LO UP FO.LO
16BH-10	17-Aug-16	2.40-3.00	<0.03	<0.03	<0.03	<0.05	<3	<10	84	N/A	84	LO
16BH-10	17-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	74	N/A	74	LO
16BH-10	17-Aug-16	4.80-5.40	<0.03	<0.03	<0.03	<0.05	<3	<10	45	N/A	45	OP FO.LO
16BH-10 LD	17-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	14	380	N/A	N/A	N/A
16BH-10	17-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	300	N/A	310	OP UP FO.LO
16BH-11	17-Aug-16	0.60-1.20	<0.03	0.04	<0.03	0.1	<3	40	236	N/A	270	OP LR.FO
16BH-11	17-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	198	N/A	200	LO UP FO.LO
16BH-11	17-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	260	N/A	260	LO
16BH-11	17-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	24	560	N/A	590	LO PAH
16BH-11	17-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	21	400	N/A	420	OP UP FO.LO
16BH-12	19-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	100	N/A	100	LO PAHs
16BH-12	19-Aug-16	1.80-2.40	<0.03	<0.03	<0.03	<0.05	<3	<10	25	N/A	25	LO
16BH-12	19-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	13	224	N/A	240	PLO PAHs
16BH-12	19-Aug-16	4.20-4.80	<0.03	<0.03	<0.03	<0.05	<3	<10	31	N/A	31	PLO PAHs
16BH-12	19-Aug-16	5.40-6.00	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-13	18-Aug-16	0-0.30	<0.03	<0.03	<0.03	<0.05	<3	<10	27	N/A	27	LO
16BH-13	18-Aug-16	0.90-1.50	<0.03	<0.03	<0.03	<0.05	<3	<10	20	N/A	20	LO
16BH-13 LD	18-Aug-16	2.10-2.70	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	N/A	N/A
16BH-13	18-Aug-16	2.10-2.70	<0.03	<0.03	<0.03	<0.05	<3	<10	< 20	N/A	<20	N/A
16BH-13	18-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	126	N/A	130	UP FO.LO LO
16BH-13	18-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	110	N/A	110	UP FO.LO LO
16BH-13	18-Aug-16	4.80-5.40	<0.03	<0.03	<0.03	<0.05	<3	<10	100	N/A	100	OP FO.LO LO

Table E2: PHC Concentrations in Soil for Onsite Property Conditions

Guidelines and Sample Information			**BTEX Concentration (mg/kg)**				**Hydrocarbon Fraction Concentration (mg/kg)**					
			Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH***	
Tier I RBSLs			2.5	10000	10000	110	N/A	N/A	N/A	N/A	4000 / 10000	
Tier I ESLs - for Samples < 1.5 mbgs			18	250	300	350	320	260	1700	3300	N/A	
ID	**Date** (dd-mmm-yr)	**Depth** (mbgs)	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**F1**	**F2**	**F3**	**F4**	**mTPH**	**Resemblance**
16BH-14	18-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	<10	36	N/A	36	LO
16BH-14	18-Aug-16	1.20-1.80	<0.03	<0.03	<0.03	<0.05	<3	<10	23	N/A	23	LO
16BH-14	18-Aug-16	2.40-3.00	<0.03	<0.03	<0.03	<0.05	<3	<10	39	N/A	39	LO
16BH-14 LD	18-Aug-16	5.10-5.70	<0.03	<0.03	<0.03	<0.05	<3	N/A	N/A	N/A	N/A	N/A
16BH-14	18-Aug-16	5.10-5.70	<0.03	<0.03	<0.03	<0.05	<3	47	530	N/A	570	OP FO.LO LO F4?
16BH-14	18-Aug-16	5.70-6.30	<0.03	<0.03	<0.03	<0.05	<3	<10	154	N/A	160	LO
16BH-15	18-Aug-16	0-0.60	<0.03	<0.03	<0.03	<0.05	<3	<50	909	N/A	910	LO, F4?
16BH-15	18-Aug-16	0.60-1.20	<0.03	<0.03	<0.03	<0.05	<3	<10	22	N/A	22	LO
16BH-15	18-Aug-16	1.80-2.30	<0.03	<0.03	<0.03	<0.05	<3	<10	87	N/A	87	LO
16BH-15	18-Aug-16	3.00-3.60	<0.03	<0.03	<0.03	<0.05	<3	<10	33	N/A	33	LO
16BH-15	18-Aug-16	3.60-4.20	<0.03	<0.03	<0.03	<0.05	<3	<10	49	N/A	49	UP FO.LO LO
16BH-15	18-Aug-16	4.80-5.40	<0.03	<0.03	<0.03	<0.05	<3	<10	100	N/A	100	LO

Most Conservative Adjacent Property Land Use: Commercial
Water Use: Non-potable
Soil Type: Coarse-grained
*Product Type: Diesel / No. 2 Fuel Oil (4000 mg/kg), No. 6 Oil / Lube Oil (10000 mg/kg)

Depth of Soil Impact: Varies (0 to greater than 1.5 mbgs)
Depth of Groundwater: Unknown / Varies
Distance to Nearest Surface Water Body: Within 10 metres of the site (Marine and Freshwater)

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Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						BH6 SS5	BH5 SS7	BH8 SS8	BH12 SA9	BH13 SA10	MW2 SA9	MW5 SA4A	13MW-01 SS8	13MW-02 SS6
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.74	1.4	<0.01	0.08	<0.01	0.9	3.9	16	0.030
Acenaphthylene	--	--		--		0.06	0.02	<0.01	<0.01	<0.01	0.65	2.40	0.45	0.017
Anthracene	--	37000	AE	32	CCME	1.7	3.4	<0.01	0.17	<0.01	4.7	11	15	0.086
Fluoranthene	--	5300	AE	180	CCME	7.4	17	0.02	0.72	<0.01	13	67	43	0.32
Fluorene	--	4100	AE	--		0.82	1.3	<0.01	0.09	<0.01	1.2	4.7	11	0.033
Naphthalene	--	25	AE	22	CCME	0.25	0.42	<0.01	0.06	<0.01	0.32	1.9	5.2	0.029
Phenanthrene	--	--		50	CCME	6.7	17	0.02	0.61	<0.01	11	**51**	**93**	0.42
Pyrene	--	3200	AE	100	CCME	6.8	15	0.02	0.63	<0.01	11	52	53	0.25
Perylene	--	--		--		na	na	na	na	na	1.1	6.2	2.8	0.032
1-Methylnaphthalene	--	--		--		na	na	na	na	na	0.21	1.6	11	0.043
2-Methylnaphthalene	--	--		--		na	na	na	na	na	0.24	1.9	12	0.042
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	3.5	7	0.01	0.27	<0.01	4.6	**27**	**22**	0.2
Benzo[a]pyrene	1	--		72	CCME	3.5	6.4	<0.01	0.24	<0.01	4.3	25	14	0.12
Benzo[b]fluoranthene	0.1	--		10^2	CCME	3.6	7.2	0.01	0.22	<0.01	3.2	**20**	**11**	0.099
Benzo[ghi]perylene	0.01	--		--		2.1	3.8	<0.01	0.14	<0.01	2.1	11	7.0	0.10
Benzo[j]fluoranthene	0.1	--		10^2	CCME	na	na	na	na	na	na	na	7.1	0.068
Benzo[k]fluoranthene	0.1	--		10^2	CCME	1.9	4	0.01	0.18	<0.01	3.2	**20**	6	0.053
Chrysene	0.01	--		--		3.3	6.8	<0.01	0.28	<0.01	4.6	26	24	0.19
Dibenz[a,h]anthracene	1	--		10	CCME	0.48	1.1	<0.01	0.03	<0.01	0.4	3.1	2.1	0.019
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	2.2	4.2	<0.01	0.14	<0.01	2.5	**13**	5.9	0.063
B(a)P TPE[1]	-	5.3	CCME	--		**15.46**	**29.54**	0.04	1.07	0.04	**18.35**	**109.41**	**64.83**	0.57
Sample Depth (mbgs)						3.00	4.30	2.40	5.50	6.10	5.2-5.8	2.1-2.7	3.6-4.2	4.2-4.8
Sample Date						2006	2006	2006	2006	2006	2002	2002	30-Jan-13	30-Jan-13

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_{E} Commercial		Concentration (mg/kg)								
						Sample Identification								
						13MW-02 SS6 LD	13MW-03 SS10	13MW-04 SS10	13MW-05 SS8	13MW-06 SS8	13MW-07 SS8	13MW-08 SS6	13MW-09 SS3	13MW-10 GS1
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.046	1.8	9.1	31	0.032	<0.010	0.24	0.02	<0.010
Acenaphthylene	--	--		--		0.024	1.1	1.3	0.54	0.017	<0.010	0.075	0.016	<0.010
Anthracene	--	37000	AE	32	CCME	0.13	9.9	23	**68**	0.06	<0.010	0.4	0.051	<0.010
Fluoranthene	--	5300	AE	180	CCME	0.4	37	77	**200**	0.29	<0.010	2.9	0.31	0.032
Fluorene	--	4100	AE	--		0.047	2.3	10	28	0.04	<0.010	0.25	0.022	<0.010
Naphthalene	--	25	AE	22	CCME	0.044	0.53	6.9	6.1	0.062	<0.010	0.25	0.016	<0.010
Phenanthrene	--	--		50	CCME	0.36	19	**87**	**250**	0.22	<0.010	2.2	0.22	0.024
Pyrene	--	3200	AE	100	CCME	0.27	28	56	**160**	0.3	<0.010	2.5	0.27	0.028
Perylene	--	--		--		0.043	3	5.2	15	0.043	<0.010	0.26	0.033	<0.010
1-Methylnaphthalene	--	--		--		0.0	0.34	2.0	3.7	0.04	<0.010	0.075	<0.010	0.011
2-Methylnaphthalene	--	--		--		0.046	0.39	2.9	4.8	0.042	<0.010	0.11	<0.010	0.017
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	0.23	**15**	**27**	**60**	0.14	<0.010	1.3	0.16	0.017
Benzo[a]pyrene	1	--		72	CCME	0.15	12	21	55	0.13	<0.010	0.96	0.12	0.012
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	0.12	9.2	**15**	**44**	0.12	<0.010	0.76	0.096	0.011
Benzo[ghi]perylene	0.01	--		--		0.1	6	11	32	0.09	<0.010	0.6	0.083	<0.010
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	0.084	5.9	9.3	**27**	0.061	<0.010	0.41	0.054	<0.010
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	0.066	5.6	9	**26**	0.064	<0.010	0.41	0.054	<0.010
Chrysene	0.01	--		--		0.2	13	25	58	0.16	<0.010	1.2	0.16	0.022
Dibenz[a,h]anthracene	1	--		10	CCME	0.023	1.9	2.8	7.7	0.023	<0.010	0.14	0.021	<0.010
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	0.079	5.3	10	**29**	0.07	<0.010	0.5	0.073	<0.010
B(a)P TPE[1]	-	5.3	CCME	--		0.70	**54.57**	**93.57**	**246.60**	0.60	0.04	4.37	0.56	0.06
Sample Depth (mbgs)						4.2-4.8	5.5-6.1	6.0-6.6	4.2-4.8	4.6-5.2	4.2-4.8	3.3-3.9	1.2-1.8	0-0.6
Sample Date						30-Jan-13	30-Jan-13	31-Jan-13	31-Jan-13	1-Feb-13	1-Feb-13	1-Feb-13	4-Feb-13	4-Feb-13

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						13MW-11 SS3	13MW-12 SS10	16BH-01	16BH-01 LD	16BH-01	16BH-01	16BH-01	16BH-02	16BH-02
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		<0.010	6	<0.01	<0.01	<0.01	0.02	0.40	<0.01	<0.01
Acenaphthylene	--	--		--		<0.010	1.1	<0.01	<0.01	<0.01	<0.01	0.13	<0.01	0.03
Anthracene	--	37000	AE	32	CCME	<0.010	10	<0.01	<0.01	<0.01	0.08	1.3	<0.01	<0.01
Fluoranthene	--	5300	AE	180	CCME	<0.010	53	0.02	0.01	0.03	0.31	12	<0.01	0.01
Fluorene	--	4100	AE	--		<0.010	7.7	<0.01	<0.01	<0.01	0.02	0.43	<0.01	<0.01
Naphthalene	--	25	AE	22	CCME	<0.010	10	0.03	0.03	<0.01	0.03	0.19	<0.01	<0.01
Phenanthrene	--	--		50	CCME	<0.010	**52**	0.06	0.06	0.02	0.25	4.3	<0.01	<0.01
Pyrene	--	3200	AE	100	CCME	<0.010	43	0.02	0.02	0.03	0.28	9.3	<0.01	<0.01
Perylene	--	--		--		<0.010	3.9	<0.01	<0.01	<0.01	0.04	1.1	<0.01	<0.01
1-Methylnaphthalene	--	--		--		<0.010	1.8	0.08	0.09	<0.01	0.05	0.37	<0.01	<0.01
2-Methylnaphthalene	--	--		--		<0.010	2.1	0.12	0.12	0.01	0.06	0.32	<0.01	<0.01
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	<0.010	**22**	0.01	0.01	0.02	0.16	4.8	<0.01	<0.01
Benzo[a]pyrene	1	--		72	CCME	<0.010	13	<0.01	<0.01	0.01	0.16	4.2	<0.01	<0.01
Benzo[b]fluoranthene	0.1	--		10^2	CCME	<0.010	10	0.01	0.01	0.01	0.12	3.3	<0.01	<0.01
Benzo[ghi]perylene	0.01	--		--		<0.010	7.6	0.02	0.02	0.01	0.10	2.3	<0.01	<0.01
Benzo[j]fluoranthene	0.1	--		10^2	CCME	<0.010	5.9	<0.01	<0.01	<0.01	0.07	1.8	<0.01	<0.01
Benzo[k]fluoranthene	0.1	--		10^2	CCME	<0.010	5.8	<0.01	<0.01	<0.01	0.07	1.8	<0.01	<0.01
Chrysene	0.01	--		--		<0.010	21	0.03	0.03	0.02	0.17	4.6	<0.01	<0.01
Dibenz[a,h]anthracene	1	--		10	CCME	<0.010	2.1	<0.01	<0.01	<0.01	0.03	0.56	<0.01	<0.01
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	<0.010	6.7	<0.01	<0.01	0.01	0.09	2.2	<0.01	<0.01
B(a)P TPE[1]	-	5.3	CCME	--		0.04	**61.28**	0.04	0.04	0.06	0.73	**18.66**	0.04	0.04
Sample Depth (mbgs)						1.2-1.8	5.5-6.1	0.6-1.2	0.6-1.2	1.8-2.4	3.0-3.6	4.8-5.4	0-0.6	1.2-1.8
Sample Date						4-Feb-13	4-Feb-13	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-02	16BH-02	16BH-03	16BH-03	16BH-03	16BH-03	16BH-03	16BH-04	16BH-04
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.4	0.22
Acenaphthylene	--	--		--		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	0.07
Anthracene	--	37000	AE	32	CCME	<0.01	0.06	<0.01	<0.01	<0.01	0.02	0.01	1.1	1.6
Fluoranthene	--	5300	AE	180	CCME	0.03	0.28	<0.01	0.02	<0.01	0.08	0.06	4.8	4.8
Fluorene	--	4100	AE	--		<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	0.35
Naphthalene	--	25	AE	22	CCME	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	0.6	0.12
Phenanthrene	--	--		50	CCME	0.02	0.25	0.01	0.02	<0.01	0.05	0.04	3.3	2.4
Pyrene	--	3200	AE	100	CCME	0.03	0.29	<0.01	0.01	<0.01	0.06	0.05	3.8	3.7
Perylene	--	--		--		<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.4	0.22
1-Methylnaphthalene	--	--		--		<0.01	0.12	0.02	0.01	<0.01	<0.01	<0.01	0.5	0.15
2-Methylnaphthalene	--	--		--		<0.01	0.13	0.03	0.02	<0.01	<0.01	<0.01	0.6	0.11
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	0.01	0.20	<0.01	<0.01	<0.01	0.03	0.02	2.1	1.3
Benzo[a]pyrene	1	--		72	CCME	0.02	0.17	<0.01	<0.01	<0.01	0.03	0.02	1.3	0.88
Benzo[b]fluoranthene	0.1	--		10^2	CCME	0.01	0.14	<0.01	0.01	<0.01	0.02	0.02	1.2	0.75
Benzo[ghi]perylene	0.01	--		--		0.01	0.11	<0.01	0.01	<0.01	0.02	0.01	0.8	0.53
Benzo[j]fluoranthene	0.1	--		10^2	CCME	<0.01	0.09	<0.01	<0.01	<0.01	0.01	<0.01	0.7	0.42
Benzo[k]fluoranthene	0.1	--		10^2	CCME	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	0.7	0.42
Chrysene	0.01	--		--		0.01	0.23	<0.01	0.01	<0.01	0.03	0.02	2.0	1.1
Dibenz[a,h]anthracene	1	--		10	CCME	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	0.15
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	<0.01	0.09	<0.01	<0.01	<0.01	0.02	0.01	0.8	0.48
B(a)P TPE[1]	-	5.3	CCME	--		0.09	0.79	0.04	0.04	0.04	0.13	0.09	6.23	4.15
					Sample Depth (mbgs)	2.4-3.0	4.8-5.4	0.6-1.2	1.8-2.4	3.0-3.6	4.2-4.8	5.4-6.0	0.6-1.2	2.4-3.0
					Sample Date	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	18-Aug-16	18-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-04	16BH-04	16BH-05	16BH-05	16BH-05	16BH-06	16BH-06	16BH-06	16BH-06
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.03	1.0	<0.2	0.59	0.44	0.10	0.01	0.04	0.22
Acenaphthylene	--	--		--		0.02	<0.01	<0.2	0.06	0.04	0.06	<0.01	0.07	0.17
Anthracene	--	37000	AE	32	CCME	0.08	0.78	0.4	1.7	0.96	0.40	0.06	0.29	0.73
Fluoranthene	--	5300	AE	180	CCME	0.23	5.4	2.2	7.0	4.2	2.5	0.47	0.92	3.3
Fluorene	--	4100	AE	--		0.05	0.73	<0.2	0.63	0.50	0.09	0.01	0.10	0.32
Naphthalene	--	25	AE	22	CCME	0.10	0.41	<0.2	0.13	0.22	0.02	<0.01	0.08	0.09
Phenanthrene	--	--		50	CCME	0.20	6.4	1.7	5.6	4.0	1.6	0.20	0.85	2.8
Pyrene	--	3200	AE	100	CCME	0.19	4.2	1.7	6.1	4.0	2.3	0.38	0.84	2.8
Perylene	--	--		--		0.02	0.29	0.3	0.75	0.45	0.27	0.05	0.10	0.43
1-Methylnaphthalene	--	--		--		0.04	0.23	<0.2	0.11	0.11	0.02	<0.01	0.02	0.07
2-Methylnaphthalene	--	--		--		0.05	0.30	<0.2	0.12	0.13	0.02	<0.01	0.04	0.06
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	0.08	1.8	0.9	3.0	2.0	1.2	0.22	0.43	1.6
Benzo[a]pyrene	1	--		72	CCME	0.06	1.1	0.9	3.2	2.0	1.2	0.18	0.40	1.8
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	0.06	1.1	0.7	2.7	1.6	0.86	0.14	0.31	1.3
Benzo[ghi]perylene	0.01	--		--		0.04	0.63	0.7	1.8	1.1	0.62	0.12	0.23	0.95
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	0.04	0.52	0.4	1.4	0.84	0.48	0.08	0.17	0.79
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	0.03	0.52	0.4	1.4	0.85	0.48	0.08	0.17	0.82
Chrysene	0.01	--		--		0.09	1.8	0.9	2.7	1.9	1.1	0.19	0.39	1.3
Dibenz[a,h]anthracene	1	--		10	CCME	<0.01	0.16	<0.2	0.52	0.32	0.18	0.03	0.06	0.27
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	0.02	0.53	0.5	1.6	0.94	0.54	0.09	0.20	0.89
B(a)P TPE[1]	-	5.3	CCME	--		0.27	5.19	3.92	**14.33**	**8.92**	5.26	0.82	1.78	**7.90**
Sample Depth (mbgs)						3.6-4.2	4.8-5.4	0-0.60	1.80-2.40	3.00-3.60	0.60-1.20	1.80-2.40	3.00-3.60	4.20-4.80
Sample Date						18-Aug-16	18-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-06	16BH-07	16BH-07	16BH-07	16BH-07	16BH-07	16BH-08	16BH-08	16BH-08
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.05	<0.01	0.08	0.03	0.01	0.09	<0.2	3.7	0.0
Acenaphthylene	--	--		--		0.04	<0.01	0.26	<0.01	<0.01	<0.01	<0.2	0.9	<0.01
Anthracene	--	37000	AE	32	CCME	0.28	0.03	1.5	0.12	0.04	0.03	0.5	7.4	0.08
Fluoranthene	--	5300	AE	180	CCME	1.1	0.18	8.0	0.53	0.23	0.09	3.0	44	0.45
Fluorene	--	4100	AE	--		0.07	<0.01	0.41	0.04	<0.01	0.02	<0.2	3.9	0.02
Naphthalene	--	25	AE	22	CCME	0.03	<0.01	0.02	0.03	0.02	0.28	0.3	1	0.02
Phenanthrene	--	--		50	CCME	0.85	0.08	4.3	0.35	0.11	0.08	1.7	44	0.27
Pyrene	--	3200	AE	100	CCME	1.0	0.14	6.2	0.46	0.21	0.10	2.4	37	0.33
Perylene	--	--		--		0.12	0.02	0.64	0.05	0.05	0.03	0.3	4.4	0.04
1-Methylnaphthalene	--	--		--		0.02	<0.01	0.04	0.03	0.03	0.05	0.4	0.8	0.01
2-Methylnaphthalene	--	--		--		0.02	0.02	0.03	0.05	0.04	0.03	0.5	1	0.02
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	0.58	0.08	3.9	0.28	0.15	0.05	1.5	**19**	0.21
Benzo[a]pyrene	1	--		72	CCME	0.51	0.08	3.1	0.22	0.17	0.05	1.1	18	0.14
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	0.38	0.06	1.9	0.17	0.12	0.04	0.9	**15**	0.13
Benzo[ghi]perylene	0.01	--		--		0.29	0.05	1.1	0.13	0.11	0.05	0.8	10	0.09
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	0.22	0.04	1.4	0.11	0.08	0.02	0.6	7.6	0.07
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	0.23	0.04	1.3	0.10	0.07	0.02	0.5	8.3	0.07
Chrysene	0.01	--		--		0.49	0.08	3.6	0.28	0.15	0.05	1.5	18	0.20
Dibenz[a,h]anthracene	1	--		10	CCME	0.08	0.01	0.40	0.03	0.03	<0.01	<0.2	3.0	0.03
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	0.26	0.04	1.2	0.11	0.09	0.03	0.6	<10	0.08
B(a)P TPE[1]	-	5.3	CCME	--		2.29	0.35	**13.55**	0.99	0.76	0.22	4.90	**80.31**	0.69
					Sample Depth (mbgs)	5.40-6.00	0-0.6	0.6-1.2	2.1-2.7	3.9-4.5	5.1-5.7	0-0.6	1.8-2.4	3.0-3.6
					Sample Date	22-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG$_{HH}$ Commercial		SQG$_{E}$ Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-08	16BH-08	16BH-09	16BH-09	16BH-09	16BH-09 LD	16BH-09	16BH-09	16BH-10
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		8.4	2.9	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19
Acenaphthylene	--	--		--		16	1.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.29
Anthracene	--	37000	AE	32	CCME	30	5	0.03	0.03	0.02	0.02	0.02	<0.01	0.83
Fluoranthene	--	5300	AE	180	CCME	71	9.2	0.20	0.15	0.12	0.11	0.12	0.03	8.4
Fluorene	--	4100	AE	--		20	4.1	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.22
Naphthalene	--	25	AE	22	CCME	**87**	14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12
Phenanthrene	--	--		50	CCME	**81**	11	0.14	0.10	0.09	0.06	0.07	0.03	2.9
Pyrene	--	3200	AE	100	CCME	60	6.3	0.15	0.11	0.10	0.09	0.09	0.03	7.1
Perylene	--	--		--		5.8	0.55	0.02	0.01	0.02	0.01	0.02	<0.01	0.84
1-Methylnaphthalene	--	--		--		11	4.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13
2-Methylnaphthalene	--	--		--		17	6.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	**34**	4.4	0.08	0.06	0.06	0.06	0.08	0.02	4.2
Benzo[a]pyrene	1	--		72	CCME	28	2.4	0.09	0.06	0.07	0.06	0.09	<0.02	3.5
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	**20**	1.6	0.07	0.05	0.05	0.05	0.08	0.01	2.5
Benzo[ghi]perylene	0.01	--		--		12	1.0	0.05	0.04	0.04	0.04	0.05	<0.01	1.6
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	**12**	1.0	0.04	0.02	0.03	0.03	0.04	<0.01	1.6
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	**11**	1.1	0.04	0.02	0.03	0.03	0.04	<0.01	1.6
Chrysene	0.01	--		--		27	3.4	0.08	0.06	0.06	0.06	0.08	0.01	3.6
Dibenz[a,h]anthracene	1	--		10	CCME	4.6	<0.4	0.01	<0.01	0.01	0.01	0.01	<0.01	0.52
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	**12**	<1	0.05	0.03	0.03	0.03	0.05	<0.01	1.6
B(a)P TPE[1]	-	5.3	CCME	--		**125.67**	**10.51**	0.39	0.25	0.30	0.27	0.39	0.06	**15.67**
					Sample Depth (mbgs)	4.2-4.8	5.4-6.0	0.60-1.20	1.80-2.40	3.00-3.60	3.00-3.60	4.20-4.80	5.40-6.00	0-0.6
					Sample Date	18-Aug-16	18-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	17-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG$_{HH}$ Commercial		SQG$_{E}$ Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-10	16BH-10	16BH-10	16BH-10	16BH-10 LD	16BH-11	16BH-11	16BH-11	16BH-11
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.24	0.09	0.02	0.01	0.02	0.11	0.15	0.08	0.17
Acenaphthylene	--	--		--		0.07	0.03	<0.02	<0.01	0.03	<0.1	0.07	0.04	0.30
Anthracene	--	37000	AE	32	CCME	0.95	0.40	0.25	<0.01	0.02	0.28	0.38	0.34	2.0
Fluoranthene	--	5300	AE	180	CCME	5.7	1.9	1.2	0.03	0.05	2.1	3.6	2.3	17
Fluorene	--	4100	AE	--		0.29	0.10	0.08	<0.01	<0.01	0.13	0.11	0.07	0.33
Naphthalene	--	25	AE	22	CCME	0.08	0.05	0.04	<0.01	<0.01	0.39	0.12	0.09	0.22
Phenanthrene	--	--		50	CCME	3.2	1.0	0.69	<0.03	<0.04	1.2	1.4	1.2	1.8
Pyrene	--	3200	AE	100	CCME	5	1.7	1.1	0.04	0.06	1.7	3.3	2.1	12
Perylene	--	--		--		0.69	0.20	0.12	<0.01	<0.01	0.23	0.43	0.25	1.9
1-Methylnaphthalene	--	--		--		0.09	0.07	0.05	<0.01	<0.01	0.89	0.15	0.10	0.15
2-Methylnaphthalene	--	--		--		0.09	0.07	0.05	<0.01	<0.01	1.3	0.19	0.13	0.17
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	3.9	1.2	0.77	0.01	0.03	1.5	1.7	1.2	7.6
Benzo[a]pyrene	1	--		72	CCME	3.4	0.95	0.55	<0.01	0.01	0.83	1.7	0.97	7.1
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	2.2	0.65	0.40	<0.01	0.01	1.1	1.3	0.74	4.2
Benzo[ghi]perylene	0.01	--		--		1.4	0.45	0.27	<0.01	<0.01	0.64	0.93	0.61	3.3
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	1.4	0.49	0.27	<0.01	<0.01	0.58	0.74	0.44	2.7
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	1.4	0.46	0.27	<0.01	<0.01	0.54	0.65	0.38	2.6
Chrysene	0.01	--		--		3.4	0.99	0.66	<0.01	0.02	1.7	1.7	1.2	6.4
Dibenz[a,h]anthracene	1	--		10	CCME	0.50	0.20	0.10	<0.01	<0.01	0.18	0.24	0.14	0.87
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	1.4	0.48	0.28	<0.01	<0.01	0.59	0.84	0.55	3.3
B(a)P TPE[1]	-	5.3	CCME	--		**14.93**	4.48	2.57	0.04	0.06	4.39	**7.47**	4.38	**30.32**
Sample Depth (mbgs)						1.2-1.8	2.4-3.0	3.6-4.2	4.8-5.4	4.8-5.4	0.6-1.2	1.8-2.4	3.0-3.6	4.2-4.8
Sample Date						17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG_{HH} Commercial		SQG_E Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-12	16BH-12	16BH-12	16BH-12	16BH-12	16BH-13	16BH-13	16BH-13	16BH-13
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.05	0.01	1.4	0.32	<0.01	<0.01	<0.01	0.13	0.04
Acenaphthylene	--	--		--		<0.01	<0.01	0.11	0.01	<0.01	<0.01	<0.01	0.05	<0.01
Anthracene	--	37000	AE	32	CCME	0.15	0.03	2.6	0.95	0.01	0.03	0.01	0.34	0.03
Fluoranthene	--	5300	AE	180	CCME	0.58	0.14	10	3.2	0.12	0.16	0.09	1.5	0.20
Fluorene	--	4100	AE	--		0.04	0.01	1.5	0.39	<0.01	<0.01	<0.01	0.19	0.03
Naphthalene	--	25	AE	22	CCME	0.02	<0.01	0.60	0.13	<0.01	<0.01	<0.01	0.06	0.02
Phenanthrene	--	--		50	CCME	0.59	0.11	10	3.6	0.05	0.07	0.05	1.2	0.15
Pyrene	--	3200	AE	100	CCME	0.55	0.11	10	2.6	0.10	0.13	0.07	1.3	0.21
Perylene	--	--		--		0.06	0.01	1.0	0.23	0.01	0.02	<0.01	0.12	0.03
1-Methylnaphthalene	--	--		--		0.01	<0.01	0.35	0.09	<0.01	<0.01	<0.01	0.05	0.02
2-Methylnaphthalene	--	--		--		0.02	<0.01	0.39	0.11	<0.01	<0.01	<0.01	0.06	0.01
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	0.32	0.06	5.5	1.4	0.06	0.09	0.04	0.87	0.07
Benzo[a]pyrene	1	--		72	CCME	0.27	0.05	4.5	1.1	0.06	0.08	0.04	0.55	0.06
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	0.18	0.04	3.4	0.85	0.05	0.07	0.03	0.43	0.05
Benzo[ghi]perylene	0.01	--		--		0.16	0.03	2.4	0.55	0.04	0.06	0.02	0.28	0.04
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	0.11	0.02	1.9	0.50	0.03	0.04	0.02	0.27	0.04
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	0.11	0.02	2.0	0.52	0.03	0.04	0.02	0.27	0.03
Chrysene	0.01	--		--		0.29	0.06	4.9	1.3	0.06	0.09	0.04	0.72	0.08
Dibenz[a,h]anthracene	1	--		10	CCME	0.04	<0.01	0.68	0.15	<0.01	0.02	<0.01	0.09	<0.01
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	0.13	0.03	2.2	0.49	0.03	0.05	0.02	0.26	0.03
B(a)P TPE[1]	-	5.3	CCME	--		1.20	0.22	**20.26**	4.93	0.26	0.39	0.18	2.58	0.26
Sample Depth (mbgs)						0.60-1.20	1.80-2.40	3.00-3.60	4.20-4.80	5.40-6.00	0.9-1.5	2.1-2.7	3.6-4.2	4.8-5.4
Sample Date						19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E3: Polycyclic Aromatic Hydrocarbons in Soil

Parameter	B(a)P PEF	SQG$_{HH}$ Commercial		SQG$_{E}$ Commercial		Concentration (mg/kg)								
						Sample Identification								
						16BH-14	16BH-14	16BH-14	16BH-14 LD	16BH-14	16BH-15	16BH-15	16BH-15	16BH-15
Non-Carcinogenic PAHs														
Acenaphthene	--	8000	AE	--		0.07	0.05	<0.01	0.01	0.03	<0.01	0.06	0.05	0.030
Acenaphthylene	--	--		--		0.06	<0.02	0.02	0.03	<0.01	<0.01	0.01	0.01	0.02
Anthracene	--	37000	AE	32	CCME	0.23	0.11	0.05	0.06	0.14	<0.01	0.22	0.11	0.16
Fluoranthene	--	5300	AE	180	CCME	1.7	0.66	0.30	0.37	0.95	<0.01	0.76	0.35	0.74
Fluorene	--	4100	AE	--		0.06	0.06	0.01	0.02	0.04	<0.01	0.08	0.04	0.05
Naphthalene	--	25	AE	22	CCME	0.07	0.02	0.01	0.01	0.02	<0.01	0.03	0.04	0.04
Phenanthrene	--	--		50	CCME	0.90	0.47	0.19	0.24	0.29	<0.01	0.71	0.41	0.40
Pyrene	--	3200	AE	100	CCME	1.5	0.52	0.27	0.32	0.82	<0.01	0.61	0.29	0.85
Perylene	--	--		--		0.19	0.06	0.05	0.06	0.09	<0.01	0.08	0.04	0.08
1-Methylnaphthalene	--	--		--		0.02	0.02	<0.01	<0.01	0.02	<0.01	0.01	0.01	0.03
2-Methylnaphthalene	--	--		--		0.03	0.02	<0.01	<0.01	0.02	<0.01	0.02	0.01	0.03
Carcinogenic PAHs														
Benzo[a]anthracene	0.1	--		10	CCME	1.0	0.31	0.17	0.20	0.49	<0.01	0.32	0.15	0.39
Benzo[a]pyrene	1	--		72	CCME	0.76	0.25	0.19	0.24	0.37	<0.01	0.33	0.17	0.33
Benzo[b]fluoranthene	0.1	--		10[2]	CCME	0.55	0.2	0.17	0.20	0.32	<0.01	0.28	0.14	0.26
Benzo[ghi]perylene	0.01	--		--		0.47	0.16	0.12	0.16	0.24	<0.01	0.19	0.11	0.17
Benzo[j]fluoranthene	0.1	--		10[2]	CCME	0.33	0.11	0.08	0.11	0.18	<0.01	0.14	0.07	0.15
Benzo[k]fluoranthene	0.1	--		10[2]	CCME	0.35	0.12	0.09	0.11	0.18	<0.01	0.15	0.08	0.14
Chrysene	0.01	--		--		0.87	0.28	0.16	0.19	0.38	<0.01	0.30	0.15	0.39
Dibenz[a,h]anthracene	1	--		10	CCME	0.13	0.04	0.03	0.04	0.07	<0.01	0.05	0.03	0.06
Indeno[1,2,3-cd]pyrene	0.1	--		10	CCME	0.43	0.14	0.10	0.14	0.21	<0.01	0.18	0.10	0.14
B(a)P TPE[1]	-	5.3	CCME	--		3.51	1.15	0.85	1.08	1.75	0.04	1.48	0.77	1.51
					Sample Depth (mbgs)	0-0.6	1.2-1.8	2.4-3.0	2.4-3.0	5.1-5.7	0.6-1.2	1.8-2.3	3.0-3.6	4.8-5.4
					Sample Date	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16

[1] Uncertainty factor of 3 was used as the PAH source may be creosote.

[2] Guideline is for the sum of Benzo [b+j+k]fluoranthene

1/2 the detection limit was used in B(a)P TPE calculations.

Table E4: Soil PCB Concentrations

Parameter	CCME Guideline (mg/kg)		Concentration (mg/kg)						
	Commercial	Residential/Parkland	16BH-02		16BH-07	16BH-09	16BH-10	16BH-14	16BH-15
Calculated Total PCB	33	1.3	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.11
		Sampling Date	16-Aug-16		17-Aug-16	19-Aug-16	17-Aug-16	18-Aug-16	18-Aug-16
		Sample Depth (mbgs)	1.80-2.40		5.10-5.70	3.60-4.20	1.20-1.80	5.70-6.30	1.80-2.30

Table E5: Soil VOC Concentrations for Detected Parameters

Parameter	CCME Guideline (µg/kg)		Concentration (µg/kg)							
	SHG$_{HH}$ Commercial	SQG$_{E}$ Commercial	16BH-02	16BH-02 LD	16BH-07	16BH-10	16BH-14	16BH-14 LD	16BH-15	16BH-09
cis-1,2-Dichloroethylene	50000	50000	<30	<30	<30	<30	48	<30	<30	<30
Tetrachloroethylene	500	34000	<30	<30	<30	31	<30	<30	<30	<30
Trichloroethylene	110	50000	<10	<10	<10	<10	50	30	<10	<10
Sample Depth (mbgs)			1.80-2.40	1.80-2.40	5.10-5.70	1.20-1.80	5.70-6.30	5.70-6.30	1.80-2.30	3.60-4.20
Sampling Date			16-Aug-16	16-Aug-16	17-Aug-16	17-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	19-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_E Commercial**		**SS1A**	**SS2A**	**SS3A**	**SS3B**	**SS3C**	**SBH1A**	**SBH2A**	**SBH2A FD (SBHX A)**	**SBH3A**	**SBH4A**	**SBH4A LD**	**SBH5A**
Aluminum	--		--		9000	10000	9400	na	na	10000	9400	9700	9500	8900	8800	8300
Antimony	63	OMOE	40	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Arsenic	31	CCME	26	CCME	5	6	7	na	na	5	6	6	4	5	5	5
Barium	10000	CCME	2000	AE	46	60	42	na	na	32	37	35	33	37	38	30
Beryllium	60	OMOE	8	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Bismuth	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Boron	24000	OMOE	120	OMOE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Cadmium	49	CCME	22	CCME	nd	nd	0.4	na	na	0.3	nd	nd	nd	nd	nd	nd
Chromium	630	CCME	87	CCME	17	19	20	na	na	22	19	16	13	15	20	13
Cobalt	250	OMOE	300	AE	8	9	9	na	na	10	9	9	7	9	9	8
Copper	4000	CCME	91	CCME	30	41	51	na	na	33	27	27	24	26	24	30
Iron	--		--		16000	18000	19000	na	na	19000	18000	19000	15000	18000	18000	16000
Lead	260	CCME	600	CCME	24	38	80	na	na	25	14	13	9.1	32	22	12
Lithium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Manganese	--		--		480	570	490	na	na	510	450	430	510	510	510	400
Mercury	24	CCME	50	CCME	0.04	0.06	0.04	na	na	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Molybdenum	1200	OMOE	40	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Nickel	310	CCME	89	CCME	14	15	22	na	na	16	15	16	11	14	14	12
Rubidium	--		--		na	na	na	na	na	na	na	na	na	na	na	na
Selenium	125	CCME	2.9	CCME	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Silver	490	OMOE	40	AE	nd	nd	nd	na	na	nd	nd	nd	nd	nd	nd	nd
Strontium	--		--		8	6	10	na	na	11	10	10	10	12	12	11
Thallium	1	CCME	3.6	CCME	nd	0.1	0.1	na	na	nd	nd	nd	nd	0.1	0.1	nd
Tin	140000	USEPA	300	AE	na	na	na	na	na	na	na	na	na	na	na	na
Uranium	33	CCME	2000	CCME	0.5	0.8	0.9	na	na	0.5	0.4	0.4	0.4	0.9	0.8	0.4
Vanadium	160	OMOE	130	CCME	25	35	44	na	na	34	24	25	22	26	27	25
Zinc	47000	OMOE	360	CCME	69	97	**1300**	**520**	**1000**	130	59	58	44	52	50	48
Sampling Depth (mbgs)					0-0.15	0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_{E} Commercial**		**SBH6A**	**SBH7A**	**SBH8A**	**SBH9A**	**SBH10A**	**SBH10A FD (SBHY A)**	**SBH11A**	**SBH12A**	**SBH12A LD**	**BH8 SA1**	**BH8 SA1 LD**	**BH10 SA1**
Aluminum	--		--		9000	8200	10000	8800	8800	9100	10000	9500	10000	14400	14600	12500
Antimony	63	OMOE	40	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Arsenic	31	CCME	26	CCME	6	< 2	5	6	5	5	6	4	5	5	5	5
Barium	10000	CCME	2000	AE	34	5	34	33	33	33	41	31	33	48	47	34
Beryllium	60	OMOE	8	AE	nd	**29**	nd	nd	nd	nd	nd	nd	nd	0.7	0.7	0.5
Bismuth	--		--		na	na	na	na	na	na	na	na	na	<1	<1	<1
Boron	24000	OMOE	120	OMOE	nd	nd	nd	nd	nd	nd	nd	nd	nd	4	3	3
Cadmium	49	CCME	22	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	0	<0.1
Chromium	630	CCME	87	CCME	15	nd	21	18	16	15	19	17	20	29	28	15
Cobalt	250	OMOE	300	AE	9	8	10	8	8	8	10	8	10	10.4	10.8	9
Copper	4000	CCME	91	CCME	25	24	27	30	24	24	27	28	28	33	33	28
Iron	--		--		17000	16000	20000	21000	17000	17000	20000	17000	18000	24400	25100	18500
Lead	260	CCME	600	CCME	10	10	26	46	21	19	13	9.7	21	19.3	17.7	10.5
Lithium	--		--		na	na	na	na	na	na	na	na	na	18.2	18.4	17.8
Manganese	--		--		460	480	490	540	430	450	480	450	490	553	571	406
Mercury	24	CCME	50	CCME	0.01	0.01	0.06	0.2	0.01	0.01	0.01	0.03	0.02	na	na	na
Molybdenum	1200	OMOE	40	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.9	0.8	0.4
Nickel	310	CCME	89	CCME	13	13	17	15	14	14	17	14	16	19	19	14
Rubidium	--		--		na	na	na	na	na	na	na	na	na	10.6	10.2	7.1
Selenium	125	CCME	2.9	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<1	<1	<1
Silver	490	OMOE	40	AE	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Strontium	--		--		8	9	11	17	22	20	15	5	5	35	36	23
Thallium	1	CCME	3.6	CCME	nd	nd	nd	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1
Tin	140000	USEPA	300	AE	na	na	na	na	na	na	na	na	na	2	1	<1
Uranium	33	CCME	2000	CCME	0.6	1.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Vanadium	160	OMOE	130	CCME	24	23	29	29	25	26	26	24	28	44	46	34
Zinc	47000	OMOE	360	CCME	84	42	61	53	50	52	58	46	51	68	67	52
Sampling Depth (mbgs)					0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0.15-0.45	0-0.6	0-0.6	0-0.6
Sampling Date					2002	2002	2002	2002	2002	2002	2002	2002	2002	20-Mar-06	29-Mar-06	23-Mar-06

Table E6: Metals in Soil

Elements (mg/kg)	SQG$_{HH}$ Commercial		SQG$_{E}$ Commercial		Concentration (mg/kg)											
					Sample Identification											
					BH 11 SA1	BH11 SA1 LD	BH12 SA2	BH12 SA2 LD	BH13 SA1	BH14 SA1	13MW-01 SS3	13MW-01 SS3 LD	13MW-02 SS2	13MW-03 SS3	13MW-05 SS3	13MW-06 SS3
Aluminum	--		--		1400	14300	13600	13500	12000	14400	8400	8900	15000	11000	11000	15000
Antimony	63	OMOE	40	AE	<0.1	0.1	0.1	0.1	0.2	<0.1	3	3	2.1	<2.0	<2.0	2.9
Arsenic	31	CCME	26	CCME	10	5	5	6	5	4	**61**	**63**	6.3	4.5	4.8	20
Barium	10000	CCME	2000	AE	56	49	53	53	51	52	110	110	150	30	30	340
Beryllium	60	OMOE	8	AE	0.8	0.7	0.8	0.8	1	0.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	--		--		<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	24000	OMOE	120	OMOE	3	3	3	4	3	3	11	10	<5.0	<5.0	<5.0	9
Cadmium	49	CCME	22	CCME	0.2	0.2	0.2	0.2	0.2	0.1	0.62	0.7	<0.30	<0.30	<0.30	<0.30
Chromium	630	CCME	87	CCME	26	27	22	42	23	21	22	22	20	17	23	25
Cobalt	250	OMOE	300	AE	11.5	11.4	11.2	11	9.9	11.6	19	20	9.7	9.1	9.7	14
Copper	4000	CCME	91	CCME	32	32	31	33	37	31	**130**	**130**	47	26	27	**140**
Iron	--		--		24100	24400	24300	26400	23300	25800	47000	49000	25000	23000	24000	37000
Lead	260	CCME	600	CCME	17.3	15.8	20.1	23.4	21.4	18.4	110	100	**270**	10	14	**1500**
Lithium	--		--		21.7	21.7	19.8	20.9	18.7	20.9	17	17	16	14	17	27
Manganese	--		--		614	615	566	578	585	566	300	320	510	520	490	810
Mercury	24	CCME	50	CCME	na	na	na	na	na	na	0.28	0.3	0.23	<0.10	<0.10	1.2
Molybdenum	1200	OMOE	40	AE	0.8	0.7	1.1	5.4	2.2	0.7	**44**	**44**	<2.0	<2.0	<2.0	3.1
Nickel	310	CCME	89	CCME	18	18	16	18	17	16	89	**110**	15	13	17	25
Rubidium	--		--		11	10.6	10.5	11.3	10.8	10.2	4.6	4.9	6	4.7	6.1	10
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	<1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Silver	490	OMOE	40	AE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	0.53
Strontium	--		--		30	28	23	23	14	19	92	96	27	12	11	93
Thallium	1	CCME	3.6	CCME	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.56	0.58	<0.10	<0.10	<0.10	0.14
Tin	140000	USEPA	300	AE	1	1	1	2	2	2	3.5	2.8	2.6	<2.0	<2.0	36
Uranium	33	CCME	2000	CCME	0.9	0.9	0.8	0.8	0.9	0.8	23	23	0.54	0.56	0.51	1.3
Vanadium	160	OMOE	130	CCME	42	43	36	36	35	44	**280**	**370**	54	37	36	35
Zinc	47000	OMOE	360	CCME	86	85	71	77	77	82	210	190	170	52	57	350
				Sampling Depth (mbgs)	0-0.6	0-0.6	0.6-1.2	0.6-1.2	0-0.6	0-0.6	0.6-1.2	0.6-1.2	1.5-2.1	1.2-1.8	1.2-1.8	1.5-2.1
				Sampling Date	25-Mar-03	25-Mar-06	22-Mar-06	22-Mar-06	26-Mar-06	27-Mar-06	30-Jan-13	30-Jan-13	30-Jan-13	30-Jan-13	30-Jan-13	30-Jan-13

