



Long Term Monitoring, 2011 Cape Christian, Nunavut

FINAL REPORT

Prepared for:

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EXECUTIVE SUMMARY

FRANZ Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada (AANDC) to conduct the first of eight long-term monitoring events planned at the former Long Range Navigation (LORAN) communication station, Cape Christian. Monitoring of the site is to be delivered in three phases over the next 25 years, as prescribed by AANDC's Cape Christian Long-Term Monitoring Plan. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01, file number 1632-11/01-11-6001/5.

The Cape Christian site is situated on a lowland costal bluff located on the northeast coast of Baffin Island about 16 km northeast of the Hamlet of Clyde River, Nunavut. The site was a former US Coast Guard Long Range Navigation communication station constructed and operated between 1954 and 1974 when it was abandoned. A remediation project led by AANDC was conducted between 2008 and 2011. Hazardous wastes were removed from the site, buildings were demolished and, site debris was collected. All non hazardous debris, demolition waste and contaminated soils were placed in a non-hazardous waste landfill (NHWL) constructed on-site.

Monitoring efforts were conducted on August 24, 2011 while based out of Clyde River. The landfill monitoring program consisted of a visual inspection of the NHWL. In addition, the natural environment was monitored; physical evidence and anecdotal evidence and information suggest that wildlife and local hunters continue to frequent this site, primarily due to its proximity to Clyde River.

Overall, physical observations suggest that the NHWL is in very good condition and performing as designed to contain the enclosed waste. Minor areas of settlement were observed near the landfill to the north and east, and some minor settlement was also noted at the toe of landfill along the north, south, and west sides. These settlement areas ranged from about 5 m² to 85 m². Two sink holes (0.8 m³ and 1.6 m³) were observed near the NHWL along the west side, and minor settlement cracks were observed near the northwest corner of the NHWL. The settlement features noted are considered to be of little consequence at the present time.

In addition to physical observations, FRANZ collected soil and groundwater samples to assess the performance of the NHWL. Analytical results for soil samples collected in the vicinity of the NHWL satisfy applicable guidelines for contaminants of potential concern at the site. As no historical groundwater data was available, concentrations of contaminants of concern in groundwater samples were compared to the average concentration from the four wells.

The road leading to the Cape