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_E Commercial**		**13MW-07 SS3**	**13MW-08 SS3**	**13MW-08 SS3 LD**	**13MW-09 SS3**	**13MW-10 GS1**	**13MW-11 SS3**	**13MW-12 SS3**	**16BH-01**	**16BH-01**	**16BH-01 LD1**	**16BH-01 LD2**	**16BH-01**
Aluminum	--		--		11000	11000	11000	11000	11000	12000	11000	15000	16000	16000	na	13000
Antimony	63	OMOE	40	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	na	6
Arsenic	31	CCME	26	CCME	2.8	5.4	5.4	5.3	4.1	5.3	4.9	7	5	5	na	10
Barium	10000	CCME	2000	AE	20	23	23	32	33	33	31	34	36	37	na	37
Beryllium	60	OMOE	8	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	na	<2
Bismuth	--		--		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	na	<2
Boron	24000	OMOE	120	OMOE	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	<50	<50	na	<50
Cadmium	49	CCME	22	CCME	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.3	<0.3	<0.3	na	<0.3
Chromium	630	CCME	87	CCME	15	23	23	17	33	21	25	22	26	28	na	24
Cobalt	250	OMOE	300	AE	7.3	8.9	8.9	8.3	8.6	10	9.2	11	12	13	na	13
Copper	4000	CCME	91	CCME	22	31	31	27	28	33	25	40	41	43	na	41
Iron	--		--		18000	23000	23000	20000	20000	25000	22000	27000	28000	29000	na	28000
Lead	260	CCME	600	CCME	6.1	12	12	24	25	12	15	8.7	11	23	10	**270**
Lithium	--		--		15	18	18	17	16	20	16	21	22	23	na	23
Manganese	--		--		360	530	530	520	440	480	500	530	600	620	na	490
Mercury	24	CCME	50	CCME	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	<0.1	na	5.2
Molybdenum	1200	OMOE	40	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2	<2	2	na	<2
Nickel	310	CCME	89	CCME	11	15	13	13	13	17	15	17	17	18	na	22
Rubidium	--		--		4.3	7.1	6.2	6.2	5.7	6.4	5.2	6	7	7	na	8
Selenium	125	CCME	2.9	CCME	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<1	<1	<1	na	<1
Silver	490	OMOE	40	AE	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.5	<0.5	<0.5	na	<0.5
Strontium	--		--		20	16	13	58	27	17	18	25	24	24	na	23
Thallium	1	CCME	3.6	CCME	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	<0.1	na	<0.1
Tin	140000	USEPA	300	AE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	na	5
Uranium	33	CCME	2000	CCME	0.32	0.75	0.64	0.56	0.71	0.59	0.73	0.7	0.8	0.7	na	0.9
Vanadium	160	OMOE	130	CCME	31	41	37	28	35	34	33	54	58	59	na	42
Zinc	47000	OMOE	360	CCME	37	52	49	64	74	57	55	58	64	64	na	120
				Sampling Depth (mbgs)	1.2-1.8	1.5-2.1	1.5-2.1	1.2-1.8	0-0.6	1.2-1.8	1.2-1.8	0.60-1.20	1.80-2.40	1.80-2.40	1.80-2.40	3.00-3.60
				Sampling Date	30-Jan-13	01-Feb-13	01-Feb-13	04-Feb-13	04-Feb-13	04-Feb-13	04-Feb-13	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_{E} Commercial**		**16BH-01**	**16BH-02**	**16BH-02**	**16BH-02**	**16BH-02**	**16BH-03**	**16BH-03**	**16BH-03**	**16BH-03**	**16BH-03**	**16BH-04**	**16BH-04**
Aluminum	--		--		13000	13000	13000	13000	6700	14000	14000	15000	11000	6600	12000	13000
Antimony	63	OMOE	40	AE	15	<2	<2	<2	<2	<2	<2	<2	<2	<2	2	12
Arsenic	31	CCME	26	CCME	19	10	7	6	16	5	7	7	8	9	26	20
Barium	10000	CCME	2000	AE	47	32	24	26	23	36	24	24	21	13	97	83
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	0.3
Chromium	630	CCME	87	CCME	26	21	15	23	20	21	19	19	18	9	42	24
Cobalt	250	OMOE	300	AE	13	10	8	10	10	12	11	11	9	4	11	15
Copper	4000	CCME	91	CCME	83	34	22	35	28	37	36	42	30	**600**	81	**150**
Iron	--		--		37000	24000	22000	25000	27000	25000	27000	25000	22000	9200	36000	40000
Lead	260	CCME	600	CCME	**490**	8.4	10	12	130	10	11	12	42	17	180	**700**
Lithium	--		--		26	20	30	25	14	20	26	29	22	12	22	29
Manganese	--		--		1100	540	850	580	340	580	710	760	710	300	510	810
Mercury	24	CCME	50	CCME	0.8	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	1.2
Molybdenum	1200	OMOE	40	AE	7	<2	<2	<2	3	<2	<2	<2	<2	<2	6	3
Nickel	310	CCME	89	CCME	25	14	12	15	22	17	17	17	16	7	25	30
Rubidium	--		--		12	6	5	6	6	6	5	5	7	6	7	10
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	490	OMOE	40	AE	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6
Strontium	--		--		45	30	50	22	34	22	15	17	28	280	38	35
Thallium	1	CCME	3.6	CCME	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1
Tin	140000	USEPA	300	AE	34	<2	<2	<2	6	<2	<2	<2	14	<2	9	43
Uranium	33	CCME	2000	CCME	2.8	0.6	0.5	0.8	1.0	0.8	0.9	1.1	0.8	0.5	1.1	1.8
Vanadium	160	OMOE	130	CCME	41	46	28	41	33	49	41	42	32	13	46	32
Zinc	47000	OMOE	360	CCME	**540**	48	51	56	230	54	55	51	85	53	180	**410**
				Sampling Depth (mbgs)	4.80-5.40	0-0.60	1.20-1.80	2.40-3.00	4.80-5.40	0.60-1.20	1.80-2.40	3.00-3.60	4.20-4.80	5.40-6.00	0.60-1.20	1.20-1.80
				Sampling Date	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	16-Aug-16	18-Aug-16	18-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	SQG$_{HH}$ Commercial		SQG$_{E}$ Commercial		**16BH-04**	**16BH-04**	**16BH-04**	**16BH-05**	**16BH-05**	**16BH-05 LD**	**16BH-05**	**16BH-06**	**16BH-06**	**16BH-06**	**16BH-06**	**16BH-06**
Aluminum	--		--		16000	8900	12000	11000	14000	14000	8600	14000	13000	13000	10000	12000
Antimony	63	OMOE	40	AE	4	4	3	8	6	5	<2	**430**	<2	<2	<2	<2
Arsenic	31	CCME	26	CCME	**52**	**38**	**37**	14	**29**	**30**	13	11	5	7	8	7
Barium	10000	CCME	2000	AE	87	69	58	93	160	160	75	54	34	38	31	29
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	0.3	<0.3	<0.3	0.6	0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	630	CCME	87	CCME	27	16	23	26	26	27	15	30	24	27	22	23
Cobalt	250	OMOE	300	AE	18	12	14	10	17	17	8	11	10	10	8	10
Copper	4000	CCME	91	CCME	**410**	76	68	**140**	**110**	**100**	58	42	31	35	35	34
Iron	--		--		88000	33000	41000	46000	42000	42000	23000	31000	26000	25000	24000	25000
Lead	260	CCME	600	CCME	**590**	230	160	**440**	**900**	**880**	**530**	**2100**	19	47	86	42
Lithium	--		--		32	18	25	18	30	29	20	20	19	20	16	21
Manganese	--		--		520	400	390	600	1300	1300	290	630	770	540	480	520
Mercury	24	CCME	50	CCME	1.6	0.7	0.4	0.2	0.7	0.7	0.5	0.2	<0.1	<0.1	<0.1	<0.1
Molybdenum	1200	OMOE	40	AE	12	**46**	29	2	9	10	3	<2	<2	<2	<2	<2
Nickel	310	CCME	89	CCME	37	34	40	27	33	35	17	19	17	17	14	17
Rubidium	--		--		12	9	10	5	13	12	7	8	6	8	6	7
Selenium	125	CCME	2.9	CCME	<1	2	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	490	OMOE	40	AE	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Strontium	--		--		100	48	58	18	49	47	24	25	25	30	22	21
Thallium	1	CCME	3.6	CCME	0.3	0.7	0.5	0.1	0.2	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	140000	USEPA	300	AE	21	29	10	39	18	20	23	220	<2	3	14	4
Uranium	33	CCME	2000	CCME	2.8	9.8	9.2	0.6	4.1	4.3	1.7	1.2	0.8	0.8	0.7	0.9
Vanadium	160	OMOE	130	CCME	41	37	40	63	52	54	24	44	39	37	30	37
Zinc	47000	OMOE	360	CCME	**370**	82	94	280	280	270	180	220	69	120	170	150
Sampling Depth (mbgs)					2.40-3.00	3.60-4.20	4.80-5.40	0-0.60	1.80-2.40	1.80-2.40	3.00-3.60	0.60-1.20	1.80-2.40	3.00-3.60	4.20-4.80	5.40-6.00
Sampling Date					18-Aug-16	18-Aug-16	18-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG$_{HH}$ Commercial**		**SQG$_E$ Commercial**		**16BH-07**	**16BH-07**	**16BH-07**	**16BH-07**	**16BH-07 LD1**	**16BH-07 LD2**	**16BH-07**	**16BH-08**	**16BH-08**	**16BH-08**	**16BH-08**	**16BH-09**
Aluminum	--		--		13000	6100	13000	13000	13000	na	8800	13000	13000	7900	6100	12000
Antimony	63	OMOE	40	AE	<2	<2	<2	3	6	na	<2	<2	15	5	**180**	<2
Arsenic	31	CCME	26	CCME	6	7	8	8	8	na	13	20	**32**	14	**160**	6
Barium	10000	CCME	2000	AE	61	32	96	100	98	na	57	95	180	82	180	41
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	na	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	na	<2	<2	<2	<2	<2	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	na	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	<0.3	<0.3	<0.3	<0.3	<0.3	na	<0.3	0.4	0.3	0.5	1.2	<0.3
Chromium	630	CCME	87	CCME	34	11	27	79	48	51	22	25	26	21	41	22
Cobalt	250	OMOE	300	AE	9	4	8	8	8	na	9	11	14	6	84	10
Copper	4000	CCME	91	CCME	66	17	55	66	59	na	**100**	67	**170**	**140**	**780**	30
Iron	--		--		30000	12000	22000	26000	25000	na	28000	32000	40000	24000	150000	24000
Lead	260	CCME	600	CCME	35	38	**270**	**400**	**290**	na	**460**	110	**2800**	**1900**	**2800**	15
Lithium	--		--		17	11	16	18	18	na	17	18	24	10	8	21
Manganese	--		--		470	210	390	540	500	na	410	560	590	370	720	570
Mercury	24	CCME	50	CCME	<0.1	0.1	0.3	0.3	0.3	na	0.7	0.2	0.3	0.2	0.3	<0.1
Molybdenum	1200	OMOE	40	AE	4	<2	2	2	2	na	5	4	8	<2	11	<2
Nickel	310	CCME	89	CCME	25	8	15	17	17	na	20	25	30	14	**130**	17
Rubidium	--		--		7	5	7	7	6	na	7	6	8	5	6	6
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	na	<1	<1	<1	<1	<1	<1
Silver	490	OMOE	40	AE	<0.5	<0.5	<0.5	<0.5	<0.5	na	0.5	<0.5	<0.5	<0.5	1.0	<0.5
Strontium	--		--		92	67	210	220	200	na	88	47	59	84	43	20
Thallium	1	CCME	3.6	CCME	<0.1	<0.1	<0.1	<0.1	<0.1	na	0.1	0.2	0.3	<0.1	0.2	<0.1
Tin	140000	USEPA	300	AE	4	2	12	13	11	na	37	30	140	100	**340**	<2
Uranium	33	CCME	2000	CCME	1.0	0.6	3.3	2.1	1.9	na	2.1	0.8	1.2	0.8	1.0	0.7
Vanadium	160	OMOE	130	CCME	37	25	35	39	37	na	26	62	37	27	54	37
Zinc	47000	OMOE	360	CCME	71	44	210	140	150	na	84	140	**540**	**490**	**1200**	58
Sampling Depth (mbgs)					0-0.60	0.60-1.20	2.10-2.70	3.90-4.50	3.90-4.50	3.90-4.50	5.10-5.70	0-0.60	1.80-2.40	3.00-3.60	4.20-4.80	0.60-1.20
Sampling Date					17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	19-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_E Commercial**		**16BH-09**	**16BH-09**	**16BH-09**	**16BH-09**	**16BH-10**	**16BH-10**	**16BH-10**	**16BH-10**	**16BH-10**	**16BH-11**	**16BH-11**	**16BH-11**
Aluminum	--		--		13000	12000	12000	12000	17000	11000	13000	13000	11000	7500	14000	13000
Antimony	63	OMOE	40	AE	<2	<2	<2	<2	4	4	4	4	<2	**50**	**45**	5
Arsenic	31	CCME	26	CCME	7	7	5	7	7	19	**27**	17	16	**79**	**65**	19
Barium	10000	CCME	2000	AE	46	37	37	27	56	130	95	77	34	380	150	51
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	<2	<2	<2	<2	11	4	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	<0.3	<0.3	<0.3	<0.3	<0.3	1.1	0.5	0.4	1.7	4.6	7.3	0.3
Chromium	630	CCME	87	CCME	28	32	24	25	22	19	20	24	24	16	22	28
Cobalt	250	OMOE	300	AE	11	11	11	12	13	18	15	14	14	14	14	13
Copper	4000	CCME	91	CCME	34	35	30	41	61	**680**	**300**	**290**	66	**10000**	**8500**	**970**
Iron	--		--		26000	24000	22000	25000	31000	37000	41000	38000	35000	34000	83000	31000
Lead	260	CCME	600	CCME	16	17	16	16	42	**930**	**1500**	**1300**	130	**1300**	**3000**	**710**
Lithium	--		--		20	19	19	24	18	26	28	29	27	11	19	21
Manganese	--		--		550	570	540	610	620	460	520	510	410	270	1300	1500
Mercury	24	CCME	50	CCME	<0.1	<0.1	<0.1	<0.1	0.3	0.4	0.6	0.6	0.3	0.7	1.6	0.5
Molybdenum	1200	OMOE	40	AE	<2	<2	<2	2	<2	3	5	5	17	7	13	3
Nickel	310	CCME	89	CCME	17	17	16	18	20	26	29	31	35	42	34	27
Rubidium	--		--		7	6	6	7	6	6	8	9	7	5	6	13
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	<1	<1	<1	<1	**3**	2	<1
Silver	490	OMOE	40	AE	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.7	<0.5	7.6	1.7	<0.5
Strontium	--		--		15	15	12	14	29	58	55	53	92	92	82	41
Thallium	1	CCME	3.6	CCME	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.3	0.4	0.2	0.1
Tin	140000	USEPA	300	AE	<2	2	<2	<2	2	42	31	21	5	130	290	67
Uranium	33	CCME	2000	CCME	0.8	0.8	0.7	0.9	0.7	0.6	1.9	2.3	6.1	1.0	3.8	2.4
Vanadium	160	OMOE	130	CCME	39	36	33	35	68	35	35	35	33	40	51	45
Zinc	47000	OMOE	360	CCME	57	55	52	66	110	**1500**	**560**	**370**	150	**9300**	**8200**	**1200**
Sampling Depth (mbgs)					1.80-2.40	3.00-3.60	4.20-4.80	5.40-6.00	0-0.60	1.20-1.80	2.40-3.00	3.60-4.20	4.80-5.40	0.60-1.20	1.80-2.40	3.00-3.60
Sampling Date					19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16	17-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)											
					Sample Identification											
Elements (mg/kg)	**SQG$_{HH}$ Commercial**		**SQG$_{E}$ Commercial**		**16BH-11**	**16BH-12**	**16BH-12**	**16BH-12**	**16BH-12**	**16BH-12**	**16BH-13**	**16BH-13**	**16BH-13**	**16BH-13**	**16BH-13**	**16BH-14**
Aluminum	--		--		13000	14000	14000	15000	13000	20000	18000	15000	16000	22000	11000	15000
Antimony	63	OMOE	40	AE	3	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	<2
Arsenic	31	CCME	26	CCME	20	7	5	17	8	11	6	10	8	13	12	6
Barium	10000	CCME	2000	AE	130	57	51	63	41	36	33	41	43	170	47	37
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	630	CCME	87	CCME	26	**140**	42	31	26	34	21	20	26	34	17	24
Cobalt	250	OMOE	300	AE	14	31	11	15	12	18	7	10	12	18	10	11
Copper	4000	CCME	91	CCME	**220**	41	32	76	47	35	19	21	26	61	28	35
Iron	--		--		37000	26000	26000	35000	26000	42000	24000	24000	25000	50000	34000	26000
Lead	260	CCME	600	CCME	**670**	90	19	220	42	180	18	21	17	**420**	**280**	29
Lithium	--		--		22	19	19	33	23	66	15	23	24	32	33	21
Manganese	--		--		490	510	510	580	600	350	310	400	490	570	350	570
Mercury	24	CCME	50	CCME	1.3	<0.1	<0.1	0.4	<0.1	0.1	<0.1	<0.1	<0.1	0.4	0.4	<0.1
Molybdenum	1200	OMOE	40	AE	7	<2	4	3	<2	<2	<2	<2	<2	<2	4	<2
Nickel	310	CCME	89	CCME	33	20	18	27	21	41	13	16	17	38	26	17
Rubidium	--		--		14	9	8	8	6	7	8	7	8	20	12	6
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	490	OMOE	40	AE	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Strontium	--		--		80	140	95	27	23	19	29	130	110	59	53	16
Thallium	1	CCME	3.6	CCME	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1
Tin	140000	USEPA	300	AE	40	2	<2	10	<2	3	<2	<2	2	21	5	<2
Uranium	33	CCME	2000	CCME	1.9	0.9	0.8	1.7	0.9	2.6	1.0	0.7	0.8	1.2	2.5	0.6
Vanadium	160	OMOE	130	CCME	45	49	45	39	38	28	40	47	44	51	23	45
Zinc	47000	OMOE	360	CCME	290	70	55	130	69	110	63	68	64	150	64	60
Sampling Depth (mbgs)					4.20-4.80	0.60-1.20	1.80-2.40	3.00-3.60	4.20-4.80	5.40-6.00	0-0.30	0.90-1.50	2.10-2.70	3.60-4.20	4.80-5.40	0-0.60
Sampling Date					17-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16

Table E6: Metals in Soil

					Concentration (mg/kg)						
					Sample Identification						
Elements (mg/kg)	**SQG_{HH} Commercial**		**SQG_E Commercial**		**16BH-14**	**16BH-14**	**16BH-14**	**16BH-15**	**16BH-15**	**16BH-15**	**16BH-15**
Aluminum	--		--		11000	13000	15000	13000	14000	14000	12000
Antimony	63	OMOE	40	AE	<2	2	<2	<2	<2	<2	2
Arsenic	31	CCME	26	CCME	5	13	12	7	8	8	15
Barium	10000	CCME	2000	AE	29	44	37	40	46	26	86
Beryllium	60	OMOE	8	AE	<2	<2	<2	<2	<2	<2	<2
Bismuth	--		--		<2	<2	<2	<2	<2	<2	<2
Boron	24000	OMOE	120	OMOE	<50	<50	<50	<50	<50	<50	<50
Cadmium	49	CCME	22	CCME	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	630	CCME	87	CCME	17	24	28	23	45	42	20
Cobalt	250	OMOE	300	AE	7	9	12	11	12	12	11
Copper	4000	CCME	91	CCME	22	50	86	36	39	33	63
Iron	--		--		17000	31000	32000	25000	29000	28000	31000
Lead	260	CCME	600	CCME	33	**350**	**370**	35	30	20	**550**
Lithium	--		--		15	16	30	17	19	19	21
Manganese	--		--		350	460	410	590	650	670	370
Mercury	24	CCME	50	CCME	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	0.4
Molybdenum	1200	OMOE	40	AE	<2	2	5	<2	3	<2	6
Nickel	310	CCME	89	CCME	12	16	26	17	20	23	28
Rubidium	--		--		5	6	14	8	8	7	9
Selenium	125	CCME	2.9	CCME	<1	<1	<1	<1	<1	<1	<1
Silver	490	OMOE	40	AE	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
Strontium	--		--		48	40	31	16	17	18	52
Thallium	1	CCME	3.6	CCME	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2
Tin	140000	USEPA	300	AE	<2	230	21	<2	<2	<2	9
Uranium	33	CCME	2000	CCME	1.1	1.6	2.8	0.8	0.8	0.7	2.3
Vanadium	160	OMOE	130	CCME	37	36	39	36	44	42	34
Zinc	47000	OMOE	360	CCME	86	100	120	67	80	83	98
Sampling Depth (mbgs)					1.20-1.80	2.40-3.00	5.10-5.70	0.60-1.20	1.80-2.30	3.00-3.60	4.80-5.40
Sampling Date					18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16	18-Aug-16

Table E7 Leachable Metal Concentrations

Parameters	Leachable Metal Concentration (mg/L)					
	Regulated Limits	16BH-06 0.6-1.2 mbgs	16BH-06 Lab Dup 0.6-1.2 mbgs	16BH-08 1.8-2.4 mbgs	16BH-10 2.4-3.0 mbgs	16BH-11 1.8-2.4 mbgs
Aluminum	N/A				0.3	0.4
Antimony	N/A				<0.02	0.04
Arsenic	2.5				<0.02	<0.02
Barium	100				0.33	0.15
Beryllium	N/A				<0.02	<0.02
Boron	500				<0.5	<0.5
Cadmium	0.5				0.007	0.14
Calcium	N/A				390	82
Chromium	5				<0.02	<0.02
Cobalt	N/A				0.05	0.02
Copper	N/A				1.9	160
Iron	N/A				<0.5	<0.5
Lead	5	0.012	0.14	2.9	2.5	**33**
Lithium	N/A				0.02	<0.02
Magnesium	N/A				8	3
Manganese	N/A				1.5	4.0
Molybdenum	N/A				<0.02	<0.02
Nickel	N/A				0.03	0.07
Potassium	N/A				6	3
Selenium	1				<0.01	<0.01
Silver	N/A				<0.005	<0.005
Strontium	N/A				0.61	0.26
Thallium	N/A				<0.001	<0.001
Tin	N/A				<0.02	<0.02
Uranium	10				0.001	0.007
Vanadium	N/A				<0.02	<0.02
Zinc	N/A				5.7	320
Sample Date		22-Aug-16	22-Aug-16	18-Aug-16	17-Aug-16	17-Aug-16

Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (current 2016)

BOLD - Exceeds Regulated Limit

Your Project #: 121811071.201
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER
Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/08/26
Report #: R4137000
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H7219
Received: 2016/08/19, 10:28

Sample Matrix: Soil
Samples Received: 32

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (1)	14	2016/08/22	2016/08/22	ATL SOP 00111	Atl. RBCA v3 m
TEH in Soil (PIRI) (1)	2	2016/08/22	2016/08/23	ATL SOP 00111	Atl. RBCA v3 m
TEH in Soil (PIRI) (1)	15	2016/08/23	2016/08/23	ATL SOP 00111	Atl. RBCA v3 m
Metals Solids Acid Extr. ICPMS	25	2016/08/23	2016/08/23	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS	2	2016/08/23	2016/08/24	ATL SOP 00058	EPA 6020A R1 m
Moisture	8	N/A	2016/08/22	ATL SOP 00001	OMOE Handbook 1983 m
Moisture	24	N/A	2016/08/23	ATL SOP 00001	OMOE Handbook 1983 m
PAH Compounds by GCMS (SIM) (1)	7	2016/08/23	2016/08/24	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	12	2016/08/23	2016/08/25	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	4	2016/08/24	2016/08/25	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	4	2016/08/24	2016/08/26	ATL SOP 00102	EPA 8270D 2007 m
PCBs in soil by GC/ECD (1)	3	2016/08/23	2016/08/25	ATL SOP 00106	EPA 8082A m
PCB Aroclor sum (soil)	3	N/A	2016/08/25		Auto Calc.
VPH in Soil (PIRI)	25	2016/08/21	2016/08/22	ATL SOP 00119	Atl. RBCA v3 m
VPH in Soil (PIRI)	6	2016/08/21	2016/08/23	ATL SOP 00119	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	15	N/A	2016/08/23	N/A	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	16	N/A	2016/08/24	N/A	Atl. RBCA v3 m
Volatile Organic Compounds in Soil	3	2016/08/21	2016/08/22	ATL SOP 00133	EPA 8260C R3 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) Soils are reported on a dry weight basis unless otherwise specified.

Your Project #: 121811071.201
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/08/26
Report #: R4137000
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6H7219
Received: 2016/08/19, 10:28

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CXQ764	CXQ765	CXQ766	CXQ767	CXQ768		
Sampling Date		2016/08/16 10:50	2016/08/16 11:20	2016/08/16 11:50	2016/08/16 12:00	2016/08/16 12:05		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-01 (0.6-1.2)**	**16BH-01 (1.8-2.4)**	**16BH-01 (3.0-3.6)**	**16BH-01 (3.6-4.2)**	**16BH-01 (4.8-5.4)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	3	4	17	10	42	1	4629347

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CXQ769	CXQ770	CXQ771	CXQ772	CXQ773		
Sampling Date		2016/08/16 13:15	2016/08/16 13:45	2016/08/16 14:00	2016/08/16 14:10	2016/08/16 14:20		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-02 (0-0.6)**	**16BH-02 (1.2-1.8)**	**16BH-02 (1.8-2.4)**	**16BH-02 (2.4-3.0)**	**16BH-02 (3.0-3.6)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	2	4	5	7	27	1	4629347

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CXQ774	CXQ775	CXQ776	CXQ777	CXQ778		
Sampling Date		2016/08/16 15:00	2016/08/16 15:40	2016/08/16 15:55	2016/08/16 16:00	2016/08/16 16:20		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-02 (4.8-5.4)**	**16BH-03 (0.6-1.2)**	**16BH-03 (1.8-2.4)**	**16BH-03 (3.0-3.6)**	**16BH-03 (4.2-4.8)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	33	3	5	15	14	1	4629347

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CXQ779	CXQ780	CXQ781	CXQ782	CXQ783		
Sampling Date		2016/08/16 16:45	2016/08/17 16:45	2016/08/17 16:55	2016/08/17 17:05	2016/08/17 17:35		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-03 (5.4-6.0)**	**16BH-07 (0-0.6)**	**16BH-07 (0.6-1.2)**	**16BH-07 (2.1-2.7)**	**16BH-07 (3.9-4.5)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	8	17	14	51	22	1	4629187

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CXQ784	CXQ785	CXQ786		CXQ787		
Sampling Date		2016/08/17 17:55	2016/08/17 11:30	2016/08/17 11:50		2016/08/17 12:10		
COC Number		N/A	N/A	N/A		N/A		
	UNITS	**16BH-07 (5.1-5.7)**	**16BH-10 (0-0.6)**	**16BH-10 (1.2-1.8)**	**QC Batch**	**16BH-10 (2.4-3.0)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	27	31	7	4629187	28	1	4629037

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CXQ788	CXQ789	CXQ790	CXQ791	CXQ792		
Sampling Date		2016/08/17 12:39	2016/08/17 13:00	2016/08/17 13:15	2016/08/17 14:45	2016/08/17 15:10		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-10 (3.6-4.2)**	**16BH-10 (4.8-5.4)**	**16BH-10 (5.4-6.0)**	**16BH-11 (0.6-1.2)**	**16BH-11 (1.8-2.4)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	29	11	29	16	35	1	4629037

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CXQ793	CXQ794		CXQ795		
Sampling Date		2016/08/17 15:35	2016/08/17 16:00		2016/08/17 16:30		
COC Number		N/A	N/A		N/A		
	UNITS	**16BH-11 (3.0-3.6)**	**16BH-11 (4.2-4.8)**	**QC Batch**	**16BH-11 (5.4-6.0)**	**RDL**	**QC Batch**
Inorganics							
Moisture	%	47	43	4629037	51	1	4629347

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B6H7219
Report Date: 2016/08/26

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ764	CXQ765	CXQ765	CXQ765		
Sampling Date		2016/08/16 10:50	2016/08/16 11:20	2016/08/16 11:20	2016/08/16 11:20		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-01 (0.6-1.2)**	**16BH-01 (1.8-2.4)**	**16BH-01 (1.8-2.4) Lab-Dup**	**16BH-01 (1.8-2.4) Lab-Dup 2**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	15000	16000	16000		10	4630634
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	<2		2	4630634
Acid Extractable Arsenic (As)	mg/kg	7	5	5		2	4630634
Acid Extractable Barium (Ba)	mg/kg	34	36	37		5	4630634
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2		2	4630634
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2		2	4630634
Acid Extractable Boron (B)	mg/kg	<50	<50	<50		50	4630634
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3		0.3	4630634
Acid Extractable Chromium (Cr)	mg/kg	22	26	28		2	4630634
Acid Extractable Cobalt (Co)	mg/kg	11	12	13		1	4630634
Acid Extractable Copper (Cu)	mg/kg	40	41	43		2	4630634
Acid Extractable Iron (Fe)	mg/kg	27000	28000	29000		50	4630634
Acid Extractable Lead (Pb)	mg/kg	8.7	11	23 (1)	10	0.5	4630634
Acid Extractable Lithium (Li)	mg/kg	21	22	23		2	4630634
Acid Extractable Manganese (Mn)	mg/kg	530	600	620		2	4630634
Acid Extractable Mercury (Hg)	mg/kg	<0.1	<0.1	<0.1		0.1	4630634
Acid Extractable Molybdenum (Mo)	mg/kg	2	<2	2		2	4630634
Acid Extractable Nickel (Ni)	mg/kg	17	17	18		2	4630634
Acid Extractable Rubidium (Rb)	mg/kg	6	7	7		2	4630634
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1		1	4630634
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5		0.5	4630634
Acid Extractable Strontium (Sr)	mg/kg	25	24	24		5	4630634
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	<0.1		0.1	4630634
Acid Extractable Tin (Sn)	mg/kg	<2	<2	<2		2	4630634
Acid Extractable Uranium (U)	mg/kg	0.7	0.8	0.7		0.1	4630634
Acid Extractable Vanadium (V)	mg/kg	54	58	59		2	4630634
Acid Extractable Zinc (Zn)	mg/kg	58	64	64		5	4630634

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Poor RPD due to sample inhomogeneity. Results confirmed by repeat digestion and analysis.

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ766	CXQ768	CXQ769	CXQ770		
Sampling Date		2016/08/16 11:50	2016/08/16 12:05	2016/08/16 13:15	2016/08/16 13:45		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-01 (3.0-3.6)**	**16BH-01 (4.8-5.4)**	**16BH-02 (0-0.6)**	**16BH-02 (1.2-1.8)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	13000	13000	13000	13000	10	4630634
Acid Extractable Antimony (Sb)	mg/kg	6	15	<2	<2	2	4630634
Acid Extractable Arsenic (As)	mg/kg	10	19	10	7	2	4630634
Acid Extractable Barium (Ba)	mg/kg	37	47	32	24	5	4630634
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4630634
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	0.5	<0.3	<0.3	0.3	4630634
Acid Extractable Chromium (Cr)	mg/kg	24	26	21	15	2	4630634
Acid Extractable Cobalt (Co)	mg/kg	13	13	10	8	1	4630634
Acid Extractable Copper (Cu)	mg/kg	41	83	34	22	2	4630634
Acid Extractable Iron (Fe)	mg/kg	28000	37000	24000	22000	50	4630634
Acid Extractable Lead (Pb)	mg/kg	270	490	8.4	10	0.5	4630634
Acid Extractable Lithium (Li)	mg/kg	23	26	20	30	2	4630634
Acid Extractable Manganese (Mn)	mg/kg	490	1100	540	850	2	4630634
Acid Extractable Mercury (Hg)	mg/kg	5.2	0.8	<0.1	<0.1	0.1	4630634
Acid Extractable Molybdenum (Mo)	mg/kg	<2	7	<2	<2	2	4630634
Acid Extractable Nickel (Ni)	mg/kg	22	25	14	12	2	4630634
Acid Extractable Rubidium (Rb)	mg/kg	8	12	6	5	2	4630634
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4630634
Acid Extractable Silver (Ag)	mg/kg	<0.5	0.8	<0.5	<0.5	0.5	4630634
Acid Extractable Strontium (Sr)	mg/kg	23	45	30	50	5	4630634
Acid Extractable Thallium (Tl)	mg/kg	<0.1	0.2	<0.1	<0.1	0.1	4630634
Acid Extractable Tin (Sn)	mg/kg	5	34	<2	<2	2	4630634
Acid Extractable Uranium (U)	mg/kg	0.9	2.8	0.6	0.5	0.1	4630634
Acid Extractable Vanadium (V)	mg/kg	42	41	46	28	2	4630634
Acid Extractable Zinc (Zn)	mg/kg	120	540	48	51	5	4630634

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ772	CXQ774	CXQ775	CXQ776		
Sampling Date		2016/08/16 14:10	2016/08/16 15:00	2016/08/16 15:40	2016/08/16 15:55		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-02 (2.4-3.0)**	**16BH-02 (4.8-5.4)**	**16BH-03 (0.6-1.2)**	**16BH-03 (1.8-2.4)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	13000	6700	14000	14000	10	4630634
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Arsenic (As)	mg/kg	6	16	5	7	2	4630634
Acid Extractable Barium (Ba)	mg/kg	26	23	36	24	5	4630634
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4630634
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4630634
Acid Extractable Chromium (Cr)	mg/kg	23	20	21	19	2	4630634
Acid Extractable Cobalt (Co)	mg/kg	10	10	12	11	1	4630634
Acid Extractable Copper (Cu)	mg/kg	35	28	37	36	2	4630634
Acid Extractable Iron (Fe)	mg/kg	25000	27000	25000	27000	50	4630634
Acid Extractable Lead (Pb)	mg/kg	12	130	10	11	0.5	4630634
Acid Extractable Lithium (Li)	mg/kg	25	14	20	26	2	4630634
Acid Extractable Manganese (Mn)	mg/kg	580	340	580	710	2	4630634
Acid Extractable Mercury (Hg)	mg/kg	<0.1	0.2	<0.1	<0.1	0.1	4630634
Acid Extractable Molybdenum (Mo)	mg/kg	<2	3	<2	<2	2	4630634
Acid Extractable Nickel (Ni)	mg/kg	15	22	17	17	2	4630634
Acid Extractable Rubidium (Rb)	mg/kg	6	6	6	5	2	4630634
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4630634
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4630634
Acid Extractable Strontium (Sr)	mg/kg	22	34	22	15	5	4630634
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4630634
Acid Extractable Tin (Sn)	mg/kg	<2	6	<2	<2	2	4630634
Acid Extractable Uranium (U)	mg/kg	0.8	1.0	0.8	0.9	0.1	4630634
Acid Extractable Vanadium (V)	mg/kg	41	33	49	41	2	4630634
Acid Extractable Zinc (Zn)	mg/kg	56	230	54	55	5	4630634

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ777	CXQ778	CXQ779	CXQ780		
Sampling Date		2016/08/16 16:00	2016/08/16 16:20	2016/08/16 16:45	2016/08/17 16:45		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-03 (3.0-3.6)**	**16BH-03 (4.2-4.8)**	**16BH-03 (5.4-6.0)**	**16BH-07 (0-0.6)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	15000	11000	6600	13000	10	4630634
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Arsenic (As)	mg/kg	7	8	9	6	2	4630634
Acid Extractable Barium (Ba)	mg/kg	24	21	13	61	5	4630634
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4630634
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4630634
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4630634
Acid Extractable Chromium (Cr)	mg/kg	19	18	9	34	2	4630634
Acid Extractable Cobalt (Co)	mg/kg	11	9	4	9	1	4630634
Acid Extractable Copper (Cu)	mg/kg	42	30	600	66	2	4630634
Acid Extractable Iron (Fe)	mg/kg	25000	22000	9200	30000	50	4630634
Acid Extractable Lead (Pb)	mg/kg	12	42	17	35	0.5	4630634
Acid Extractable Lithium (Li)	mg/kg	29	22	12	17	2	4630634
Acid Extractable Manganese (Mn)	mg/kg	760	710	300	470	2	4630634
Acid Extractable Mercury (Hg)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4630634
Acid Extractable Molybdenum (Mo)	mg/kg	<2	<2	<2	4	2	4630634
Acid Extractable Nickel (Ni)	mg/kg	17	16	7	25	2	4630634
Acid Extractable Rubidium (Rb)	mg/kg	5	7	6	7	2	4630634
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4630634
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4630634
Acid Extractable Strontium (Sr)	mg/kg	17	28	280	92	5	4630634
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4630634
Acid Extractable Tin (Sn)	mg/kg	<2	14	<2	4	2	4630634
Acid Extractable Uranium (U)	mg/kg	1.1	0.8	0.5	1.0	0.1	4630634
Acid Extractable Vanadium (V)	mg/kg	42	32	13	37	2	4630634
Acid Extractable Zinc (Zn)	mg/kg	51	85	53	71	5	4630634

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ781	CXQ782		CXQ783	CXQ783		
Sampling Date		2016/08/17 16:55	2016/08/17 17:05		2016/08/17 17:35	2016/08/17 17:35		
COC Number		N/A	N/A		N/A	N/A		
	UNITS	**16BH-07 (0.6-1.2)**	**16BH-07 (2.1-2.7)**	**QC Batch**	**16BH-07 (3.9-4.5)**	**16BH-07 (3.9-4.5) Lab-Dup**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	6100	13000	4630634	13000	13000	10	4630810
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	4630634	3	6	2	4630810
Acid Extractable Arsenic (As)	mg/kg	7	8	4630634	8	8	2	4630810
Acid Extractable Barium (Ba)	mg/kg	32	96	4630634	100	98	5	4630810
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	4630634	<2	<2	2	4630810
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	4630634	<2	<2	2	4630810
Acid Extractable Boron (B)	mg/kg	<50	<50	4630634	<50	<50	50	4630810
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	4630634	<0.3	<0.3	0.3	4630810
Acid Extractable Chromium (Cr)	mg/kg	11	27	4630634	79	48 (1)	2	4630810
Acid Extractable Cobalt (Co)	mg/kg	4	8	4630634	8	8	1	4630810
Acid Extractable Copper (Cu)	mg/kg	17	55	4630634	66	59	2	4630810
Acid Extractable Iron (Fe)	mg/kg	12000	22000	4630634	26000	25000	50	4630810
Acid Extractable Lead (Pb)	mg/kg	38	270	4630634	400	290	0.5	4630810
Acid Extractable Lithium (Li)	mg/kg	11	16	4630634	18	18	2	4630810
Acid Extractable Manganese (Mn)	mg/kg	210	390	4630634	540	500	2	4630810
Acid Extractable Mercury (Hg)	mg/kg	0.1	0.3	4630634	0.3	0.3	0.1	4630810
Acid Extractable Molybdenum (Mo)	mg/kg	<2	2	4630634	2	2	2	4630810
Acid Extractable Nickel (Ni)	mg/kg	8	15	4630634	17	17	2	4630810
Acid Extractable Rubidium (Rb)	mg/kg	5	7	4630634	7	6	2	4630810
Acid Extractable Selenium (Se)	mg/kg	<1	<1	4630634	<1	<1	1	4630810
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	4630634	<0.5	<0.5	0.5	4630810
Acid Extractable Strontium (Sr)	mg/kg	67	210	4630634	220	200	5	4630810
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	4630634	<0.1	<0.1	0.1	4630810
Acid Extractable Tin (Sn)	mg/kg	2	12	4630634	13	11	2	4630810
Acid Extractable Uranium (U)	mg/kg	0.6	3.3	4630634	2.1	1.9	0.1	4630810
Acid Extractable Vanadium (V)	mg/kg	25	35	4630634	39	37	2	4630810
Acid Extractable Zinc (Zn)	mg/kg	44	210	4630634	140	150	5	4630810

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Poor RPD due to sample inhomogeneity. Results confirmed by repeat digestion and analysis.

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ783	CXQ784	CXQ785	CXQ786		
Sampling Date		2016/08/17 17:35	2016/08/17 17:55	2016/08/17 11:30	2016/08/17 11:50		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-07 (3.9-4.5) Lab-Dup 2**	**16BH-07 (5.1-5.7)**	**16BH-10 (0-0.6)**	**16BH-10 (1.2-1.8)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg		8800	17000	11000	10	4630810
Acid Extractable Antimony (Sb)	mg/kg		<2	4	4	2	4630810
Acid Extractable Arsenic (As)	mg/kg		13	7	19	2	4630810
Acid Extractable Barium (Ba)	mg/kg		57	56	130	5	4630810
Acid Extractable Beryllium (Be)	mg/kg		<2	<2	<2	2	4630810
Acid Extractable Bismuth (Bi)	mg/kg		<2	<2	<2	2	4630810
Acid Extractable Boron (B)	mg/kg		<50	<50	<50	50	4630810
Acid Extractable Cadmium (Cd)	mg/kg		<0.3	<0.3	1.1	0.3	4630810
Acid Extractable Chromium (Cr)	mg/kg	51 (1)	22	22	19	2	4630810
Acid Extractable Cobalt (Co)	mg/kg		9	13	18	1	4630810
Acid Extractable Copper (Cu)	mg/kg		100	61	680	2	4630810
Acid Extractable Iron (Fe)	mg/kg		28000	31000	37000	50	4630810
Acid Extractable Lead (Pb)	mg/kg		460	42	930	0.5	4630810
Acid Extractable Lithium (Li)	mg/kg		17	18	26	2	4630810
Acid Extractable Manganese (Mn)	mg/kg		410	620	460	2	4630810
Acid Extractable Mercury (Hg)	mg/kg		0.7	0.3	0.4	0.1	4630810
Acid Extractable Molybdenum (Mo)	mg/kg		5	<2	3	2	4630810
Acid Extractable Nickel (Ni)	mg/kg		20	20	26	2	4630810
Acid Extractable Rubidium (Rb)	mg/kg		7	6	6	2	4630810
Acid Extractable Selenium (Se)	mg/kg		<1	<1	<1	1	4630810
Acid Extractable Silver (Ag)	mg/kg		0.5	<0.5	<0.5	0.5	4630810
Acid Extractable Strontium (Sr)	mg/kg		88	29	58	5	4630810
Acid Extractable Thallium (Tl)	mg/kg		0.1	<0.1	0.1	0.1	4630810
Acid Extractable Tin (Sn)	mg/kg		37	2	42	2	4630810
Acid Extractable Uranium (U)	mg/kg		2.1	0.7	0.6	0.1	4630810
Acid Extractable Vanadium (V)	mg/kg		26	68	35	2	4630810
Acid Extractable Zinc (Zn)	mg/kg		84	110	1500	5	4630810

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Poor RPD due to sample inhomogeneity.

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ787	CXQ788	CXQ789		CXQ791		
Sampling Date		2016/08/17 12:10	2016/08/17 12:39	2016/08/17 13:00		2016/08/17 14:45		
COC Number		N/A	N/A	N/A		N/A		
	UNITS	**16BH-10 (2.4-3.0)**	**16BH-10 (3.6-4.2)**	**16BH-10 (4.8-5.4)**	**RDL**	**16BH-11 (0.6-1.2)**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	13000	13000	11000	10	7500	10	4630810
Acid Extractable Antimony (Sb)	mg/kg	4	4	<2	2	50	2	4630810
Acid Extractable Arsenic (As)	mg/kg	27	17	16	2	79	2	4630810
Acid Extractable Barium (Ba)	mg/kg	95	77	34	5	380	5	4630810
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	2	<2	2	4630810
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	2	11	2	4630810
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	50	<50	50	4630810
Acid Extractable Cadmium (Cd)	mg/kg	0.5	0.4	1.7	0.3	4.6	0.3	4630810
Acid Extractable Chromium (Cr)	mg/kg	20	24	24	2	16	2	4630810
Acid Extractable Cobalt (Co)	mg/kg	15	14	14	1	14	1	4630810
Acid Extractable Copper (Cu)	mg/kg	300	290	66	2	10000	20	4630810
Acid Extractable Iron (Fe)	mg/kg	41000	38000	35000	50	34000	50	4630810
Acid Extractable Lead (Pb)	mg/kg	1500	1300	130	0.5	1300	0.5	4630810
Acid Extractable Lithium (Li)	mg/kg	28	29	27	2	11	2	4630810
Acid Extractable Manganese (Mn)	mg/kg	520	510	410	2	270	2	4630810
Acid Extractable Mercury (Hg)	mg/kg	0.6	0.6	0.3	0.1	0.7	0.1	4630810
Acid Extractable Molybdenum (Mo)	mg/kg	5	5	17	2	7	2	4630810
Acid Extractable Nickel (Ni)	mg/kg	29	31	35	2	42	2	4630810
Acid Extractable Rubidium (Rb)	mg/kg	8	9	7	2	5	2	4630810
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	1	3	1	4630810
Acid Extractable Silver (Ag)	mg/kg	0.5	0.7	<0.5	0.5	7.6	0.5	4630810
Acid Extractable Strontium (Sr)	mg/kg	55	53	92	5	92	5	4630810
Acid Extractable Thallium (Tl)	mg/kg	0.1	0.1	0.3	0.1	0.4	0.1	4630810
Acid Extractable Tin (Sn)	mg/kg	31	21	5	2	130	2	4630810
Acid Extractable Uranium (U)	mg/kg	1.9	2.3	6.1	0.1	1.0	0.1	4630810
Acid Extractable Vanadium (V)	mg/kg	35	35	33	2	40	2	4630810
Acid Extractable Zinc (Zn)	mg/kg	560	370	150	5	9300	5	4630810

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CXQ792		CXQ793	CXQ794		
Sampling Date		2016/08/17 15:10		2016/08/17 15:35	2016/08/17 16:00		
COC Number		N/A		N/A	N/A		
	UNITS	**16BH-11 (1.8-2.4)**	**RDL**	**16BH-11 (3.0-3.6)**	**16BH-11 (4.2-4.8)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	14000	10	13000	13000	10	4630810
Acid Extractable Antimony (Sb)	mg/kg	45	2	5	3	2	4630810
Acid Extractable Arsenic (As)	mg/kg	65	2	19	20	2	4630810
Acid Extractable Barium (Ba)	mg/kg	150	5	51	130	5	4630810
Acid Extractable Beryllium (Be)	mg/kg	<2	2	<2	<2	2	4630810
Acid Extractable Bismuth (Bi)	mg/kg	4	2	<2	<2	2	4630810
Acid Extractable Boron (B)	mg/kg	<50	50	<50	<50	50	4630810
Acid Extractable Cadmium (Cd)	mg/kg	7.3	0.3	0.3	0.4	0.3	4630810
Acid Extractable Chromium (Cr)	mg/kg	22	2	28	26	2	4630810
Acid Extractable Cobalt (Co)	mg/kg	14	1	13	14	1	4630810
Acid Extractable Copper (Cu)	mg/kg	8500	20	970	220	2	4630810
Acid Extractable Iron (Fe)	mg/kg	83000	50	31000	37000	50	4630810
Acid Extractable Lead (Pb)	mg/kg	3000	0.5	710	670	0.5	4630810
Acid Extractable Lithium (Li)	mg/kg	19	2	21	22	2	4630810
Acid Extractable Manganese (Mn)	mg/kg	1300	2	1500	490	2	4630810
Acid Extractable Mercury (Hg)	mg/kg	1.6	0.1	0.5	1.3	0.1	4630810
Acid Extractable Molybdenum (Mo)	mg/kg	13	2	3	7	2	4630810
Acid Extractable Nickel (Ni)	mg/kg	34	2	27	33	2	4630810
Acid Extractable Rubidium (Rb)	mg/kg	6	2	13	14	2	4630810
Acid Extractable Selenium (Se)	mg/kg	2	1	<1	<1	1	4630810
Acid Extractable Silver (Ag)	mg/kg	1.7	0.5	<0.5	0.5	0.5	4630810
Acid Extractable Strontium (Sr)	mg/kg	82	5	41	80	5	4630810
Acid Extractable Thallium (Tl)	mg/kg	0.2	0.1	0.1	0.3	0.1	4630810
Acid Extractable Tin (Sn)	mg/kg	290	2	67	40	2	4630810
Acid Extractable Uranium (U)	mg/kg	3.8	0.1	2.4	1.9	0.1	4630810
Acid Extractable Vanadium (V)	mg/kg	51	2	45	45	2	4630810
Acid Extractable Zinc (Zn)	mg/kg	8200	5	1200	290	5	4630810

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B6H7219
Report Date: 2016/08/26

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ764	CXQ764	CXQ765	CXQ766	CXQ768		
Sampling Date		2016/08/16 10:50	2016/08/16 10:50	2016/08/16 11:20	2016/08/16 11:50	2016/08/16 12:05		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-01 (0.6-1.2)**	**16BH-01 (0.6-1.2) Lab-Dup**	**16BH-01 (1.8-2.4)**	**16BH-01 (3.0-3.6)**	**16BH-01 (4.8-5.4)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	0.08	0.09	<0.01	0.05	0.37	0.01	4630624
2-Methylnaphthalene	mg/kg	0.12	0.12	0.01	0.06	0.32	0.01	4630624
Acenaphthene	mg/kg	<0.01	<0.01	<0.01	0.02	0.40	0.01	4630624
Acenaphthylene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.13	0.01	4630624
Anthracene	mg/kg	<0.01	<0.01	<0.01	0.08	1.3	0.01	4630624
Benzo(a)anthracene	mg/kg	0.01	0.01	0.02	0.16	4.8	0.01	4630624
Benzo(a)pyrene	mg/kg	<0.01	<0.01	0.01	0.16	4.2	0.01	4630624
Benzo(b)fluoranthene	mg/kg	0.01	0.01	0.01	0.12	3.3	0.01	4630624
Benzo(g,h,i)perylene	mg/kg	0.02	0.02	0.01	0.10	2.3	0.01	4630624
Benzo(j)fluoranthene	mg/kg	<0.01	<0.01	<0.01	0.07	1.8	0.01	4630624
Benzo(k)fluoranthene	mg/kg	<0.01	<0.01	<0.01	0.07	1.8	0.01	4630624
Chrysene	mg/kg	0.03	0.03	0.02	0.17	4.6	0.01	4630624
Dibenz(a,h)anthracene	mg/kg	<0.01	<0.01	<0.01	0.03	0.56	0.01	4630624
Fluoranthene	mg/kg	0.02	0.01	0.03	0.31	12	0.01	4630624
Fluorene	mg/kg	<0.01	<0.01	<0.01	0.02	0.43	0.01	4630624
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	<0.01	0.01	0.09	2.2	0.01	4630624
Naphthalene	mg/kg	0.03	0.03	<0.01	0.03	0.19	0.01	4630624
Perylene	mg/kg	<0.01	<0.01	<0.01	0.04	1.1	0.01	4630624
Phenanthrene	mg/kg	0.06	0.06	0.02	0.25	4.3	0.01	4630624
Pyrene	mg/kg	0.02	0.02	0.03	0.28	9.3	0.01	4630624
Surrogate Recovery (%)								
D10-Anthracene	%	94	97	81	60	89		4630624
D14-Terphenyl (FS)	%	98	100	93	76	97		4630624
D8-Acenaphthylene	%	100	109	99	90	96		4630624

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ769		CXQ770		CXQ772	CXQ774		
Sampling Date		2016/08/16 13:15		2016/08/16 13:45		2016/08/16 14:10	2016/08/16 15:00		
COC Number		N/A		N/A		N/A	N/A		
	UNITS	**16BH-02 (0-0.6)**	**QC Batch**	**16BH-02 (1.2-1.8)**	**QC Batch**	**16BH-02 (2.4-3.0)**	**16BH-02 (4.8-5.4)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.12	0.01	4630624
2-Methylnaphthalene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.13	0.01	4630624
Acenaphthene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.03	0.01	4630624
Acenaphthylene	mg/kg	<0.01	4630624	0.03	4632423	<0.01	<0.01	0.01	4630624
Anthracene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.06	0.01	4630624
Benzo(a)anthracene	mg/kg	<0.01	4630624	<0.01	4632423	0.01	0.20	0.01	4630624
Benzo(a)pyrene	mg/kg	<0.01	4630624	<0.01	4632423	0.02	0.17	0.01	4630624
Benzo(b)fluoranthene	mg/kg	<0.01	4630624	<0.01	4632423	0.01	0.14	0.01	4630624
Benzo(g,h,i)perylene	mg/kg	<0.01	4630624	<0.01	4632423	0.01	0.11	0.01	4630624
Benzo(j)fluoranthene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.09	0.01	4630624
Benzo(k)fluoranthene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.08	0.01	4630624
Chrysene	mg/kg	<0.01	4630624	<0.01	4632423	0.01	0.23	0.01	4630624
Dibenz(a,h)anthracene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.03	0.01	4630624
Fluoranthene	mg/kg	<0.01	4630624	0.01	4632423	0.03	0.28	0.01	4630624
Fluorene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.02	0.01	4630624
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.09	0.01	4630624
Naphthalene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.06	0.01	4630624
Perylene	mg/kg	<0.01	4630624	<0.01	4632423	<0.01	0.03	0.01	4630624
Phenanthrene	mg/kg	<0.01	4630624	<0.01	4632423	0.02	0.25	0.01	4630624
Pyrene	mg/kg	<0.01	4630624	<0.01	4632423	0.03	0.29	0.01	4630624
Surrogate Recovery (%)									
D10-Anthracene	%	95	4630624	95	4632423	66	76		4630624
D14-Terphenyl (FS)	%	95	4630624	79	4632423	78	95		4630624
D8-Acenaphthylene	%	97	4630624	77	4632423	95	90		4630624

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ775	CXQ776	CXQ777	CXQ778	CXQ779		
Sampling Date		2016/08/16 15:40	2016/08/16 15:55	2016/08/16 16:00	2016/08/16 16:20	2016/08/16 16:45		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-03 (0.6-1.2)**	**16BH-03 (1.8-2.4)**	**16BH-03 (3.0-3.6)**	**16BH-03 (4.2-4.8)**	**16BH-03 (5.4-6.0)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	0.02	0.01	<0.01	<0.01	<0.01	0.01	4630624
2-Methylnaphthalene	mg/kg	0.03	0.02	<0.01	<0.01	<0.01	0.01	4630624
Acenaphthene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Acenaphthylene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Anthracene	mg/kg	<0.01	<0.01	<0.01	0.02	0.01	0.01	4630624
Benzo(a)anthracene	mg/kg	<0.01	<0.01	<0.01	0.03	0.02	0.01	4630624
Benzo(a)pyrene	mg/kg	<0.01	<0.01	<0.01	0.03	0.02	0.01	4630624
Benzo(b)fluoranthene	mg/kg	<0.01	0.01	<0.01	0.02	0.02	0.01	4630624
Benzo(g,h,i)perylene	mg/kg	<0.01	0.01	<0.01	0.02	0.01	0.01	4630624
Benzo(j)fluoranthene	mg/kg	<0.01	<0.01	<0.01	0.01	<0.01	0.01	4630624
Benzo(k)fluoranthene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Chrysene	mg/kg	<0.01	0.01	<0.01	0.03	0.02	0.01	4630624
Dibenz(a,h)anthracene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Fluoranthene	mg/kg	<0.01	0.02	<0.01	0.08	0.06	0.01	4630624
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	<0.01	<0.01	0.02	0.01	0.01	4630624
Naphthalene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Perylene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4630624
Phenanthrene	mg/kg	0.01	0.02	<0.01	0.05	0.04	0.01	4630624
Pyrene	mg/kg	<0.01	0.01	<0.01	0.06	0.05	0.01	4630624
Surrogate Recovery (%)								
D10-Anthracene	%	70	74	75	58	91		4630624
D14-Terphenyl (FS)	%	104	76	76	74	95		4630624
D8-Acenaphthylene	%	96	94	91	89	89		4630624

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ780	CXQ781	CXQ782	CXQ783	CXQ784		
Sampling Date		2016/08/17 16:45	2016/08/17 16:55	2016/08/17 17:05	2016/08/17 17:35	2016/08/17 17:55		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-07 (0-0.6)**	**16BH-07 (0.6-1.2)**	**16BH-07 (2.1-2.7)**	**16BH-07 (3.9-4.5)**	**16BH-07 (5.1-5.7)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	<0.01	0.04	0.03	0.03	0.05	0.01	4630624
2-Methylnaphthalene	mg/kg	0.02	0.03	0.05	0.04	0.03	0.01	4630624
Acenaphthene	mg/kg	<0.01	0.08	0.03	0.01	0.09	0.01	4630624
Acenaphthylene	mg/kg	<0.01	0.26	<0.01	<0.01	<0.01	0.01	4630624
Anthracene	mg/kg	0.03	1.5	0.12	0.04	0.03	0.01	4630624
Benzo(a)anthracene	mg/kg	0.08	3.9	0.28	0.15	0.05	0.01	4630624
Benzo(a)pyrene	mg/kg	0.08	3.1	0.22	0.17	0.05	0.01	4630624
Benzo(b)fluoranthene	mg/kg	0.06	1.9	0.17	0.12	0.04	0.01	4630624
Benzo(g,h,i)perylene	mg/kg	0.05	1.1	0.13	0.11	0.05	0.01	4630624
Benzo(j)fluoranthene	mg/kg	0.04	1.4	0.11	0.08	0.02	0.01	4630624
Benzo(k)fluoranthene	mg/kg	0.04	1.3	0.10	0.07	0.02	0.01	4630624
Chrysene	mg/kg	0.08	3.6	0.28	0.15	0.05	0.01	4630624
Dibenz(a,h)anthracene	mg/kg	0.01	0.40	0.03	0.03	<0.01	0.01	4630624
Fluoranthene	mg/kg	0.18	8.0	0.53	0.23	0.09	0.01	4630624
Fluorene	mg/kg	<0.01	0.41	0.04	<0.01	0.02	0.01	4630624
Indeno(1,2,3-cd)pyrene	mg/kg	0.04	1.2	0.11	0.09	0.03	0.01	4630624
Naphthalene	mg/kg	<0.01	0.02	0.03	0.02	0.28	0.01	4630624
Perylene	mg/kg	0.02	0.64	0.05	0.05	0.03	0.01	4630624
Phenanthrene	mg/kg	0.08	4.3	0.35	0.11	0.08	0.01	4630624
Pyrene	mg/kg	0.14	6.2	0.46	0.21	0.10	0.01	4630624
Surrogate Recovery (%)								
D10-Anthracene	%	77	85	94	73	92		4630624
D14-Terphenyl (FS)	%	77	90	94	75	96		4630624
D8-Acenaphthylene	%	91	88	91	89	80		4630624

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ785	CXQ786		CXQ787		CXQ788		
Sampling Date		2016/08/17 11:30	2016/08/17 11:50		2016/08/17 12:10		2016/08/17 12:39		
COC Number		N/A	N/A		N/A		N/A		
	UNITS	**16BH-10 (0-0.6)**	**16BH-10 (1.2-1.8)**	**QC Batch**	**16BH-10 (2.4-3.0)**	**RDL**	**16BH-10 (3.6-4.2)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	0.13	0.09	4630624	0.07	0.01	0.05	0.01	4632423
2-Methylnaphthalene	mg/kg	0.14	0.09	4630624	0.07	0.01	0.05	0.01	4632423
Acenaphthene	mg/kg	0.19	0.24	4630624	0.09	0.01	0.02	0.01	4632423
Acenaphthylene	mg/kg	0.29	0.07	4630624	0.03	0.01	<0.02 (1)	0.02	4632423
Anthracene	mg/kg	0.83	0.95	4630624	0.40	0.01	0.25	0.01	4632423
Benzo(a)anthracene	mg/kg	4.2	3.9	4630624	1.2	0.01	0.77	0.01	4632423
Benzo(a)pyrene	mg/kg	3.5	3.4	4630624	0.95	0.01	0.55	0.01	4632423
Benzo(b)fluoranthene	mg/kg	2.5	2.2	4630624	0.65	0.01	0.40	0.01	4632423
Benzo(g,h,i)perylene	mg/kg	1.6	1.4	4630624	0.45	0.01	0.27	0.01	4632423
Benzo(j)fluoranthene	mg/kg	1.6	1.4	4630624	0.49	0.01	0.27	0.01	4632423
Benzo(k)fluoranthene	mg/kg	1.6	1.4	4630624	0.46	0.01	0.27	0.01	4632423
Chrysene	mg/kg	3.6	3.4	4630624	0.99	0.01	0.66	0.01	4632423
Dibenz(a,h)anthracene	mg/kg	0.52	0.50	4630624	0.20	0.01	0.10	0.01	4632423
Fluoranthene	mg/kg	8.4	5.7	4630624	1.9	0.01	1.2	0.01	4632423
Fluorene	mg/kg	0.22	0.29	4630624	0.10	0.01	0.08	0.01	4632423
Indeno(1,2,3-cd)pyrene	mg/kg	1.6	1.4	4630624	0.48	0.01	0.28	0.01	4632423
Naphthalene	mg/kg	0.12	0.08	4630624	0.05	0.01	0.04	0.01	4632423
Perylene	mg/kg	0.84	0.69	4630624	0.20	0.01	0.12	0.01	4632423
Phenanthrene	mg/kg	2.9	3.2	4630624	1.0	0.01	0.69	0.01	4632423
Pyrene	mg/kg	7.1	5.0	4630624	1.7	0.01	1.1	0.01	4632423
Surrogate Recovery (%)									
D10-Anthracene	%	92	91	4630624	70		85		4632423
D14-Terphenyl (FS)	%	95	94	4630624	71		77		4632423
D8-Acenaphthylene	%	95	93	4630624	76		70		4632423

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

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ789		CXQ789		CXQ791		CXQ792		
Sampling Date		2016/08/17 13:00		2016/08/17 13:00		2016/08/17 14:45		2016/08/17 15:10		
COC Number		N/A		N/A		N/A		N/A		
	UNITS	**16BH-10 (4.8-5.4)**	**RDL**	**16BH-10 (4.8-5.4) Lab-Dup**	**RDL**	**16BH-11 (0.6-1.2)**	**RDL**	**16BH-11 (1.8-2.4)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons										
1-Methylnaphthalene	mg/kg	<0.01	0.01	<0.01	0.01	0.89	0.01	0.15	0.01	4632423
2-Methylnaphthalene	mg/kg	<0.01	0.01	<0.01	0.01	1.3	0.01	0.19	0.01	4632423
Acenaphthene	mg/kg	0.01	0.01	0.02	0.01	0.11	0.01	0.15	0.01	4632423
Acenaphthylene	mg/kg	<0.01	0.01	0.03	0.01	<0.1 (1)	0.1	0.07	0.01	4632423
Anthracene	mg/kg	<0.01	0.01	0.02	0.01	0.28	0.01	0.38	0.01	4632423
Benzo(a)anthracene	mg/kg	0.01	0.01	0.03	0.01	1.5	0.01	1.7	0.01	4632423
Benzo(a)pyrene	mg/kg	<0.01	0.01	0.01	0.01	0.83	0.01	1.7	0.01	4632423
Benzo(b)fluoranthene	mg/kg	<0.01	0.01	0.01	0.01	1.1	0.01	1.3	0.01	4632423
Benzo(g,h,i)perylene	mg/kg	<0.01	0.01	<0.01	0.01	0.64	0.01	0.93	0.01	4632423
Benzo(j)fluoranthene	mg/kg	<0.01	0.01	<0.01	0.01	0.58	0.01	0.74	0.01	4632423
Benzo(k)fluoranthene	mg/kg	<0.01	0.01	<0.01	0.01	0.54	0.01	0.65	0.01	4632423
Chrysene	mg/kg	<0.01	0.01	0.02	0.01	1.7	0.01	1.7	0.01	4632423
Dibenz(a,h)anthracene	mg/kg	<0.01	0.01	<0.01	0.01	0.18	0.01	0.24	0.01	4632423
Fluoranthene	mg/kg	0.03	0.01	0.05	0.01	2.1	0.01	3.6	0.01	4632423
Fluorene	mg/kg	<0.01	0.01	<0.01	0.01	0.13	0.01	0.11	0.01	4632423
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	0.01	<0.01	0.01	0.59	0.01	0.84	0.01	4632423
Naphthalene	mg/kg	<0.01	0.01	<0.01	0.01	0.39	0.01	0.12	0.01	4632423
Perylene	mg/kg	<0.01	0.01	<0.01	0.01	0.23	0.01	0.43	0.01	4632423
Phenanthrene	mg/kg	<0.03 (1)	0.03	<0.04 (1)	0.04	1.2	0.01	1.4	0.01	4632423
Pyrene	mg/kg	0.04	0.01	0.06	0.01	1.7	0.01	3.3	0.01	4632423
Surrogate Recovery (%)										
D10-Anthracene	%	80		78		100		78		4632423
D14-Terphenyl (FS)	%	75		71		112		93		4632423
D8-Acenaphthylene	%	75		76		97		89		4632423

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Elevated PAH RDL(s) due to matrix / co-extractive interference.

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CXQ793	CXQ794		
Sampling Date		2016/08/17 15:35	2016/08/17 16:00		
COC Number		N/A	N/A		
	UNITS	**16BH-11 (3.0-3.6)**	**16BH-11 (4.2-4.8)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons					
1-Methylnaphthalene	mg/kg	0.10	0.15	0.01	4632423
2-Methylnaphthalene	mg/kg	0.13	0.17	0.01	4632423
Acenaphthene	mg/kg	0.08	0.17	0.01	4632423
Acenaphthylene	mg/kg	0.04	0.30	0.01	4632423
Anthracene	mg/kg	0.34	2.0	0.01	4632423
Benzo(a)anthracene	mg/kg	1.2	7.6	0.01	4632423
Benzo(a)pyrene	mg/kg	0.97	7.1	0.01	4632423
Benzo(b)fluoranthene	mg/kg	0.74	4.2	0.01	4632423
Benzo(g,h,i)perylene	mg/kg	0.61	3.3	0.01	4632423
Benzo(j)fluoranthene	mg/kg	0.44	2.7	0.01	4632423
Benzo(k)fluoranthene	mg/kg	0.38	2.6	0.01	4632423
Chrysene	mg/kg	1.2	6.4	0.01	4632423
Dibenz(a,h)anthracene	mg/kg	0.14	0.87	0.01	4632423
Fluoranthene	mg/kg	2.3	17	0.01	4632423
Fluorene	mg/kg	0.07	0.33	0.01	4632423
Indeno(1,2,3-cd)pyrene	mg/kg	0.55	3.3	0.01	4632423
Naphthalene	mg/kg	0.09	0.22	0.01	4632423
Perylene	mg/kg	0.25	1.9	0.01	4632423
Phenanthrene	mg/kg	1.2	1.8	0.01	4632423
Pyrene	mg/kg	2.1	12	0.01	4632423
Surrogate Recovery (%)					
D10-Anthracene	%	101	83		4632423
D14-Terphenyl (FS)	%	108	95		4632423
D8-Acenaphthylene	%	93	94		4632423

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CXQ771	CXQ771	CXQ784	CXQ786		
Sampling Date		2016/08/16 14:00	2016/08/16 14:00	2016/08/17 17:55	2016/08/17 11:50		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-02 (1.8-2.4)**	**16BH-02 (1.8-2.4) Lab-Dup**	**16BH-07 (5.1-5.7)**	**16BH-10 (1.2-1.8)**	**RDL**	**QC Batch**
Volatile Organics							
1,1,1-Trichloroethane	ug/kg	<30	<30	<30	<30	30	4629571
1,1,2,2-Tetrachloroethane	ug/kg	<30	<30	<30	<30	30	4629571
1,1,2-Trichloroethane	ug/kg	<30	<30	<30	<30	30	4629571
1,1-Dichloroethane	ug/kg	<30	<30	<30	<30	30	4629571
1,1-Dichloroethylene	ug/kg	<30	<30	<30	<30	30	4629571
1,2-Dichlorobenzene	ug/kg	<30	<30	<30	<30	30	4629571
1,2-Dichloroethane	ug/kg	<30	<30	<30	<30	30	4629571
1,2-Dichloropropane	ug/kg	<30	<30	<30	<30	30	4629571
1,3-Dichlorobenzene	ug/kg	<30	<30	<30	<30	30	4629571
1,4-Dichlorobenzene	ug/kg	<30	<30	<30	<30	30	4629571
Benzene	ug/kg	<30	<30	<30	<30	30	4629571
Bromodichloromethane	ug/kg	<30	<30	<30	<30	30	4629571
Bromoform	ug/kg	<30	<30	<30	<30	30	4629571
Bromomethane	ug/kg	<50	<50	<50	<50	50	4629571
Carbon Tetrachloride	ug/kg	<30	<30	<30	<30	30	4629571
Chlorobenzene	ug/kg	<30	<30	<30	<30	30	4629571
Chloroethane	ug/kg	<200	<200	<200	<200	200	4629571
Chloroform	ug/kg	<30	<30	<30	<30	30	4629571
cis-1,2-Dichloroethylene	ug/kg	<30	<30	<30	<30	30	4629571
cis-1,3-Dichloropropene	ug/kg	<30	<30	<30	<30	30	4629571
Dibromochloromethane	ug/kg	<30	<30	<30	<30	30	4629571
Ethylbenzene	ug/kg	<30	<30	<30	<30	30	4629571
Ethylene Dibromide	ug/kg	<30	<30	<30	<30	30	4629571
Methylene Chloride(Dichloromethane)	ug/kg	<50	<50	<50	<50	50	4629571
o-Xylene	ug/kg	<30	<30	<30	<30	30	4629571
p+m-Xylene	ug/kg	<30	<30	<30	<30	30	4629571
Styrene	ug/kg	<30	<30	<30	<30	30	4629571
Tetrachloroethylene	ug/kg	<30	<30	<30	31	30	4629571
Toluene	ug/kg	<30	<30	<30	<30	30	4629571
trans-1,2-Dichloroethylene	ug/kg	<30	<30	<30	<30	30	4629571
trans-1,3-Dichloropropene	ug/kg	<30	<30	<30	<30	30	4629571

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CXQ771	CXQ771	CXQ784	CXQ786		
Sampling Date		2016/08/16 14:00	2016/08/16 14:00	2016/08/17 17:55	2016/08/17 11:50		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-02 (1.8-2.4)**	**16BH-02 (1.8-2.4) Lab-Dup**	**16BH-07 (5.1-5.7)**	**16BH-10 (1.2-1.8)**	**RDL**	**QC Batch**
Trichloroethylene	ug/kg	<10	<10	<10	<10	10	4629571
Trichlorofluoromethane (FREON 11)	ug/kg	<30	<30	<30	<30	30	4629571
Vinyl Chloride	ug/kg	<20	<20	<20	<20	20	4629571
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	98 (1)	98 (1)	98 (1)	100		4629571
D10-o-Xylene	%	99	98	88	102		4629571
D4-1,2-Dichloroethane	%	97	96	98	89		4629571
D8-Toluene	%	102	102	102	105		4629571

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) VOC samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Job #: B6H7219
Report Date: 2016/08/26

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ764	CXQ765	CXQ766		CXQ767		
Sampling Date		2016/08/16 10:50	2016/08/16 11:20	2016/08/16 11:50		2016/08/16 12:00		
COC Number		N/A	N/A	N/A		N/A		
	UNITS	**16BH-01 (0.6-1.2)**	**16BH-01 (1.8-2.4)**	**16BH-01 (3.0-3.6)**	**QC Batch**	**16BH-01 (3.6-4.2)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	4629159	<0.03	0.03	4629423
Toluene	mg/kg	<0.03	<0.03	<0.03	4629159	<0.03	0.03	4629423
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	4629159	<0.03	0.03	4629423
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	4629159	<0.05	0.05	4629423
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	4629159	<3	3	4629423
>C10-C16 Hydrocarbons	mg/kg	20	<10	<10	4629466	<10	10	4629466
>C16-C21 Hydrocarbons	mg/kg	31	<10	<10	4629466	<10	10	4629466
>C21-<C32 Hydrocarbons	mg/kg	160	26	24	4629466	53	20	4629466
Modified TPH (Tier1)	mg/kg	210	26	24	4628353	53	20	4628353
Reached Baseline at C32	mg/kg	No	Yes	Yes	4629466	No	N/A	4629466
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (3)	4629466	COMMENT (2)	N/A	4629466
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	99	99	99	4629466	96		4629466
n-Dotriacontane - Extractable	%	121	123	118	4629466	102		4629466
Isobutylbenzene - Volatile	%	100	102	108	4629159	95		4629423

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel oil range. Lube oil fraction.
(2) Lube oil fraction.
(3) Possible lube oil fraction.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ767		CXQ768	CXQ769	CXQ770		
Sampling Date		2016/08/16 12:00		2016/08/16 12:05	2016/08/16 13:15	2016/08/16 13:45		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-01 (3.6-4.2) Lab-Dup**	**QC Batch**	**16BH-01 (4.8-5.4)**	**16BH-02 (0-0.6)**	**16BH-02 (1.2-1.8)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	4629423	<0.03	<0.03	<0.03	0.03	4629159
Toluene	mg/kg	<0.03	4629423	<0.03	<0.03	<0.03	0.03	4629159
Ethylbenzene	mg/kg	<0.03	4629423	<0.03	<0.03	<0.03	0.03	4629159
Total Xylenes	mg/kg	<0.05	4629423	<0.05	<0.05	<0.05	0.05	4629159
C6 - C10 (less BTEX)	mg/kg	<3	4629423	12	<3	<3	3	4629159
>C10-C16 Hydrocarbons	mg/kg	<10	4629466	760	<10	<10	10	4629466
>C16-C21 Hydrocarbons	mg/kg	<10	4629466	200	<10	<10	10	4629466
>C21-<C32 Hydrocarbons	mg/kg	25	4629466	320	<20	<20	20	4629466
Modified TPH (Tier1)	mg/kg		4628353	1300	<20	<20	20	4628353
Reached Baseline at C32	mg/kg		4629466	Yes	NA	NA	N/A	4629466
Hydrocarbon Resemblance	mg/kg		4629466	COMMENT (1)	NA	NA	N/A	4629466
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	100	4629466	107	95	99		4629466
n-Dotriacontane - Extractable	%	120	4629466	98	111	116		4629466
Isobutylbenzene - Volatile	%	94	4629423	109	104	88		4629159

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Weathered fuel oil fraction. Unidentified compound(s) in fuel / lube range. Possible lube oil fraction.

Maxxam Job #: B6H7219
Report Date: 2016/08/26

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ772	CXQ773	CXQ774		CXQ775		
Sampling Date		2016/08/16 14:10	2016/08/16 14:20	2016/08/16 15:00		2016/08/16 15:40		
COC Number		N/A	N/A	N/A		N/A		
	UNITS	**16BH-02 (2.4-3.0)**	**16BH-02 (3.0-3.6)**	**16BH-02 (4.8-5.4)**	**QC Batch**	**16BH-03 (0.6-1.2)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	4629159	<0.03	0.03	4631091
Toluene	mg/kg	<0.03	<0.03	0.09	4629159	<0.03	0.03	4631091
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	4629159	<0.03	0.03	4631091
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	4629159	<0.05	0.05	4631091
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	4629159	<3	3	4631091
>C10-C16 Hydrocarbons	mg/kg	<10	20	<10	4629466	<10	10	4630589
>C16-C21 Hydrocarbons	mg/kg	<10	120	21	4629466	<10	10	4630589
>C21-<C32 Hydrocarbons	mg/kg	<20	320	68	4629466	<20	20	4630589
Modified TPH (Tier1)	mg/kg	<20	460	90	4628353	<20	20	4628353
Reached Baseline at C32	mg/kg	NA	Yes	Yes	4629466	NA	N/A	4630589
Hydrocarbon Resemblance	mg/kg	NA	COMMENT (1)	COMMENT (2)	4629466	NA	N/A	4630589
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	96	96	100	4629466	92		4630589
n-Dotriacontane - Extractable	%	117	109	114	4629466	108		4630589
Isobutylbenzene - Volatile	%	105	97	117	4629159	101		4631091

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Possible lube oil fraction; interference from possible PAHs.
(2) Unidentified compound(s) in fuel oil range. Possible lube oil fraction.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ775		CXQ776	CXQ777	CXQ778		
Sampling Date		2016/08/16 15:40		2016/08/16 15:55	2016/08/16 16:00	2016/08/16 16:20		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-03 (0.6-1.2) Lab-Dup**	**QC Batch**	**16BH-03 (1.8-2.4)**	**16BH-03 (3.0-3.6)**	**16BH-03 (4.2-4.8)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	4631091	<0.03	<0.03	<0.03	0.03	4629159
Toluene	mg/kg	<0.03	4631091	<0.03	<0.03	<0.03	0.03	4629159
Ethylbenzene	mg/kg	<0.03	4631091	<0.03	<0.03	<0.03	0.03	4629159
Total Xylenes	mg/kg	<0.05	4631091	<0.05	<0.05	<0.05	0.05	4629159
C6 - C10 (less BTEX)	mg/kg	<3	4631091	<3	<3	<3	3	4629159
>C10-C16 Hydrocarbons	mg/kg	<10	4630589	<10	<10	<10	10	4629466
>C16-C21 Hydrocarbons	mg/kg	<10	4630589	<10	<10	<10	10	4629466
>C21-<C32 Hydrocarbons	mg/kg	<20	4630589	<20	<20	<20	20	4629466
Modified TPH (Tier1)	mg/kg		4628353	<20	<20	<20	20	4628353
Reached Baseline at C32	mg/kg		4630589	NA	NA	NA	N/A	4629466
Hydrocarbon Resemblance	mg/kg		4630589	NA	NA	NA	N/A	4629466
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	90	4630589	98	96	93		4629466
n-Dotriacontane - Extractable	%	101	4630589	88	122	118 (1)		4629466
Isobutylbenzene - Volatile	%	77	4631091	89	93	94		4629159

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ779		CXQ780		CXQ781	CXQ782		
Sampling Date		2016/08/16 16:45		2016/08/17 16:45		2016/08/17 16:55	2016/08/17 17:05		
COC Number		N/A		N/A		N/A	N/A		
	UNITS	**16BH-03 (5.4-6.0)**	**QC Batch**	**16BH-07 (0-0.6)**	**QC Batch**	**16BH-07 (0.6-1.2)**	**16BH-07 (2.1-2.7)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg	<0.03	4629159	<0.03	4629419	<0.03	<0.03	0.03	4629419
Toluene	mg/kg	<0.03	4629159	<0.03	4629419	<0.03	<0.03	0.03	4629419
Ethylbenzene	mg/kg	<0.03	4629159	<0.03	4629419	<0.03	<0.03	0.03	4629419
Total Xylenes	mg/kg	<0.05	4629159	<0.05	4629419	<0.05	<0.05	0.05	4629419
C6 - C10 (less BTEX)	mg/kg	<3	4629159	<3	4629419	<3	<3	3	4629419
>C10-C16 Hydrocarbons	mg/kg	<10	4629466	<10	4629466	<10	<10	10	4630589
>C16-C21 Hydrocarbons	mg/kg	<10	4629466	<10	4629466	26	<10	10	4630589
>C21-<C32 Hydrocarbons	mg/kg	<20	4629466	25	4629466	61	52	20	4630589
Modified TPH (Tier1)	mg/kg	<20	4628353	25	4628353	87	52	20	4628353
Reached Baseline at C32	mg/kg	NA	4629466	Yes	4629466	Yes	Yes	N/A	4630589
Hydrocarbon Resemblance	mg/kg	NA	4629466	COMMENT (1)	4629466	COMMENT (2)	COMMENT (3)	N/A	4630589
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	97	4629466	96	4629466	92	92		4630589
n-Dotriacontane - Extractable	%	117	4629466	120	4629466	110	111		4630589
Isobutylbenzene - Volatile	%	117	4629159	107	4629419	100	97		4629419

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Possible lube oil fraction.
(2) Possible lube oil fraction. Unidentified compound(s) in fuel / lube range.
(3) Lube oil fraction.

Maxxam Job #: B6H7219
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ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ783	CXQ784	CXQ785	CXQ786	CXQ787		
Sampling Date		2016/08/17 17:35	2016/08/17 17:55	2016/08/17 11:30	2016/08/17 11:50	2016/08/17 12:10		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-07 (3.9-4.5)**	**16BH-07 (5.1-5.7)**	**16BH-10 (0-0.6)**	**16BH-10 (1.2-1.8)**	**16BH-10 (2.4-3.0)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Toluene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	4629419
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	<3	<3	3	4629419
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	<10	10	4630589
>C16-C21 Hydrocarbons	mg/kg	<10	19	46	37	16	10	4630589
>C21-<C32 Hydrocarbons	mg/kg	42	52	220	140	68	20	4630589
Modified TPH (Tier1)	mg/kg	42	71	270	180	84	20	4628353
Reached Baseline at C32	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	4630589
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (2)	COMMENT (2)	COMMENT (1)	N/A	4630589
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	91	92	92	92	92		4630589
n-Dotriacontane - Extractable	%	116	111	98	109	125 (3)		4630589
Isobutylbenzene - Volatile	%	122	102	118	99	115 (4)		4629419

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction.
(2) Lube oil fraction. Unidentified compound(s) in fuel / lube range.
(3) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.
(4) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ788	CXQ789		CXQ790	CXQ790		
Sampling Date		2016/08/17 12:39	2016/08/17 13:00		2016/08/17 13:15	2016/08/17 13:15		
COC Number		N/A	N/A		N/A	N/A		
	UNITS	**16BH-10 (3.6-4.2)**	**16BH-10 (4.8-5.4)**	**QC Batch**	**16BH-10 (5.4-6.0)**	**16BH-10 (5.4-6.0) Lab-Dup**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	4629419	<0.03	<0.03	0.03	4631116
Toluene	mg/kg	<0.03	<0.03	4629419	<0.03	<0.03	0.03	4631116
Ethylbenzene	mg/kg	<0.03	<0.03	4629419	<0.03	<0.03	0.03	4631116
Total Xylenes	mg/kg	<0.05	<0.05	4629419	<0.05	<0.05	0.05	4631116
C6 - C10 (less BTEX)	mg/kg	<3	<3	4629419	<3	<3	3	4631116
>C10-C16 Hydrocarbons	mg/kg	<10	<10	4630589	<10	14	10	4629153
>C16-C21 Hydrocarbons	mg/kg	15	16	4630589	130	160	10	4629153
>C21-<C32 Hydrocarbons	mg/kg	59	29	4630589	170	220	20	4629153
Modified TPH (Tier1)	mg/kg	74	45	4628353	310		20	4628353
Reached Baseline at C32	mg/kg	Yes	Yes	4630589	Yes		N/A	4629153
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	4630589	COMMENT (3)		N/A	4629153
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	92	93	4630589	92	93		4629153
n-Dotriacontane - Extractable	%	119 (4)	115	4630589	101	96		4629153
Isobutylbenzene - Volatile	%	111	104 (5)	4629419	91	102		4631116

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Lube oil fraction.
(2) One product in fuel / lube range.
(3) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(4) TEH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.
(5) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

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ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CXQ791	CXQ792	CXQ793	CXQ794	CXQ795		
Sampling Date		2016/08/17 14:45	2016/08/17 15:10	2016/08/17 15:35	2016/08/17 16:00	2016/08/17 16:30		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-11 (0.6-1.2)**	**16BH-11 (1.8-2.4)**	**16BH-11 (3.0-3.6)**	**16BH-11 (4.2-4.8)**	**16BH-11 (5.4-6.0)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Toluene	mg/kg	0.04	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4629419
Total Xylenes	mg/kg	0.10	<0.05	<0.05	<0.05	<0.05	0.05	4629419
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	<3	<3	3	4629419
>C10-C16 Hydrocarbons	mg/kg	40	<10	<10	24	21	10	4630589
>C16-C21 Hydrocarbons	mg/kg	46	48	45	150	140	10	4630589
>C21-<C32 Hydrocarbons	mg/kg	190	150	220	410	260	20	4630589
Modified TPH (Tier1)	mg/kg	270	200	260	590	420	20	4628353
Reached Baseline at C32	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	4630589
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (3)	COMMENT (4)	COMMENT (5)	N/A	4630589
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	91	93	91	91	93		4630589
n-Dotriacontane - Extractable	%	105	106	108	99	104		4630589
Isobutylbenzene - Volatile	%	92	107	128	111	106		4629419

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel oil range. Lube oil fraction.
(2) Lube oil fraction. Unidentified compound(s) in fuel / lube range.
(3) Lube oil fraction.
(4) Lube oil fraction; interference from possible PAHs.
(5) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.

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Stantec Consulting Ltd
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Site Location: FUNDY QUAY
Sampler Initials: DB

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		CXQ771	CXQ784	CXQ786		
Sampling Date		2016/08/16 14:00	2016/08/17 17:55	2016/08/17 11:50		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-02 (1.8-2.4)**	**16BH-07 (5.1-5.7)**	**16BH-10 (1.2-1.8)**	**RDL**	**QC Batch**
PCBs						
Aroclor 1016	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1221	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1232	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1248	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1242	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1254	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Aroclor 1260	ug/g	<0.05	<0.05	<0.05	0.05	4630566
Calculated Total PCB	ug/g	<0.050	<0.050	<0.050	0.050	4628347
Surrogate Recovery (%)						
Decachlorobiphenyl	%	114	113	105		4630566

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

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

Package 1	7.0°C
Package 2	6.7°C
Package 3	6.7°C
Package 4	3.3°C

Headpace present in samples 16BH-01 (1.8-2.4), 16BH-01 (3.0-3.6),BH16-01 (3.6-4.2), BH16-02 (3.0-3.6), 16BH-02 (4.8-5.4), 16BH-07 (0.6-1.2), 16BH-07 (3.9-4.5) and 16BH-11 (5.4-6.0) which may result in a loss of volatiles.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4629153	Isobutylbenzene - Extractable	2016/08/22	94	30 - 130	93	30 - 130	96	%		
4629153	n-Dotriacontane - Extractable	2016/08/22	116	30 - 130	97	30 - 130	96	%		
4629159	Isobutylbenzene - Volatile	2016/08/22	101	60 - 130	81	60 - 130	89	%		
4629419	Isobutylbenzene - Volatile	2016/08/22	107	60 - 130	106	60 - 130	102	%		
4629423	Isobutylbenzene - Volatile	2016/08/22	103	60 - 130	100	60 - 130	105	%		
4629466	Isobutylbenzene - Extractable	2016/08/22	97	30 - 130	96	30 - 130	94	%		
4629466	n-Dotriacontane - Extractable	2016/08/22	100	30 - 130	114	30 - 130	111	%		
4629571	4-Bromofluorobenzene	2016/08/22	100 (1)	60 - 140	98	60 - 140	96	%		
4629571	D10-o-Xylene	2016/08/22	99	60 - 130	86	60 - 130	101	%		
4629571	D4-1,2-Dichloroethane	2016/08/22	99	60 - 140	93	60 - 140	97	%		
4629571	D8-Toluene	2016/08/22	101	60 - 140	104	60 - 140	102	%		
4630566	Decachlorobiphenyl	2016/08/25	102	30 - 130	107	30 - 130	108	%		
4630589	Isobutylbenzene - Extractable	2016/08/23	93	30 - 130	91	30 - 130	91	%		
4630589	n-Dotriacontane - Extractable	2016/08/23	104	30 - 130	88	30 - 130	94	%		
4630624	D10-Anthracene	2016/08/24	79	30 - 130	91	30 - 130	92	%		
4630624	D14-Terphenyl (FS)	2016/08/24	87	30 - 130	92	30 - 130	98	%		
4630624	D8-Acenaphthylene	2016/08/24	104	30 - 130	100	30 - 130	98	%		
4631091	Isobutylbenzene - Volatile	2016/08/23	97	60 - 130	101	60 - 130	99	%		
4631116	Isobutylbenzene - Volatile	2016/08/23	93	60 - 130	102	60 - 130	100	%		
4632423	D10-Anthracene	2016/08/25	88	30 - 130	80	30 - 130	87	%		
4632423	D14-Terphenyl (FS)	2016/08/25	90	30 - 130	76	30 - 130	87	%		
4632423	D8-Acenaphthylene	2016/08/25	78	30 - 130	75	30 - 130	79	%		
4629153	>C10-C16 Hydrocarbons	2016/08/23	99	30 - 130	96	30 - 130	<10	mg/kg	NC	50
4629153	>C16-C21 Hydrocarbons	2016/08/23	112	30 - 130	96	30 - 130	<10	mg/kg	17	50
4629153	>C21-<C32 Hydrocarbons	2016/08/23	NC	30 - 130	84	30 - 130	<20	mg/kg	24	50
4629159	Benzene	2016/08/22	92	60 - 130	73	60 - 140	<0.03	mg/kg	NC	50
4629159	C6 - C10 (less BTEX)	2016/08/22					<3	mg/kg	NC	50
4629159	Ethylbenzene	2016/08/22	92	60 - 130	79	60 - 140	<0.03	mg/kg	NC	50
4629159	Toluene	2016/08/22	88	60 - 130	75	60 - 140	<0.03	mg/kg	NC	50
4629159	Total Xylenes	2016/08/22	92	60 - 130	78	60 - 140	<0.05	mg/kg	NC	50
4629419	Benzene	2016/08/22	98	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4629419	C6 - C10 (less BTEX)	2016/08/22					<3	mg/kg	NC	50
4629419	Ethylbenzene	2016/08/22	99	60 - 130	101	60 - 140	<0.03	mg/kg	NC	50
4629419	Toluene	2016/08/22	91	60 - 130	95	60 - 140	<0.03	mg/kg	NC	50
4629419	Total Xylenes	2016/08/22	96	60 - 130	102	60 - 140	<0.05	mg/kg	NC	50
4629423	Benzene	2016/08/22	93	60 - 130	92	60 - 140	<0.03	mg/kg	NC	50
4629423	C6 - C10 (less BTEX)	2016/08/22					<3	mg/kg	NC	50
4629423	Ethylbenzene	2016/08/22	93	60 - 130	100	60 - 140	<0.03	mg/kg	NC	50
4629423	Toluene	2016/08/22	93	60 - 130	97	60 - 140	<0.03	mg/kg	NC	50
4629423	Total Xylenes	2016/08/22	96	60 - 130	102	60 - 140	<0.05	mg/kg	NC	50
4629466	>C10-C16 Hydrocarbons	2016/08/22	89	30 - 130	89	30 - 130	<10	mg/kg	NC	50
4629466	>C16-C21 Hydrocarbons	2016/08/22	86	30 - 130	82	30 - 130	<10	mg/kg	NC	50
4629466	>C21-<C32 Hydrocarbons	2016/08/22	102	30 - 130	100	30 - 130	<20	mg/kg	NC	50
4629571	1,1,1-Trichloroethane	2016/08/22	105	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4629571	1,1,2,2-Tetrachloroethane	2016/08/22	91	60 - 140	80	60 - 130	<30	ug/kg	NC	50
4629571	1,1,2-Trichloroethane	2016/08/22	99	60 - 140	88	60 - 130	<30	ug/kg	NC	50
4629571	1,1-Dichloroethane	2016/08/22	104	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4629571	1,1-Dichloroethylene	2016/08/22	105	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4629571	1,2-Dichlorobenzene	2016/08/22	94	60 - 140	88	60 - 130	<30	ug/kg	NC	50
4629571	1,2-Dichloroethane	2016/08/22	96	60 - 140	85	60 - 130	<30	ug/kg	NC	50
4629571	1,2-Dichloropropane	2016/08/22	100	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4629571	1,3-Dichlorobenzene	2016/08/22	98	60 - 140	92	60 - 130	<30	ug/kg	NC	50
4629571	1,4-Dichlorobenzene	2016/08/22	96	60 - 140	90	60 - 130	<30	ug/kg	NC	50
4629571	Benzene	2016/08/22	97	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4629571	Bromodichloromethane	2016/08/22	99	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4629571	Bromoform	2016/08/22	96	60 - 140	84	60 - 130	<30	ug/kg	NC	50
4629571	Bromomethane	2016/08/22	96	60 - 140	83	60 - 140	<50	ug/kg	NC	50
4629571	Carbon Tetrachloride	2016/08/22	102	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4629571	Chlorobenzene	2016/08/22	101	60 - 140	92	60 - 130	<30	ug/kg	NC	50
4629571	Chloroethane	2016/08/22	95	60 - 140	86	60 - 140	<200	ug/kg	NC	50
4629571	Chloroform	2016/08/22	98	60 - 140	89	60 - 130	<30	ug/kg	NC	50
4629571	cis-1,2-Dichloroethylene	2016/08/22	101	60 - 140	92	60 - 130	<30	ug/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4629571	cis-1,3-Dichloropropene	2016/08/22	101	60 - 140	88	60 - 130	<30	ug/kg	NC	50
4629571	Dibromochloromethane	2016/08/22	98	60 - 140	88	60 - 130	<30	ug/kg	NC	50
4629571	Ethylbenzene	2016/08/22	106	60 - 140	100	60 - 130	<30	ug/kg	NC	50
4629571	Ethylene Dibromide	2016/08/22	96	60 - 140	85	60 - 130	<30	ug/kg	NC	50
4629571	Methylene Chloride(Dichloromethane)	2016/08/22	101	60 - 140	91	60 - 130	<50	ug/kg	NC	50
4629571	o-Xylene	2016/08/22	107	60 - 140	101	60 - 130	<30	ug/kg	NC	50
4629571	p+m-Xylene	2016/08/22	104	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4629571	Styrene	2016/08/22	104	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4629571	Tetrachloroethylene	2016/08/22	108	60 - 140	105	60 - 130	<30	ug/kg	NC	50
4629571	Toluene	2016/08/22	104	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4629571	trans-1,2-Dichloroethylene	2016/08/22	104	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4629571	trans-1,3-Dichloropropene	2016/08/22	98	60 - 140	81	60 - 130	<30	ug/kg	NC	50
4629571	Trichloroethylene	2016/08/22	105	60 - 140	100	60 - 130	<10	ug/kg	NC	50
4629571	Trichlorofluoromethane (FREON 11)	2016/08/22	95	60 - 140	89	60 - 140	<30	ug/kg	NC	50
4629571	Vinyl Chloride	2016/08/22	93	60 - 140	84	60 - 140	<20	ug/kg	NC	50
4630566	Aroclor 1016	2016/08/25					<0.05	ug/g	NC	50
4630566	Aroclor 1221	2016/08/25					<0.05	ug/g	NC	50
4630566	Aroclor 1232	2016/08/25					<0.05	ug/g	NC	50
4630566	Aroclor 1242	2016/08/25					<0.05	ug/g	NC	50
4630566	Aroclor 1248	2016/08/25					<0.05	ug/g	NC	50
4630566	Aroclor 1254	2016/08/25	116	30 - 130	117	30 - 130	<0.05	ug/g	NC	50
4630566	Aroclor 1260	2016/08/25					<0.05	ug/g	NC	50
4630589	>C10-C16 Hydrocarbons	2016/08/23	92	30 - 130	95	30 - 130	<10	mg/kg	NC	50
4630589	>C16-C21 Hydrocarbons	2016/08/23	90	30 - 130	92	30 - 130	<10	mg/kg	NC	50
4630589	>C21-<C32 Hydrocarbons	2016/08/23	91	30 - 130	78	30 - 130	<20	mg/kg	NC	50
4630624	1-Methylnaphthalene	2016/08/24	80	30 - 130	80	30 - 130	<0.01	mg/kg	2.1	50
4630624	2-Methylnaphthalene	2016/08/24	84	30 - 130	83	30 - 130	<0.01	mg/kg	3.8	50
4630624	Acenaphthene	2016/08/24	82	30 - 130	81	30 - 130	<0.01	mg/kg	NC	50
4630624	Acenaphthylene	2016/08/24	98	30 - 130	92	30 - 130	<0.01	mg/kg	NC	50
4630624	Anthracene	2016/08/24	74	30 - 130	100	30 - 130	<0.01	mg/kg	NC	50
4630624	Benzo(a)anthracene	2016/08/24	104	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4630624	Benzo(a)pyrene	2016/08/24	94	30 - 130	102	30 - 130	<0.01	mg/kg	NC	50
4630624	Benzo(b)fluoranthene	2016/08/24	92	30 - 130	99	30 - 130	<0.01	mg/kg	NC	50
4630624	Benzo(g,h,i)perylene	2016/08/24	74	30 - 130	94	30 - 130	<0.01	mg/kg	NC	50
4630624	Benzo(j)fluoranthene	2016/08/24	86	30 - 130	92	30 - 130	<0.01	mg/kg	NC	50
4630624	Benzo(k)fluoranthene	2016/08/24	93	30 - 130	99	30 - 130	<0.01	mg/kg	NC	50
4630624	Chrysene	2016/08/24	97	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4630624	Dibenz(a,h)anthracene	2016/08/24	79	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4630624	Fluoranthene	2016/08/24	84	30 - 130	86	30 - 130	<0.01	mg/kg	NC	50
4630624	Fluorene	2016/08/24	92	30 - 130	88	30 - 130	<0.01	mg/kg	NC	50
4630624	Indeno(1,2,3-cd)pyrene	2016/08/24	83	30 - 130	96	30 - 130	<0.01	mg/kg	NC	50
4630624	Naphthalene	2016/08/24	77	30 - 130	77	30 - 130	<0.01	mg/kg	NC	50
4630624	Perylene	2016/08/24	92	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4630624	Phenanthrene	2016/08/24	76	30 - 130	82	30 - 130	<0.01	mg/kg	8.6	50
4630624	Pyrene	2016/08/24	89	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4630634	Acid Extractable Aluminum (Al)	2016/08/23					<10	mg/kg	2.5	35
4630634	Acid Extractable Antimony (Sb)	2016/08/23	99	75 - 125	112	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Arsenic (As)	2016/08/23	103	75 - 125	107	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Barium (Ba)	2016/08/23	NC	75 - 125	111	75 - 125	<5	mg/kg	3.4	35
4630634	Acid Extractable Beryllium (Be)	2016/08/23	106	75 - 125	105	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Bismuth (Bi)	2016/08/23	107	75 - 125	107	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Boron (B)	2016/08/23	92	75 - 125	96	75 - 125	<50	mg/kg	NC	35
4630634	Acid Extractable Cadmium (Cd)	2016/08/23	105	75 - 125	108	75 - 125	<0.3	mg/kg	NC	35
4630634	Acid Extractable Chromium (Cr)	2016/08/23	NC	75 - 125	108	75 - 125	<2	mg/kg	8.9	35
4630634	Acid Extractable Cobalt (Co)	2016/08/23	107	75 - 125	109	75 - 125	<1	mg/kg	6.9	35
4630634	Acid Extractable Copper (Cu)	2016/08/23	NC	75 - 125	108	75 - 125	<2	mg/kg	6.4	35
4630634	Acid Extractable Iron (Fe)	2016/08/23					<50	mg/kg	2.2	35
4630634	Acid Extractable Lead (Pb)	2016/08/23	106	75 - 125	110	75 - 125	<0.5	mg/kg	68 (2)	35
4630634	Acid Extractable Lithium (Li)	2016/08/23	109	75 - 125	100	75 - 125	<2	mg/kg	3.8	35
4630634	Acid Extractable Manganese (Mn)	2016/08/23	NC	75 - 125	107	75 - 125	<2	mg/kg	3.2	35
4630634	Acid Extractable Mercury (Hg)	2016/08/23	97	75 - 125	106	75 - 125	<0.1	mg/kg	NC	35
4630634	Acid Extractable Molybdenum (Mo)	2016/08/23	111	75 - 125	107	75 - 125	<2	mg/kg	NC	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4630634	Acid Extractable Nickel (Ni)	2016/08/23	105	75 - 125	108	75 - 125	<2	mg/kg	6.6	35
4630634	Acid Extractable Rubidium (Rb)	2016/08/23	101	75 - 125	103	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Selenium (Se)	2016/08/23	105	75 - 125	108	75 - 125	<1	mg/kg	NC	35
4630634	Acid Extractable Silver (Ag)	2016/08/23	112	75 - 125	108	75 - 125	<0.5	mg/kg	NC	35
4630634	Acid Extractable Strontium (Sr)	2016/08/23	108	75 - 125	109	75 - 125	<5	mg/kg	NC	35
4630634	Acid Extractable Thallium (Tl)	2016/08/23	108	75 - 125	109	75 - 125	<0.1	mg/kg	NC	35
4630634	Acid Extractable Tin (Sn)	2016/08/23	102	75 - 125	109	75 - 125	<2	mg/kg	NC	35
4630634	Acid Extractable Uranium (U)	2016/08/23	115	75 - 125	115	75 - 125	<0.1	mg/kg	9.9	35
4630634	Acid Extractable Vanadium (V)	2016/08/23	NC	75 - 125	110	75 - 125	<2	mg/kg	2.8	35
4630634	Acid Extractable Zinc (Zn)	2016/08/23	NC	75 - 125	107	75 - 125	<5	mg/kg	0.015	35
4630810	Acid Extractable Aluminum (Al)	2016/08/23					<10	mg/kg	0.43	35
4630810	Acid Extractable Antimony (Sb)	2016/08/23	NC	75 - 125	106	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Arsenic (As)	2016/08/23	105	75 - 125	105	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Barium (Ba)	2016/08/23	NC	75 - 125	108	75 - 125	<5	mg/kg	6.0	35
4630810	Acid Extractable Beryllium (Be)	2016/08/23	109	75 - 125	102	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Bismuth (Bi)	2016/08/23	107	75 - 125	107	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Boron (B)	2016/08/23	98	75 - 125	95	75 - 125	<50	mg/kg	NC	35
4630810	Acid Extractable Cadmium (Cd)	2016/08/23	107	75 - 125	105	75 - 125	<0.3	mg/kg	NC	35
4630810	Acid Extractable Chromium (Cr)	2016/08/23	NC	75 - 125	105	75 - 125	<2	mg/kg	50 (2)	35
4630810	Acid Extractable Cobalt (Co)	2016/08/23	107	75 - 125	106	75 - 125	<1	mg/kg	5.8	35
4630810	Acid Extractable Copper (Cu)	2016/08/23	NC	75 - 125	107	75 - 125	<2	mg/kg	9.8	35
4630810	Acid Extractable Iron (Fe)	2016/08/23					<50	mg/kg	1.7	35
4630810	Acid Extractable Lead (Pb)	2016/08/23	NC	75 - 125	109	75 - 125	<0.5	mg/kg	30	35
4630810	Acid Extractable Lithium (Li)	2016/08/23	108	75 - 125	96	75 - 125	<2	mg/kg	1.1	35
4630810	Acid Extractable Manganese (Mn)	2016/08/23	NC	75 - 125	105	75 - 125	<2	mg/kg	7.3	35
4630810	Acid Extractable Mercury (Hg)	2016/08/23	100	75 - 125	107	75 - 125	<0.1	mg/kg	NC	35
4630810	Acid Extractable Molybdenum (Mo)	2016/08/23	125	75 - 125	111	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Nickel (Ni)	2016/08/23	106	75 - 125	106	75 - 125	<2	mg/kg	1.1	35
4630810	Acid Extractable Rubidium (Rb)	2016/08/23	104	75 - 125	103	75 - 125	<2	mg/kg	NC	35
4630810	Acid Extractable Selenium (Se)	2016/08/23	106	75 - 125	107	75 - 125	<1	mg/kg	NC	35
4630810	Acid Extractable Silver (Ag)	2016/08/23	107	75 - 125	105	75 - 125	<0.5	mg/kg	NC	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4630810	Acid Extractable Strontium (Sr)	2016/08/23	NC	75 - 125	105	75 - 125	<5	mg/kg	6.2	35
4630810	Acid Extractable Thallium (Tl)	2016/08/23	109	75 - 125	110	75 - 125	<0.1	mg/kg	NC	35
4630810	Acid Extractable Tin (Sn)	2016/08/23	NC	75 - 125	113	75 - 125	<2	mg/kg	13	35
4630810	Acid Extractable Uranium (U)	2016/08/23	116	75 - 125	113	75 - 125	<0.1	mg/kg	9.6	35
4630810	Acid Extractable Vanadium (V)	2016/08/23	NC	75 - 125	106	75 - 125	<2	mg/kg	6.7	35
4630810	Acid Extractable Zinc (Zn)	2016/08/23	NC	75 - 125	106	75 - 125	<5	mg/kg	7.2	35
4631091	Benzene	2016/08/23	91	60 - 130	94	60 - 140	<0.03	mg/kg	NC	50
4631091	C6 - C10 (less BTEX)	2016/08/23					<3	mg/kg	NC	50
4631091	Ethylbenzene	2016/08/23	90	60 - 130	102	60 - 140	<0.03	mg/kg	NC	50
4631091	Toluene	2016/08/23	90	60 - 130	99	60 - 140	<0.03	mg/kg	NC	50
4631091	Total Xylenes	2016/08/23	92	60 - 130	104	60 - 140	<0.05	mg/kg	NC	50
4631116	Benzene	2016/08/23	85	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50
4631116	C6 - C10 (less BTEX)	2016/08/23					<3	mg/kg	NC	50
4631116	Ethylbenzene	2016/08/23	88	60 - 130	98	60 - 140	<0.03	mg/kg	NC	50
4631116	Toluene	2016/08/23	83	60 - 130	92	60 - 140	<0.03	mg/kg	NC	50
4631116	Total Xylenes	2016/08/23	90	60 - 130	99	60 - 140	<0.05	mg/kg	NC	50
4632423	1-Methylnaphthalene	2016/08/25	79	30 - 130	79	30 - 130	<0.01	mg/kg	NC	50
4632423	2-Methylnaphthalene	2016/08/25	84	30 - 130	81	30 - 130	<0.01	mg/kg	NC	50
4632423	Acenaphthene	2016/08/25	91	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4632423	Acenaphthylene	2016/08/25	101	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4632423	Anthracene	2016/08/25	107	30 - 130	96	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(a)anthracene	2016/08/25	115	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(a)pyrene	2016/08/25	87	30 - 130	93	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(b)fluoranthene	2016/08/25	95	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(g,h,i)perylene	2016/08/25	87	30 - 130	94	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(j)fluoranthene	2016/08/25	88	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4632423	Benzo(k)fluoranthene	2016/08/25	98	30 - 130	96	30 - 130	<0.01	mg/kg	NC	50
4632423	Chrysene	2016/08/25	100	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4632423	Dibenz(a,h)anthracene	2016/08/25	91	30 - 130	94	30 - 130	<0.01	mg/kg	NC	50
4632423	Fluoranthene	2016/08/25	103	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50
4632423	Fluorene	2016/08/25	94	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4632423	Indeno(1,2,3-cd)pyrene	2016/08/25	92	30 - 130	98	30 - 130	<0.01	mg/kg	NC	50
4632423	Naphthalene	2016/08/25	79	30 - 130	79	30 - 130	<0.01	mg/kg	NC	50
4632423	Perylene	2016/08/25	94	30 - 130	94	30 - 130	<0.01	mg/kg	NC	50
4632423	Phenanthrene	2016/08/25	84	30 - 130	74	30 - 130	<0.01	mg/kg	NC (3)	50
4632423	Pyrene	2016/08/25	102	30 - 130	91	30 - 130	<0.01	mg/kg	NC	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) VOC samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(2) Poor RPD due to sample inhomogeneity. Results confirmed by repeat digestion and analysis.

(3) Elevated PAH RDL(s) due to matrix / co-extractive interference.

VALIDATION SIGNATURE PAGE

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

Alan G Stewart

Alan Stewart, Scientific Specialist (Organics)

Eric Dearman, Scientific Specialist

Philippe Deveau

Phil Deveau

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.

* All bottles labelled 16BA-XX they should be BH16-XX

ATL FCD 00149 / Revision

Maxxam
A Bureau Veritas Group Company

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455 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

CHAIN OF CUSTODY RECORD

COC #:

Page 1 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Sait John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121810711.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	CUSTODY SEAL Y / N Intact	COOLER TEMPERATURES			AVERAGE TEMP
		9	6	6	
		6	6	8	
		6	7	7	
		8	6	4	

INTEGRITY [✓ YES] ~~NO~~ ML 2016/08/18 12:20

Integrity Checklist By: ML

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH16-01 (0-0.6m)	2016/08/16	10:40	Soil	1																							☒	* Limited
2	BH16-01 (0.6-1.2)	"	10:50	"	1								☒				☒			☒									Sample
3	BH 16-01 (1.2-1.8)	"	11:05	"	1																							☒	recovery
4	BH 16-01 (1.8-2.4)	"	11:20	"	1								☒				☒			☒									Some
5	BH 16-01 (2.4-3.0)	"	11:40	"	1																							☒	bottles
6	BH16-01 (3.0-3.6)	"	11:50	"	1								☒				☒			☒									may not
7	BH16-01 (3.6-4.2)	"	12:00	"	1												☒												be Filled *
8	BH16-01 (4.8-5.4)	"	12:05	"	2								☒				☒			☒								☒	*
9	BH16-01 (5.4-6.0)	"	12:15	"	2								■				■			■								☒	2016 AUG 19 10:28 *
10																												■	*

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Tode	2016/08/18	13:00	MCOMEAU			B6H7219
Marilou Tode			MCOMEAU			B6H7218

No analysis hold

16BH-01 (5.4-6.0) Bottle 2/2 opened in our office

Maxxam
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465 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 2 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John , NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	Intact	COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
						[✓ YES] / NO ML 2016/08/20
						Integrity Checklist By: ML

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals (Soil): * Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	* RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	* PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH 16-02 (0-0.6)	2016/08/16	Soil ←	13:15	2								X				X			X									* Limited
X ~~2~~	~~BH 16-02 (0.6-1.2)~~	~~"~~	~~"~~	~~↔ 13:30~~	~~2~~	X																							Sample
3	BH 16-02 (1.2-1.8)	"	"	↔ 13:45	2								X				X			X									recovery
4	BH 16-02 (1.8-2.4)	"	"	↔ 14:00	2																	X	X						Some
5	BH 16-02 (2.4-3.0)	"	"	↔ 14:10	2								X				X			X									bottles
6	BH 16-02 (3.0-3.6)	"	"	↔ 14:20	1												X												may not
7	BH 16-02 (3.6-4.2)	"	"	↔ 14:30	1																							X	be filled *
8	BH 16-02 (4.2-4.8)	"	"	↔ 14:45	1																							X	*
9	BH 16-02 (4.8-5.4)	"	"	↔ 15:00	1								X				X			X									2016 AUG 19 10:28
X ~~10~~	~~BH 16-02 (5.4-6.0)~~	~~"~~	~~"~~	~~↔ 15:15~~	~~2~~	X																							*

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2016/08/18	13:00				B6H7219
Marilyn Toole						B6H7218

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465 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
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ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 3 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
IF RUSH please specify date (Surcharges will be appl
Date Required:
Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	Intact	COOLER TEMPERATURES			AVERAGE TEMP

INTEGRITY ML
[✓ YES] / NO
Integrity Checklist By: ML 2016/08/20

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals (Soil): * Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	* RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	* PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH 16-03 (0-0.6)	2016/08/16	1530	Soil	2																							X	* Limited
2	BH 16-03 (0.6-1.2)	"	15:40	"	2								X				X			X									sample
3	BH16-03 (1.2-1.8)	"	15:50	"	1																							X	recovery
4	BH16-03 (1.8-2.4)	"	15:55	"	1								X				X			X									some
5	BH16-03 (2.4-3.0)	"	15:58	"	1																							X	bottles
6	BH16-03 (3.0-3.6)	"	16:00	"	2								X				X			X									may not
7	BH16-03 (3.6-4.2)	"	16:10	"	1																							X	be filled *
8	BH16-03 (4.2-4.8)	"	16:20	"	1								X				X			X									*
9	BH16-03 (4.8-5.4)	"	16:30	"	1																							X	*
10	BH16-03 (5.4-6.0)	"	16:45	"	1								X				X			X									*

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/18	13:00				B6H7219
Marilou Toole						B6H7218

2016 AUG 19 10:28

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www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 4 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.207
Site Location: ~~Bay~~ Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
IF RUSH please specify date (Surcharges will be appl
Date Required:
Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY ALC
Present	Intact					[✓ YES] [✓ NO]
						Integrity Checklist By: 2016/08/20
						NL

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

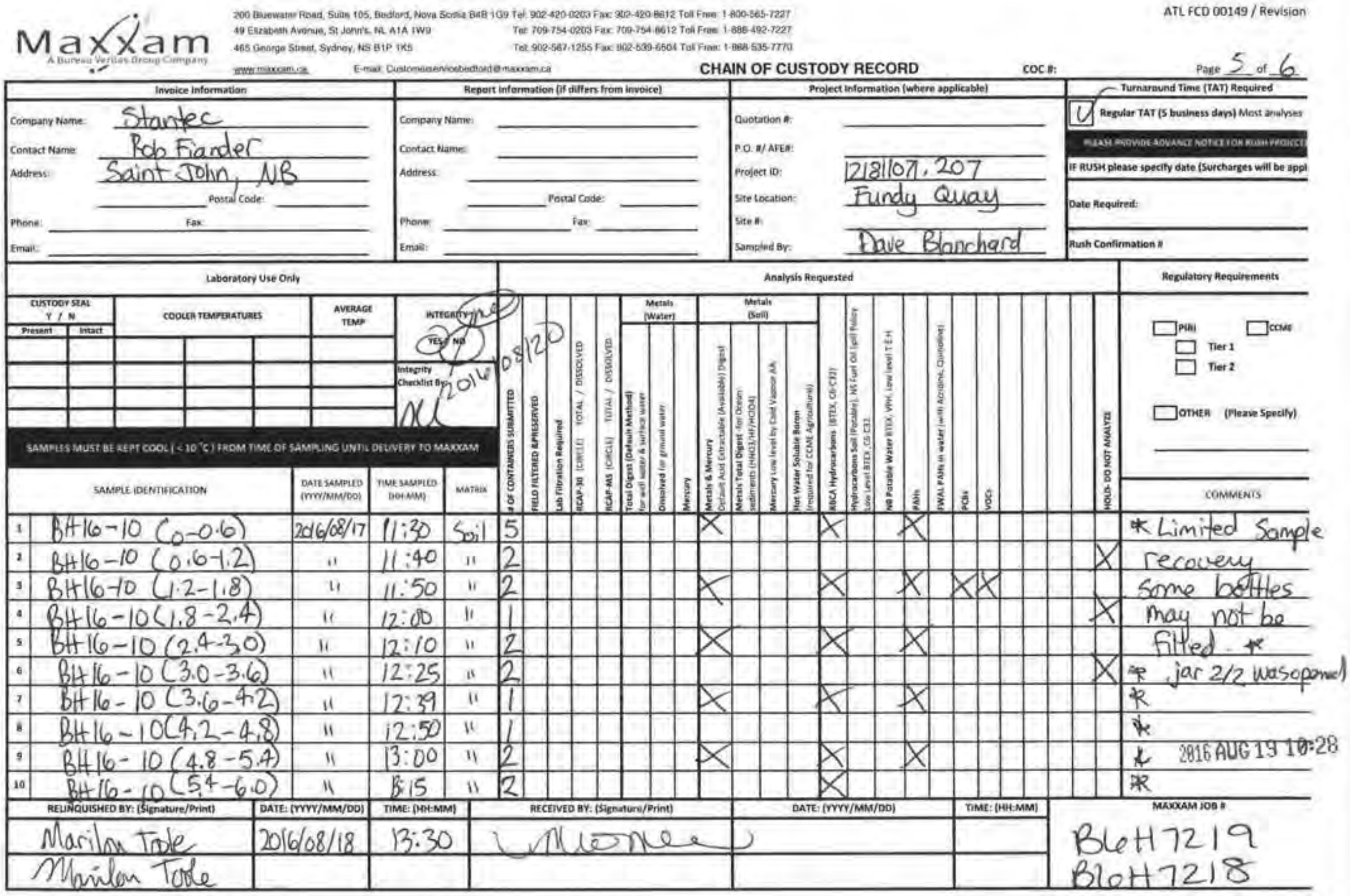
Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH16-07(0-0.6)	2016/08/17	16:45	Soil	2								X				X			X									* Limited Soil
2	BH16-07(0.6-1.2)	"	16:55	"	1								X				X			X									Sample recovery
3	~~BH16-07(1.5-2.1)~~				~~1~~																								some bottles may
4	BH16-07(2.1-2.7)	"	17:05	"	1								X				X			X									not be filled
5	BH16-07(2.7-3.3)	"	17:15	"	1																							X	*
6	~~BH16-07(3.3-3.9)~~				~~0~~																								*
7	BH16-07(3.9-4.5)	"	17:35	"	1								X				X			X									*
8	BH16-07(4.5-5.1)	"	17:45	"	2																							X	* Jar 2/2 was opened
9	BH16-07(5.1-5.7)	"	17:55	"	2								X				X			X		X	X						* 2016 AUG 19 10:28
10	BH16-07(5.7-6.3)	"	18:05	"	2																							X	*

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/18	13:30				B6H7219
Marilou Toole						B6H7218



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ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 5 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 1218107, 207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					[✓ YES] / NO
						Integrity Checklist By: ML 2016/08/20

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest (for Ocean sediments (HNO3/HF/HClO4))	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH16-10 (0-0.6)	2016/08/17	11:30	Soil	5								X				X			X									* Limited Sample
2	BH16-10 (0.6-1.2)	"	11:40	"	2																							X	recovery
3	BH16-10 (1.2-1.8)	"	11:50	"	2								X				X			X		X	X						some bottles
4	BH16-10 (1.8-2.4)	"	12:00	"	1																							X	may not be
5	BH16-10 (2.4-3.0)	"	12:10	"	2								X				X			X									filled. *
6	BH16-10 (3.0-3.6)	"	12:25	"	2																							X	* jar 2/2 wasopened)
7	BH16-10 (3.6-4.2)	"	12:39	"	1								X				X			X									*
8	BH16-10 (4.2-4.8)	"	12:50	"	1																								*
9	BH16-10 (4.8-5.4)	"	13:00	"	2								X				X			X									* 2016 AUG 19 10:28
10	BH16-10 (5.4-6.0)	"	13:15	"	2												X												*

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2016/08/18	13:30				B6H7219 B6H7218
Marilyn Toole						

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ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 6 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					[✓ YES] / NO
						Integrity Checklist By: 2016/08/20

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH16-11 (0-0.6)	2016/08/17	14:30	Soil	2																							X	* Limited sample recovery, some bottles may not be filled
2	BH16-11 (0.6-1.2)	"	14:45	"	1								X				X			X									
3	BH16-11 (1.2-1.8)	"	15:00	"	1																							X	
4	BH16-11 (1.8-2.4)	"	15:10	"	1								X				X			X									
5	BH16-11 (2.4-3.0)	"	15:25	"	1																							X	
6	BH16-11 (3.0-3.6)	"	15:35	"	1								X				X			X									
7	BH16-11 (3.6-4.2)	"	15:45	"	1																							X	
8	BH16-11 (4.2-4.8)	"	16:00	"	2								X				X			X									
9	BH16-11 (4.8-5.4)	"	16:15	"	1																							X	
10	BH16-11 (5.4-6.0)	"	16:30	"	1												X												

2016 AUG 19 10:29

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilan Toole	2016/08/18	13:30				B6H7219 B6H7218
Marilan Toole						

Your Project #: 121811071.702
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/08/31
Report #: R4148542
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I0652
Received: 2016/08/23, 10:31

Sample Matrix: Soil
Samples Received: 30

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (1)	6	2016/08/26	2016/08/26	ATL SOP 00111	Atl. RBCA v3 m
TEH in Soil (PIRI) (1)	24	2016/08/26	2016/08/27	ATL SOP 00111	Atl. RBCA v3 m
Metals Solids Acid Extr. ICPMS	21	2016/08/26	2016/08/26	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS	1	2016/08/29	2016/08/30	ATL SOP 00058	EPA 6020A R1 m
Moisture	30	N/A	2016/08/26	ATL SOP 00001	OMOE Handbook 1983 m
PAH Compounds by GCMS (SIM) (1)	1	2016/08/25	2016/08/27	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	12	2016/08/26	2016/08/27	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	3	2016/08/26	2016/08/30	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	5	2016/08/26	2016/08/31	ATL SOP 00102	EPA 8270D 2007 m
PCBs in soil by GC/ECD (1)	2	2016/08/26	2016/08/29	ATL SOP 00106	EPA 8082A m
PCB Aroclor sum (soil)	2	N/A	2016/08/29		Auto Calc.
VPH in Soil (PIRI)	25	2016/08/25	2016/08/26	ATL SOP 00119	Atl. RBCA v3 m
VPH in Soil (PIRI)	3	2016/08/25	2016/08/27	ATL SOP 00119	Atl. RBCA v3 m
VPH in Soil (PIRI)	2	2016/08/25	2016/08/29	ATL SOP 00119	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	1	N/A	2016/08/29	N/A	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	29	N/A	2016/08/30	N/A	Atl. RBCA v3 m
Volatile Organic Compounds in Soil	2	2016/08/25	2016/08/26	ATL SOP 00133	EPA 8260C R3 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) Soils are reported on a dry weight basis unless otherwise specified.

Your Project #: 121811071.702
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER
Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/08/31
Report #: R4148542
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I0652
Received: 2016/08/23, 10:31

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CYH314	CYH315	CYH316	CYH317	CYH318		
Sampling Date		2016/08/18 16:00	2016/08/18 16:10	2016/08/18 16:30	2016/08/18 16:50	2016/08/18 17:10		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-04 (0.6-1.2)**	**16BH-04 (1.2-1.8)**	**16BH-04 (2.4-3.0)**	**16BH-04 (3.6-4.2)**	**16BH-04 (4.8-5.4)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	8	21	41	20	37	1	4634527

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYH319	CYH320	CYH321	CYH322	CYH323		
Sampling Date		2016/08/18 17:20	2016/08/18 14:15	2016/08/18 14:25	2016/08/18 14:50	2016/08/18 15:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-04 (5.4-6.0)**	**16BH-08 (0-0.6)**	**16BH-08 (0.6-1.2)**	**16BH-08 (1.8-2.4)**	**16BH-08 (2.4-3.0)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	30	6	29	22	20	1	4634527

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYH324	CYH325	CYH326	CYH327	CYH328		
Sampling Date		2016/08/18 15:15	2016/08/18 15:40	2016/08/18 16:00	2016/08/18 10:00	2016/08/18 10:10		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-08 (3.0-3.6)**	**16BH-08 (4.2-4.8)**	**16BH-08 (5.4-6.0)**	**16BH-13 (0-0.3)**	**16BH-13 (0.9-1.5)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	21	36	19	18	7	1	4634527

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYH329	CYH330	CYH331	CYH332		
Sampling Date		2016/08/18 10:30	2016/08/18 10:35	2016/08/18 10:45	2016/08/18 11:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-13 (2.1-2.7)**	**16BH-13 (3.0-3.6)**	**16BH-13 (3.6-4.2)**	**16BH-13 (4.8-5.4)**	**RDL**	**QC Batch**
Inorganics							
Moisture	%	5	21	25	17	1	4634527

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CYH333	CYH334	CYH335	CYH336	CYH337		
Sampling Date		2016/08/18 12:30	2016/08/18 13:00	2016/08/18 13:20	2016/08/18 13:50	2016/08/18 14:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-14 (0-0.6)**	**16BH-14 (1.2-1.8)**	**16BH-14 (2.4-3.0)**	**16BH-14 (5.1-5.7)**	**16BH-14 (5.7-6.3)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	19	7	16	44	23	1	4634974

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYH338	CYH339	CYH340	CYH341	CYH342		
Sampling Date		2016/08/18 08:15	2016/08/18 08:30	2016/08/18 08:50	2016/08/18 09:07	2016/08/18 09:15		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-15 (0-0.6)**	**16BH-15 (0.6-1.2)**	**16BH-15 (1.8-2.3)**	**16BH-15 (3.0-3.6)**	**16BH-15 (3.6-4.2)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	6	12	3	4	13	1	4634974

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYH343		
Sampling Date		2016/08/18 09:30		
COC Number		N/A		
	UNITS	**16BH-15 (4.8-5.4)**	**RDL**	**QC Batch**
Inorganics				
Moisture	%	39	1	4634974

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH314	CYH315	CYH316	CYH317		
Sampling Date		2016/08/18 16:00	2016/08/18 16:10	2016/08/18 16:30	2016/08/18 16:50		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-04 (0.6-1.2)**	**16BH-04 (1.2-1.8)**	**16BH-04 (2.4-3.0)**	**16BH-04 (3.6-4.2)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	12000	13000	16000	8900	10	4636418
Acid Extractable Antimony (Sb)	mg/kg	2	12	4	4	2	4636418
Acid Extractable Arsenic (As)	mg/kg	26	20	52	38	2	4636418
Acid Extractable Barium (Ba)	mg/kg	97	83	87	69	5	4636418
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4636418
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4636418
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4636418
Acid Extractable Cadmium (Cd)	mg/kg	0.4	0.3	0.3	<0.3	0.3	4636418
Acid Extractable Chromium (Cr)	mg/kg	42	24	27	16	2	4636418
Acid Extractable Cobalt (Co)	mg/kg	11	15	18	12	1	4636418
Acid Extractable Copper (Cu)	mg/kg	81	150	410	76	2	4636418
Acid Extractable Iron (Fe)	mg/kg	36000	40000	88000	33000	50	4636418
Acid Extractable Lead (Pb)	mg/kg	180	700	590	230	0.5	4636418
Acid Extractable Lithium (Li)	mg/kg	22	29	32	18	2	4636418
Acid Extractable Manganese (Mn)	mg/kg	510	810	520	400	2	4636418
Acid Extractable Mercury (Hg)	mg/kg	0.3	1.2	1.6	0.7	0.1	4636418
Acid Extractable Molybdenum (Mo)	mg/kg	6	3	12	46	2	4636418
Acid Extractable Nickel (Ni)	mg/kg	25	30	37	34	2	4636418
Acid Extractable Rubidium (Rb)	mg/kg	7	10	12	9	2	4636418
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	2	1	4636418
Acid Extractable Silver (Ag)	mg/kg	<0.5	0.6	<0.5	0.6	0.5	4636418
Acid Extractable Strontium (Sr)	mg/kg	38	35	100	48	5	4636418
Acid Extractable Thallium (Tl)	mg/kg	0.2	0.1	0.3	0.7	0.1	4636418
Acid Extractable Tin (Sn)	mg/kg	9	43	21	29	2	4636418
Acid Extractable Uranium (U)	mg/kg	1.1	1.8	2.8	9.8	0.1	4636418
Acid Extractable Vanadium (V)	mg/kg	46	32	41	37	2	4636418
Acid Extractable Zinc (Zn)	mg/kg	180	410	370	82	5	4636418

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B6I0652
Report Date: 2016/08/31

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DR

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH318	CYH320	CYH322	CYH324		
Sampling Date		2016/08/18 17:10	2016/08/18 14:15	2016/08/18 14:50	2016/08/18 15:15		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-04 (4.8-5.4)**	**16BH-08 (0-0.6)**	**16BH-08 (1.8-2.4)**	**16BH-08 (3.0-3.6)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	12000	13000	13000	7900	10	4636418
Acid Extractable Antimony (Sb)	mg/kg	3	<2	15	5	2	4636418
Acid Extractable Arsenic (As)	mg/kg	37	20	32	14	2	4636418
Acid Extractable Barium (Ba)	mg/kg	58	95	180	82	5	4636418
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4636418
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4636418
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4636418
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	0.4	0.3	0.5	0.3	4636418
Acid Extractable Chromium (Cr)	mg/kg	23	25	26	21	2	4636418
Acid Extractable Cobalt (Co)	mg/kg	14	11	14	6	1	4636418
Acid Extractable Copper (Cu)	mg/kg	68	67	170	140	2	4636418
Acid Extractable Iron (Fe)	mg/kg	41000	32000	40000	24000	50	4636418
Acid Extractable Lead (Pb)	mg/kg	160	110	2800	1900	0.5	4636418
Acid Extractable Lithium (Li)	mg/kg	25	18	24	10	2	4636418
Acid Extractable Manganese (Mn)	mg/kg	390	560	590	370	2	4636418
Acid Extractable Mercury (Hg)	mg/kg	0.4	0.2	0.3	0.2	0.1	4636418
Acid Extractable Molybdenum (Mo)	mg/kg	29	4	8	<2	2	4636418
Acid Extractable Nickel (Ni)	mg/kg	40	25	30	14	2	4636418
Acid Extractable Rubidium (Rb)	mg/kg	10	6	8	5	2	4636418
Acid Extractable Selenium (Se)	mg/kg	1	<1	<1	<1	1	4636418
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4636418
Acid Extractable Strontium (Sr)	mg/kg	58	47	59	84	5	4636418
Acid Extractable Thallium (Tl)	mg/kg	0.5	0.2	0.3	<0.1	0.1	4636418
Acid Extractable Tin (Sn)	mg/kg	10	30	140	100	2	4636418
Acid Extractable Uranium (U)	mg/kg	9.2	0.8	1.2	0.8	0.1	4636418
Acid Extractable Vanadium (V)	mg/kg	40	62	37	27	2	4636418
Acid Extractable Zinc (Zn)	mg/kg	94	140	540	490	5	4636418

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH325			CYH327		CYH328		
Sampling Date		2016/08/18 15:40			2016/08/18 10:00		2016/08/18 10:10		
COC Number		N/A			N/A		N/A		
	UNITS	**16BH-08 (4.2-4.8)**	**RDL**	**QC Batch**	**16BH-13 (0-0.3)**	**QC Batch**	**16BH-13 (0.9-1.5)**	**RDL**	**QC Batch**
Metals									
Acid Extractable Aluminum (Al)	mg/kg	6100	10	4638651	18000	4636418	15000	10	4636276
Acid Extractable Antimony (Sb)	mg/kg	180	2	4638651	<2	4636418	<2	2	4636276
Acid Extractable Arsenic (As)	mg/kg	160	2	4638651	6	4636418	10	2	4636276
Acid Extractable Barium (Ba)	mg/kg	180	5	4638651	33	4636418	41	5	4636276
Acid Extractable Beryllium (Be)	mg/kg	<2	2	4638651	<2	4636418	<2	2	4636276
Acid Extractable Bismuth (Bi)	mg/kg	<2	2	4638651	<2	4636418	<2	2	4636276
Acid Extractable Boron (B)	mg/kg	<50	50	4638651	<50	4636418	<50	50	4636276
Acid Extractable Cadmium (Cd)	mg/kg	1.2	0.3	4638651	<0.3	4636418	<0.3	0.3	4636276
Acid Extractable Chromium (Cr)	mg/kg	41	2	4638651	21	4636418	20	2	4636276
Acid Extractable Cobalt (Co)	mg/kg	84	1	4638651	7	4636418	10	1	4636276
Acid Extractable Copper (Cu)	mg/kg	780	2	4638651	19	4636418	21	2	4636276
Acid Extractable Iron (Fe)	mg/kg	150000	500	4638651	24000	4636418	24000	50	4636276
Acid Extractable Lead (Pb)	mg/kg	2800	0.5	4638651	18	4636418	21	0.5	4636276
Acid Extractable Lithium (Li)	mg/kg	8	2	4638651	15	4636418	23	2	4636276
Acid Extractable Manganese (Mn)	mg/kg	720	2	4638651	310	4636418	400	2	4636276
Acid Extractable Mercury (Hg)	mg/kg	0.3	0.1	4638651	<0.1	4636418	<0.1	0.1	4636276
Acid Extractable Molybdenum (Mo)	mg/kg	11	2	4638651	<2	4636418	<2	2	4636276
Acid Extractable Nickel (Ni)	mg/kg	130	2	4638651	13	4636418	16	2	4636276
Acid Extractable Rubidium (Rb)	mg/kg	6	2	4638651	8	4636418	7	2	4636276
Acid Extractable Selenium (Se)	mg/kg	<1	1	4638651	<1	4636418	<1	1	4636276
Acid Extractable Silver (Ag)	mg/kg	1.0	0.5	4638651	<0.5	4636418	<0.5	0.5	4636276
Acid Extractable Strontium (Sr)	mg/kg	43	5	4638651	29	4636418	130	5	4636276
Acid Extractable Thallium (Tl)	mg/kg	0.2	0.1	4638651	<0.1	4636418	<0.1	0.1	4636276
Acid Extractable Tin (Sn)	mg/kg	340	2	4638651	<2	4636418	<2	2	4636276
Acid Extractable Uranium (U)	mg/kg	1.0	0.1	4638651	1.0	4636418	0.7	0.1	4636276
Acid Extractable Vanadium (V)	mg/kg	54	2	4638651	40	4636418	47	2	4636276
Acid Extractable Zinc (Zn)	mg/kg	1200	5	4638651	63	4636418	68	5	4636276

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH329	CYH331	CYH332	CYH333		
Sampling Date		2016/08/18 10:30	2016/08/18 10:45	2016/08/18 11:00	2016/08/18 12:30		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-13 (2.1-2.7)**	**16BH-13 (3.6-4.2)**	**16BH-13 (4.8-5.4)**	**16BH-14 (0-0.6)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	16000	22000	11000	15000	10	4636276
Acid Extractable Antimony (Sb)	mg/kg	<2	2	<2	<2	2	4636276
Acid Extractable Arsenic (As)	mg/kg	8	13	12	6	2	4636276
Acid Extractable Barium (Ba)	mg/kg	43	170	47	37	5	4636276
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4636276
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4636276
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4636276
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4636276
Acid Extractable Chromium (Cr)	mg/kg	26	34	17	24	2	4636276
Acid Extractable Cobalt (Co)	mg/kg	12	18	10	11	1	4636276
Acid Extractable Copper (Cu)	mg/kg	26	61	28	35	2	4636276
Acid Extractable Iron (Fe)	mg/kg	25000	50000	34000	26000	50	4636276
Acid Extractable Lead (Pb)	mg/kg	17	420	280	29	0.5	4636276
Acid Extractable Lithium (Li)	mg/kg	24	32	33	21	2	4636276
Acid Extractable Manganese (Mn)	mg/kg	490	570	350	570	2	4636276
Acid Extractable Mercury (Hg)	mg/kg	<0.1	0.4	0.4	<0.1	0.1	4636276
Acid Extractable Molybdenum (Mo)	mg/kg	<2	<2	4	<2	2	4636276
Acid Extractable Nickel (Ni)	mg/kg	17	38	26	17	2	4636276
Acid Extractable Rubidium (Rb)	mg/kg	8	20	12	6	2	4636276
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4636276
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4636276
Acid Extractable Strontium (Sr)	mg/kg	110	59	53	16	5	4636276
Acid Extractable Thallium (Tl)	mg/kg	<0.1	0.1	0.1	<0.1	0.1	4636276
Acid Extractable Tin (Sn)	mg/kg	2	21	5	<2	2	4636276
Acid Extractable Uranium (U)	mg/kg	0.8	1.2	2.5	0.6	0.1	4636276
Acid Extractable Vanadium (V)	mg/kg	44	51	23	45	2	4636276
Acid Extractable Zinc (Zn)	mg/kg	64	150	64	60	5	4636276

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH334	CYH335	CYH336	CYH339		
Sampling Date		2016/08/18 13:00	2016/08/18 13:20	2016/08/18 13:50	2016/08/18 08:30		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-14 (1.2-1.8)**	**16BH-14 (2.4-3.0)**	**16BH-14 (5.1-5.7)**	**16BH-15 (0.6-1.2)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	11000	13000	15000	13000	10	4636276
Acid Extractable Antimony (Sb)	mg/kg	<2	2	<2	<2	2	4636276
Acid Extractable Arsenic (As)	mg/kg	5	13	12	7	2	4636276
Acid Extractable Barium (Ba)	mg/kg	29	44	37	40	5	4636276
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4636276
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4636276
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4636276
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4636276
Acid Extractable Chromium (Cr)	mg/kg	17	24	28	23	2	4636276
Acid Extractable Cobalt (Co)	mg/kg	7	9	12	11	1	4636276
Acid Extractable Copper (Cu)	mg/kg	22	50	86	36	2	4636276
Acid Extractable Iron (Fe)	mg/kg	17000	31000	32000	25000	50	4636276
Acid Extractable Lead (Pb)	mg/kg	33	350	370	35	0.5	4636276
Acid Extractable Lithium (Li)	mg/kg	15	16	30	17	2	4636276
Acid Extractable Manganese (Mn)	mg/kg	350	460	410	590	2	4636276
Acid Extractable Mercury (Hg)	mg/kg	<0.1	<0.1	0.5	<0.1	0.1	4636276
Acid Extractable Molybdenum (Mo)	mg/kg	<2	2	5	<2	2	4636276
Acid Extractable Nickel (Ni)	mg/kg	12	16	26	17	2	4636276
Acid Extractable Rubidium (Rb)	mg/kg	5	6	14	8	2	4636276
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4636276
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	3.5	<0.5	0.5	4636276
Acid Extractable Strontium (Sr)	mg/kg	48	40	31	16	5	4636276
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	0.2	<0.1	0.1	4636276
Acid Extractable Tin (Sn)	mg/kg	<2	230	21	<2	2	4636276
Acid Extractable Uranium (U)	mg/kg	1.1	1.6	2.8	0.8	0.1	4636276
Acid Extractable Vanadium (V)	mg/kg	37	36	39	36	2	4636276
Acid Extractable Zinc (Zn)	mg/kg	86	100	120	67	5	4636276

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYH340	CYH341	CYH343		
Sampling Date		2016/08/18 08:50	2016/08/18 09:07	2016/08/18 09:30		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-15 (1.8-2.3)**	**16BH-15 (3.0-3.6)**	**16BH-15 (4.8-5.4)**	**RDL**	**QC Batch**
Metals						
Acid Extractable Aluminum (Al)	mg/kg	14000	14000	12000	10	4636276
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	2	2	4636276
Acid Extractable Arsenic (As)	mg/kg	8	8	15	2	4636276
Acid Extractable Barium (Ba)	mg/kg	46	26	86	5	4636276
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	2	4636276
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	2	4636276
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	50	4636276
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	0.3	4636276
Acid Extractable Chromium (Cr)	mg/kg	45	42	20	2	4636276
Acid Extractable Cobalt (Co)	mg/kg	12	12	11	1	4636276
Acid Extractable Copper (Cu)	mg/kg	39	33	63	2	4636276
Acid Extractable Iron (Fe)	mg/kg	29000	28000	31000	50	4636276
Acid Extractable Lead (Pb)	mg/kg	30	20	550	0.5	4636276
Acid Extractable Lithium (Li)	mg/kg	19	19	21	2	4636276
Acid Extractable Manganese (Mn)	mg/kg	650	670	370	2	4636276
Acid Extractable Mercury (Hg)	mg/kg	<0.1	<0.1	0.4	0.1	4636276
Acid Extractable Molybdenum (Mo)	mg/kg	3	<2	6	2	4636276
Acid Extractable Nickel (Ni)	mg/kg	20	23	28	2	4636276
Acid Extractable Rubidium (Rb)	mg/kg	8	7	9	2	4636276
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	1	4636276
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	0.5	4636276
Acid Extractable Strontium (Sr)	mg/kg	17	18	52	5	4636276
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	0.2	0.1	4636276
Acid Extractable Tin (Sn)	mg/kg	<2	<2	9	2	4636276
Acid Extractable Uranium (U)	mg/kg	0.8	0.7	2.3	0.1	4636276
Acid Extractable Vanadium (V)	mg/kg	44	42	34	2	4636276
Acid Extractable Zinc (Zn)	mg/kg	80	83	98	5	4636276

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH314		CYH316	CYH317	CYH318		
Sampling Date		2016/08/18 16:00		2016/08/18 16:30	2016/08/18 16:50	2016/08/18 17:10		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-04 (0.6-1.2)**	**RDL**	**16BH-04 (2.4-3.0)**	**16BH-04 (3.6-4.2)**	**16BH-04 (4.8-5.4)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	0.5	0.2	0.15	0.04	0.23	0.01	4636131
2-Methylnaphthalene	mg/kg	0.6	0.2	0.11	0.05	0.30	0.01	4636131
Acenaphthene	mg/kg	0.4	0.2	0.22	0.03	1.0	0.01	4636131
Acenaphthylene	mg/kg	<0.2	0.2	0.07	0.02	<0.01	0.01	4636131
Anthracene	mg/kg	1.1	0.2	1.6	0.08	0.78	0.01	4636131
Benzo(a)anthracene	mg/kg	2.1	0.2	1.3	0.08	1.8	0.01	4636131
Benzo(a)pyrene	mg/kg	1.3	0.2	0.88	0.06	1.1	0.01	4636131
Benzo(b)fluoranthene	mg/kg	1.2	0.2	0.75	0.06	1.1	0.01	4636131
Benzo(g,h,i)perylene	mg/kg	0.8	0.2	0.53	0.04	0.63	0.01	4636131
Benzo(j)fluoranthene	mg/kg	0.7	0.2	0.42	0.04	0.52	0.01	4636131
Benzo(k)fluoranthene	mg/kg	0.7	0.2	0.42	0.03	0.52	0.01	4636131
Chrysene	mg/kg	2.0	0.2	1.1	0.09	1.8	0.01	4636131
Dibenz(a,h)anthracene	mg/kg	0.2	0.2	0.15	<0.01	0.16	0.01	4636131
Fluoranthene	mg/kg	4.8	0.2	4.8	0.23	5.4	0.01	4636131
Fluorene	mg/kg	0.5	0.2	0.35	0.05	0.73	0.01	4636131
Indeno(1,2,3-cd)pyrene	mg/kg	0.8	0.2	0.48	0.02	0.53	0.01	4636131
Naphthalene	mg/kg	0.6	0.2	0.12	0.10	0.41	0.01	4636131
Perylene	mg/kg	0.4	0.2	0.22	0.02	0.29	0.01	4636131
Phenanthrene	mg/kg	3.3	0.2	2.4	0.20	6.4	0.01	4636131
Pyrene	mg/kg	3.8	0.2	3.7	0.19	4.2	0.01	4636131
Surrogate Recovery (%)								
D10-Anthracene	%	126		92	74	86		4636131
D14-Terphenyl (FS)	%	92 (1)		102	88	99		4636131
D8-Acenaphthylene	%	84		78	84	84		4636131

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

Maxxam Job #: B6I0652
Report Date: 2016/08/31

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DR

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH320		CYH322		CYH324		CYH325		
Sampling Date		2016/08/18 14:15		2016/08/18 14:50		2016/08/18 15:15		2016/08/18 15:40		
COC Number		N/A		N/A		N/A		N/A		
	UNITS	**16BH-08 (0-0.6)**	**RDL**	**16BH-08 (1.8-2.4)**	**RDL**	**16BH-08 (3.0-3.6)**	**RDL**	**16BH-08 (4.2-4.8)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons										
1-Methylnaphthalene	mg/kg	0.4	0.2	0.8	0.1	0.01	0.01	11	0.2	4636131
2-Methylnaphthalene	mg/kg	0.5	0.2	1.0	0.1	0.02	0.01	17	0.2	4636131
Acenaphthene	mg/kg	<0.2	0.2	3.7	0.1	0.02	0.01	8.4	0.2	4636131
Acenaphthylene	mg/kg	<0.2	0.2	0.9	0.1	<0.01	0.01	16	0.2	4636131
Anthracene	mg/kg	0.5	0.2	7.4	0.1	0.08	0.01	30	0.2	4636131
Benzo(a)anthracene	mg/kg	1.5	0.2	19	0.1	0.21	0.01	34	0.2	4636131
Benzo(a)pyrene	mg/kg	1.1	0.2	18	0.1	0.14	0.01	28	0.2	4636131
Benzo(b)fluoranthene	mg/kg	0.9	0.2	15	0.1	0.13	0.01	20	0.2	4636131
Benzo(g,h,i)perylene	mg/kg	0.8	0.2	10	0.1	0.09	0.01	12	0.2	4636131
Benzo(j)fluoranthene	mg/kg	0.6	0.2	7.6	0.1	0.07	0.01	12	0.2	4636131
Benzo(k)fluoranthene	mg/kg	0.5	0.2	8.3	0.1	0.07	0.01	11	0.2	4636131
Chrysene	mg/kg	1.5	0.2	18	0.1	0.20	0.01	27	0.2	4636131
Dibenz(a,h)anthracene	mg/kg	<0.2	0.2	3.0	0.1	0.03	0.01	4.6	0.2	4636131
Fluoranthene	mg/kg	3.0	0.2	44	0.1	0.45	0.01	71	0.2	4636131
Fluorene	mg/kg	<0.2	0.2	3.9	0.1	0.02	0.01	20	0.2	4636131
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	0.2	<10 (1)	10	0.08	0.01	12 (1)	10	4636131
Naphthalene	mg/kg	0.3	0.2	1.0	0.1	0.02	0.01	87	0.2	4636131
Perylene	mg/kg	0.3	0.2	4.4	0.1	0.04	0.01	5.8	0.2	4636131
Phenanthrene	mg/kg	1.7	0.2	44	0.1	0.27	0.01	81	0.2	4636131
Pyrene	mg/kg	2.4	0.2	37	0.1	0.33	0.01	60	0.2	4636131
Surrogate Recovery (%)										
D10-Anthracene	%	114		128		91		105		4636131
D14-Terphenyl (FS)	%	80 (2)		117 (2)		100		125 (2)		4636131
D8-Acenaphthylene	%	92		103		90		88		4636131

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

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH326		CYH328	CYH329	CYH331		
Sampling Date		2016/08/18 16:00		2016/08/18 10:10	2016/08/18 10:30	2016/08/18 10:45		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-08 (5.4-6.0)**	**RDL**	**16BH-13 (0.9-1.5)**	**16BH-13 (2.1-2.7)**	**16BH-13 (3.6-4.2)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	4.6	0.01	<0.01	<0.01	0.05	0.01	4636131
2-Methylnaphthalene	mg/kg	6.1	0.01	<0.01	<0.01	0.06	0.01	4636131
Acenaphthene	mg/kg	2.9	0.01	<0.01	<0.01	0.13	0.01	4636131
Acenaphthylene	mg/kg	1.2	0.01	<0.01	<0.01	0.05	0.01	4636131
Anthracene	mg/kg	5.0	0.01	0.03	0.01	0.34	0.01	4636131
Benzo(a)anthracene	mg/kg	4.4	0.01	0.09	0.04	0.87	0.01	4636131
Benzo(a)pyrene	mg/kg	2.4	0.01	0.08	0.04	0.55	0.01	4636131
Benzo(b)fluoranthene	mg/kg	1.6	0.01	0.07	0.03	0.43	0.01	4636131
Benzo(g,h,i)perylene	mg/kg	1.0	0.01	0.06	0.02	0.28	0.01	4636131
Benzo(j)fluoranthene	mg/kg	1.0	0.01	0.04	0.02	0.27	0.01	4636131
Benzo(k)fluoranthene	mg/kg	1.1	0.01	0.04	0.02	0.27	0.01	4636131
Chrysene	mg/kg	3.4	0.01	0.09	0.04	0.72	0.01	4636131
Dibenz(a,h)anthracene	mg/kg	<0.4 (1)	0.4	0.02	<0.01	0.09	0.01	4636131
Fluoranthene	mg/kg	9.2	0.01	0.16	0.09	1.5	0.01	4636131
Fluorene	mg/kg	4.1	0.01	<0.01	<0.01	0.19	0.01	4636131
Indeno(1,2,3-cd)pyrene	mg/kg	<1 (1)	1	0.05	0.02	0.26	0.01	4636131
Naphthalene	mg/kg	14 (2)	0.1	<0.01	<0.01	0.06	0.01	4636131
Perylene	mg/kg	0.55	0.01	0.02	<0.01	0.12	0.01	4636131
Phenanthrene	mg/kg	11	0.01	0.07	0.05	1.2	0.01	4636131
Pyrene	mg/kg	6.3	0.01	0.13	0.07	1.3	0.01	4636131
Surrogate Recovery (%)								
D10-Anthracene	%	89		89	86	81		4636131
D14-Terphenyl (FS)	%	79		94	93	93		4636131
D8-Acenaphthylene	%	90		89	87	87		4636131

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

Maxxam Job #: B6I0652
Report Date: 2016/08/31

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DR

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH332	CYH333		CYH334			CYH335		
Sampling Date		2016/08/18 11:00	2016/08/18 12:30		2016/08/18 13:00			2016/08/18 13:20		
COC Number		N/A	N/A		N/A			N/A		
	UNITS	**16BH-13 (4.8-5.4)**	**16BH-14 (0-0.6)**	**RDL**	**16BH-14 (1.2-1.8)**	**RDL**	**QC Batch**	**16BH-14 (2.4-3.0)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons										
1-Methylnaphthalene	mg/kg	0.02	0.02	0.01	0.02	0.01	4636131	<0.01	0.01	4636198
2-Methylnaphthalene	mg/kg	0.01	0.03	0.01	0.02	0.01	4636131	<0.01	0.01	4636198
Acenaphthene	mg/kg	0.04	0.07	0.01	0.05	0.01	4636131	<0.01	0.01	4636198
Acenaphthylene	mg/kg	<0.01	0.06	0.01	<0.02 (1)	0.02	4636131	0.02	0.01	4636198
Anthracene	mg/kg	0.03	0.23	0.01	0.11	0.01	4636131	0.05	0.01	4636198
Benzo(a)anthracene	mg/kg	0.07	1.0	0.01	0.31	0.01	4636131	0.17	0.01	4636198
Benzo(a)pyrene	mg/kg	0.06	0.76	0.01	0.25	0.01	4636131	0.19	0.01	4636198
Benzo(b)fluoranthene	mg/kg	0.05	0.55	0.01	0.20	0.01	4636131	0.17	0.01	4636198
Benzo(g,h,i)perylene	mg/kg	0.04	0.47	0.01	0.16	0.01	4636131	0.12	0.01	4636198
Benzo(j)fluoranthene	mg/kg	0.04	0.33	0.01	0.11	0.01	4636131	0.08	0.01	4636198
Benzo(k)fluoranthene	mg/kg	0.03	0.35	0.01	0.12	0.01	4636131	0.09	0.01	4636198
Chrysene	mg/kg	0.08	0.87	0.01	0.28	0.01	4636131	0.16	0.01	4636198
Dibenz(a,h)anthracene	mg/kg	<0.01	0.13	0.01	0.04	0.01	4636131	0.03	0.01	4636198
Fluoranthene	mg/kg	0.20	1.7	0.01	0.66	0.01	4636131	0.30	0.01	4636198
Fluorene	mg/kg	0.03	0.06	0.01	0.06	0.01	4636131	0.01	0.01	4636198
Indeno(1,2,3-cd)pyrene	mg/kg	0.03	0.43	0.01	0.14	0.01	4636131	0.10	0.01	4636198
Naphthalene	mg/kg	0.02	0.07	0.01	0.02	0.01	4636131	0.01	0.01	4636198
Perylene	mg/kg	0.03	0.19	0.01	0.06	0.01	4636131	0.05	0.01	4636198
Phenanthrene	mg/kg	0.15	0.90	0.01	0.47	0.01	4636131	0.19	0.01	4636198
Pyrene	mg/kg	0.21	1.5	0.01	0.52	0.01	4636131	0.27	0.01	4636198
Surrogate Recovery (%)										
D10-Anthracene	%	79	92		76		4636131	78		4636198
D14-Terphenyl (FS)	%	90	105		91		4636131	82		4636198
D8-Acenaphthylene	%	85	81		85		4636131	81		4636198

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

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH335		CYH336		CYH339	CYH340		
Sampling Date		2016/08/18 13:20		2016/08/18 13:50		2016/08/18 08:30	2016/08/18 08:50		
COC Number		N/A		N/A		N/A	N/A		
	UNITS	**16BH-14 (2.4-3.0) Lab-Dup**	**QC Batch**	**16BH-14 (5.1-5.7)**	**QC Batch**	**16BH-15 (0.6-1.2)**	**16BH-15 (1.8-2.3)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	<0.01	4636198	0.02	4636131	<0.01	0.01	0.01	4636198
2-Methylnaphthalene	mg/kg	<0.01	4636198	0.02	4636131	<0.01	0.02	0.01	4636198
Acenaphthene	mg/kg	0.01	4636198	0.03	4636131	<0.01	0.06	0.01	4636198
Acenaphthylene	mg/kg	0.03	4636198	<0.01	4636131	<0.01	0.01	0.01	4636198
Anthracene	mg/kg	0.06	4636198	0.14	4636131	<0.01	0.22	0.01	4636198
Benzo(a)anthracene	mg/kg	0.20	4636198	0.49	4636131	<0.01	0.32	0.01	4636198
Benzo(a)pyrene	mg/kg	0.24	4636198	0.37	4636131	<0.01	0.33	0.01	4636198
Benzo(b)fluoranthene	mg/kg	0.20	4636198	0.32	4636131	<0.01	0.28	0.01	4636198
Benzo(g,h,i)perylene	mg/kg	0.16	4636198	0.24	4636131	<0.01	0.19	0.01	4636198
Benzo(j)fluoranthene	mg/kg	0.11	4636198	0.18	4636131	<0.01	0.14	0.01	4636198
Benzo(k)fluoranthene	mg/kg	0.11	4636198	0.18	4636131	<0.01	0.15	0.01	4636198
Chrysene	mg/kg	0.19	4636198	0.38	4636131	<0.01	0.30	0.01	4636198
Dibenz(a,h)anthracene	mg/kg	0.04	4636198	0.07	4636131	<0.01	0.05	0.01	4636198
Fluoranthene	mg/kg	0.37	4636198	0.95	4636131	<0.01	0.76	0.01	4636198
Fluorene	mg/kg	0.02	4636198	0.04	4636131	<0.01	0.08	0.01	4636198
Indeno(1,2,3-cd)pyrene	mg/kg	0.14	4636198	0.21	4636131	<0.01	0.18	0.01	4636198
Naphthalene	mg/kg	0.01	4636198	0.02	4636131	<0.01	0.03	0.01	4636198
Perylene	mg/kg	0.06	4636198	0.09	4636131	<0.01	0.08	0.01	4636198
Phenanthrene	mg/kg	0.24	4636198	0.29	4636131	<0.01	0.71	0.01	4636198
Pyrene	mg/kg	0.32	4636198	0.82	4636131	<0.01	0.61	0.01	4636198
Surrogate Recovery (%)									
D10-Anthracene	%	76	4636198	88	4636131	72	74		4636198
D14-Terphenyl (FS)	%	75	4636198	104	4636131	71	77		4636198
D8-Acenaphthylene	%	81	4636198	79	4636131	71	82		4636198

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYH341	CYH343		
Sampling Date		2016/08/18 09:07	2016/08/18 09:30		
COC Number		N/A	N/A		
	UNITS	**16BH-15 (3.0-3.6)**	**16BH-15 (4.8-5.4)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons					
1-Methylnaphthalene	mg/kg	0.01	0.03	0.01	4636198
2-Methylnaphthalene	mg/kg	0.01	0.03	0.01	4636198
Acenaphthene	mg/kg	0.05	0.03	0.01	4636198
Acenaphthylene	mg/kg	0.01	0.02	0.01	4636198
Anthracene	mg/kg	0.11	0.16	0.01	4636198
Benzo(a)anthracene	mg/kg	0.15	0.39	0.01	4636198
Benzo(a)pyrene	mg/kg	0.17	0.33	0.01	4636198
Benzo(b)fluoranthene	mg/kg	0.14	0.26	0.01	4636198
Benzo(g,h,i)perylene	mg/kg	0.11	0.17	0.01	4636198
Benzo(j)fluoranthene	mg/kg	0.07	0.15	0.01	4636198
Benzo(k)fluoranthene	mg/kg	0.08	0.14	0.01	4636198
Chrysene	mg/kg	0.15	0.39	0.01	4636198
Dibenz(a,h)anthracene	mg/kg	0.03	0.06	0.01	4636198
Fluoranthene	mg/kg	0.35	0.74	0.01	4636198
Fluorene	mg/kg	0.04	0.05	0.01	4636198
Indeno(1,2,3-cd)pyrene	mg/kg	0.10	0.14	0.01	4636198
Naphthalene	mg/kg	0.04	0.04	0.01	4636198
Perylene	mg/kg	0.04	0.08	0.01	4636198
Phenanthrene	mg/kg	0.41	0.40	0.01	4636198
Pyrene	mg/kg	0.29	0.85	0.01	4636198
Surrogate Recovery (%)					
D10-Anthracene	%	81	59		4636198
D14-Terphenyl (FS)	%	78	97		4636198
D8-Acenaphthylene	%	85	74		4636198

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CYH337	CYH337	CYH340		
Sampling Date		2016/08/18 14:00	2016/08/18 14:00	2016/08/18 08:50		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-14 (5.7-6.3)**	**16BH-14 (5.7-6.3) Lab-Dup**	**16BH-15 (1.8-2.3)**	**RDL**	**QC Batch**
Volatile Organics						
1,1,1-Trichloroethane	ug/kg	<30	<30	<30	30	4636125
1,1,2,2-Tetrachloroethane	ug/kg	<30	<30	<30	30	4636125
1,1,2-Trichloroethane	ug/kg	<30	<30	<30	30	4636125
1,1-Dichloroethane	ug/kg	<30	<30	<30	30	4636125
1,1-Dichloroethylene	ug/kg	<30	<30	<30	30	4636125
1,2-Dichlorobenzene	ug/kg	<30	<30	<30	30	4636125
1,2-Dichloroethane	ug/kg	<30	<30	<30	30	4636125
1,2-Dichloropropane	ug/kg	<30	<30	<30	30	4636125
1,3-Dichlorobenzene	ug/kg	<30	<30	<30	30	4636125
1,4-Dichlorobenzene	ug/kg	<30	<30	<30	30	4636125
Benzene	ug/kg	<30	<30	<30	30	4636125
Bromodichloromethane	ug/kg	<30	<30	<30	30	4636125
Bromoform	ug/kg	<30	<30	<30	30	4636125
Bromomethane	ug/kg	<50	<50	<50	50	4636125
Carbon Tetrachloride	ug/kg	<30	<30	<30	30	4636125
Chlorobenzene	ug/kg	<30	<30	<30	30	4636125
Chloroethane	ug/kg	<200	<200	<200	200	4636125
Chloroform	ug/kg	<30	<30	<30	30	4636125
cis-1,2-Dichloroethylene	ug/kg	48	<30	<30	30	4636125
cis-1,3-Dichloropropene	ug/kg	<30	<30	<30	30	4636125
Dibromochloromethane	ug/kg	<30	<30	<30	30	4636125
Ethylbenzene	ug/kg	<30	<30	<30	30	4636125
Ethylene Dibromide	ug/kg	<30	<30	<30	30	4636125
Methylene Chloride(Dichloromethane)	ug/kg	<50	<50	<50	50	4636125
o-Xylene	ug/kg	<30	<30	<30	30	4636125
p+m-Xylene	ug/kg	<30	<30	<30	30	4636125
Styrene	ug/kg	<30	<30	<30	30	4636125
Tetrachloroethylene	ug/kg	<30	<30	<30	30	4636125
Toluene	ug/kg	<30	<30	<30	30	4636125
trans-1,2-Dichloroethylene	ug/kg	<30	<30	<30	30	4636125
trans-1,3-Dichloropropene	ug/kg	<30	<30	<30	30	4636125

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CYH337	CYH337	CYH340		
Sampling Date		2016/08/18 14:00	2016/08/18 14:00	2016/08/18 08:50		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-14 (5.7-6.3)**	**16BH-14 (5.7-6.3) Lab-Dup**	**16BH-15 (1.8-2.3)**	**RDL**	**QC Batch**
Trichloroethylene	ug/kg	50	30	<10	10	4636125
Trichlorofluoromethane (FREON 11)	ug/kg	<30	<30	<30	30	4636125
Vinyl Chloride	ug/kg	<20	<20	<20	20	4636125
Surrogate Recovery (%)						
4-Bromofluorobenzene	%	97	97	95 (1)		4636125
D10-o-Xylene	%	91	90	104		4636125
D4-1,2-Dichloroethane	%	97	97	105		4636125
D8-Toluene	%	100	99	98		4636125

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

(1) VOC samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Job #: B6I0652
Report Date: 2016/08/31

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DR

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH314		CYH315	CYH316	CYH317		
Sampling Date		2016/08/18 16:00		2016/08/18 16:10	2016/08/18 16:30	2016/08/18 16:50		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-04 (0.6-1.2)**	**RDL**	**16BH-04 (1.2-1.8)**	**16BH-04 (2.4-3.0)**	**16BH-04 (3.6-4.2)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	0.07	0.03	<0.03	<0.03	<0.03	0.03	4636129
Toluene	mg/kg	0.23	0.03	0.05	<0.03	<0.03	0.03	4636129
Ethylbenzene	mg/kg	0.05	0.03	<0.03	<0.03	<0.03	0.03	4636129
Total Xylenes	mg/kg	0.54	0.05	0.11	<0.05	<0.05	0.05	4636129
C6 - C10 (less BTEX)	mg/kg	4	3	<3	<3	<3	3	4636129
>C10-C16 Hydrocarbons	mg/kg	<50 (1)	50	45	31	<10	10	4636219
>C16-C21 Hydrocarbons	mg/kg	88 (1)	50	110	140	13	10	4636219
>C21-<C32 Hydrocarbons	mg/kg	630 (1)	80	200	320	35	20	4636219
Modified TPH (Tier1)	mg/kg	720	80	350	490	48	20	4634364
Reached Baseline at C32	mg/kg	No	N/A	No	No	Yes	N/A	4636219
Hydrocarbon Resemblance	mg/kg	COMMENT (2)	N/A	COMMENT (3)	COMMENT (3)	COMMENT (4)	N/A	4636219
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	83		81	81	80		4636219
n-Dotriacontane - Extractable	%	127		103	96	111		4636219
Isobutylbenzene - Volatile	%	91 (5)		99	71	96		4636129

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to sample dilution.
(2) Lube oil fraction.
(3) One product in fuel / lube range; interference from possible PAHs.
(4) Possible lube oil fraction.
(5) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH318	CYH319	CYH319		CYH320		
Sampling Date		2016/08/18 17:10	2016/08/18 17:20	2016/08/18 17:20		2016/08/18 14:15		
COC Number		N/A	N/A	N/A		N/A		
	UNITS	**16BH-04 (4.8-5.4)**	**16BH-04 (5.4-6.0)**	**16BH-04 (5.4-6.0) Lab-Dup**	**RDL**	**16BH-08 (0-0.6)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	0.03	0.08	0.03	4636129
Toluene	mg/kg	<0.03	<0.03	<0.03	0.03	0.21	0.03	4636129
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	0.03	0.03	0.03	4636129
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	0.05	0.32	0.05	4636129
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	3	8	3	4636129
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	10	73 (1)	50	4636219
>C16-C21 Hydrocarbons	mg/kg	44	110	100	10	95 (1)	50	4636219
>C21-<C32 Hydrocarbons	mg/kg	90	180	140	20	620 (1)	80	4636219
Modified TPH (Tier1)	mg/kg	130	280		20	790	80	4634364
Reached Baseline at C32	mg/kg	Yes	Yes		N/A	No	N/A	4636219
Hydrocarbon Resemblance	mg/kg	COMMENT (2)	COMMENT (3)		N/A	COMMENT (4)	N/A	4636219
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	80	82	81		85		4636219
n-Dotriacontane - Extractable	%	119	92	89		109		4636219
Isobutylbenzene - Volatile	%	102	93 (5)	107 (5)		89 (5)		4636129

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to sample dilution.
(2) One product in fuel / lube range.
(3) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(4) Unidentified compound(s) in fuel / lube range. Lube oil fraction.
(5) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH321	CYH322	CYH323	CYH324	CYH325		
Sampling Date		2016/08/18 14:25	2016/08/18 14:50	2016/08/18 15:00	2016/08/18 15:15	2016/08/18 15:40		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-08 (0.6-1.2)**	**16BH-08 (1.8-2.4)**	**16BH-08 (2.4-3.0)**	**16BH-08 (3.0-3.6)**	**16BH-08 (4.2-4.8)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	8.3	0.03	4636129
Toluene	mg/kg	<0.03	0.07	<0.03	<0.03	17	0.03	4636129
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	6.1	0.03	4636129
Total Xylenes	mg/kg	0.06	0.14	<0.05	<0.05	39	0.05	4636129
C6 - C10 (less BTEX)	mg/kg	<3	4	<3	<3	78	3	4636129
>C10-C16 Hydrocarbons	mg/kg	160	96	<10	<10	540	10	4636219
>C16-C21 Hydrocarbons	mg/kg	930	340	<10	<10	800	10	4636219
>C21-<C32 Hydrocarbons	mg/kg	2300	970	41	21	1000	20	4636219
Modified TPH (Tier1)	mg/kg	3400	1400	41	21	2400	20	4634364
Reached Baseline at C32	mg/kg	No	No	Yes	Yes	No	N/A	4636219
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (1)	COMMENT (2)	COMMENT (3)	COMMENT (1)	N/A	4636219
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	81	81	79	81	82		4636219
n-Dotriacontane - Extractable	%	121	115	106	107	106		4636219
Isobutylbenzene - Volatile	%	82	93	94	91	76		4636129

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel / lube range; interference from possible PAHs.
(2) Lube oil fraction.
(3) Possible lube oil fraction.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH326		CYH327	CYH328	CYH329		
Sampling Date		2016/08/18 16:00		2016/08/18 10:00	2016/08/18 10:10	2016/08/18 10:30		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-08 (5.4-6.0)**	**QC Batch**	**16BH-13 (0-0.3)**	**16BH-13 (0.9-1.5)**	**16BH-13 (2.1-2.7)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	0.14	4636130	<0.03	<0.03	<0.03	0.03	4636130
Toluene	mg/kg	0.20	4636130	<0.03	<0.03	<0.03	0.03	4636130
Ethylbenzene	mg/kg	0.15	4636130	<0.03	<0.03	<0.03	0.03	4636130
Total Xylenes	mg/kg	0.69	4636130	<0.05	<0.05	<0.05	0.05	4636130
C6 - C10 (less BTEX)	mg/kg	<3	4636130	<3	<3	<3	3	4636130
>C10-C16 Hydrocarbons	mg/kg	130	4636219	<10	<10	<10	10	4636272
>C16-C21 Hydrocarbons	mg/kg	270	4636219	<10	<10	<10	10	4636272
>C21-<C32 Hydrocarbons	mg/kg	230	4636219	27	20	<20	20	4636272
Modified TPH (Tier1)	mg/kg	630	4634364	27	20	<20	20	4634364
Reached Baseline at C32	mg/kg	No	4636219	Yes	Yes	NA	N/A	4636272
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	4636219	COMMENT (2)	COMMENT (2)	NA	N/A	4636272
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	80	4636219	79	78	79		4636272
n-Dotriacontane - Extractable	%	98	4636219	116	110	109		4636272
Isobutylbenzene - Volatile	%	97	4636130	102	104	94		4636130

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel / lube range; interference from possible PAHs.
(2) Lube oil fraction.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH329	CYH330	CYH331	CYH332	CYH333		
Sampling Date		2016/08/18 10:30	2016/08/18 10:35	2016/08/18 10:45	2016/08/18 11:00	2016/08/18 12:30		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-13 (2.1-2.7) Lab-Dup**	**16BH-13 (3.0-3.6)**	**16BH-13 (3.6-4.2)**	**16BH-13 (4.8-5.4)**	**16BH-14 (0-0.6)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4636130
Toluene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4636130
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4636130
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	4636130
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	<3	<3	3	4636130
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	<10	10	4636272
>C16-C21 Hydrocarbons	mg/kg	<10	40	32	37	<10	10	4636272
>C21-<C32 Hydrocarbons	mg/kg	<20	86	80	63	36	20	4636272
Modified TPH (Tier1)	mg/kg		130	110	100	36	20	4634364
Reached Baseline at C32	mg/kg		Yes	Yes	Yes	Yes	N/A	4636272
Hydrocarbon Resemblance	mg/kg		COMMENT (1)	COMMENT (1)	COMMENT (2)	COMMENT (3)	N/A	4636272
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	78	93	95	78	77		4636272
n-Dotriacontane - Extractable	%	106	86	91	114	116		4636272
Isobutylbenzene - Volatile	%	105	101	109	106	111		4636130

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Unidentified compound(s) in fuel / lube range. Lube oil fraction.
(2) One product in fuel / lube range. Lube oil fraction.

(3) Lube oil fraction.

Maxxam Job #: B6I0652
Report Date: 2016/08/31

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DR

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH334	CYH335		CYH336	CYH336		
Sampling Date		2016/08/18 13:00	2016/08/18 13:20		2016/08/18 13:50	2016/08/18 13:50		
COC Number		N/A	N/A		N/A	N/A		
	UNITS	**16BH-14 (1.2-1.8)**	**16BH-14 (2.4-3.0)**	**QC Batch**	**16BH-14 (5.1-5.7)**	**16BH-14 (5.1-5.7) Lab-Dup**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	4636130	<0.03	<0.03	0.03	4636744
Toluene	mg/kg	<0.03	<0.03	4636130	<0.03	<0.03	0.03	4636744
Ethylbenzene	mg/kg	<0.03	<0.03	4636130	<0.03	<0.03	0.03	4636744
Total Xylenes	mg/kg	<0.05	<0.05	4636130	<0.05	<0.05	0.05	4636744
C6 - C10 (less BTEX)	mg/kg	<3	<3	4636130	<3	<3	3	4636744
>C10-C16 Hydrocarbons	mg/kg	<10	<10	4636272	47		10	4636272
>C16-C21 Hydrocarbons	mg/kg	<10	<10	4636272	120		10	4636272
>C21-<C32 Hydrocarbons	mg/kg	23	39	4636272	410		20	4636272
Modified TPH (Tier1)	mg/kg	23	39	4634364	570		20	4634364
Reached Baseline at C32	mg/kg	Yes	Yes	4636272	No		N/A	4636272
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (1)	4636272	COMMENT (2)		N/A	4636272
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	77	77	4636272	78			4636272
n-Dotriacontane - Extractable	%	105	107	4636272	88			4636272
Isobutylbenzene - Volatile	%	106	109	4636130	126	128		4636744

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Lube oil fraction.
(2) One product in fuel / lube range. Lube oil fraction.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH337		CYH338		CYH339		CYH340		
Sampling Date		2016/08/18 14:00		2016/08/18 08:15		2016/08/18 08:30		2016/08/18 08:50		
COC Number		N/A		N/A		N/A		N/A		
	UNITS	**16BH-14 (5.7-6.3)**	**RDL**	**16BH-15 (0-0.6)**	**RDL**	**16BH-15 (0.6-1.2)**	**QC Batch**	**16BH-15 (1.8-2.3)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/kg	<0.03	0.03	<0.03	0.03	<0.03	4636130	<0.03	0.03	4638583
Toluene	mg/kg	<0.03	0.03	<0.03	0.03	<0.03	4636130	<0.03	0.03	4638583
Ethylbenzene	mg/kg	<0.03	0.03	<0.03	0.03	<0.03	4636130	<0.03	0.03	4638583
Total Xylenes	mg/kg	<0.05	0.05	<0.05	0.05	<0.05	4636130	<0.05	0.05	4638583
C6 - C10 (less BTEX)	mg/kg	<3	3	<3	3	<3	4636130	<3	3	4638583
>C10-C16 Hydrocarbons	mg/kg	<10	10	<50 (1)	50	<10	4636272	<10	10	4636272
>C16-C21 Hydrocarbons	mg/kg	34	10	59 (1)	50	<10	4636272	<10	10	4636272
>C21-<C32 Hydrocarbons	mg/kg	120	20	850 (1)	80	22	4636272	87	20	4636272
Modified TPH (Tier1)	mg/kg	160	20	910	80	22	4634364	87	20	4634364
Reached Baseline at C32	mg/kg	Yes	N/A	No	N/A	Yes	4636272	Yes	N/A	4636272
Hydrocarbon Resemblance	mg/kg	COMMENT (2)	N/A	COMMENT (2)	N/A	COMMENT (2)	4636272	COMMENT (2)	N/A	4636272
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	77		80		78	4636272	92		4636272
n-Dotriacontane - Extractable	%	98		88		118	4636272	96		4636272
Isobutylbenzene - Volatile	%	108 (3)		96		100 (3)	4636130	105		4638583

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Elevated TEH RDL(s) due to sample dilution.
(2) Lube oil fraction.
(3) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYH341	CYH342	CYH343		
Sampling Date		2016/08/18 09:07	2016/08/18 09:15	2016/08/18 09:30		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-15 (3.0-3.6)**	**16BH-15 (3.6-4.2)**	**16BH-15 (4.8-5.4)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons						
Benzene	mg/kg	<0.03	<0.03	<0.03	0.03	4636130
Toluene	mg/kg	<0.03	<0.03	<0.03	0.03	4636130
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	0.03	4636130
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	0.05	4636130
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	3	4636130
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	10	4636272
>C16-C21 Hydrocarbons	mg/kg	<10	14	28	10	4636272
>C21-<C32 Hydrocarbons	mg/kg	33	35	72	20	4636272
Modified TPH (Tier1)	mg/kg	33	49	100	20	4634364
Reached Baseline at C32	mg/kg	Yes	Yes	Yes	N/A	4636272
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (1)	N/A	4636272
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	80	78	78		4636272
n-Dotriacontane - Extractable	%	114	110	112		4636272
Isobutylbenzene - Volatile	%	108	108	104		4636130

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction.
(2) Unidentified compound(s) in fuel / lube range. Lube oil fraction.

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		CYH337	CYH340		
Sampling Date		2016/08/18 14:00	2016/08/18 08:50		
COC Number		N/A	N/A		
	UNITS	**16BH-14 (5.7-6.3)**	**16BH-15 (1.8-2.3)**	**RDL**	**QC Batch**
PCBs					
Aroclor 1016	ug/g	<0.05	<0.05	0.05	4636225
Aroclor 1221	ug/g	<0.05	<0.05	0.05	4636225
Aroclor 1232	ug/g	<0.05	<0.05	0.05	4636225
Aroclor 1248	ug/g	<0.05	<0.05	0.05	4636225
Aroclor 1242	ug/g	<0.05	<0.05	0.05	4636225
Aroclor 1254	ug/g	<0.05	0.11	0.05	4636225
Aroclor 1260	ug/g	<0.05	<0.05	0.05	4636225
Calculated Total PCB	ug/g	<0.050	0.11	0.050	4634357
Surrogate Recovery (%)					
Decachlorobiphenyl	%	104	94		4636225

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

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

Package 1	7.3°C
Package 2	2.7°C
Package 3	5.3°C
Package 4	5.3°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4636125	4-Bromofluorobenzene	2016/08/26	98	60 - 140	98	60 - 140	94	%		
4636125	D10-o-Xylene	2016/08/26	87	60 - 130	92	60 - 130	105	%		
4636125	D4-1,2-Dichloroethane	2016/08/26	103	60 - 140	100	60 - 140	99	%		
4636125	D8-Toluene	2016/08/26	98	60 - 140	99	60 - 140	99	%		
4636129	Isobutylbenzene - Volatile	2016/08/26	105 (1)	60 - 130	93	60 - 130	99	%		
4636130	Isobutylbenzene - Volatile	2016/08/26	96	60 - 130	101	60 - 130	94	%		
4636131	D10-Anthracene	2016/08/27	86	30 - 130	85	30 - 130	74	%		
4636131	D14-Terphenyl (FS)	2016/08/27	93	30 - 130	89	30 - 130	81	%		
4636131	D8-Acenaphthylene	2016/08/27	93	30 - 130	92	30 - 130	91	%		
4636198	D10-Anthracene	2016/08/29	85	30 - 130	62	30 - 130	93	%		
4636198	D14-Terphenyl (FS)	2016/08/29	82	30 - 130	80	30 - 130	108	%		
4636198	D8-Acenaphthylene	2016/08/29	83	30 - 130	88	30 - 130	85	%		
4636219	Isobutylbenzene - Extractable	2016/08/26	81	30 - 130	82	30 - 130	83	%		
4636219	n-Dotriacontane - Extractable	2016/08/26	93	30 - 130	105	30 - 130	104	%		
4636225	Decachlorobiphenyl	2016/08/29	95	30 - 130	100	30 - 130	110	%		
4636272	Isobutylbenzene - Extractable	2016/08/26	79	30 - 130	93	30 - 130	79	%		
4636272	n-Dotriacontane - Extractable	2016/08/26	113	30 - 130	74	30 - 130	107	%		
4636744	Isobutylbenzene - Volatile	2016/08/26	124	60 - 130	107	60 - 130	101	%		
4638583	Isobutylbenzene - Volatile	2016/08/29	114	60 - 130	86	60 - 130	86	%		
4636125	1,1,1-Trichloroethane	2016/08/26	101	60 - 140	107	60 - 130	<30	ug/kg	NC	50
4636125	1,1,2,2-Tetrachloroethane	2016/08/26	84	60 - 140	87	60 - 130	<30	ug/kg	NC	50
4636125	1,1,2-Trichloroethane	2016/08/26	95	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4636125	1,1-Dichloroethane	2016/08/26	101	60 - 140	105	60 - 130	<30	ug/kg	NC	50
4636125	1,1-Dichloroethylene	2016/08/26	97	60 - 140	107	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichlorobenzene	2016/08/26	84	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichloroethane	2016/08/26	90	60 - 140	92	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichloropropane	2016/08/26	93	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4636125	1,3-Dichlorobenzene	2016/08/26	86	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4636125	1,4-Dichlorobenzene	2016/08/26	84	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	Benzene	2016/08/26	90	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4636125	Bromodichloromethane	2016/08/26	93	60 - 140	96	60 - 130	<30	ug/kg	NC	50

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636125	Bromoform	2016/08/26	88	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	Bromomethane	2016/08/26	85	60 - 140	97	60 - 140	<50	ug/kg	NC	50
4636125	Carbon Tetrachloride	2016/08/26	98	60 - 140	104	60 - 130	<30	ug/kg	NC	50
4636125	Chlorobenzene	2016/08/26	90	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4636125	Chloroethane	2016/08/26	89	60 - 140	97	60 - 140	<200	ug/kg	NC	50
4636125	Chloroform	2016/08/26	96	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4636125	cis-1,2-Dichloroethylene	2016/08/26	98	60 - 140	103	60 - 130	<30	ug/kg	NC	50
4636125	cis-1,3-Dichloropropene	2016/08/26	89	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4636125	Dibromochloromethane	2016/08/26	93	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4636125	Ethylbenzene	2016/08/26	94	60 - 140	101	60 - 130	<30	ug/kg	NC	50
4636125	Ethylene Dibromide	2016/08/26	90	60 - 140	93	60 - 130	<30	ug/kg	NC	50
4636125	Methylene Chloride(Dichloromethane)	2016/08/26	100	60 - 140	105	60 - 130	<50	ug/kg	NC	50
4636125	o-Xylene	2016/08/26	94	60 - 140	101	60 - 130	<30	ug/kg	NC	50
4636125	p+m-Xylene	2016/08/26	91	60 - 140	100	60 - 130	<30	ug/kg	NC	50
4636125	Styrene	2016/08/26	83	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4636125	Tetrachloroethylene	2016/08/26	97	60 - 140	106	60 - 130	<30	ug/kg	NC	50
4636125	Toluene	2016/08/26	95	60 - 140	102	60 - 130	<30	ug/kg	NC	50
4636125	trans-1,2-Dichloroethylene	2016/08/26	99	60 - 140	106	60 - 130	<30	ug/kg	NC	50
4636125	trans-1,3-Dichloropropene	2016/08/26	85	60 - 140	90	60 - 130	<30	ug/kg	NC	50
4636125	Trichloroethylene	2016/08/26	95	60 - 140	104	60 - 130	<10	ug/kg	NC	50
4636125	Trichlorofluoromethane (FREON 11)	2016/08/26	85	60 - 140	97	60 - 140	<30	ug/kg	NC	50
4636125	Vinyl Chloride	2016/08/26	82	60 - 140	81	60 - 140	<20	ug/kg	NC	50
4636129	Benzene	2016/08/26	108	60 - 130	80	60 - 140	<0.03	mg/kg	NC	50
4636129	C6 - C10 (less BTEX)	2016/08/26					<3	mg/kg	NC	50
4636129	Ethylbenzene	2016/08/26	106	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50
4636129	Toluene	2016/08/26	107	60 - 130	87	60 - 140	<0.03	mg/kg	NC	50
4636129	Total Xylenes	2016/08/26	107	60 - 130	91	60 - 140	<0.05	mg/kg	NC	50
4636130	Benzene	2016/08/26	97	60 - 130	97	60 - 140	<0.03	mg/kg	NC	50
4636130	C6 - C10 (less BTEX)	2016/08/26					<3	mg/kg	NC	50
4636130	Ethylbenzene	2016/08/26	98	60 - 130	107	60 - 140	<0.03	mg/kg	NC	50
4636130	Toluene	2016/08/26	96	60 - 130	102	60 - 140	<0.03	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636130	Total Xylenes	2016/08/26	97	60 - 130	106	60 - 140	<0.05	mg/kg	NC	50
4636131	1-Methylnaphthalene	2016/08/27	76	30 - 130	78	30 - 130	<0.01	mg/kg	NC	50
4636131	2-Methylnaphthalene	2016/08/27	83	30 - 130	85	30 - 130	<0.01	mg/kg	NC	50
4636131	Acenaphthene	2016/08/27	87	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4636131	Acenaphthylene	2016/08/27	90	30 - 130	95	30 - 130	<0.01	mg/kg	NC	50
4636131	Anthracene	2016/08/27	109	30 - 130	110	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(a)anthracene	2016/08/27	109	30 - 130	109	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(a)pyrene	2016/08/27	96	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(b)fluoranthene	2016/08/27	106	30 - 130	92	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(g,h,i)perylene	2016/08/27	96	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(j)fluoranthene	2016/08/27	84	30 - 130	79	30 - 130	<0.01	mg/kg	NC	50
4636131	Benzo(k)fluoranthene	2016/08/27	98	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4636131	Chrysene	2016/08/27	99	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4636131	Dibenz(a,h)anthracene	2016/08/27	95	30 - 130	88	30 - 130	<0.01	mg/kg	NC	50
4636131	Fluoranthene	2016/08/27	100	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50
4636131	Fluorene	2016/08/27	97	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4636131	Indeno(1,2,3-cd)pyrene	2016/08/27	98	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50
4636131	Naphthalene	2016/08/27	75	30 - 130	78	30 - 130	<0.01	mg/kg	NC	50
4636131	Perylene	2016/08/27	93	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4636131	Phenanthrene	2016/08/27	85	30 - 130	86	30 - 130	<0.01	mg/kg	NC	50
4636131	Pyrene	2016/08/27	99	30 - 130	98	30 - 130	<0.01	mg/kg	NC	50
4636198	1-Methylnaphthalene	2016/08/31	82	30 - 130	86	30 - 130	<0.01	mg/kg	NC	50
4636198	2-Methylnaphthalene	2016/08/31	84	30 - 130	94	30 - 130	<0.01	mg/kg	NC	50
4636198	Acenaphthene	2016/08/31	98	30 - 130	89	30 - 130	<0.01	mg/kg	NC	50
4636198	Acenaphthylene	2016/08/31	84	30 - 130	104	30 - 130	<0.01	mg/kg	NC	50
4636198	Anthracene	2016/08/31	116	30 - 130	94	30 - 130	<0.01	mg/kg	6.4	50
4636198	Benzo(a)anthracene	2016/08/31	96	30 - 130	109	30 - 130	<0.01	mg/kg	19	50
4636198	Benzo(a)pyrene	2016/08/31	111	30 - 130	99	30 - 130	<0.01	mg/kg	26	50
4636198	Benzo(b)fluoranthene	2016/08/31	108	30 - 130	98	30 - 130	<0.01	mg/kg	20	50
4636198	Benzo(g,h,i)perylene	2016/08/31	115	30 - 130	103	30 - 130	<0.01	mg/kg	29	50
4636198	Benzo(j)fluoranthene	2016/08/31	94	30 - 130	89	30 - 130	<0.01	mg/kg	26	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636198	Benzo(k)fluoranthene	2016/08/31	106	30 - 130	101	30 - 130	<0.01	mg/kg	21	50
4636198	Chrysene	2016/08/31	83	30 - 130	92	30 - 130	<0.01	mg/kg	19	50
4636198	Dibenz(a,h)anthracene	2016/08/31	108	30 - 130	104	30 - 130	<0.01	mg/kg	NC	50
4636198	Fluoranthene	2016/08/31	97	30 - 130	94	30 - 130	<0.01	mg/kg	18	50
4636198	Fluorene	2016/08/31	92	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4636198	Indeno(1,2,3-cd)pyrene	2016/08/31	111	30 - 130	105	30 - 130	<0.01	mg/kg	31	50
4636198	Naphthalene	2016/08/31	85	30 - 130	88	30 - 130	<0.01	mg/kg	NC	50
4636198	Perylene	2016/08/31	100	30 - 130	99	30 - 130	<0.01	mg/kg	NC	50
4636198	Phenanthrene	2016/08/31	115	30 - 130	95	30 - 130	<0.01	mg/kg	24	50
4636198	Pyrene	2016/08/31	90	30 - 130	89	30 - 130	<0.01	mg/kg	17	50
4636219	>C10-C16 Hydrocarbons	2016/08/26	100	30 - 130	104	30 - 130	<10	mg/kg	NC	50
4636219	>C16-C21 Hydrocarbons	2016/08/26	92	30 - 130	95	30 - 130	<10	mg/kg	6.8	50
4636219	>C21-<C32 Hydrocarbons	2016/08/26	NC	30 - 130	82	30 - 130	<20	mg/kg	21	50
4636225	Aroclor 1016	2016/08/29					<0.05	ug/g	NC	50
4636225	Aroclor 1221	2016/08/29					<0.05	ug/g	NC	50
4636225	Aroclor 1232	2016/08/29					<0.05	ug/g	NC	50
4636225	Aroclor 1242	2016/08/29					<0.05	ug/g	NC	50
4636225	Aroclor 1248	2016/08/29					<0.05	ug/g	NC	50
4636225	Aroclor 1254	2016/08/29	114	30 - 130	108	30 - 130	<0.05	ug/g	NC	50
4636225	Aroclor 1260	2016/08/29					<0.05	ug/g	NC	50
4636272	>C10-C16 Hydrocarbons	2016/08/26	103	30 - 130	103	30 - 130	<10	mg/kg	NC	50
4636272	>C16-C21 Hydrocarbons	2016/08/26	89	30 - 130	89	30 - 130	<10	mg/kg	NC	50
4636272	>C21-<C32 Hydrocarbons	2016/08/26	105	30 - 130	107	30 - 130	<20	mg/kg	NC	50
4636276	Acid Extractable Aluminum (Al)	2016/08/26					<10	mg/kg	2.6	35
4636276	Acid Extractable Antimony (Sb)	2016/08/26	96	75 - 125	103	75 - 125	<2	mg/kg	NC	35
4636276	Acid Extractable Arsenic (As)	2016/08/26	103	75 - 125	102	75 - 125	<2	mg/kg	3.8	35
4636276	Acid Extractable Barium (Ba)	2016/08/26	NC	75 - 125	102	75 - 125	<5	mg/kg	3.7	35
4636276	Acid Extractable Beryllium (Be)	2016/08/26	98	75 - 125	96	75 - 125	<2	mg/kg	NC	35
4636276	Acid Extractable Bismuth (Bi)	2016/08/26	104	75 - 125	104	75 - 125	<2	mg/kg		
4636276	Acid Extractable Boron (B)	2016/08/26	86	75 - 125	93	75 - 125	<50	mg/kg	NC	35
4636276	Acid Extractable Cadmium (Cd)	2016/08/26	103	75 - 125	103	75 - 125	<0.3	mg/kg	NC	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636276	Acid Extractable Chromium (Cr)	2016/08/26	103	75 - 125	102	75 - 125	<2	mg/kg	3.9	35
4636276	Acid Extractable Cobalt (Co)	2016/08/26	103	75 - 125	104	75 - 125	<1	mg/kg	1.2	35
4636276	Acid Extractable Copper (Cu)	2016/08/26	104	75 - 125	103	75 - 125	<2	mg/kg	2.0	35
4636276	Acid Extractable Iron (Fe)	2016/08/26					<50	mg/kg	0.83	35
4636276	Acid Extractable Lead (Pb)	2016/08/26	NC	75 - 125	100	75 - 125	<0.5	mg/kg	3.7	35
4636276	Acid Extractable Lithium (Li)	2016/08/26	102	75 - 125	104	75 - 125	<2	mg/kg		
4636276	Acid Extractable Manganese (Mn)	2016/08/26	NC	75 - 125	106	75 - 125	<2	mg/kg	1.9	35
4636276	Acid Extractable Mercury (Hg)	2016/08/26	97	75 - 125	103	75 - 125	<0.1	mg/kg	NC	35
4636276	Acid Extractable Molybdenum (Mo)	2016/08/26	NC	75 - 125	106	75 - 125	<2	mg/kg	NC	35
4636276	Acid Extractable Nickel (Ni)	2016/08/26	100	75 - 125	100	75 - 125	<2	mg/kg	0.55	35
4636276	Acid Extractable Rubidium (Rb)	2016/08/26	97	75 - 125	102	75 - 125	<2	mg/kg		
4636276	Acid Extractable Selenium (Se)	2016/08/26	101	75 - 125	102	75 - 125	<1	mg/kg	NC	35
4636276	Acid Extractable Silver (Ag)	2016/08/26	108	75 - 125	108	75 - 125	<0.5	mg/kg	NC	35
4636276	Acid Extractable Strontium (Sr)	2016/08/26	109	75 - 125	103	75 - 125	<5	mg/kg	NC	35
4636276	Acid Extractable Thallium (Tl)	2016/08/26	101	75 - 125	105	75 - 125	<0.1	mg/kg	NC	35
4636276	Acid Extractable Tin (Sn)	2016/08/26	128 (2)	75 - 125	108	75 - 125	<2	mg/kg	NC	35
4636276	Acid Extractable Uranium (U)	2016/08/26	104	75 - 125	104	75 - 125	<0.1	mg/kg	5.7	35
4636276	Acid Extractable Vanadium (V)	2016/08/26	100	75 - 125	101	75 - 125	<2	mg/kg	3.1	35
4636276	Acid Extractable Zinc (Zn)	2016/08/26	NC	75 - 125	107	75 - 125	<5	mg/kg	0.79	35
4636418	Acid Extractable Aluminum (Al)	2016/08/29					<10	mg/kg	12	35
4636418	Acid Extractable Antimony (Sb)	2016/08/29	NC	75 - 125	104	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Arsenic (As)	2016/08/29	101	75 - 125	105	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Barium (Ba)	2016/08/29	NC	75 - 125	102	75 - 125	<5	mg/kg	3.6	35
4636418	Acid Extractable Beryllium (Be)	2016/08/29	101	75 - 125	100	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Bismuth (Bi)	2016/08/29	103	75 - 125	106	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Boron (B)	2016/08/29	89	75 - 125	97	75 - 125	<50	mg/kg	NC	35
4636418	Acid Extractable Cadmium (Cd)	2016/08/29	106	75 - 125	105	75 - 125	<0.3	mg/kg	NC	35
4636418	Acid Extractable Chromium (Cr)	2016/08/29	94	75 - 125	104	75 - 125	<2	mg/kg	24	35
4636418	Acid Extractable Cobalt (Co)	2016/08/29	103	75 - 125	105	75 - 125	<1	mg/kg	5.8	35
4636418	Acid Extractable Copper (Cu)	2016/08/29	NC	75 - 125	104	75 - 125	<2	mg/kg	5.9	35
4636418	Acid Extractable Iron (Fe)	2016/08/29					<50	mg/kg	5.4	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636418	Acid Extractable Lead (Pb)	2016/08/29	97	75 - 125	102	75 - 125	<0.5	mg/kg	28	35
4636418	Acid Extractable Lithium (Li)	2016/08/29	107	75 - 125	105	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Manganese (Mn)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg	13	35
4636418	Acid Extractable Mercury (Hg)	2016/08/29	99	75 - 125	100	75 - 125	<0.1	mg/kg	NC	35
4636418	Acid Extractable Molybdenum (Mo)	2016/08/29	71 (2)	75 - 125	109	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Nickel (Ni)	2016/08/29	98	75 - 125	102	75 - 125	<2	mg/kg	18	35
4636418	Acid Extractable Rubidium (Rb)	2016/08/29	104	75 - 125	103	75 - 125	<2	mg/kg	8.5	35
4636418	Acid Extractable Selenium (Se)	2016/08/29	102	75 - 125	105	75 - 125	<1	mg/kg	NC	35
4636418	Acid Extractable Silver (Ag)	2016/08/29	81	75 - 125	109	75 - 125	<0.5	mg/kg	NC	35
4636418	Acid Extractable Strontium (Sr)	2016/08/29	82	75 - 125	106	75 - 125	<5	mg/kg	NC	35
4636418	Acid Extractable Thallium (Tl)	2016/08/29	105	75 - 125	104	75 - 125	<0.1	mg/kg	NC	35
4636418	Acid Extractable Tin (Sn)	2016/08/29	80	75 - 125	107	75 - 125	<2	mg/kg	NC	35
4636418	Acid Extractable Uranium (U)	2016/08/29	106	75 - 125	105	75 - 125	<0.1	mg/kg	32	35
4636418	Acid Extractable Vanadium (V)	2016/08/29	102	75 - 125	103	75 - 125	<2	mg/kg	0.36	35
4636418	Acid Extractable Zinc (Zn)	2016/08/29	NC	75 - 125	107	75 - 125	<5	mg/kg	1.7	35
4636744	Benzene	2016/08/26	118	60 - 130	81	60 - 140	<0.03	mg/kg	NC	50
4636744	C6 - C10 (less BTEX)	2016/08/26					<3	mg/kg	NC	50
4636744	Ethylbenzene	2016/08/26	119	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50
4636744	Toluene	2016/08/26	117	60 - 130	82	60 - 140	<0.03	mg/kg	NC	50
4636744	Total Xylenes	2016/08/26	119	60 - 130	91	60 - 140	<0.05	mg/kg	NC	50
4638583	Benzene	2016/08/29	110	60 - 130	76	60 - 140	<0.03	mg/kg	NC	50
4638583	C6 - C10 (less BTEX)	2016/08/29					<3	mg/kg	NC	50
4638583	Ethylbenzene	2016/08/29	112	60 - 130	85	60 - 140	<0.03	mg/kg	NC	50
4638583	Toluene	2016/08/29	110	60 - 130	81	60 - 140	<0.03	mg/kg	NC	50
4638583	Total Xylenes	2016/08/29	111	60 - 130	85	60 - 140	<0.05	mg/kg	NC	50
4638651	Acid Extractable Aluminum (Al)	2016/08/29					<10	mg/kg		
4638651	Acid Extractable Antimony (Sb)	2016/08/29	96	75 - 125	105	75 - 125	<2	mg/kg		
4638651	Acid Extractable Arsenic (As)	2016/08/29	99	75 - 125	105	75 - 125	<2	mg/kg	6.5	35
4638651	Acid Extractable Barium (Ba)	2016/08/29	NC	75 - 125	101	75 - 125	<5	mg/kg		
4638651	Acid Extractable Beryllium (Be)	2016/08/29	104	75 - 125	102	75 - 125	<2	mg/kg		
4638651	Acid Extractable Bismuth (Bi)	2016/08/29	105	75 - 125	104	75 - 125	<2	mg/kg		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4638651	Acid Extractable Boron (B)	2016/08/29	100	75 - 125	102	75 - 125	<50	mg/kg		
4638651	Acid Extractable Cadmium (Cd)	2016/08/29	103	75 - 125	104	75 - 125	<0.3	mg/kg		
4638651	Acid Extractable Chromium (Cr)	2016/08/29	107	75 - 125	104	75 - 125	<2	mg/kg		
4638651	Acid Extractable Cobalt (Co)	2016/08/29	105	75 - 125	106	75 - 125	<1	mg/kg		
4638651	Acid Extractable Copper (Cu)	2016/08/29	NC	75 - 125	106	75 - 125	<2	mg/kg		
4638651	Acid Extractable Iron (Fe)	2016/08/29					<50	mg/kg		
4638651	Acid Extractable Lead (Pb)	2016/08/29	NC	75 - 125	101	75 - 125	<0.5	mg/kg	4.0	35
4638651	Acid Extractable Lithium (Li)	2016/08/29	109	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Manganese (Mn)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Mercury (Hg)	2016/08/29	98	75 - 125	102	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Molybdenum (Mo)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Nickel (Ni)	2016/08/29	108	75 - 125	104	75 - 125	<2	mg/kg		
4638651	Acid Extractable Rubidium (Rb)	2016/08/29	101	75 - 125	102	75 - 125	<2	mg/kg		
4638651	Acid Extractable Selenium (Se)	2016/08/29	102	75 - 125	104	75 - 125	<1	mg/kg		
4638651	Acid Extractable Silver (Ag)	2016/08/29	104	75 - 125	108	75 - 125	<0.5	mg/kg		
4638651	Acid Extractable Strontium (Sr)	2016/08/29	NC	75 - 125	101	75 - 125	<5	mg/kg		
4638651	Acid Extractable Thallium (Tl)	2016/08/29	104	75 - 125	106	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Tin (Sn)	2016/08/29	NC	75 - 125	106	75 - 125	<2	mg/kg		
4638651	Acid Extractable Uranium (U)	2016/08/29	109	75 - 125	103	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Vanadium (V)	2016/08/29	111	75 - 125	103	75 - 125	<2	mg/kg		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4638651	Acid Extractable Zinc (Zn)	2016/08/29	NC	75 - 125	105	75 - 125	<5	mg/kg		

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) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(2) Recovery is within QC acceptance limits. < 10 % of compounds in multi-component analysis in violation.

VALIDATION SIGNATURE PAGE

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

Alan G Stewart

Alan Stewart, Scientific Specialist (Organics)

Jim King, Inorganics Manager, Bedford

Philippe Deveau

Phil Deveau

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

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

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CHAIN OF CUSTODY RECORD

COC #:

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Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	Intact	COOLER TEMPERATURES			AVERAGE TEMP
		4	9	9	
		5	1	2	
		8	7	1	
		1	7	8	

INTEGRITY YES / [✓ NO]

Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) * Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	* RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	* PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16 BH-04 (0.6-1.2)	2016/08/16	16:00	Soil	1								☒				☒			☒									* limited
2	16 BH-04 (1.2-1.8)	"	16:10	"	1								☒				☒												sample recovery.
3	16 BH-04 (1.8-2.4)	"	16:20	"	1																							☒	Jars may not
4	16 BH-04 (2.4-3.0)	"	16:30	"	1								☒				☒			☒									be full
5	16 BH-04 (3.0-3.6)	"	16:40	"	1																							☒	
6	16 BH-04 (3.6-4.2)	"	16:50	"	1								☒				☒			☒									
7	16 BH-04 (4.2-4.8)	"	17:00	"	1																							☒	
8	16 BH-04 (4.8-5.4)	"	17:10	"	1								☒				☒			☒									
9	16 BH-04 (5.4-6.0)	"	17:20	"	1												☒												
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/22	13:00	KIM BROCK	2016/08/23	10:31	B6I0652 B6I0653 (HOLD)
Marilou Toole						

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485 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
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Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ **Regular TAT (5 business days)** Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H.	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-08 (0-0.6)	2016/08/18	14:15	Soil	5								X				X			X									* Limited
2	16BH-08 (0.6-1.2)	"	14:25	"	1												X												Sample recovery.
3	16BH-08 (1.2-1.8)	"	14:40	"	1																							X	Jars may not
4	16BH-08 (1.8-2.4)	"	14:50	"	1								X				X			X									be full.
5	16BH-08 (2.4-3.0)	"	15:00	"	5												X												
6	16BH-08 (3.0-3.6)	"	15:15	"	1								X				X			X									
7	16BH-08 (3.6-4.2)	"	15:30	"	5																							X	Jar 3/5 opened in office
8	16BH-08 (4.2-4.8)	"	15:40	"	2								X				X			X									
9	16BH-08 (4.8-5.4)	"	15:50	"	5																							X	
10	16BH-08 (5.4-6.0)	"	16:00	"	1												X			X									

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2018/08/22	13:00	Kim Brace	2016/08/23	10:31	B6I0652 B6I0653 (HOLD)
Marilyn Toole						

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Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071,702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest (for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-13(0-0.3)	2016/08/18	10:00	Soil	5								X				X												* Limited
2	16BH-13(0.9-1.5)	"	10:10	"	1								X				X			X									sample recovery.
3	16BH-13(1.5-2.1)	"	10:20	"	1																							X	
4	16BH-13(2.1-2.7)	"	10:30	"	2								X				X			X									Jars may not
5	16BH-13(3.0-3.6)	"	10:35	"	1												X												be full.
6	16BH-13(3.6-4.2)	"	10:45	"	2								X				X			X									
7	16BH-13(4.2-4.8)	"	10:50	"	1																							X	
8	16BH-13(4.8-5.4)	"	11:00	"	2								X				X			X									
9	16BH-13(5.4-6.0)	"	11:45	"	1																							X	
10																													

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Marilyn Toole	2016/08/22	13:00	KIM GRACE	2016/08/23	10:31
Marilyn Toole					

MAXXAM JOB #
B6I0652
B6I0653 (HOLD)

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Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:
Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-14(0-0.6)	2016/08/18	12:30	Soil	5								X				X			X									Limited
2	16BH-14(0.6-1.2)	"	12:45	"	1																							X	Sample recovery
3	16BH-14(1.2-1.8)	"	13:00	"	1								X				X			X									Jars may not
4	16BH-14(1.8-2.4)	"	13:10	"	1																							X	be full!
5	16BH-14(2.4-3.0)	"	13:20	"	1								X				X			X									
6	16BH-14(3.0-3.6)	"	13:30	"	1																							X	
7	16BH-14(4.5-5.1)	"	13:40	"	1																							X	
8	16BH-14(5.1-5.7)	"	13:50	"	1								X				X			X									
9	16BH-14(5.7-6.3)	"	14:00	"	1												X					X	X						
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/22	13:30	Kim Bone	2016/08/23	10:31	B6I0652 B6I0653 (HOLD)
Marilou Toole						

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P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

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Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	Intact	COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
						YES / [✓ NO]
						Integrity Checklist By: Vh

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

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1	16BH-15(0-0.6)	2016/08/18	8:15	Soil	5												☒												* Limited
2	16BH-15(0.6-1.2)	"	8:30	"	2								☒				☒			☒								■	Sample recovery
3	16BH-15(1.2-1.8)	"	8:40	"	1																							☒	Jars may not
4	16BH-15(1.8-2.3)	"	8:50	"	1								☒				☒			☒		☒	☒						be full.
5	16BH-15(2.4-3.0)	"	9:00	"	1																							☒	
6	16BH-15(3.0-3.6)	"	9:07	"	1								☒				☒			☒									
7	16BH-15(3.6-4.2)	"	9:15	"	2												☒												Jar 2/2 opened in office
8	16BH-15(4.2-4.8)	"	9:22	"	1																							☒	
9	16BH-15(4.8-5.4)	"	9:30	"	2								☒				☒			☒									
10	16BH-15(5.4-6.0)	"	9:45	"	1																							☒	

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/18	13:45	Kim Grace	2016/08/23	10:31	B6I0652 B6I0653 (HOLD
Marilou Toole						

Your Project #: 121811071.702
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/09/07
Report #: R4157068
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I1066
Received: 2016/08/24, 10:27

Sample Matrix: Soil
Samples Received: 20

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Soil (PIRI) (1)	17	2016/08/29	2016/08/29	ATL SOP 00111	Atl. RBCA v3 m
TEH in Soil (PIRI) (1)	2	2016/08/29	2016/08/31	ATL SOP 00111	Atl. RBCA v3 m
Metals Solids Acid Extr. ICPMS	17	2016/08/29	2016/08/29	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS	1	2016/08/29	2016/08/30	ATL SOP 00058	EPA 6020A R1 m
Moisture	20	N/A	2016/08/29	ATL SOP 00001	OMOE Handbook 1983 m
PAH Compounds by GCMS (SIM) (1)	5	2016/08/29	2016/08/31	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	12	2016/08/29	2016/09/01	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	1	2016/09/01	2016/09/02	ATL SOP 00102	EPA 8270D 2007 m
PCBs in soil by GC/ECD (1)	1	2016/08/29	2016/08/30	ATL SOP 00106	EPA 8082A m
PCB Aroclor sum (soil)	1	N/A	2016/08/30		Auto Calc.
VPH in Soil (PIRI)	7	2016/08/26	2016/08/26	ATL SOP 00119	Atl. RBCA v3 m
VPH in Soil (PIRI)	11	2016/08/26	2016/08/29	ATL SOP 00119	Atl. RBCA v3 m
VPH in Soil (PIRI)	1	2016/08/26	2016/08/30	ATL SOP 00119	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	1	N/A	2016/08/30	N/A	Atl. RBCA v3 m
ModTPH (T1) Calc. for Soil	18	N/A	2016/08/31	N/A	Atl. RBCA v3 m
Volatile Organic Compounds in Soil	1	2016/08/26	2016/08/26	ATL SOP 00133	EPA 8260C R3 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) Soils are reported on a dry weight basis unless otherwise specified.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
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Total Cover Pages : 1

RESULTS OF ANALYSES OF SOIL

Maxxam ID		CYJ406	CYJ407	CYJ408	CYJ409	CYJ410		
Sampling Date		2016/08/19 13:30	2016/08/19 13:45	2016/08/19 14:45	2016/08/19 15:00	2016/08/22 09:15		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-05 (0-0.6)**	**16BH-05 (0.6-1.2)**	**16BH-05 (1.8-2.4)**	**16BH-05 (3.0-3.6)**	**16BH-06 (0.6-1.2)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	9	13	37	28	5	1	4636250

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYJ411	CYJ412	CYJ413	CYJ414	CYJ415		
Sampling Date		2016/08/22 09:45	2016/08/22 10:30	2016/08/22 11:00	2016/08/22 11:30	2016/08/19 12:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-06 (1.8-2.4)**	**16BH-06 (3.0-3.6)**	**16BH-06 (4.2-4.8)**	**16BH-06 (5.4-6.0)**	**16BH-09 (0.6-1.2)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	10	6	7	15	6	1	4636250

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYJ416	CYJ417	CYJ418	CYJ419	CYJ420		
Sampling Date		2016/08/19 12:20	2016/08/19 12:40	2016/08/19 12:50	2016/08/19 13:00	2016/08/19 13:15		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-09 (1.8-2.4)**	**16BH-09 (3.0-3.6)**	**16BH-09 (3.6-4.2)**	**16BH-09 (4.2-4.8)**	**16BH-09 (5.4-6.0)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	5	8	15	6	13	1	4636250

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		CYJ421	CYJ422	CYJ423	CYJ424	CYJ425		
Sampling Date		2016/08/19 08:30	2016/08/19 09:00	2016/08/19 09:30	2016/08/19 10:15	2016/08/19 11:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-12 (0.6-1.2)**	**16BH-12 (1.8-2.4)**	**16BH-12 (3.0-3.6)**	**16BH-12 (4.2-4.8)**	**16BH-12 (5.4-6.0)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	18	5	20	8	15	1	4636250

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYJ406	CYJ408	CYJ408	CYJ409		
Sampling Date		2016/08/19 13:30	2016/08/19 14:45	2016/08/19 14:45	2016/08/19 15:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-05 (0-0.6)**	**16BH-05 (1.8-2.4)**	**16BH-05 (1.8-2.4) Lab-Dup**	**16BH-05 (3.0-3.6)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	11000	14000	14000	8600	10	4638866
Acid Extractable Antimony (Sb)	mg/kg	8	6	5	<2	2	4638866
Acid Extractable Arsenic (As)	mg/kg	14	29	30	13	2	4638866
Acid Extractable Barium (Ba)	mg/kg	93	160	160	75	5	4638866
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4638866
Acid Extractable Cadmium (Cd)	mg/kg	0.6	0.3	0.4	<0.3	0.3	4638866
Acid Extractable Chromium (Cr)	mg/kg	26	26	27	15	2	4638866
Acid Extractable Cobalt (Co)	mg/kg	10	17	17	8	1	4638866
Acid Extractable Copper (Cu)	mg/kg	140	110	100	58	2	4638866
Acid Extractable Iron (Fe)	mg/kg	46000	42000	42000	23000	50	4638866
Acid Extractable Lead (Pb)	mg/kg	440	900	880	530	0.5	4638866
Acid Extractable Lithium (Li)	mg/kg	18	30	29	20	2	4638866
Acid Extractable Manganese (Mn)	mg/kg	600	1300	1300	290	2	4638866
Acid Extractable Mercury (Hg)	mg/kg	0.2	0.7	0.7	0.5	0.1	4638866
Acid Extractable Molybdenum (Mo)	mg/kg	2	9	10	3	2	4638866
Acid Extractable Nickel (Ni)	mg/kg	27	33	35	17	2	4638866
Acid Extractable Rubidium (Rb)	mg/kg	5	13	12	7	2	4638866
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4638866
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4638866
Acid Extractable Strontium (Sr)	mg/kg	18	49	47	24	5	4638866
Acid Extractable Thallium (Tl)	mg/kg	0.1	0.2	0.3	0.1	0.1	4638866
Acid Extractable Tin (Sn)	mg/kg	39	18	20	23	2	4638866
Acid Extractable Uranium (U)	mg/kg	0.6	4.1	4.3	1.7	0.1	4638866
Acid Extractable Vanadium (V)	mg/kg	63	52	54	24	2	4638866
Acid Extractable Zinc (Zn)	mg/kg	280	280	270	180	5	4638866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYJ410		CYJ411	CYJ412		
Sampling Date		2016/08/22 09:15		2016/08/22 09:45	2016/08/22 10:30		
COC Number		N/A		N/A	N/A		
	UNITS	**16BH-06 (0.6-1.2)**	**RDL**	**16BH-06 (1.8-2.4)**	**16BH-06 (3.0-3.6)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	14000	10	13000	13000	10	4638866
Acid Extractable Antimony (Sb)	mg/kg	430	20	<2	<2	2	4638866
Acid Extractable Arsenic (As)	mg/kg	11	2	5	7	2	4638866
Acid Extractable Barium (Ba)	mg/kg	54	5	34	38	5	4638866
Acid Extractable Beryllium (Be)	mg/kg	<2	2	<2	<2	2	4638866
Acid Extractable Bismuth (Bi)	mg/kg	<2	2	<2	<2	2	4638866
Acid Extractable Boron (B)	mg/kg	<50	50	<50	<50	50	4638866
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	0.3	<0.3	<0.3	0.3	4638866
Acid Extractable Chromium (Cr)	mg/kg	30	2	24	27	2	4638866
Acid Extractable Cobalt (Co)	mg/kg	11	1	10	10	1	4638866
Acid Extractable Copper (Cu)	mg/kg	42	2	31	35	2	4638866
Acid Extractable Iron (Fe)	mg/kg	31000	50	26000	25000	50	4638866
Acid Extractable Lead (Pb)	mg/kg	2100	0.5	19	47	0.5	4638866
Acid Extractable Lithium (Li)	mg/kg	20	2	19	20	2	4638866
Acid Extractable Manganese (Mn)	mg/kg	630	2	770	540	2	4638866
Acid Extractable Mercury (Hg)	mg/kg	0.2	0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Molybdenum (Mo)	mg/kg	<2	2	<2	<2	2	4638866
Acid Extractable Nickel (Ni)	mg/kg	19	2	17	17	2	4638866
Acid Extractable Rubidium (Rb)	mg/kg	8	2	6	8	2	4638866
Acid Extractable Selenium (Se)	mg/kg	<1	1	<1	<1	1	4638866
Acid Extractable Silver (Ag)	mg/kg	<0.5	0.5	<0.5	<0.5	0.5	4638866
Acid Extractable Strontium (Sr)	mg/kg	25	5	25	30	5	4638866
Acid Extractable Thallium (Tl)	mg/kg	<0.1	0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Tin (Sn)	mg/kg	220	2	<2	3	2	4638866
Acid Extractable Uranium (U)	mg/kg	1.2	0.1	0.8	0.8	0.1	4638866
Acid Extractable Vanadium (V)	mg/kg	44	2	39	37	2	4638866
Acid Extractable Zinc (Zn)	mg/kg	220	5	69	120	5	4638866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYJ413		CYJ414	CYJ415	CYJ416		
Sampling Date		2016/08/22 11:00		2016/08/22 11:30	2016/08/19 12:00	2016/08/19 12:20		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-06 (4.2-4.8)**	**QC Batch**	**16BH-06 (5.4-6.0)**	**16BH-09 (0.6-1.2)**	**16BH-09 (1.8-2.4)**	**RDL**	**QC Batch**
Metals								
Acid Extractable Aluminum (Al)	mg/kg	10000	4638651	12000	12000	13000	10	4638866
Acid Extractable Antimony (Sb)	mg/kg	<2	4638651	<2	<2	<2	2	4638866
Acid Extractable Arsenic (As)	mg/kg	8	4638651	7	6	7	2	4638866
Acid Extractable Barium (Ba)	mg/kg	31	4638651	29	41	46	5	4638866
Acid Extractable Beryllium (Be)	mg/kg	<2	4638651	<2	<2	<2	2	4638866
Acid Extractable Bismuth (Bi)	mg/kg	<2	4638651	<2	<2	<2	2	4638866
Acid Extractable Boron (B)	mg/kg	<50	4638651	<50	<50	<50	50	4638866
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	4638651	<0.3	<0.3	<0.3	0.3	4638866
Acid Extractable Chromium (Cr)	mg/kg	22	4638651	23	22	28	2	4638866
Acid Extractable Cobalt (Co)	mg/kg	8	4638651	10	10	11	1	4638866
Acid Extractable Copper (Cu)	mg/kg	35	4638651	34	30	34	2	4638866
Acid Extractable Iron (Fe)	mg/kg	24000	4638651	25000	24000	26000	50	4638866
Acid Extractable Lead (Pb)	mg/kg	86	4638651	42	15	16	0.5	4638866
Acid Extractable Lithium (Li)	mg/kg	16	4638651	21	21	20	2	4638866
Acid Extractable Manganese (Mn)	mg/kg	480	4638651	520	570	550	2	4638866
Acid Extractable Mercury (Hg)	mg/kg	<0.1	4638651	<0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Molybdenum (Mo)	mg/kg	<2	4638651	<2	<2	<2	2	4638866
Acid Extractable Nickel (Ni)	mg/kg	14	4638651	17	17	17	2	4638866
Acid Extractable Rubidium (Rb)	mg/kg	6	4638651	7	6	7	2	4638866
Acid Extractable Selenium (Se)	mg/kg	<1	4638651	<1	<1	<1	1	4638866
Acid Extractable Silver (Ag)	mg/kg	<0.5	4638651	<0.5	<0.5	<0.5	0.5	4638866
Acid Extractable Strontium (Sr)	mg/kg	22	4638651	21	20	15	5	4638866
Acid Extractable Thallium (Tl)	mg/kg	<0.1	4638651	<0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Tin (Sn)	mg/kg	14	4638651	4	<2	<2	2	4638866
Acid Extractable Uranium (U)	mg/kg	0.7	4638651	0.9	0.7	0.8	0.1	4638866
Acid Extractable Vanadium (V)	mg/kg	30	4638651	37	37	39	2	4638866
Acid Extractable Zinc (Zn)	mg/kg	170	4638651	150	58	57	5	4638866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYJ417	CYJ419	CYJ420	CYJ421		
Sampling Date		2016/08/19 12:40	2016/08/19 13:00	2016/08/19 13:15	2016/08/19 08:30		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-09 (3.0-3.6)**	**16BH-09 (4.2-4.8)**	**16BH-09 (5.4-6.0)**	**16BH-12 (0.6-1.2)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	12000	12000	12000	14000	10	4638866
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Arsenic (As)	mg/kg	7	5	7	7	2	4638866
Acid Extractable Barium (Ba)	mg/kg	37	37	27	57	5	4638866
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4638866
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4638866
Acid Extractable Chromium (Cr)	mg/kg	32	24	25	140	2	4638866
Acid Extractable Cobalt (Co)	mg/kg	11	11	12	31	1	4638866
Acid Extractable Copper (Cu)	mg/kg	35	30	41	41	2	4638866
Acid Extractable Iron (Fe)	mg/kg	24000	22000	25000	26000	50	4638866
Acid Extractable Lead (Pb)	mg/kg	17	16	16	90	0.5	4638866
Acid Extractable Lithium (Li)	mg/kg	19	19	24	19	2	4638866
Acid Extractable Manganese (Mn)	mg/kg	570	540	610	510	2	4638866
Acid Extractable Mercury (Hg)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Molybdenum (Mo)	mg/kg	<2	<2	2	<2	2	4638866
Acid Extractable Nickel (Ni)	mg/kg	17	16	18	20	2	4638866
Acid Extractable Rubidium (Rb)	mg/kg	6	6	7	9	2	4638866
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4638866
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4638866
Acid Extractable Strontium (Sr)	mg/kg	15	12	14	140	5	4638866
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Tin (Sn)	mg/kg	2	<2	<2	2	2	4638866
Acid Extractable Uranium (U)	mg/kg	0.8	0.7	0.9	0.9	0.1	4638866
Acid Extractable Vanadium (V)	mg/kg	36	33	35	49	2	4638866
Acid Extractable Zinc (Zn)	mg/kg	55	52	66	70	5	4638866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B6I1066
Report Date: 2016/09/07

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		CYJ422	CYJ423	CYJ424	CYJ425		
Sampling Date		2016/08/19 09:00	2016/08/19 09:30	2016/08/19 10:15	2016/08/19 11:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-12 (1.8-2.4)**	**16BH-12 (3.0-3.6)**	**16BH-12 (4.2-4.8)**	**16BH-12 (5.4-6.0)**	**RDL**	**QC Batch**
Metals							
Acid Extractable Aluminum (Al)	mg/kg	14000	15000	13000	20000	10	4638866
Acid Extractable Antimony (Sb)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Arsenic (As)	mg/kg	5	17	8	11	2	4638866
Acid Extractable Barium (Ba)	mg/kg	51	63	41	36	5	4638866
Acid Extractable Beryllium (Be)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Bismuth (Bi)	mg/kg	<2	<2	<2	<2	2	4638866
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	50	4638866
Acid Extractable Cadmium (Cd)	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3	4638866
Acid Extractable Chromium (Cr)	mg/kg	42	31	26	34	2	4638866
Acid Extractable Cobalt (Co)	mg/kg	11	15	12	18	1	4638866
Acid Extractable Copper (Cu)	mg/kg	32	76	47	35	2	4638866
Acid Extractable Iron (Fe)	mg/kg	26000	35000	26000	42000	50	4638866
Acid Extractable Lead (Pb)	mg/kg	19	220	42	180	0.5	4638866
Acid Extractable Lithium (Li)	mg/kg	19	33	23	66	2	4638866
Acid Extractable Manganese (Mn)	mg/kg	510	580	600	350	2	4638866
Acid Extractable Mercury (Hg)	mg/kg	<0.1	0.4	<0.1	0.1	0.1	4638866
Acid Extractable Molybdenum (Mo)	mg/kg	4	3	<2	<2	2	4638866
Acid Extractable Nickel (Ni)	mg/kg	18	27	21	41	2	4638866
Acid Extractable Rubidium (Rb)	mg/kg	8	8	6	7	2	4638866
Acid Extractable Selenium (Se)	mg/kg	<1	<1	<1	<1	1	4638866
Acid Extractable Silver (Ag)	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5	4638866
Acid Extractable Strontium (Sr)	mg/kg	95	27	23	19	5	4638866
Acid Extractable Thallium (Tl)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1	4638866
Acid Extractable Tin (Sn)	mg/kg	<2	10	<2	3	2	4638866
Acid Extractable Uranium (U)	mg/kg	0.8	1.7	0.9	2.6	0.1	4638866
Acid Extractable Vanadium (V)	mg/kg	45	39	38	28	2	4638866
Acid Extractable Zinc (Zn)	mg/kg	55	130	69	110	5	4638866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYJ406		CYJ408	CYJ409	CYJ410		
Sampling Date		2016/08/19 13:30		2016/08/19 14:45	2016/08/19 15:00	2016/08/22 09:15		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-05 (0-0.6)**	**RDL**	**16BH-05 (1.8-2.4)**	**16BH-05 (3.0-3.6)**	**16BH-06 (0.6-1.2)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	<0.2	0.2	0.11	0.11	0.02	0.01	4638619
2-Methylnaphthalene	mg/kg	<0.2	0.2	0.12	0.13	0.02	0.01	4638619
Acenaphthene	mg/kg	<0.2	0.2	0.59	0.44	0.10	0.01	4638619
Acenaphthylene	mg/kg	<0.2	0.2	0.06	0.04	0.06	0.01	4638619
Anthracene	mg/kg	0.4	0.2	1.7	0.96	0.40	0.01	4638619
Benzo(a)anthracene	mg/kg	0.9	0.2	3.0	2.0	1.2	0.01	4638619
Benzo(a)pyrene	mg/kg	0.9	0.2	3.2	2.0	1.2	0.01	4638619
Benzo(b)fluoranthene	mg/kg	0.7	0.2	2.7	1.6	0.86	0.01	4638619
Benzo(g,h,i)perylene	mg/kg	0.7	0.2	1.8	1.1	0.62	0.01	4638619
Benzo(j)fluoranthene	mg/kg	0.4	0.2	1.4	0.84	0.48	0.01	4638619
Benzo(k)fluoranthene	mg/kg	0.4	0.2	1.4	0.85	0.48	0.01	4638619
Chrysene	mg/kg	0.9	0.2	2.7	1.9	1.1	0.01	4638619
Dibenz(a,h)anthracene	mg/kg	<0.2	0.2	0.52	0.32	0.18	0.01	4638619
Fluoranthene	mg/kg	2.2	0.2	7.0	4.2	2.5	0.01	4638619
Fluorene	mg/kg	<0.2	0.2	0.63	0.50	0.09	0.01	4638619
Indeno(1,2,3-cd)pyrene	mg/kg	0.5	0.2	1.6	0.94	0.54	0.01	4638619
Naphthalene	mg/kg	<0.2	0.2	0.13	0.22	0.02	0.01	4638619
Perylene	mg/kg	0.3	0.2	0.75	0.45	0.27	0.01	4638619
Phenanthrene	mg/kg	1.7	0.2	5.6	4.0	1.6	0.01	4638619
Pyrene	mg/kg	1.7	0.2	6.1	4.0	2.3	0.01	4638619
Surrogate Recovery (%)								
D10-Anthracene	%	111		99	94	91		4638619
D14-Terphenyl (FS)	%	107 (1)		112	124	115		4638619
D8-Acenaphthylene	%	125		96	102	104		4638619

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYJ411	CYJ412	CYJ413	CYJ414	CYJ415		
Sampling Date		2016/08/22 09:45	2016/08/22 10:30	2016/08/22 11:00	2016/08/22 11:30	2016/08/19 12:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-06 (1.8-2.4)**	**16BH-06 (3.0-3.6)**	**16BH-06 (4.2-4.8)**	**16BH-06 (5.4-6.0)**	**16BH-09 (0.6-1.2)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	<0.01	0.02	0.07	0.02	<0.01	0.01	4638621
2-Methylnaphthalene	mg/kg	<0.01	0.04	0.06	0.02	<0.01	0.01	4638621
Acenaphthene	mg/kg	0.01	0.04	0.22	0.05	0.01	0.01	4638621
Acenaphthylene	mg/kg	<0.01	0.07	0.17	0.04	<0.01	0.01	4638621
Anthracene	mg/kg	0.06	0.29	0.73	0.28	0.03	0.01	4638621
Benzo(a)anthracene	mg/kg	0.22	0.43	1.6	0.58	0.08	0.01	4638621
Benzo(a)pyrene	mg/kg	0.18	0.40	1.8	0.51	0.09	0.01	4638621
Benzo(b)fluoranthene	mg/kg	0.14	0.31	1.3	0.38	0.07	0.01	4638621
Benzo(g,h,i)perylene	mg/kg	0.12	0.23	0.95	0.29	0.05	0.01	4638621
Benzo(j)fluoranthene	mg/kg	0.08	0.17	0.79	0.22	0.04	0.01	4638621
Benzo(k)fluoranthene	mg/kg	0.08	0.17	0.82	0.23	0.04	0.01	4638621
Chrysene	mg/kg	0.19	0.39	1.3	0.49	0.08	0.01	4638621
Dibenz(a,h)anthracene	mg/kg	0.03	0.06	0.27	0.08	0.01	0.01	4638621
Fluoranthene	mg/kg	0.47	0.92	3.3	1.1	0.20	0.01	4638621
Fluorene	mg/kg	0.01	0.10	0.32	0.07	0.01	0.01	4638621
Indeno(1,2,3-cd)pyrene	mg/kg	0.09	0.20	0.89	0.26	0.05	0.01	4638621
Naphthalene	mg/kg	<0.01	0.08	0.09	0.03	<0.01	0.01	4638621
Perylene	mg/kg	0.05	0.10	0.43	0.12	0.02	0.01	4638621
Phenanthrene	mg/kg	0.20	0.85	2.8	0.85	0.14	0.01	4638621
Pyrene	mg/kg	0.38	0.84	2.8	1.0	0.15	0.01	4638621
Surrogate Recovery (%)								
D10-Anthracene	%	115	112	88	113	104		4638621
D14-Terphenyl (FS)	%	106	101	88	105	94		4638621
D8-Acenaphthylene	%	120	104	111	116	109		4638621

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYJ416	CYJ417	CYJ417	CYJ419		
Sampling Date		2016/08/19 12:20	2016/08/19 12:40	2016/08/19 12:40	2016/08/19 13:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-09 (1.8-2.4)**	**16BH-09 (3.0-3.6)**	**16BH-09 (3.0-3.6) Lab-Dup**	**16BH-09 (4.2-4.8)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons							
1-Methylnaphthalene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
2-Methylnaphthalene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
Acenaphthene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
Acenaphthylene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
Anthracene	mg/kg	0.03	0.02	0.02	0.02	0.01	4638621
Benzo(a)anthracene	mg/kg	0.06	0.06	0.06	0.08	0.01	4638621
Benzo(a)pyrene	mg/kg	0.06	0.07	0.06	0.09	0.01	4638621
Benzo(b)fluoranthene	mg/kg	0.05	0.05	0.05	0.08	0.01	4638621
Benzo(g,h,i)perylene	mg/kg	0.04	0.04	0.04	0.05	0.01	4638621
Benzo(j)fluoranthene	mg/kg	0.02	0.03	0.03	0.04	0.01	4638621
Benzo(k)fluoranthene	mg/kg	0.02	0.03	0.03	0.04	0.01	4638621
Chrysene	mg/kg	0.06	0.06	0.06	0.08	0.01	4638621
Dibenz(a,h)anthracene	mg/kg	<0.01	0.01	0.01	0.01	0.01	4638621
Fluoranthene	mg/kg	0.15	0.12	0.11	0.12	0.01	4638621
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
Indeno(1,2,3-cd)pyrene	mg/kg	0.03	0.03	0.03	0.05	0.01	4638621
Naphthalene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01	4638621
Perylene	mg/kg	0.01	0.02	0.01	0.02	0.01	4638621
Phenanthrene	mg/kg	0.10	0.09	0.06	0.07	0.01	4638621
Pyrene	mg/kg	0.11	0.10	0.09	0.09	0.01	4638621
Surrogate Recovery (%)							
D10-Anthracene	%	119	115	112	119		4638621
D14-Terphenyl (FS)	%	112	103	108	98		4638621
D8-Acenaphthylene	%	107	104	106	111		4638621

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYJ420		CYJ421	CYJ422		CYJ423		
Sampling Date		2016/08/19 13:15		2016/08/19 08:30	2016/08/19 09:00		2016/08/19 09:30		
COC Number		N/A		N/A	N/A		N/A		
	UNITS	**16BH-09 (5.4-6.0)**	**RDL**	**16BH-12 (0.6-1.2)**	**16BH-12 (1.8-2.4)**	**RDL**	**16BH-12 (3.0-3.6)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons									
1-Methylnaphthalene	mg/kg	<0.01	0.01	0.01	<0.01	0.01	0.35	0.01	4638621
2-Methylnaphthalene	mg/kg	<0.01	0.01	0.02	<0.01	0.01	0.39	0.01	4638621
Acenaphthene	mg/kg	<0.01	0.01	0.05	0.01	0.01	1.4	0.01	4638621
Acenaphthylene	mg/kg	<0.01	0.01	<0.01	<0.01	0.01	0.11	0.01	4638621
Anthracene	mg/kg	<0.01	0.01	0.15	0.03	0.01	2.6	0.01	4638621
Benzo(a)anthracene	mg/kg	0.02	0.01	0.32	0.06	0.01	5.5	0.01	4638621
Benzo(a)pyrene	mg/kg	<0.02 (1)	0.02	0.27	0.05	0.01	4.5	0.01	4638621
Benzo(b)fluoranthene	mg/kg	0.01	0.01	0.18	0.04	0.01	3.4	0.01	4638621
Benzo(g,h,i)perylene	mg/kg	<0.01	0.01	0.16	0.03	0.01	2.4	0.01	4638621
Benzo(j)fluoranthene	mg/kg	<0.01	0.01	0.11	0.02	0.01	1.9	0.01	4638621
Benzo(k)fluoranthene	mg/kg	<0.01	0.01	0.11	0.02	0.01	2.0	0.01	4638621
Chrysene	mg/kg	0.01	0.01	0.29	0.06	0.01	4.9	0.01	4638621
Dibenz(a,h)anthracene	mg/kg	<0.01	0.01	0.04	<0.01	0.01	0.68	0.01	4638621
Fluoranthene	mg/kg	0.03	0.01	0.58	0.14	0.01	10 (2)	0.1	4638621
Fluorene	mg/kg	<0.01	0.01	0.04	0.01	0.01	1.5	0.01	4638621
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	0.01	0.13	0.03	0.01	2.2	0.01	4638621
Naphthalene	mg/kg	<0.01	0.01	0.02	<0.01	0.01	0.60	0.01	4638621
Perylene	mg/kg	<0.01	0.01	0.06	0.01	0.01	1.0	0.01	4638621
Phenanthrene	mg/kg	0.03	0.01	0.59	0.11	0.01	10	0.01	4638621
Pyrene	mg/kg	0.03	0.01	0.55	0.11	0.01	10	0.01	4638621
Surrogate Recovery (%)									
D10-Anthracene	%	94		118	96		98		4638621
D14-Terphenyl (FS)	%	91		100	95		98		4638621
D8-Acenaphthylene	%	103		104	113		110		4638621

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

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		CYJ424		CYJ425		
Sampling Date		2016/08/19 10:15		2016/08/19 11:00		
COC Number		N/A		N/A		
	UNITS	**16BH-12 (4.2-4.8)**	**QC Batch**	**16BH-12 (5.4-6.0)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons						
1-Methylnaphthalene	mg/kg	0.09	4643890	<0.01	0.01	4638621
2-Methylnaphthalene	mg/kg	0.11	4643890	<0.01	0.01	4638621
Acenaphthene	mg/kg	0.32	4643890	<0.01	0.01	4638621
Acenaphthylene	mg/kg	0.01	4643890	<0.01	0.01	4638621
Anthracene	mg/kg	0.95	4643890	0.01	0.01	4638621
Benzo(a)anthracene	mg/kg	1.4	4643890	0.06	0.01	4638621
Benzo(a)pyrene	mg/kg	1.1	4643890	0.06	0.01	4638621
Benzo(b)fluoranthene	mg/kg	0.85	4643890	0.05	0.01	4638621
Benzo(g,h,i)perylene	mg/kg	0.55	4643890	0.04	0.01	4638621
Benzo(j)fluoranthene	mg/kg	0.50	4643890	0.03	0.01	4638621
Benzo(k)fluoranthene	mg/kg	0.52	4643890	0.03	0.01	4638621
Chrysene	mg/kg	1.3	4643890	0.06	0.01	4638621
Dibenz(a,h)anthracene	mg/kg	0.15	4643890	<0.01	0.01	4638621
Fluoranthene	mg/kg	3.2	4643890	0.12	0.01	4638621
Fluorene	mg/kg	0.39	4643890	<0.01	0.01	4638621
Indeno(1,2,3-cd)pyrene	mg/kg	0.49	4643890	0.03	0.01	4638621
Naphthalene	mg/kg	0.13	4643890	<0.01	0.01	4638621
Perylene	mg/kg	0.23	4643890	0.01	0.01	4638621
Phenanthrene	mg/kg	3.6	4643890	0.05	0.01	4638621
Pyrene	mg/kg	2.6	4643890	0.10	0.01	4638621
Surrogate Recovery (%)						
D10-Anthracene	%	108	4643890	102		4638621
D14-Terphenyl (FS)	%	104	4643890	97		4638621
D8-Acenaphthylene	%	92	4643890	111		4638621

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CYJ418		
Sampling Date		2016/08/19 12:50		
COC Number		N/A		
	UNITS	**16BH-09 (3.6-4.2)**	**RDL**	**QC Batch**
Volatile Organics				
1,1,1-Trichloroethane	ug/kg	<30	30	4636125
1,1,2,2-Tetrachloroethane	ug/kg	<30	30	4636125
1,1,2-Trichloroethane	ug/kg	<30	30	4636125
1,1-Dichloroethane	ug/kg	<30	30	4636125
1,1-Dichloroethylene	ug/kg	<30	30	4636125
1,2-Dichlorobenzene	ug/kg	<30	30	4636125
1,2-Dichloroethane	ug/kg	<30	30	4636125
1,2-Dichloropropane	ug/kg	<30	30	4636125
1,3-Dichlorobenzene	ug/kg	<30	30	4636125
1,4-Dichlorobenzene	ug/kg	<30	30	4636125
Benzene	ug/kg	<30	30	4636125
Bromodichloromethane	ug/kg	<30	30	4636125
Bromoform	ug/kg	<30	30	4636125
Bromomethane	ug/kg	<50	50	4636125
Carbon Tetrachloride	ug/kg	<30	30	4636125
Chlorobenzene	ug/kg	<30	30	4636125
Chloroethane	ug/kg	<200	200	4636125
Chloroform	ug/kg	<30	30	4636125
cis-1,2-Dichloroethylene	ug/kg	<30	30	4636125
cis-1,3-Dichloropropene	ug/kg	<30	30	4636125
Dibromochloromethane	ug/kg	<30	30	4636125
Ethylbenzene	ug/kg	<30	30	4636125
Ethylene Dibromide	ug/kg	<30	30	4636125
Methylene Chloride(Dichloromethane)	ug/kg	<50	50	4636125
o-Xylene	ug/kg	<30	30	4636125
p+m-Xylene	ug/kg	<30	30	4636125
Styrene	ug/kg	<30	30	4636125
Tetrachloroethylene	ug/kg	<30	30	4636125
Toluene	ug/kg	<30	30	4636125
trans-1,2-Dichloroethylene	ug/kg	<30	30	4636125
trans-1,3-Dichloropropene	ug/kg	<30	30	4636125
Trichloroethylene	ug/kg	<10	10	4636125
Trichlorofluoromethane (FREON 11)	ug/kg	<30	30	4636125

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

VOLATILE ORGANICS BY GC/MS (SOIL)

Maxxam ID		CYJ418		
Sampling Date		2016/08/19 12:50		
COC Number		N/A		
	UNITS	**16BH-09 (3.6-4.2)**	**RDL**	**QC Batch**
Vinyl Chloride	ug/kg	<20	20	4636125
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	98 (1)		4636125
D10-o-Xylene	%	95		4636125
D4-1,2-Dichloroethane	%	95		4636125
D8-Toluene	%	100		4636125

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

(1) VOC samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYJ406	CYJ407		CYJ408		CYJ409		
Sampling Date		2016/08/19 13:30	2016/08/19 13:45		2016/08/19 14:45		2016/08/19 15:00		
COC Number		N/A	N/A		N/A		N/A		
	UNITS	**16BH-05 (0-0.6)**	**16BH-05 (0.6-1.2)**	**QC Batch**	**16BH-05 (1.8-2.4)**	**QC Batch**	**16BH-05 (3.0-3.6)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg	<0.03	0.04	4636744	<0.03	4638584	<0.03	0.03	4636744
Toluene	mg/kg	<0.03	0.05	4636744	<0.03	4638584	<0.03	0.03	4636744
Ethylbenzene	mg/kg	<0.03	<0.03	4636744	<0.03	4638584	<0.03	0.03	4636744
Total Xylenes	mg/kg	<0.05	0.10	4636744	<0.05	4638584	<0.05	0.05	4636744
C6 - C10 (less BTEX)	mg/kg	<3	<3	4636744	<3	4638584	<3	3	4636744
>C10-C16 Hydrocarbons	mg/kg	25	30	4638616	<10	4638616	<10	10	4638616
>C16-C21 Hydrocarbons	mg/kg	76	100	4638616	35	4638616	33	10	4638616
>C21-<C32 Hydrocarbons	mg/kg	820	600	4638616	160	4638616	110	20	4638616
Modified TPH (Tier1)	mg/kg	920	730	4634521	190	4634521	140	20	4634521
Reached Baseline at C32	mg/kg	No	No	4638616	No	4638616	Yes	N/A	4638616
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (1)	4638616	COMMENT (1)	4638616	COMMENT (2)	N/A	4638616
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	77	78	4638616	94	4638616	95		4638616
n-Dotriacontane - Extractable	%	119	108	4638616	88	4638616	106		4638616
Isobutylbenzene - Volatile	%	101	114	4636744	108	4638584	130		4636744

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction.
(2) Lube oil fraction; interference from possible PAHs.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYJ410	CYJ411	CYJ412	CYJ413		
Sampling Date		2016/08/22 09:15	2016/08/22 09:45	2016/08/22 10:30	2016/08/22 11:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**16BH-06 (0.6-1.2)**	**16BH-06 (1.8-2.4)**	**16BH-06 (3.0-3.6)**	**16BH-06 (4.2-4.8)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	0.03	4636744
Toluene	mg/kg	<0.03	<0.03	<0.03	<0.03	0.03	4636744
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	0.03	4636744
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	<0.05	0.05	4636744
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	<3	3	4636744
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	10	4638616
>C16-C21 Hydrocarbons	mg/kg	14	<10	<10	<10	10	4638616
>C21-<C32 Hydrocarbons	mg/kg	54	<20	<20	26	20	4638616
Modified TPH (Tier1)	mg/kg	68	<20	<20	26	20	4634521
Reached Baseline at C32	mg/kg	Yes	NA	NA	Yes	N/A	4638616
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	NA	NA	COMMENT (2)	N/A	4638616
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	94	93	93	95		4638616
n-Dotriacontane - Extractable	%	89	90	93	99		4638616
Isobutylbenzene - Volatile	%	122	122	114	101		4636744

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction; interference from possible PAHs.
(2) Possible lube oil fraction; interference from possible PAHs.

Maxxam Job #: B6I1066
Report Date: 2016/09/07

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DB

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYJ414		CYJ415	CYJ416	CYJ417		
Sampling Date		2016/08/22 11:30		2016/08/19 12:00	2016/08/19 12:20	2016/08/19 12:40		
COC Number		N/A		N/A	N/A	N/A		
	UNITS	**16BH-06 (5.4-6.0)**	**QC Batch**	**16BH-09 (0.6-1.2)**	**16BH-09 (1.8-2.4)**	**16BH-09 (3.0-3.6)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	4638584	<0.03	<0.03	<0.03	0.03	4638584
Toluene	mg/kg	<0.03	4638584	<0.03	<0.03	<0.03	0.03	4638584
Ethylbenzene	mg/kg	<0.03	4638584	<0.03	<0.03	<0.03	0.03	4638584
Total Xylenes	mg/kg	<0.05	4638584	<0.05	<0.05	<0.05	0.05	4638584
C6 - C10 (less BTEX)	mg/kg	<3	4638584	<3	<3	<3	3	4638584
>C10-C16 Hydrocarbons	mg/kg	<10	4638881	<10	<10	<10	10	4638616
>C16-C21 Hydrocarbons	mg/kg	<10	4638881	<10	<10	<10	10	4638616
>C21-<C32 Hydrocarbons	mg/kg	<20	4638881	<20	<20	<20	20	4638616
Modified TPH (Tier1)	mg/kg	<20	4634521	<20	<20	<20	20	4634521
Reached Baseline at C32	mg/kg	NA	4638881	NA	NA	NA	N/A	4638616
Hydrocarbon Resemblance	mg/kg	NA	4638881	NA	NA	NA	N/A	4638616
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	94	4638881	93	93	92		4638616
n-Dotriacontane - Extractable	%	91	4638881	91	88	88		4638616
Isobutylbenzene - Volatile	%	106 (1)	4638584	109	99	102 (1)		4638584

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYJ419	CYJ419		CYJ420	CYJ420		
Sampling Date		2016/08/19 13:00	2016/08/19 13:00		2016/08/19 13:15	2016/08/19 13:15		
COC Number		N/A	N/A		N/A	N/A		
	UNITS	**16BH-09 (4.2-4.8)**	**16BH-09 (4.2-4.8) Lab-Dup**	**QC Batch**	**16BH-09 (5.4-6.0)**	**16BH-09 (5.4-6.0) Lab-Dup**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	4638584	<0.03		0.03	4638584
Toluene	mg/kg	<0.03	<0.03	4638584	<0.03		0.03	4638584
Ethylbenzene	mg/kg	<0.03	<0.03	4638584	<0.03		0.03	4638584
Total Xylenes	mg/kg	<0.05	<0.05	4638584	<0.05		0.05	4638584
C6 - C10 (less BTEX)	mg/kg	<3	<3	4638584	<3		3	4638584
>C10-C16 Hydrocarbons	mg/kg	<10	<10	4638613	<10	<10	10	4638616
>C16-C21 Hydrocarbons	mg/kg	<10	<10	4638613	<10	<10	10	4638616
>C21-<C32 Hydrocarbons	mg/kg	<20	<20	4638613	<20	<20	20	4638616
Modified TPH (Tier1)	mg/kg	<20		4634521	<20		20	4634521
Reached Baseline at C32	mg/kg	NA		4638613	NA		N/A	4638616
Hydrocarbon Resemblance	mg/kg	NA		4638613	NA		N/A	4638616
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	80	79	4638613	93	92		4638616
n-Dotriacontane - Extractable	%	86	82	4638613	90	85		4638616
Isobutylbenzene - Volatile	%	103 (1)	90 (1)	4638584	104			4638584

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

(1) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		CYJ421	CYJ422	CYJ423	CYJ424	CYJ425		
Sampling Date		2016/08/19 08:30	2016/08/19 09:00	2016/08/19 09:30	2016/08/19 10:15	2016/08/19 11:00		
COC Number		N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-12 (0.6-1.2)**	**16BH-12 (1.8-2.4)**	**16BH-12 (3.0-3.6)**	**16BH-12 (4.2-4.8)**	**16BH-12 (5.4-6.0)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4638584
Toluene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4638584
Ethylbenzene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	4638584
Total Xylenes	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	4638584
C6 - C10 (less BTEX)	mg/kg	<3	<3	<3	<3	<3	3	4638584
>C10-C16 Hydrocarbons	mg/kg	<10	<10	13	<10	<10	10	4638616
>C16-C21 Hydrocarbons	mg/kg	21	<10	64	<10	<10	10	4638616
>C21-<C32 Hydrocarbons	mg/kg	80	25	160	31	<20	20	4638616
Modified TPH (Tier1)	mg/kg	100	25	240	31	<20	20	4634521
Reached Baseline at C32	mg/kg	Yes	Yes	Yes	Yes	NA	N/A	4638616
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (3)	COMMENT (3)	NA	N/A	4638616
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	92	92	92	95	93		4638616
n-Dotriacontane - Extractable	%	99	97	83	98	92		4638616
Isobutylbenzene - Volatile	%	101	93	106	107	99		4638584

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction; interference from possible PAHs.
(2) Lube oil fraction.
(3) Possible lube oil fraction; interference from possible PAHs.

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		CYJ418		
Sampling Date		2016/08/19 12:50		
COC Number		N/A		
	UNITS	**16BH-09 (3.6-4.2)**	**RDL**	**QC Batch**
PCBs				
Aroclor 1016	ug/g	<0.05	0.05	4638957
Aroclor 1221	ug/g	<0.05	0.05	4638957
Aroclor 1232	ug/g	<0.05	0.05	4638957
Aroclor 1248	ug/g	<0.05	0.05	4638957
Aroclor 1242	ug/g	<0.05	0.05	4638957
Aroclor 1254	ug/g	<0.05	0.05	4638957
Aroclor 1260	ug/g	<0.05	0.05	4638957
Calculated Total PCB	ug/g	<0.050	0.050	4634357
Surrogate Recovery (%)				
Decachlorobiphenyl	%	114		4638957

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Maxxam Job #: B6I1066
Report Date: 2016/09/07

QUALITY ASSURANCE REPORT

Stantec Consulting Ltd
Client Project #: 121811071.702
Site Location: FUNDY QUAY
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636125	4-Bromofluorobenzene	2016/08/26	98	60 - 140	98	60 - 140	94	%		
4636125	D10-o-Xylene	2016/08/26	87	60 - 130	92	60 - 130	105	%		
4636125	D4-1,2-Dichloroethane	2016/08/26	103	60 - 140	100	60 - 140	99	%		
4636125	D8-Toluene	2016/08/26	98	60 - 140	99	60 - 140	99	%		
4636744	Isobutylbenzene - Volatile	2016/08/26	124	60 - 130	107	60 - 130	101	%		
4638584	Isobutylbenzene - Volatile	2016/08/29	104	60 - 130	102	60 - 130	95	%		
4638613	Isobutylbenzene - Extractable	2016/08/29	79	30 - 130	80	30 - 130	81	%		
4638613	n-Dotriacontane - Extractable	2016/08/29	91	30 - 130	88	30 - 130	79	%		
4638616	Isobutylbenzene - Extractable	2016/08/29	94	30 - 130	92	30 - 130	92	%		
4638616	n-Dotriacontane - Extractable	2016/08/29	94	30 - 130	90	30 - 130	89	%		
4638619	D10-Anthracene	2016/08/29	99	30 - 130	100	30 - 130	93	%		
4638619	D14-Terphenyl (FS)	2016/08/29	96	30 - 130	105	30 - 130	113	%		
4638619	D8-Acenaphthylene	2016/08/29	114	30 - 130	99	30 - 130	96	%		
4638621	D10-Anthracene	2016/08/31	115	30 - 130	105	30 - 130	100	%		
4638621	D14-Terphenyl (FS)	2016/08/31	102	30 - 130	106	30 - 130	100	%		
4638621	D8-Acenaphthylene	2016/08/31	108	30 - 130	107	30 - 130	104	%		
4638881	Isobutylbenzene - Extractable	2016/08/29	94	30 - 130	92	30 - 130	93	%		
4638881	n-Dotriacontane - Extractable	2016/08/29	97	30 - 130	97	30 - 130	92	%		
4638957	Decachlorobiphenyl	2016/08/30	107	30 - 130	110	30 - 130	119	%		
4643890	D10-Anthracene	2016/09/02	126	30 - 130	93	30 - 130	96	%		
4643890	D14-Terphenyl (FS)	2016/09/02	113	30 - 130	89	30 - 130	100	%		
4643890	D8-Acenaphthylene	2016/09/02	114	30 - 130	98	30 - 130	92	%		
4636125	1,1,1-Trichloroethane	2016/08/26	101	60 - 140	107	60 - 130	<30	ug/kg	NC	50
4636125	1,1,2,2-Tetrachloroethane	2016/08/26	84	60 - 140	87	60 - 130	<30	ug/kg	NC	50
4636125	1,1,2-Trichloroethane	2016/08/26	95	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4636125	1,1-Dichloroethane	2016/08/26	101	60 - 140	105	60 - 130	<30	ug/kg	NC	50
4636125	1,1-Dichloroethylene	2016/08/26	97	60 - 140	107	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichlorobenzene	2016/08/26	84	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichloroethane	2016/08/26	90	60 - 140	92	60 - 130	<30	ug/kg	NC	50
4636125	1,2-Dichloropropane	2016/08/26	93	60 - 140	97	60 - 130	<30	ug/kg	NC	50
4636125	1,3-Dichlorobenzene	2016/08/26	86	60 - 140	95	60 - 130	<30	ug/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4636125	1,4-Dichlorobenzene	2016/08/26	84	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	Benzene	2016/08/26	90	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4636125	Bromodichloromethane	2016/08/26	93	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4636125	Bromoform	2016/08/26	88	60 - 140	91	60 - 130	<30	ug/kg	NC	50
4636125	Bromomethane	2016/08/26	85	60 - 140	97	60 - 140	<50	ug/kg	NC	50
4636125	Carbon Tetrachloride	2016/08/26	98	60 - 140	104	60 - 130	<30	ug/kg	NC	50
4636125	Chlorobenzene	2016/08/26	90	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4636125	Chloroethane	2016/08/26	89	60 - 140	97	60 - 140	<200	ug/kg	NC	50
4636125	Chloroform	2016/08/26	96	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4636125	cis-1,2-Dichloroethylene	2016/08/26	98	60 - 140	103	60 - 130	<30	ug/kg	NC	50
4636125	cis-1,3-Dichloropropene	2016/08/26	89	60 - 140	96	60 - 130	<30	ug/kg	NC	50
4636125	Dibromochloromethane	2016/08/26	93	60 - 140	95	60 - 130	<30	ug/kg	NC	50
4636125	Ethylbenzene	2016/08/26	94	60 - 140	101	60 - 130	<30	ug/kg	NC	50
4636125	Ethylene Dibromide	2016/08/26	90	60 - 140	93	60 - 130	<30	ug/kg	NC	50
4636125	Methylene Chloride(Dichloromethane)	2016/08/26	100	60 - 140	105	60 - 130	<50	ug/kg	NC	50
4636125	o-Xylene	2016/08/26	94	60 - 140	101	60 - 130	<30	ug/kg	NC	50
4636125	p+m-Xylene	2016/08/26	91	60 - 140	100	60 - 130	<30	ug/kg	NC	50
4636125	Styrene	2016/08/26	83	60 - 140	99	60 - 130	<30	ug/kg	NC	50
4636125	Tetrachloroethylene	2016/08/26	97	60 - 140	106	60 - 130	<30	ug/kg	NC	50
4636125	Toluene	2016/08/26	95	60 - 140	102	60 - 130	<30	ug/kg	NC	50
4636125	trans-1,2-Dichloroethylene	2016/08/26	99	60 - 140	106	60 - 130	<30	ug/kg	NC	50
4636125	trans-1,3-Dichloropropene	2016/08/26	85	60 - 140	90	60 - 130	<30	ug/kg	NC	50
4636125	Trichloroethylene	2016/08/26	95	60 - 140	104	60 - 130	<10	ug/kg	NC	50
4636125	Trichlorofluoromethane (FREON 11)	2016/08/26	85	60 - 140	97	60 - 140	<30	ug/kg	NC	50
4636125	Vinyl Chloride	2016/08/26	82	60 - 140	81	60 - 140	<20	ug/kg	NC	50
4636744	Benzene	2016/08/26	118	60 - 130	81	60 - 140	<0.03	mg/kg	NC	50
4636744	C6 - C10 (less BTEX)	2016/08/26					<3	mg/kg	NC	50
4636744	Ethylbenzene	2016/08/26	119	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50
4636744	Toluene	2016/08/26	117	60 - 130	82	60 - 140	<0.03	mg/kg	NC	50
4636744	Total Xylenes	2016/08/26	119	60 - 130	91	60 - 140	<0.05	mg/kg	NC	50
4638584	Benzene	2016/08/29	96	60 - 130	90	60 - 140	<0.03	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4638584	C6 - C10 (less BTEX)	2016/08/29					<3	mg/kg	NC	50
4638584	Ethylbenzene	2016/08/29	95	60 - 130	101	60 - 140	<0.03	mg/kg	NC	50
4638584	Toluene	2016/08/29	94	60 - 130	96	60 - 140	<0.03	mg/kg	NC	50
4638584	Total Xylenes	2016/08/29	97	60 - 130	103	60 - 140	<0.05	mg/kg	NC	50
4638613	>C10-C16 Hydrocarbons	2016/08/29	94	30 - 130	95	30 - 130	<10	mg/kg	NC	50
4638613	>C16-C21 Hydrocarbons	2016/08/29	89	30 - 130	90	30 - 130	<10	mg/kg	NC	50
4638613	>C21-<C32 Hydrocarbons	2016/08/29	86	30 - 130	86	30 - 130	<20	mg/kg	NC	50
4638616	>C10-C16 Hydrocarbons	2016/08/29	98	30 - 130	96	30 - 130	<10	mg/kg	NC	50
4638616	>C16-C21 Hydrocarbons	2016/08/29	92	30 - 130	91	30 - 130	<10	mg/kg	NC	50
4638616	>C21-<C32 Hydrocarbons	2016/08/29	81	30 - 130	83	30 - 130	<20	mg/kg	NC	50
4638619	1-Methylnaphthalene	2016/08/31	78	30 - 130	80	30 - 130	<0.01	mg/kg	NC	50
4638619	2-Methylnaphthalene	2016/08/31	81	30 - 130	83	30 - 130	<0.01	mg/kg	NC	50
4638619	Acenaphthene	2016/08/31	89	30 - 130	87	30 - 130	<0.01	mg/kg	NC	50
4638619	Acenaphthylene	2016/08/31	84	30 - 130	91	30 - 130	<0.01	mg/kg	NC	50
4638619	Anthracene	2016/08/31	97	30 - 130	88	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(a)anthracene	2016/08/31	88	30 - 130	81	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(a)pyrene	2016/08/31	104	30 - 130	104	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(b)fluoranthene	2016/08/31	98	30 - 130	100	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(g,h,i)perylene	2016/08/31	103	30 - 130	99	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(j)fluoranthene	2016/08/31	88	30 - 130	93	30 - 130	<0.01	mg/kg	NC	50
4638619	Benzo(k)fluoranthene	2016/08/31	99	30 - 130	100	30 - 130	<0.01	mg/kg	NC	50
4638619	Chrysene	2016/08/31	74	30 - 130	75	30 - 130	<0.01	mg/kg	NC	50
4638619	Dibenz(a,h)anthracene	2016/08/31	98	30 - 130	99	30 - 130	<0.01	mg/kg	NC	50
4638619	Fluoranthene	2016/08/31	80	30 - 130	73	30 - 130	<0.01	mg/kg	NC	50
4638619	Fluorene	2016/08/31	88	30 - 130	95	30 - 130	<0.01	mg/kg	NC	50
4638619	Indeno(1,2,3-cd)pyrene	2016/08/31	99	30 - 130	96	30 - 130	<0.01	mg/kg	NC	50
4638619	Naphthalene	2016/08/31	82	30 - 130	83	30 - 130	<0.01	mg/kg	NC	50
4638619	Perylene	2016/08/31	98	30 - 130	97	30 - 130	<0.01	mg/kg	NC	50
4638619	Phenanthrene	2016/08/31	94	30 - 130	95	30 - 130	<0.01	mg/kg	NC	50
4638619	Pyrene	2016/08/31	85	30 - 130	78	30 - 130	<0.01	mg/kg	NC	50
4638621	1-Methylnaphthalene	2016/09/01	73	30 - 130	76	30 - 130	<0.01	mg/kg	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4638621	2-Methylnaphthalene	2016/09/01	75	30 - 130	78	30 - 130	<0.01	mg/kg	NC	50
4638621	Acenaphthene	2016/09/01	88	30 - 130	87	30 - 130	<0.01	mg/kg	NC	50
4638621	Acenaphthylene	2016/09/01	77	30 - 130	75	30 - 130	<0.01	mg/kg	NC	50
4638621	Anthracene	2016/09/01	111	30 - 130	110	30 - 130	<0.01	mg/kg	NC	50
4638621	Benzo(a)anthracene	2016/09/01	100	30 - 130	105	30 - 130	<0.01	mg/kg	1.4	50
4638621	Benzo(a)pyrene	2016/09/01	103	30 - 130	105	30 - 130	<0.01	mg/kg	5.3	50
4638621	Benzo(b)fluoranthene	2016/09/01	97	30 - 130	100	30 - 130	<0.01	mg/kg	NC	50
4638621	Benzo(g,h,i)perylene	2016/09/01	104	30 - 130	106	30 - 130	<0.01	mg/kg	NC	50
4638621	Benzo(j)fluoranthene	2016/09/01	87	30 - 130	90	30 - 130	<0.01	mg/kg	NC	50
4638621	Benzo(k)fluoranthene	2016/09/01	98	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4638621	Chrysene	2016/09/01	85	30 - 130	90	30 - 130	<0.01	mg/kg	4.4	50
4638621	Dibenz(a,h)anthracene	2016/09/01	101	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4638621	Fluoranthene	2016/09/01	81	30 - 130	93	30 - 130	<0.01	mg/kg	6.0	50
4638621	Fluorene	2016/09/01	86	30 - 130	83	30 - 130	<0.01	mg/kg	NC	50
4638621	Indeno(1,2,3-cd)pyrene	2016/09/01	101	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4638621	Naphthalene	2016/09/01	74	30 - 130	79	30 - 130	<0.01	mg/kg	NC	50
4638621	Perylene	2016/09/01	98	30 - 130	102	30 - 130	<0.01	mg/kg	NC	50
4638621	Phenanthrene	2016/09/01	95	30 - 130	101	30 - 130	<0.01	mg/kg	31	50
4638621	Pyrene	2016/09/01	91	30 - 130	99	30 - 130	<0.01	mg/kg	11	50
4638651	Acid Extractable Aluminum (Al)	2016/08/29					<10	mg/kg		
4638651	Acid Extractable Antimony (Sb)	2016/08/29	96	75 - 125	105	75 - 125	<2	mg/kg		
4638651	Acid Extractable Arsenic (As)	2016/08/29	99	75 - 125	105	75 - 125	<2	mg/kg	6.5	35
4638651	Acid Extractable Barium (Ba)	2016/08/29	NC	75 - 125	101	75 - 125	<5	mg/kg		
4638651	Acid Extractable Beryllium (Be)	2016/08/29	104	75 - 125	102	75 - 125	<2	mg/kg		
4638651	Acid Extractable Bismuth (Bi)	2016/08/29	105	75 - 125	104	75 - 125	<2	mg/kg		
4638651	Acid Extractable Boron (B)	2016/08/29	100	75 - 125	102	75 - 125	<50	mg/kg		
4638651	Acid Extractable Cadmium (Cd)	2016/08/29	103	75 - 125	104	75 - 125	<0.3	mg/kg		
4638651	Acid Extractable Chromium (Cr)	2016/08/29	107	75 - 125	104	75 - 125	<2	mg/kg		
4638651	Acid Extractable Cobalt (Co)	2016/08/29	105	75 - 125	106	75 - 125	<1	mg/kg		
4638651	Acid Extractable Copper (Cu)	2016/08/29	NC	75 - 125	106	75 - 125	<2	mg/kg		
4638651	Acid Extractable Iron (Fe)	2016/08/29					<50	mg/kg		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4638651	Acid Extractable Lead (Pb)	2016/08/29	NC	75 - 125	101	75 - 125	<0.5	mg/kg	4.0	35
4638651	Acid Extractable Lithium (Li)	2016/08/29	109	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Manganese (Mn)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Mercury (Hg)	2016/08/29	98	75 - 125	102	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Molybdenum (Mo)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg		
4638651	Acid Extractable Nickel (Ni)	2016/08/29	108	75 - 125	104	75 - 125	<2	mg/kg		
4638651	Acid Extractable Rubidium (Rb)	2016/08/29	101	75 - 125	102	75 - 125	<2	mg/kg		
4638651	Acid Extractable Selenium (Se)	2016/08/29	102	75 - 125	104	75 - 125	<1	mg/kg		
4638651	Acid Extractable Silver (Ag)	2016/08/29	104	75 - 125	108	75 - 125	<0.5	mg/kg		
4638651	Acid Extractable Strontium (Sr)	2016/08/29	NC	75 - 125	101	75 - 125	<5	mg/kg		
4638651	Acid Extractable Thallium (Tl)	2016/08/29	104	75 - 125	106	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Tin (Sn)	2016/08/29	NC	75 - 125	106	75 - 125	<2	mg/kg		
4638651	Acid Extractable Uranium (U)	2016/08/29	109	75 - 125	103	75 - 125	<0.1	mg/kg		
4638651	Acid Extractable Vanadium (V)	2016/08/29	111	75 - 125	103	75 - 125	<2	mg/kg		
4638651	Acid Extractable Zinc (Zn)	2016/08/29	NC	75 - 125	105	75 - 125	<5	mg/kg		
4638866	Acid Extractable Aluminum (Al)	2016/08/29					<10	mg/kg	1.8	35
4638866	Acid Extractable Antimony (Sb)	2016/08/29	NC	75 - 125	111	75 - 125	<2	mg/kg	NC	35
4638866	Acid Extractable Arsenic (As)	2016/08/29	NC	75 - 125	105	75 - 125	<2	mg/kg	3.9	35
4638866	Acid Extractable Barium (Ba)	2016/08/29	NC	75 - 125	105	75 - 125	<5	mg/kg	2.3	35
4638866	Acid Extractable Beryllium (Be)	2016/08/29	102	75 - 125	102	75 - 125	<2	mg/kg	NC	35
4638866	Acid Extractable Bismuth (Bi)	2016/08/29	107	75 - 125	108	75 - 125	<2	mg/kg	NC	35
4638866	Acid Extractable Boron (B)	2016/08/29	96	75 - 125	101	75 - 125	<50	mg/kg	NC	35
4638866	Acid Extractable Cadmium (Cd)	2016/08/29	103	75 - 125	105	75 - 125	<0.3	mg/kg	NC	35
4638866	Acid Extractable Chromium (Cr)	2016/08/29	NC	75 - 125	104	75 - 125	<2	mg/kg	1.2	35
4638866	Acid Extractable Cobalt (Co)	2016/08/29	107	75 - 125	106	75 - 125	<1	mg/kg	1.9	35
4638866	Acid Extractable Copper (Cu)	2016/08/29	NC	75 - 125	104	75 - 125	<2	mg/kg	1.0	35
4638866	Acid Extractable Iron (Fe)	2016/08/29					<50	mg/kg	0.086	35
4638866	Acid Extractable Lead (Pb)	2016/08/29	NC	75 - 125	106	75 - 125	<0.5	mg/kg	1.3	35
4638866	Acid Extractable Lithium (Li)	2016/08/29	NC	75 - 125	107	75 - 125	<2	mg/kg	2.1	35
4638866	Acid Extractable Manganese (Mn)	2016/08/29	NC	75 - 125	104	75 - 125	<2	mg/kg	0.35	35
4638866	Acid Extractable Mercury (Hg)	2016/08/29	103	75 - 125	107	75 - 125	<0.1	mg/kg	2.2	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4638866	Acid Extractable Molybdenum (Mo)	2016/08/29	NC	75 - 125	99	75 - 125	<2	mg/kg	NC	35
4638866	Acid Extractable Nickel (Ni)	2016/08/29	NC	75 - 125	103	75 - 125	<2	mg/kg	6.7	35
4638866	Acid Extractable Rubidium (Rb)	2016/08/29	102	75 - 125	101	75 - 125	<2	mg/kg	3.5	35
4638866	Acid Extractable Selenium (Se)	2016/08/29	103	75 - 125	101	75 - 125	<1	mg/kg	NC	35
4638866	Acid Extractable Silver (Ag)	2016/08/29	107	75 - 125	107	75 - 125	<0.5	mg/kg	NC	35
4638866	Acid Extractable Strontium (Sr)	2016/08/29	NC	75 - 125	108	75 - 125	<5	mg/kg	2.6	35
4638866	Acid Extractable Thallium (Tl)	2016/08/29	108	75 - 125	110	75 - 125	<0.1	mg/kg	NC	35
4638866	Acid Extractable Tin (Sn)	2016/08/29	NC	75 - 125	108	75 - 125	<2	mg/kg	9.4	35
4638866	Acid Extractable Uranium (U)	2016/08/29	117	75 - 125	113	75 - 125	<0.1	mg/kg	5.3	35
4638866	Acid Extractable Vanadium (V)	2016/08/29	NC	75 - 125	108	75 - 125	<2	mg/kg	4.0	35
4638866	Acid Extractable Zinc (Zn)	2016/08/29	NC	75 - 125	102	75 - 125	<5	mg/kg	2.2	35
4638881	>C10-C16 Hydrocarbons	2016/08/29	96	30 - 130	92	30 - 130	<10	mg/kg	NC	50
4638881	>C16-C21 Hydrocarbons	2016/08/29	81	30 - 130	77	30 - 130	<10	mg/kg	NC	50
4638881	>C21-<C32 Hydrocarbons	2016/08/29	103	30 - 130	105	30 - 130	<20	mg/kg	NC	50
4638957	Aroclor 1016	2016/08/30					<0.05	ug/g	NC	50
4638957	Aroclor 1221	2016/08/30					<0.05	ug/g	NC	50
4638957	Aroclor 1232	2016/08/30					<0.05	ug/g	NC	50
4638957	Aroclor 1242	2016/08/30					<0.05	ug/g	NC	50
4638957	Aroclor 1248	2016/08/30					<0.05	ug/g	NC	50
4638957	Aroclor 1254	2016/08/30	117	30 - 130	120	30 - 130	<0.05	ug/g	NC	50
4638957	Aroclor 1260	2016/08/30					<0.05	ug/g	NC	50
4643890	1-Methylnaphthalene	2016/09/03	96	30 - 130	92	30 - 130	<0.01	mg/kg	9.1	50
4643890	2-Methylnaphthalene	2016/09/03	107	30 - 130	96	30 - 130	<0.01	mg/kg	0.69	50
4643890	Acenaphthene	2016/09/03	119	30 - 130	86	30 - 130	<0.01	mg/kg	20	50
4643890	Acenaphthylene	2016/09/03	112	30 - 130	96	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Anthracene	2016/09/03	127	30 - 130	109	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Benzo(a)anthracene	2016/09/03	143 (1)	30 - 130	110	30 - 130	<0.01	mg/kg	3.2	50
4643890	Benzo(a)pyrene	2016/09/03	108	30 - 130	108	30 - 130	<0.01	mg/kg	15	50
4643890	Benzo(b)fluoranthene	2016/09/03	113	30 - 130	109	30 - 130	<0.01	mg/kg	16	50
4643890	Benzo(g,h,i)perylene	2016/09/03	107	30 - 130	100	30 - 130	<0.01	mg/kg	14	50
4643890	Benzo(j)fluoranthene	2016/09/03	115	30 - 130	99	30 - 130	<0.01	mg/kg	11	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4643890	Benzo(k)fluoranthene	2016/09/03	122	30 - 130	107	30 - 130	<0.01	mg/kg	21	50
4643890	Chrysene	2016/09/03	141 (1)	30 - 130	96	30 - 130	<0.01	mg/kg	12	50
4643890	Dibenz(a,h)anthracene	2016/09/03	104	30 - 130	98	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Fluoranthene	2016/09/03	115	30 - 130	93	30 - 130	<0.01	mg/kg	6.8	50
4643890	Fluorene	2016/09/03	115	30 - 130	94	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Indeno(1,2,3-cd)pyrene	2016/09/03	103	30 - 130	97	30 - 130	<0.01	mg/kg	4.7	50
4643890	Naphthalene	2016/09/03	98	30 - 130	88	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Perylene	2016/09/03	102	30 - 130	101	30 - 130	<0.01	mg/kg	NC	50
4643890	Phenanthrene	2016/09/03	115	30 - 130	96	30 - 130	<0.01	mg/kg	NC (2)	50
4643890	Pyrene	2016/09/03	88	30 - 130	92	30 - 130	<0.01	mg/kg	20	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) Matrix Spike: results are outside acceptance limit. Analysis was repeated with similar results.

(2) Elevated PAH RDL(s) due to matrix / co-extractive interference.

VALIDATION SIGNATURE PAGE

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

Kevin G. Mac Donald

Kevin MacDonald, Inorganics Supervisor

Philippe Deveau

Phil Deveau

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

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

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CHAIN OF CUSTODY RECORD

COC #:

Page ____ of ____

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECT

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	ICAP-30 (CIRCLE) TOTAL / DISSOLVED	ICAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water)			Metals (Soil)				RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable); NS Fuel Oil Spill Policy Low Level BTEX,C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
										Total Digest (Default Method) for well water & surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Hot Water Soluble Boron (required for CCME Agricultural)													
1	16BH-05(0-0.6)	2016/08/19	13:30	Soil	5								X				X			X									* Poor sample
2	16 BH-05(0.6-1.2)	"	13:45	"	1												X												recovery.
* 3	16 BH-05(1.2-1.8)	"	14:25	"	1																							X	Jars may
4	16 BH-05(1.8-2.4)	"	14:45	"	2								X				X			X									not be full.
5	16 BH-05(3.0-3.6)	"	15:00	"	1								X				X			X									
6																													Jar 2/2 opened
7																													
8																													
9																													
10																													

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Marilou Toole	2016/08/23	13:00	Brw KIMBRACE		
Marilou Toole					

MAXXAM JOB #
2016 AUG 24 10:27
B6J1066
B6I1103 (HOLD)

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CHAIN OF CUSTODY RECORD

COC #:

Page ____ of ____

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	ICAP-30 (CIRCLE) TOTAL / DISSOLVED	ICAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water)			Metals (Soil)				RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level TEH	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
										Total Digest (Default Method) for well water & surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Hot Water Soluble Boron (required for CCME Agricultural)													
1	16 BH-06 (0.6-1.2)	2016/08/22	9:15	Soil	5								X				X			X									* For sample
2	16 BH-06 (1.2-1.8)	"	9:30	"	1																							X	recovery.
3	16 BH-06 (1.8-2.4)	"	9:45	"	2								X				X			X									Jars may not
4	16 BH-06 (2.4-2.5)	"	10:00	"	1																							X	be full.
5	16 BH-06 (3.0-3.6)	"	10:30	"	5								X				X			X	▨	X	X						
6	16 BH-06 (3.6-4.2)	"	10:45	"	1																							X	
7	16 BH-06 (4.2-4.8)	"	11:00	"	3								X				X			X									
8	16 BH-06 (4.8-5.4)	"	11:15	"	5																							X	
9	16 BH-06 (5.4-6.0)	"	11:30	"	5								X				X			X									
10																													

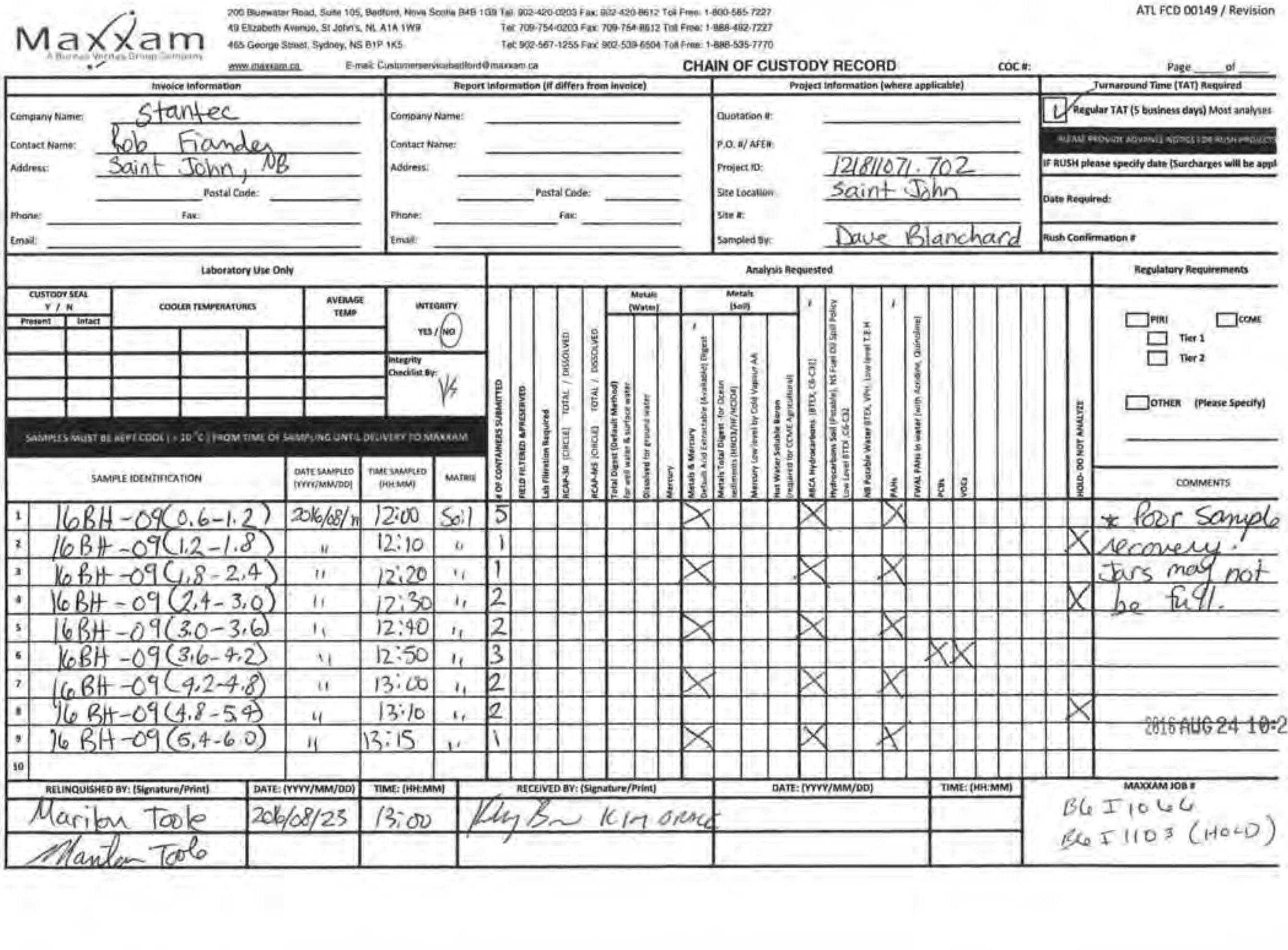
* (beside row 4)

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2016/08/23	14:00	KIM GRACE			2016 AUG 24 10:27 B6I1066 B6I1103 (HOLD)
Marilyn Toole						



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ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page ____ of ____

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Saint John
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By: VF

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-09(0.6-1.2)	2016/08/18	12:00	Soil	5								X				X			X									* Poor Sample
2	16BH-09(1.2-1.8)	"	12:10	"	1																							X	recovery.
3	16BH-09(1.8-2.4)	"	12:20	"	1								X				X			X									Jars may not
4	16BH-09(2.4-3.0)	"	12:30	"	2																							X	be full.
5	16BH-09(3.0-3.6)	"	12:40	"	2								X				X			X									
6	16BH-09(3.6-4.2)	"	12:50	"	3																	X	X						
7	16BH-09(4.2-4.8)	"	13:00	"	2								X				X			X									
8	16BH-09(4.8-5.4)	"	13:10	"	2																							X	
9	16BH-09(5.4-6.0)	"	13:15	"	1								X				X			X									
10																													

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

2016 AUG 24 10:27

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Marilou Toole	2016/08/23	13:00	Kim Orme		
Marilou Toole					

MAXXAM JOB #
B6I1066
B6I1103 (HOLD)

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CHAIN OF CUSTODY RECORD

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Contact Name: Rob Flander
Address: Saint John, NB
Postal Code:
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Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID:
Site Location: 121811071.702
Site #: Fundy Quay
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECT

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	Intact	COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
						YES / [✓ NO]
						Integrity Checklist By: KB

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BA-12(0.6-1.2)	2016 ~~2016~~/08/19	8:30	Soil	5								X				X			X									* Poor sample
* 2	16BH-12(1.2-1.8)	"	8:40	"	1																							X	recovery.
* 3	16BH-12 (1.8-2.4)	"	9:00	"	1								X				X			X									Jars may
* 4	16BH-12 (2.4-3.0)	"	9:15	"	1																							X	not be fill.d
5	16BH-12 (3.0-3.6)	"	9:30	"	1								X				X			X									
6	16BH-12 (3.6-4.2)	"	9:50	"	1																							X	
7	16BH-12 (4.2-4.8)	"	10:15	"	2								X				X			X									2016 AUG 24 10:27
8	16BH-12 (4.8-5.4)	"	10:45	"	2																							X	
9	16BH-12 (5.4-6.0)	"	11:00	"	3								X				X			X									Jar 3/3 opened
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2016/08/23	13:45	Kim Brae KIM BRAE			B6I1066 B6I1103 (HOLD)
Marilyn Toole						

Your Project #: 121811071.207
Site Location: FUNDY QUAY, SAINT JOHN
Your C.O.C. #: N/A

Attention:ROB FIANDER
Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/09/02
Report #: R4153071
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6I3560
Received: 2016/08/29, 09:13

Sample Matrix: Water
Samples Received: 17

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
TEH in Water (PIRI)	12	2016/08/31	2016/08/31	ATL SOP 00113	Atl. RBCA v3 m
TEH in Water (PIRI)	5	2016/08/31	2016/09/01	ATL SOP 00113	Atl. RBCA v3 m
VPH in Water (PIRI)	9	N/A	2016/09/01	ATL SOP 00118	Atl. RBCA v3 m
VPH in Water (PIRI)	8	N/A	2016/09/02	ATL SOP 00118	Atl. RBCA v3 m
ModTPH (T1) Calc. for Water	17	N/A	2016/09/02	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.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Project Manager
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CYV019	CYV019	CYV020	CYV021	CYV022	CYV023		
Sampling Date		2016/08/24	2016/08/24	2016/08/24	2016/08/24	2016/08/25	2016/08/25		
COC Number		N/A	N/A	N/A	N/A	N/A	N/A		
	UNITS	**MW6**	**MW6 Lab-Dup**	**13MW-7**	**16BH-03**	**16BH-04**	**16BH-05**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	4642196
Toluene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	4642196
Ethylbenzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	4642196
Total Xylenes	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	4642196
C6 - C10 (less BTEX)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4642196
>C10-C16 Hydrocarbons	mg/L	<0.05		<0.05	<0.05	<0.05	0.06	0.05	4641995
>C16-C21 Hydrocarbons	mg/L	<0.05		<0.05	<0.05	0.22	0.12	0.05	4641995
>C21-<C32 Hydrocarbons	mg/L	<0.1		<0.1	<0.1	0.2	0.1	0.1	4641995
Modified TPH (Tier1)	mg/L	<0.1		<0.1	<0.1	0.4	0.3	0.1	4638756
Reached Baseline at C32	mg/L	NA		NA	NA	Yes	Yes	N/A	4641995
Hydrocarbon Resemblance	mg/L	NA		NA	NA	COMMENT (1)	COMMENT (2)	N/A	4641995
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	102		94	104	100	101		4641995
n-Dotriacontane - Extractable	%	113		106	112	112	110		4641995
Isobutylbenzene - Volatile	%	100	101	99	101	100	99		4642196

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) One product in fuel / lube range.
(2) Unidentified compound(s) in fuel oil range. Unidentified compound(s) in lube oil range.

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CYV024	CYV024	CYV025	CYV026		CYV027		
Sampling Date		2016/08/25	2016/08/25	2016/08/25	2016/08/25		2016/08/25		
COC Number		N/A	N/A	N/A	N/A		N/A		
	UNITS	**16BH-06**	**16BH-06 Lab-Dup**	**16BH-07**	**16BH-10**	**QC Batch**	**16BH-11**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.001		<0.001	<0.001	4642196	<0.001	0.001	4642216
Toluene	mg/L	<0.001		<0.001	0.005	4642196	<0.001	0.001	4642216
Ethylbenzene	mg/L	<0.001		<0.001	<0.001	4642196	<0.001	0.001	4642216
Total Xylenes	mg/L	<0.002		<0.002	<0.002	4642196	<0.002	0.002	4642216
C6 - C10 (less BTEX)	mg/L	<0.01		<0.01	<0.01	4642196	<0.01	0.01	4642216
>C10-C16 Hydrocarbons	mg/L	<0.05	<0.05	<0.05	0.27	4641995	0.06	0.05	4641995
>C16-C21 Hydrocarbons	mg/L	0.12	0.09	0.17	0.20	4641995	0.40	0.05	4641995
>C21-<C32 Hydrocarbons	mg/L	<0.1	<0.1	<0.1	0.1	4641995	0.2	0.1	4641995
Modified TPH (Tier1)	mg/L	0.1		0.2	0.6	4638756	0.7	0.1	4638756
Reached Baseline at C32	mg/L	Yes		Yes	Yes	4641995	Yes	N/A	4641995
Hydrocarbon Resemblance	mg/L	COMMENT (1)		COMMENT (1)	COMMENT (2)	4641995	COMMENT (3)	N/A	4641995
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	104	92	107	109	4641995	105		4641995
n-Dotriacontane - Extractable	%	116	99	120	121	4641995	112		4641995
Isobutylbenzene - Volatile	%	100		101	101	4642196	94		4642216

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Unidentified compound(s) in fuel oil range.
(2) Unidentified compound(s) in fuel oil range. Unidentified compound(s) in lube oil range.

(3) Unidentified compound(s) in fuel / lube range.

Maxxam Job #: B6I3560
Report Date: 2016/09/02

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY, SAINT JOHN
Sampler Initials: DB

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CYV027	CYV028	CYV029	CYV030	CYV031	CYV032		
Sampling Date		2016/08/25	2016/08/25	2016/08/25	2016/08/25	2016/08/25	2016/08/25		
COC Number		N/A	N/A	N/A	N/A	N/A	N/A		
	UNITS	**16BH-11 Lab-Dup**	**16BH-12**	**16BH-13**	**16BH-14**	**13MW-1**	**13MW-2**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	4642216
Toluene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	4642216
Ethylbenzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	4642216
Total Xylenes	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	4642216
C6 - C10 (less BTEX)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	4642216
>C10-C16 Hydrocarbons	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	0.05	4641995
>C16-C21 Hydrocarbons	mg/L		0.11	<0.05	<0.05	<0.05	<0.05	0.05	4641995
>C21-<C32 Hydrocarbons	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4641995
Modified TPH (Tier1)	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	0.1	4638756
Reached Baseline at C32	mg/L		Yes	NA	NA	NA	NA	N/A	4641995
Hydrocarbon Resemblance	mg/L		COMMENT (1)	NA	NA	NA	NA	N/A	4641995
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%		104	102	105	102	104		4641995
n-Dotriacontane - Extractable	%		112	109	112	113	114 (2)		4641995
Isobutylbenzene - Volatile	%	83	94	96	91	90	101		4642216

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Unidentified compound(s) in fuel oil range.
(2) TEH sample contained sediment.

Maxxam Job #: B6I3560
Report Date: 2016/09/02

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY, SAINT JOHN
Sampler Initials: DB

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		CYV033	CYV034	CYV035		
Sampling Date		2016/08/25	2016/08/25	2016/08/25		
COC Number		N/A	N/A	N/A		
	UNITS	**13MW-5**	**13MW-6**	**13MW-9**	**RDL**	**QC Batch**
Petroleum Hydrocarbons						
Benzene	mg/L	<0.001	<0.001	<0.001	0.001	4642216
Toluene	mg/L	<0.001	<0.001	<0.001	0.001	4642216
Ethylbenzene	mg/L	<0.001	<0.001	<0.001	0.001	4642216
Total Xylenes	mg/L	<0.002	<0.002	<0.002	0.002	4642216
C6 - C10 (less BTEX)	mg/L	<0.01	<0.01	<0.01	0.01	4642216
>C10-C16 Hydrocarbons	mg/L	<0.05	<0.05	<0.05	0.05	4641995
>C16-C21 Hydrocarbons	mg/L	0.07	<0.05	0.06	0.05	4641995
>C21-<C32 Hydrocarbons	mg/L	0.2	<0.1	<0.1	0.1	4641995
Modified TPH (Tier1)	mg/L	0.3	<0.1	<0.1	0.1	4638756
Reached Baseline at C32	mg/L	Yes	NA	NA	N/A	4641995
Hydrocarbon Resemblance	mg/L	COMMENT (1)	NA	NA	N/A	4641995
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	97	103	105		4641995
n-Dotriacontane - Extractable	%	103 (2)	113	113		4641995
Isobutylbenzene - Volatile	%	72	74	86		4642216

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Lube oil fraction.
(2) TEH sample contained sediment.

Maxxam Job #: B6I3560
Report Date: 2016/09/02

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY, SAINT JOHN
Sampler Initials: DB

GENERAL COMMENTS

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4641995	Isobutylbenzene - Extractable	2016/08/31	115	30 - 130	101	30 - 130	95	%		
4641995	n-Dotriacontane - Extractable	2016/08/31	116	30 - 130	114	30 - 130	120	%		
4642196	Isobutylbenzene - Volatile	2016/09/01	100	70 - 130	102	70 - 130	103	%		
4642216	Isobutylbenzene - Volatile	2016/09/01	98	70 - 130	94	70 - 130	86	%		
4641995	>C10-C16 Hydrocarbons	2016/08/31	106	70 - 130	100	70 - 130	<0.05	mg/L	NC	40
4641995	>C16-C21 Hydrocarbons	2016/08/31	100	70 - 130	96	70 - 130	<0.05	mg/L	NC	40
4641995	>C21-<C32 Hydrocarbons	2016/08/31	114	70 - 130	117	70 - 130	<0.1	mg/L	NC	40
4642196	Benzene	2016/09/01	118	70 - 130	107	70 - 130	<0.001	mg/L	NC	40
4642196	C6 - C10 (less BTEX)	2016/09/01					<0.01	mg/L	NC	40
4642196	Ethylbenzene	2016/09/01	114	70 - 130	105	70 - 130	<0.001	mg/L	NC	40
4642196	Toluene	2016/09/01	113	70 - 130	105	70 - 130	<0.001	mg/L	NC	40
4642196	Total Xylenes	2016/09/01	113	70 - 130	106	70 - 130	<0.002	mg/L	NC	40
4642216	Benzene	2016/09/02	120	70 - 130	108	70 - 130	<0.001	mg/L	NC	40
4642216	C6 - C10 (less BTEX)	2016/09/02					<0.01	mg/L	NC	40
4642216	Ethylbenzene	2016/09/02	115	70 - 130	105	70 - 130	<0.001	mg/L	NC	40
4642216	Toluene	2016/09/02	117	70 - 130	107	70 - 130	<0.001	mg/L	NC	40
4642216	Total Xylenes	2016/09/02	114	70 - 130	107	70 - 130	<0.002	mg/L	NC	40

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

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

Spiked Blank: A blank matrix 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).

Maxxam Job #: B6I3560
Report Date: 2016/09/02

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY, SAINT JOHN
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

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

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

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

Maxxam
A Bureau Veritas Group Company

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465 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / Revision 18

CHAIN OF CUSTODY RECORD

COC #:

Page 1 2

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John NB
Postal Code:
Phone 506-634-2185 Fax: 506-634-8104
Email: rob.fiander@stantec.com

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #: Stantec standing offer
P.O. #/ AFE#: 121811071.207
Project ID: 121811071.207
Site Location: Saint John
Site #: Fundy Quay
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☒ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be applied)

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	CUSTODY SEAL Y / N Intact	COOLER TEMPERATURES			AVERAGE TEMP

INTEGRITY
YES / [✓ NO]
Integrity Checklist By: AW

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

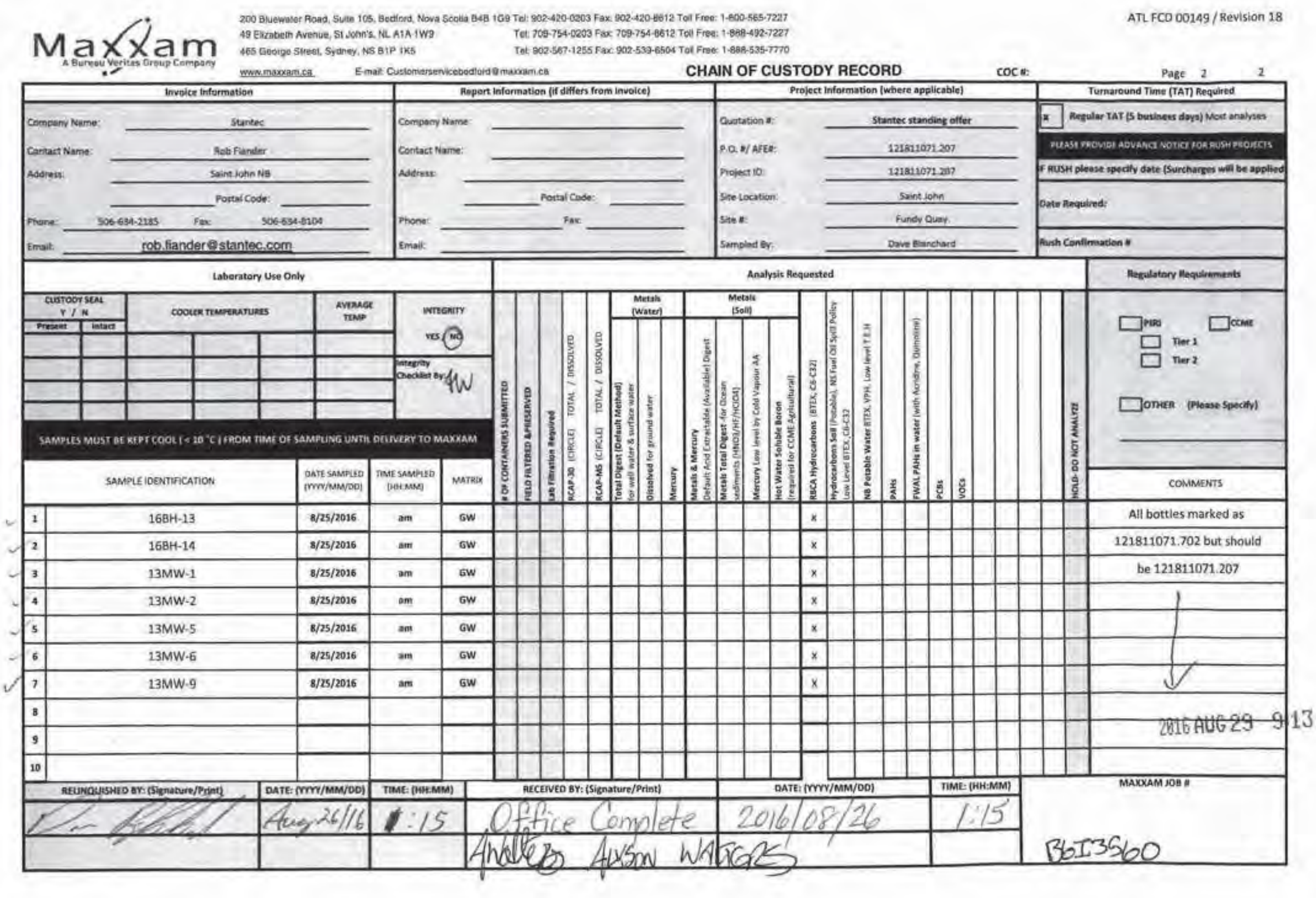
☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	MW6	8/24/2016	pm	GW													x												All bottles marked as
2	13MW-7	8/24/2016	pm	GW													x												121811071.702 but should
3	16BH-03	8/24/2016	pm	GW													x												be 121811071.207
4	16BH-04	8/25/2016	am	GW													x												
5	16BH-05	8/25/2016	am	GW													x												
6	16BH-06	8/25/2016	am	GW													x												
7	16BH-07	8/25/2016	am	GW													x												
8	16BH-10	8/25/2016	am	GW													x												
9	16BH-11	8/25/2016	am	GW													x												
10	16BH-12	8/25/2016	am	GW													x												

2016 AUG 29 9:13

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Dave Blanchard	Aug 26/16	1:15	Office Complete	2016/08/26	1:15	
			ANSON WALTERS			B6I3560



Maxxam
A Bureau Veritas Group Company

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ATL FCD 00149 / Revision 18

CHAIN OF CUSTODY RECORD

COC #:

Page 2 2

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John NB
Postal Code:
Phone: 506-634-2185 Fax: 506-634-8104
Email: rob.fiander@stantec.com

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Project Information (where applicable)

Quotation #: Stantec standing offer
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Project ID: 121811071.207
Site Location: Saint John
Site #: Fundy Quay
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☒ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be applied)

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By: AW

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED & PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-13	8/25/2016	am	GW													x												All bottles marked as
2	16BH-14	8/25/2016	am	GW													x												121811071.702 but should
3	13MW-1	8/25/2016	am	GW													x												be 121811071.207
4	13MW-2	8/25/2016	am	GW													x												
5	13MW-5	8/25/2016	am	GW													x												
6	13MW-6	8/25/2016	am	GW													x												
7	13MW-9	8/25/2016	am	GW													x												
8																													2016 AUG 29 9:13
9																													
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
	Aug 26/16	[illegible]:15	Office Complete	2016/08/26	1:15	B6I3560
			ALISON WALTERS			

Your Project #: 121811071.201
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER
Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/11/08
Report #: R4239589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6N5007
Received: 2016/10/28, 16:26

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	2	2016/11/04	2016/11/07	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	2	N/A	2016/11/04	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	2	N/A	2016/11/04	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
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.

Your Project #: 121811071.201
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2016/11/08
Report #: R4239589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6N5007
Received: 2016/10/28, 16:26

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Key Account Specialist
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2

Maxxam Job #: B6N5007
Report Date: 2016/11/08

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

RESULTS OF ANALYSES OF SOIL

Maxxam ID		DIV113	DIV114	
Sampling Date		2016/08/17 12:10	2016/08/17 15:10	
COC Number		N/A	N/A	
	UNITS	**16BH-10 (2.4-3.0) (P#CXQ787)**	**16BH-11 (1.8-2.4) (P#CXQ792)**	**QC Batch**
Inorganics				
Sample Weight (as received)	g	100	100	4731751
Initial pH	N/A	5.0	4.9	4731761
Final pH	N/A	5.4	5.3	4731761
QC Batch = Quality Control Batch				

Maxxam Job #: B6N5007
Report Date: 2016/11/08

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

ELEMENTS BY ICP/MS (SOIL)

Maxxam ID		DIV113		DIV114		
Sampling Date		2016/08/17 12:10		2016/08/17 15:10		
COC Number		N/A		N/A		
	UNITS	**16BH-10 (2.4-3.0) (P#CXQ787)**	**RDL**	**16BH-11 (1.8-2.4) (P#CXQ792)**	**RDL**	**QC Batch**
Metals						
Leachable Aluminum (Al)	mg/L	0.3	0.1	0.4	0.1	4733486
Leachable Antimony (Sb)	mg/L	<0.02	0.02	0.04	0.02	4733486
Leachable Arsenic (As)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Barium (Ba)	mg/L	0.33	0.05	0.15	0.05	4733486
Leachable Beryllium (Be)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Boron (B)	mg/L	<0.5	0.5	<0.5	0.5	4733486
Leachable Cadmium (Cd)	mg/L	0.007	0.003	0.14	0.003	4733486
Leachable Calcium (Ca)	mg/L	390	1	82	1	4733486
Leachable Chromium (Cr)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Cobalt (Co)	mg/L	0.05	0.01	0.02	0.01	4733486
Leachable Copper (Cu)	mg/L	1.9	0.02	160	0.2	4733486
Leachable Iron (Fe)	mg/L	<0.5	0.5	<0.5	0.5	4733486
Leachable Lead (Pb)	mg/L	2.5	0.005	33	0.005	4733486
Leachable Lithium (Li)	mg/L	0.02	0.02	<0.02	0.02	4733486
Leachable Magnesium (Mg)	mg/L	8	1	3	1	4733486
Leachable Manganese (Mn)	mg/L	1.5	0.02	4.0	0.02	4733486
Leachable Molybdenum (Mo)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Nickel (Ni)	mg/L	0.03	0.02	0.07	0.02	4733486
Leachable Potassium (K)	mg/L	6	1	3	1	4733486
Leachable Selenium (Se)	mg/L	<0.01	0.01	<0.01	0.01	4733486
Leachable Silver (Ag)	mg/L	<0.005	0.005	<0.005	0.005	4733486
Leachable Strontium (Sr)	mg/L	0.61	0.05	0.26	0.05	4733486
Leachable Thallium (Tl)	mg/L	<0.001	0.001	<0.001	0.001	4733486
Leachable Tin (Sn)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Uranium (U)	mg/L	0.001	0.001	0.007	0.001	4733486
Leachable Vanadium (V)	mg/L	<0.02	0.02	<0.02	0.02	4733486
Leachable Zinc (Zn)	mg/L	5.7	0.05	320	0.05	4733486

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

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

Package 1	7.0°C
Package 2	6.7°C
Package 3	6.7°C
Package 4	3.3°C

Results relate only to the items tested.

Maxxam Job #: B6N5007
Report Date: 2016/11/08

QUALITY ASSURANCE REPORT

Stantec Consulting Ltd
Client Project #: 121811071.201

Site Location: FUNDY QUAY
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4731751	Sample Weight (as received)	2016/11/04					NA	g		
4733486	Leachable Aluminum (Al)	2016/11/07			110	80 - 120	<0.1	mg/L	NC	35
4733486	Leachable Antimony (Sb)	2016/11/07	104	75 - 125	102	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Arsenic (As)	2016/11/07	98	75 - 125	99	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Barium (Ba)	2016/11/07	NC	75 - 125	99	80 - 120	<0.05	mg/L	13	35
4733486	Leachable Beryllium (Be)	2016/11/07	96	75 - 125	99	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Boron (B)	2016/11/07	94	75 - 125	100	80 - 120	<0.5	mg/L	NC	35
4733486	Leachable Cadmium (Cd)	2016/11/07	96	75 - 125	99	80 - 120	<0.003	mg/L	NC	35
4733486	Leachable Calcium (Ca)	2016/11/07			105	80 - 120	<1	mg/L	36 (1)	35
4733486	Leachable Chromium (Cr)	2016/11/07	94	75 - 125	99	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Cobalt (Co)	2016/11/07	93	75 - 125	100	80 - 120	<0.01	mg/L	NC	35
4733486	Leachable Copper (Cu)	2016/11/07	92	75 - 125	98	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Iron (Fe)	2016/11/07			104	80 - 120	<0.5	mg/L	NC	35
4733486	Leachable Lead (Pb)	2016/11/07	95	75 - 125	101	80 - 120	<0.005	mg/L	NC	35
4733486	Leachable Lithium (Li)	2016/11/07	101	75 - 125	105	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Magnesium (Mg)	2016/11/07			108	80 - 120	<1	mg/L	1.6	35
4733486	Leachable Manganese (Mn)	2016/11/07	NC	75 - 125	103	80 - 120	<0.02	mg/L	0.58	35
4733486	Leachable Molybdenum (Mo)	2016/11/07	103	75 - 125	103	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Nickel (Ni)	2016/11/07	92	75 - 125	100	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Potassium (K)	2016/11/07			111	80 - 120	<1	mg/L	NC	35
4733486	Leachable Selenium (Se)	2016/11/07	96	75 - 125	98	80 - 120	<0.01	mg/L	NC	35
4733486	Leachable Silver (Ag)	2016/11/07	95	75 - 125	98	80 - 120	<0.005	mg/L	NC	35
4733486	Leachable Strontium (Sr)	2016/11/07	98	75 - 125	105	80 - 120	<0.05	mg/L	24	35
4733486	Leachable Thallium (Tl)	2016/11/07	98	75 - 125	104	80 - 120	<0.001	mg/L	NC	35
4733486	Leachable Tin (Sn)	2016/11/07	104	75 - 125	105	80 - 120	<0.02	mg/L	NC	35
4733486	Leachable Uranium (U)	2016/11/07	103	75 - 125	107	80 - 120	<0.001	mg/L	NC	35
4733486	Leachable Vanadium (V)	2016/11/07	96	75 - 125	101	80 - 120	<0.02	mg/L	NC	35

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4733486	Leachable Zinc (Zn)	2016/11/07	95	75 - 125	100	80 - 120	<0.05	mg/L	NC	35

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.

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) Poor RPD due to sample inhomogeneity. < 10 % of compounds in multi-component analysis in violation.

Maxxam Job #: B6N5007
Report Date: 2016/11/08

Stantec Consulting Ltd
Client Project #: 121811071.201
Site Location: FUNDY QUAY
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

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

Kevin G. MacDonald

Kevin MacDonald, Inorganics Supervisor

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

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 5 of 6

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121810771.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N Present	CUSTODY SEAL Y / N Intact	COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
						[✓ YES] / NO
						Integrity Checklist By: 2016/08/20 NC

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

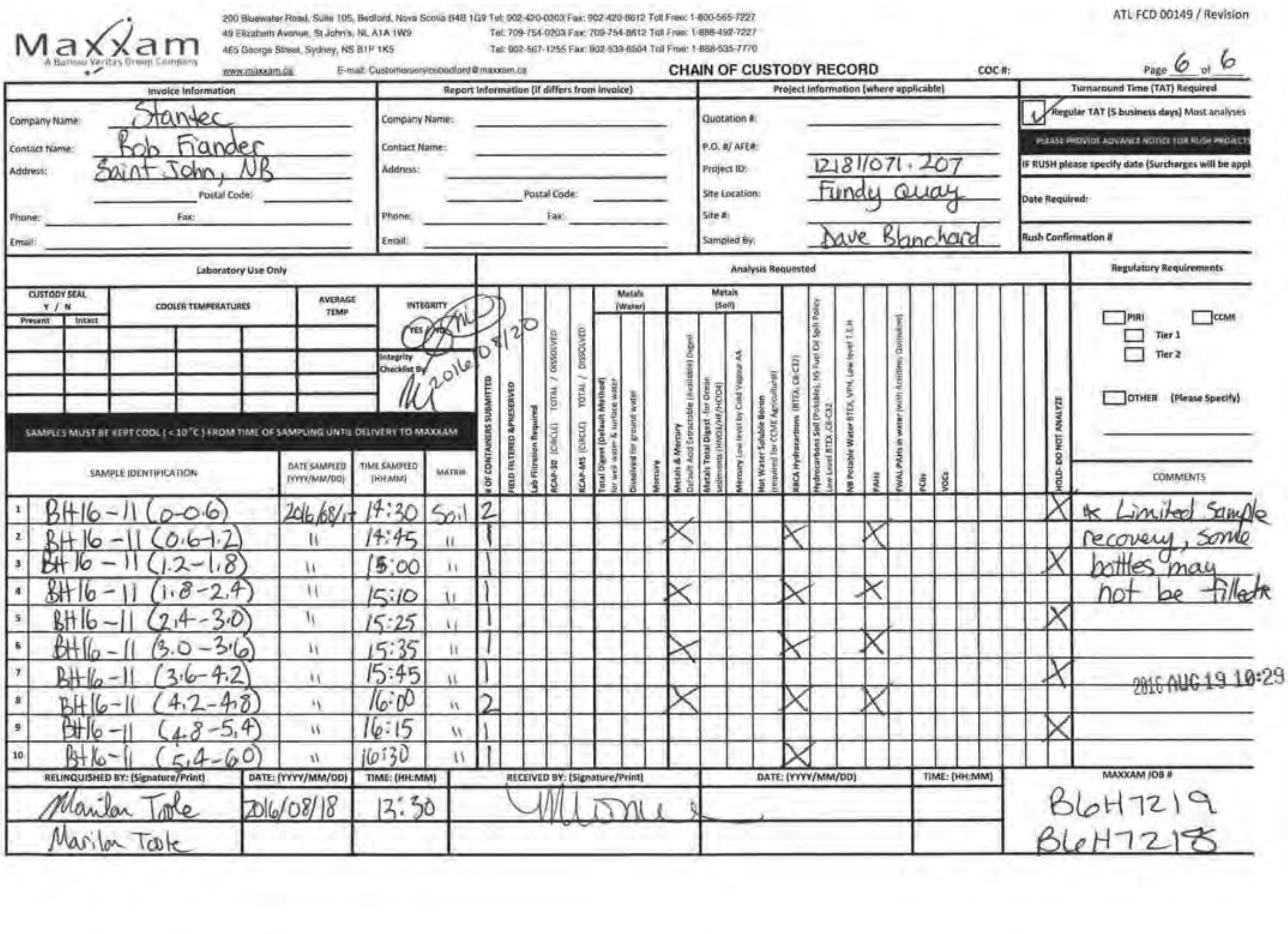
	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water) Total Digest (Default Method) for well water & surface water	Metals (Water) Dissolved for ground water	Metals (Water) Mercury	Metals (Soil) Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil) Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil) Mercury Low level by Cold Vapour AA	Metals (Soil) Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level TEH	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	BH16-10 (0-0.6)	2016/08/17	11:30	Soil	5								X				X			X									* Limited Sample
2	BH16-10 (0.6-1.2)	"	11:40	"	2																							X	recovery
3	BH16-10 (1.2-1.8)	"	11:50	"	2								X				X			X		X	X						some bottles
4	BH16-10 (1.8-2.4)	"	12:00	"	1																							X	may not be
5	BH16-10 (2.4-3.0)	"	12:10	"	2								X				X			X									filled. *
6	BH16-10 (3.0-3.6)	"	12:25	"	2																							X	* jar 2/2 was opened
7	BH16-10 (3.6-4.2)	"	12:39	"	1								X				X			X									*
8	BH16-10 (4.2-4.8)	"	12:50	"	1																								*
9	BH16-10 (4.8-5.4)	"	13:00	"	2								X				X			X									* 2016 AUG 19 10:28
10	BH16-10 (5.4-6.0)	"	13:15	"	2												X												*

Regulatory Requirements

☐ PIIRI ☐ CCME
☐ Tier 1
☐ Tier 2

☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2016/08/18	13:30				B6H7219
Marilyn Toole						B6H7218



Maxxam
A Bureau Veritas Group Company

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ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page 6 of 6

Invoice Information

Company Name: Stantec
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Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.207
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
IF RUSH please specify date (Surcharges will be appl
Date Required:
Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					[✓ YES] / NO
						Integrity Checklist By 2016/08/20

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water)			Metals (Soil)				RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
										Total Digest (Default Method) for well water & surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Hot Water Soluble Boron (required for CCME Agricultural)													
1	BH16-11 (0-0.6)	2016/08/17	14:30	Soil	2																							X	* Limited Sample
2	BH16-11 (0.6-1.2)	11	14:45	11	1								X				X			X									recovery, some
3	BH16-11 (1.2-1.8)	11	15:00	11	1																							X	bottles may
4	BH16-11 (1.8-2.4)	11	15:10	11	1								X				X			X									not be filled
5	BH16-11 (2.4-3.0)	11	15:25	11	1																							X	
6	BH16-11 (3.0-3.6)	11	15:35	11	1								X				X			X									
7	BH16-11 (3.6-4.2)	11	15:45	11	1																							X	2016 AUG 19 10:29
8	BH16-11 (4.2-4.8)	11	16:00	11	2								X				X			X									
9	BH16-11 (4.8-5.4)	11	16:15	11	1																							X	
10	BH16-11 (5.4-6.0)	11	16:30	11	1												X												

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilou Toole	2016/08/18	13:30				B6H7219
Marilou Toole						B6H7218

Your Project #: 121811071.207
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2017/01/18
Report #: R4328851
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B707819
Received: 2017/01/13, 13:00

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	2	2017/01/17	2017/01/17	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	2	N/A	2017/01/17	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	2	N/A	2017/01/17	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
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.

Your Project #: 121811071.207
Site Location: FUNDY QUAY
Your C.O.C. #: N/A

Attention:ROB FIANDER

Stantec Consulting Ltd
130 Somerset
Saint John, NB
E2K 2X4

Report Date: 2017/01/18
Report #: R4328851
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B707819
Received: 2017/01/13, 13:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marie Muise, Key Account Specialist
Email: MMuise@maxxam.ca
Phone# (902)420-0203 Ext:253
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

ATLANTIC TCLP LEACHATE + LEAD (SOIL)

Maxxam ID		DTE351	DTE351	DTE353		
Sampling Date		2016/08/22 09:15	2016/08/22 09:15	2016/08/18 14:50		
COC Number		N/A	N/A	N/A		
	UNITS	**16BH-06 (0.6-1.2) (P#DIX904)**	**16BH-06 (0.6-1.2) (P#DIX904) Lab-Dup**	**16BH-08 (1.8-2.4) (P#DIX738)**	**RDL**	**QC Batch**
Inorganics						
Sample Weight (as received)	g	100	100	96	N/A	4825952
Initial pH	N/A	4.9	4.9	4.9		4825948
Final pH	N/A	5.5	5.3	5.2		4825948
Metals						
Leachable Lead (Pb)	mg/L	0.012	0.14 (1)	2.9	0.005	4827366

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Poor RPD due to sample inhomogeneity. Insufficient sample for repeat extraction.

GENERAL COMMENTS

Sample DTE353 [16BH-08 (1.8-2.4) (P#DIX738)] : Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Results relate only to the items tested.

Maxxam Job #: B707819
Report Date: 2017/01/18

QUALITY ASSURANCE REPORT

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
4825952	Sample Weight (as received)	2017/01/17					NA	g	0.027	N/A
4827366	Leachable Lead (Pb)	2017/01/17	96	75 - 125	97	80 - 120	<0.005	mg/L	NC (1)	35

N/A = Not Applicable

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

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

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

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

NC (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) Poor RPD due to sample inhomogeneity. Insufficient sample for repeat extraction.

Maxxam Job #: B707819
Report Date: 2017/01/18

Stantec Consulting Ltd
Client Project #: 121811071.207
Site Location: FUNDY QUAY
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

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

Mike Mac Gill

Mike MacGillivray, Scientific Specialist (Inorganics)

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

Maxxam
A Bureau Veritas Group Company

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49 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / Revision

CHAIN OF CUSTODY RECORD

COC #:

Page ____ of ____

Invoice Information

Company Name: Stantec
Contact Name: Rob Fiander
Address: Saint John, NB
Postal Code:
Phone: Fax:
Email:

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Postal Code:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP
Present	Intact				

INTEGRITY YES / [✓ NO]

Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	RCAP-30 (CIRCLE) TOTAL / DISSOLVED	RCAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water)			Metals (Soil)																	
										Total Digest (Default Method) for well water & surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Hot Water Soluble Boron (required for CCME Agricultural)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
1	16BH-08 (0-0.6)	2016/08/18	14:15	Soil	5								☒				☒			☒									* Limited
2	16BH-08 (0.6-1.2)	"	14:25	"	1												☒												Sample recovery.
3	16BH-08 (1.2-1.8)	"	14:40	"	1																							☒	Jars may not
4	16BH-08 (1.8-2.4)	"	14:50	"	1								☒				☒			☒									be full.
5	16BH-08 (2.4-3.0)	"	15:00	"	5												☒												
6	16BH-08 (3.0-3.6)	"	15:15	"	1								☒				☒			☒									
7	16BH-08 (3.6-4.2)	"	15:30	"	5																							☒	Jar 3/5 opened in office
8	16BH-08 (4.2-4.8)	"	15:40	"	2								☒				☒			☒									
9	16BH-08 (4.8-5.4)	"	15:50	"	5																							☒	
10	16BH-08 (5.4-6.0)	"	16:00	"	1												☒			☒									

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Marilyn Toole	2018/08/22	13:00	Kim Brace	2016/08/23	10:31	B6I0652 B6I0653 (HOLD)
Marilyn Toole						

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ATL FCD 00149 / Revision

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Project Information (where applicable)

Quotation #:
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Project ID: 121811071.702
Site Location: Fundy Quay
Site #:
Sampled By: Dave Blanchard

Turnaround Time (TAT) Required

☑ Regular TAT (5 business days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

IF RUSH please specify date (Surcharges will be appl

Date Required:

Rush Confirmation #

Laboratory Use Only

CUSTODY SEAL Y / N		COOLER TEMPERATURES			AVERAGE TEMP	INTEGRITY
Present	Intact					YES / [✓ NO]
						Integrity Checklist By:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	Lab Filtration Required	ICAP-30 (CIRCLE) TOTAL / DISSOLVED	ICAP-MS (CIRCLE) TOTAL / DISSOLVED	Metals (Water)			Metals (Soil)				RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H.	PAHs	FWAL PAHs in water (with Acridine, Quinoline)	PCBs	VOCs					HOLD- DO NOT ANALYZE	COMMENTS
										Total Digest (Default Method) for well water & surface water	Dissolved for ground water	Mercury	Metals & Mercury Default Acid Extractable (Available) Digest	Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Mercury Low level by Cold Vapour AA	Hot Water Soluble Boron (required for CCME Agricultural)													
1	16BH-05(0-0.6)	2016/08/19	13:30	Soil	5								X				X			X									* Poor sample
2	16 BH-05(0.6-1.2)	"	13:45	"	1												X												recovery.
* 3	16 BH-05(1.2-1.8)	"	14:25	"	1																							X	Jars may
4	16 BH-05(1.8-2.4)	"	14:45	"	2								X				X			X									not be full.
5	16 BH-05(3.0-3.6)	"	15:00	"	1								X				X			X									
6																													Jar 2/2 opened
7																													
8																													
9																													
10																													

Regulatory Requirements

☐ PIRI ☐ CCME
☐ Tier 1
☐ Tier 2
☐ OTHER (Please Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Marilou Toole	2016/08/23	13:00	Brw KIMBRACE		
Marilou Toole					

MAXXAM JOB #
2016 AUG 24 10:27
B6I1066
B6I1103 (HOLD)

January 20, 2017

Appendix F

Preliminary 3D Visualization and Quantity Take Off

Excavated soil volumes

Below are the preliminary excavated soil volumes classified by concentration. The approximate area of proposed buildings excavations for Area #2, Area #3 and Area #4 used for the calculations is shown on Drawing 1 and 2 in Appendix B. An excavation depth of 3.3 mbgs was used for the calculations as described in the Draft Remediation Plan (December, 2015). Excavation volumes will need to be revisited as design information for the redevelopment project becomes available.

Arsenic	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<12	13466
12 to <17	7342
17 to <26	5042
26 to <31	1189
>=31	2298

BaP-TPE	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<5.3	29093
5.3 to <15.9	244
15.9 to <100	0
>=100	0

Benzo(a)pyrene	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<0.7	29337
0.7 to <20	0
20 to <72	0
>=72	0

Lead	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<140	14535
140 to <260	4322
260 to <300	1028
300 to <600	4629
>=600	4823

Vanadium	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<39	10661
39 to <130	18046
130 to <160	105
>=160	105

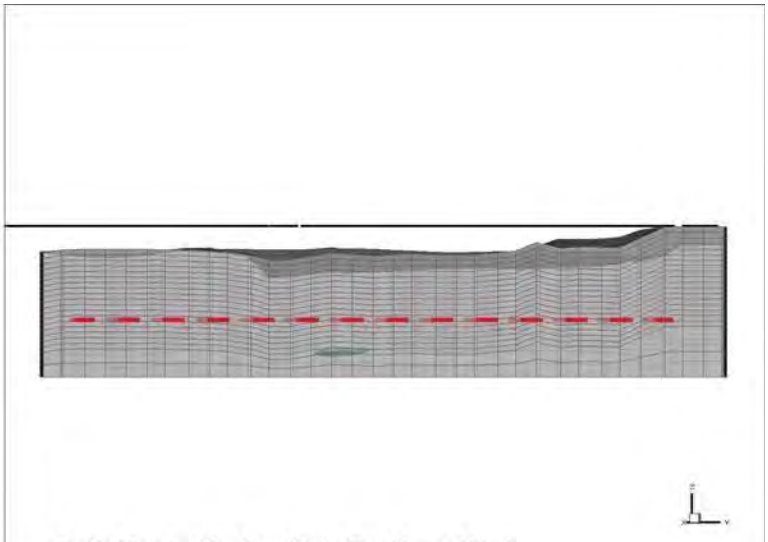
Antimony	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<7.5	26772
7.5 to <20	2100
20 to <40	405
40 to <63	60
>=63	0

Benzene	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<0.099	29337
0.099 to <2.5	0
2.5 to <5	0
5 to <10	0
>=10	0

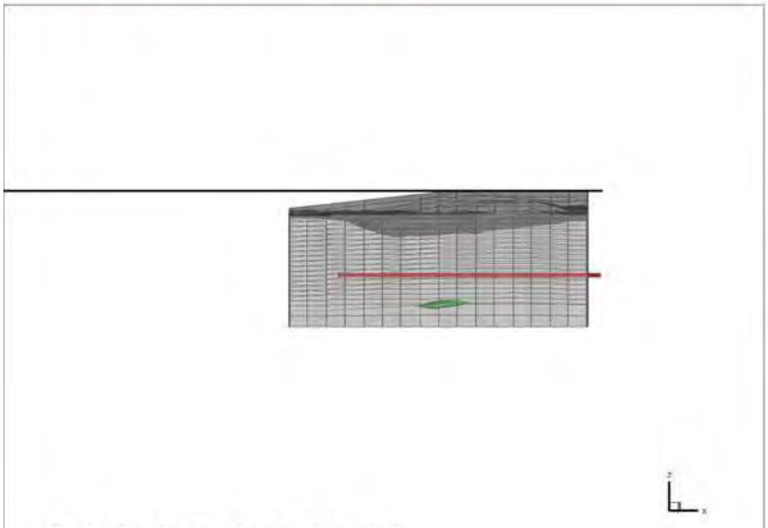
Copper	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<63	12617
63 to <91	5094
91 to <1100	10831
1100 to <4000	690
>=4000	105

Modified TPH	
Concentration Bin (mg/kg)	**Soil Volume (m^3)**
<74	6949
74 to <270	11135
270 to <870	9642
870 to <1100	908
1100 to <4000	703
4000 to <10000	0
>=10000	0

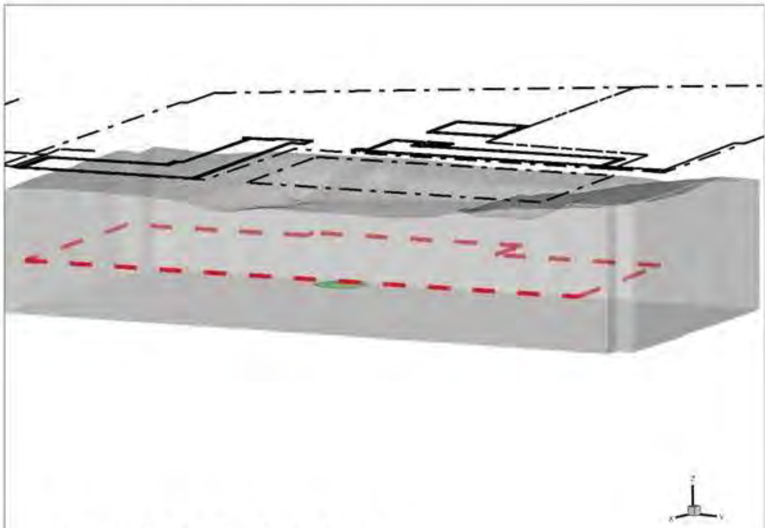
Plan View



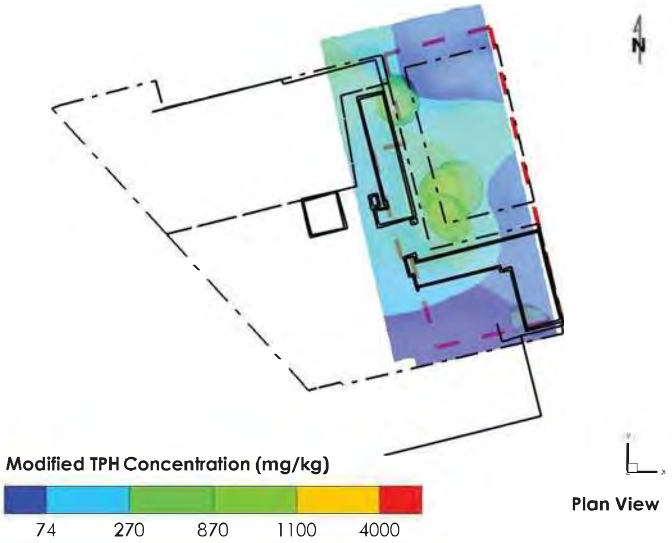
Profile View Looking from Water Street toward West



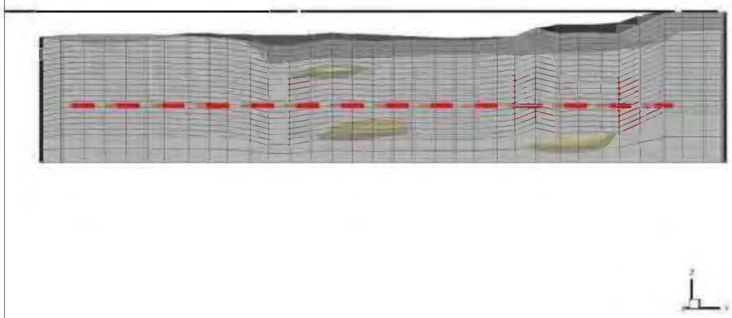
Profile View Looking from South to North



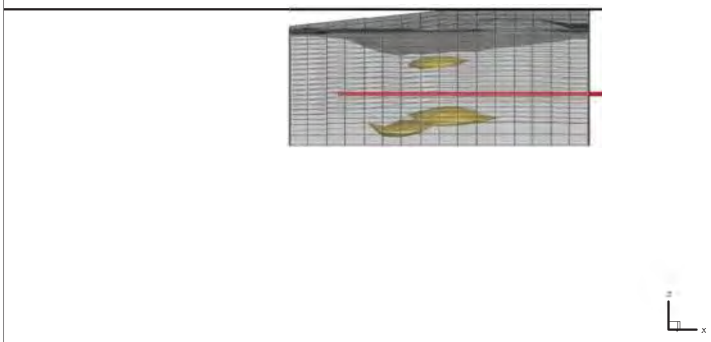
Perspective View from Water Street



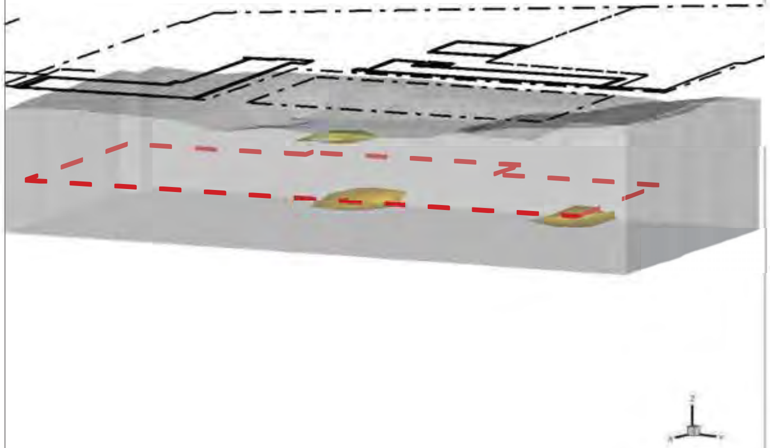
Plan View



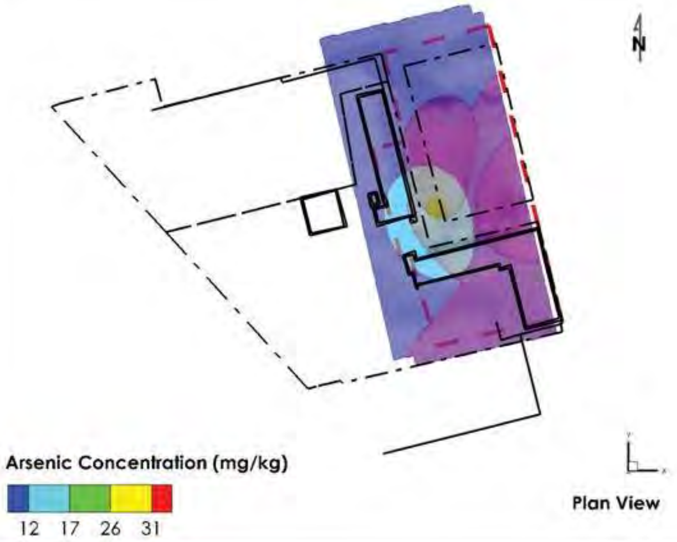
Profile View Looking from Water Street toward West



Profile View Looking from South to North



Perspective View from Water Street



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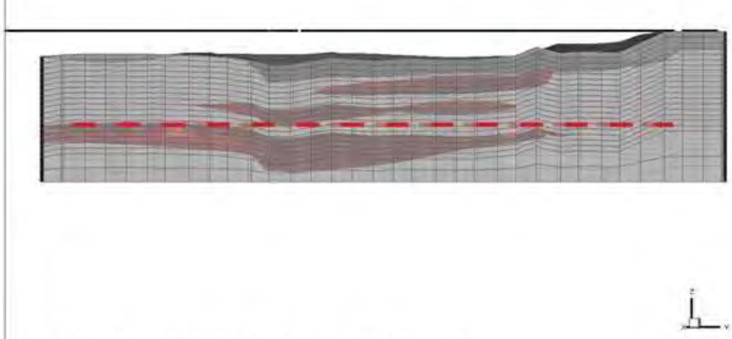
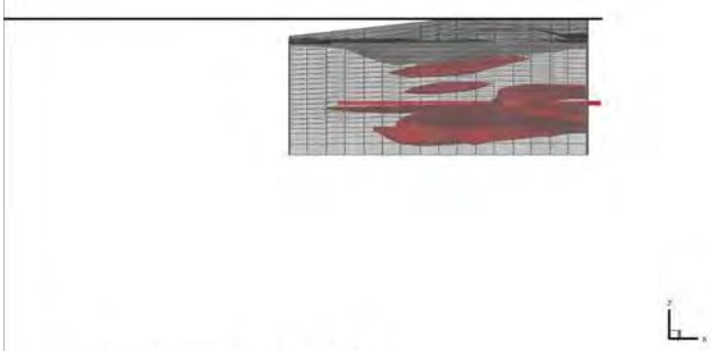
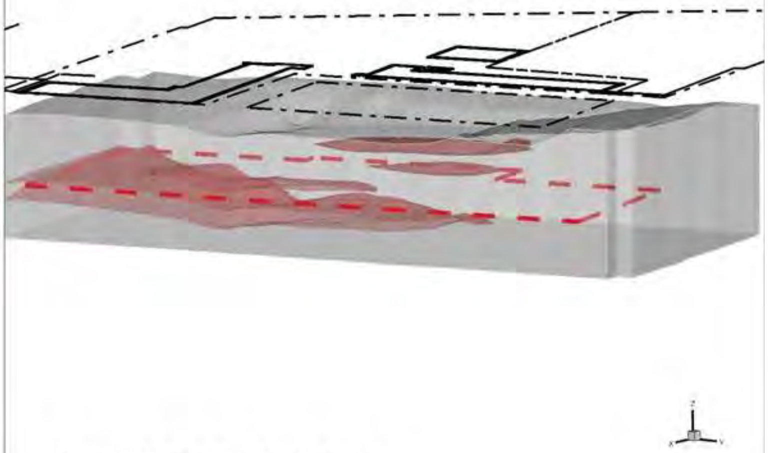


Profile View Looking from Water Street toward West

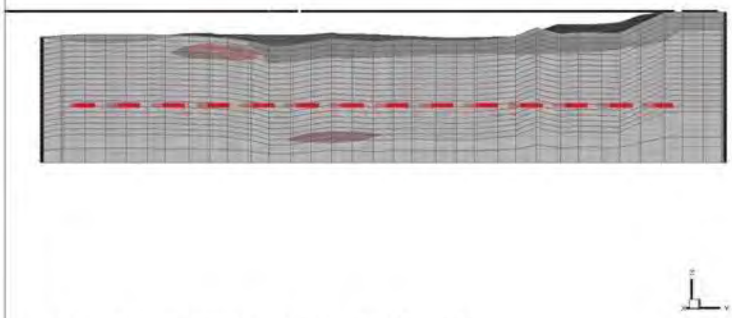


Profile View Looking from South to North



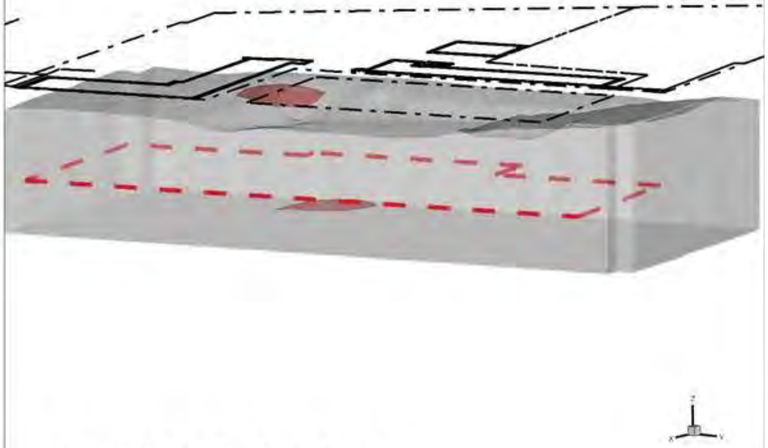
Perspective View from Water Street

Plan View

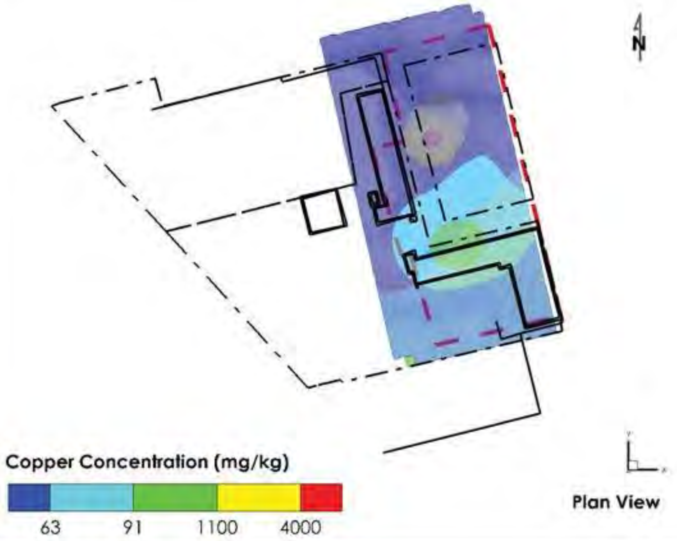


Profile View Looking from Water Street toward West

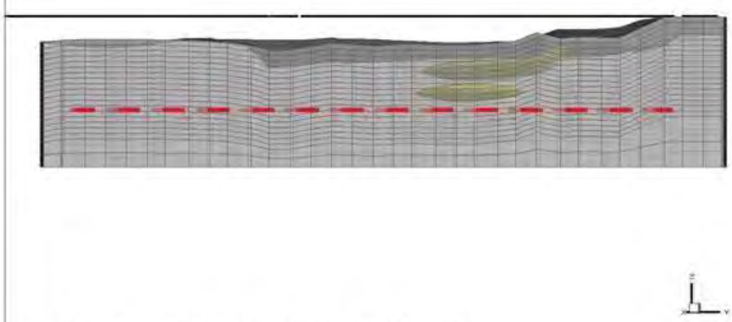
Profile View Looking from South to North



Perspective View from Water Street



Plan View



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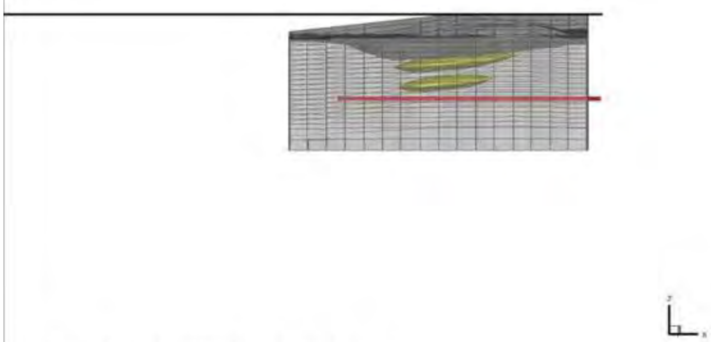
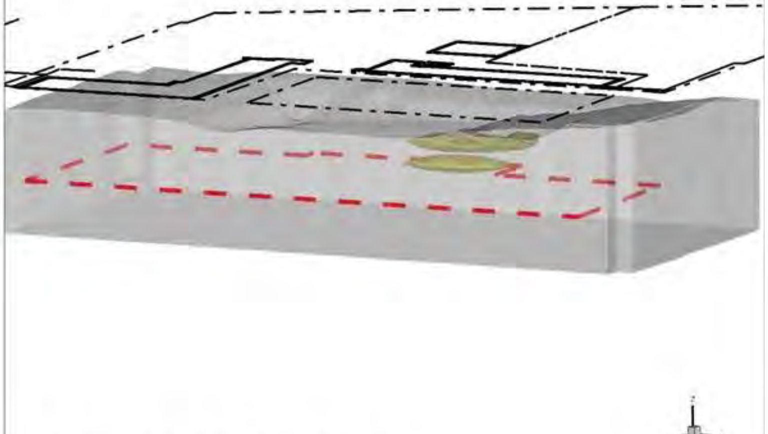
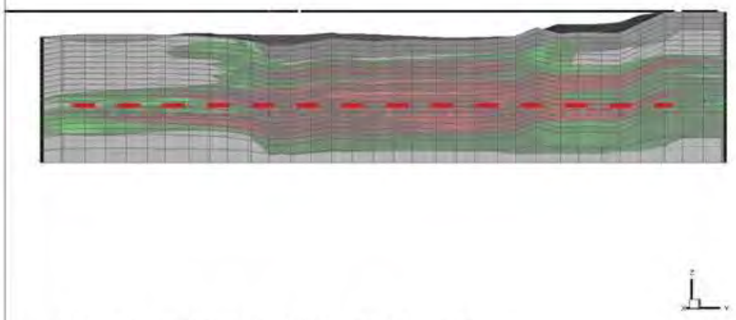


Profile View Looking from South to North



Perspective View from Water Street

Plan View



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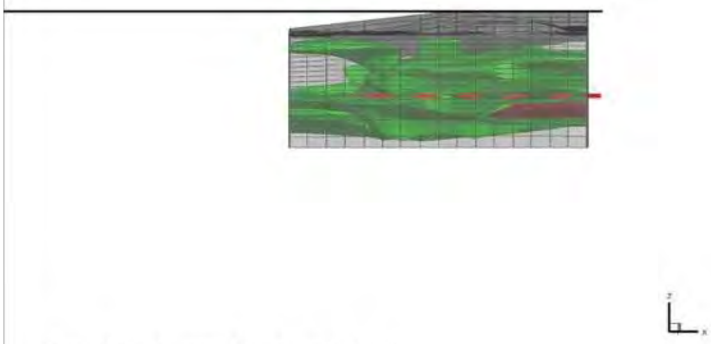

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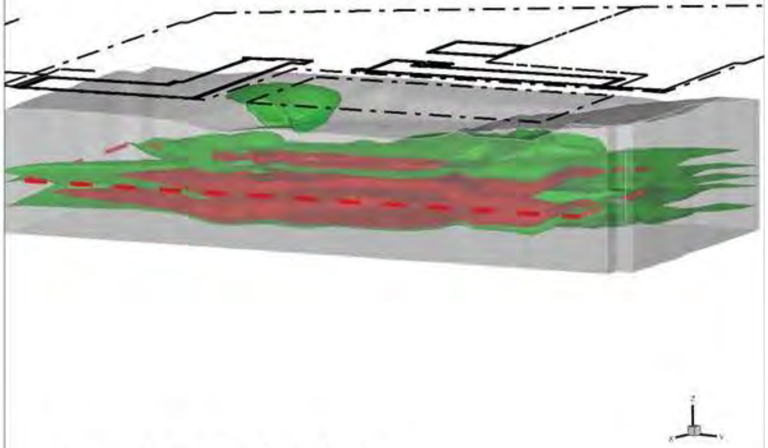

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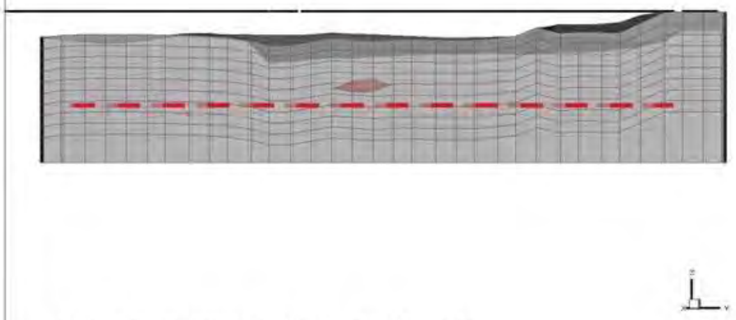

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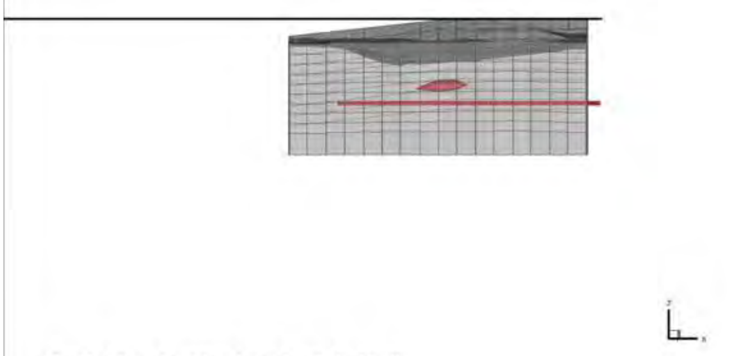

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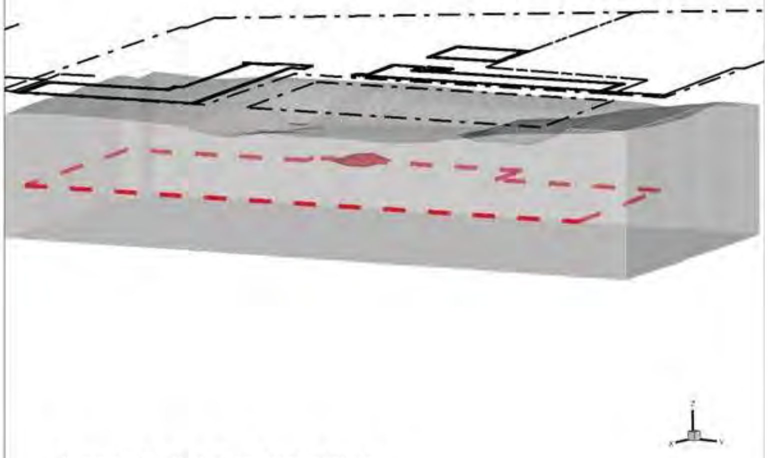

Perspective View from Water Street

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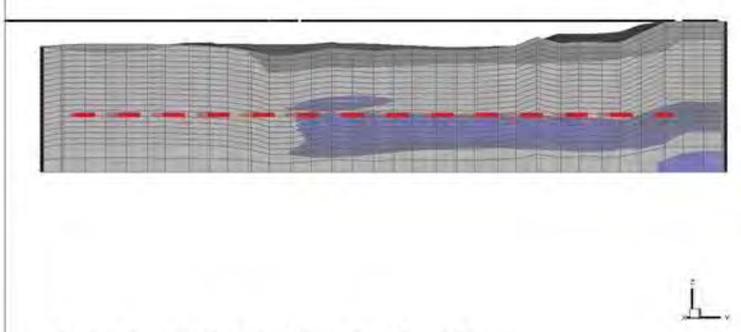

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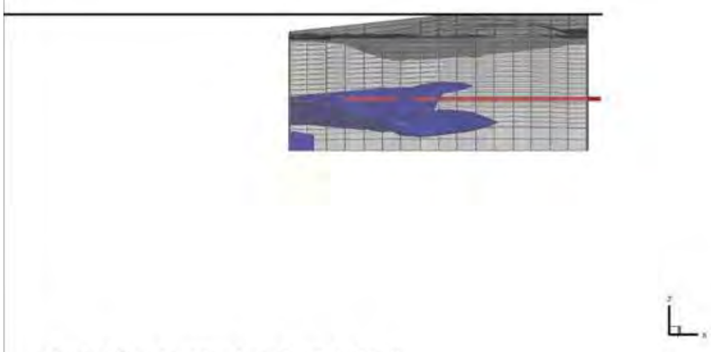

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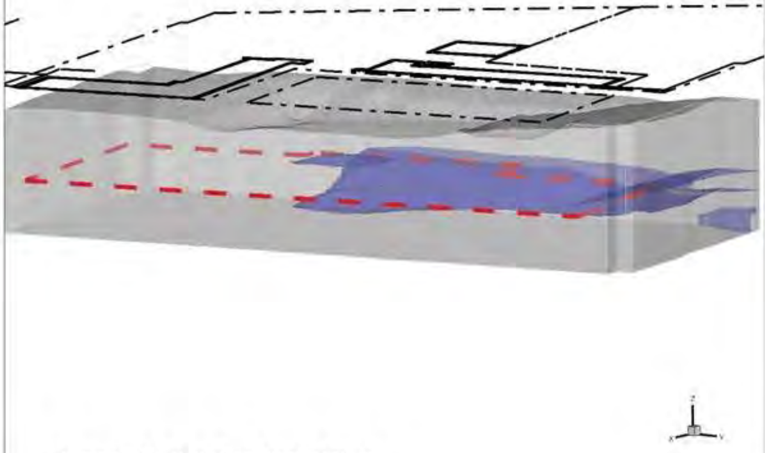

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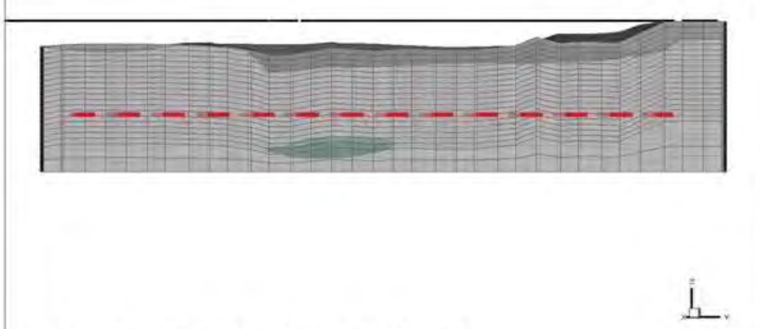
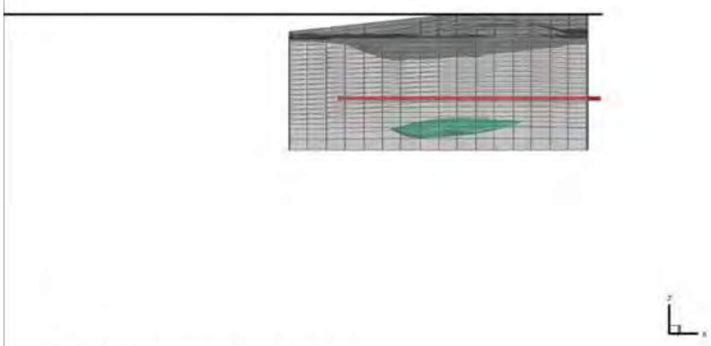
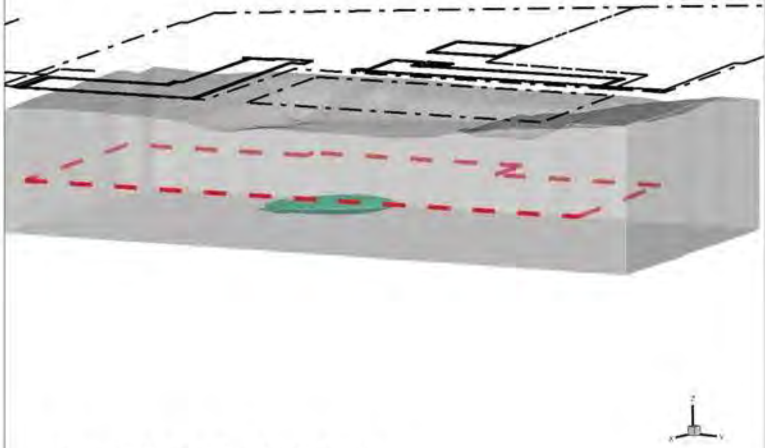
Plan View



Profile View Looking from Water Street toward West



Profile View Looking from South to North



Perspective View from Water Street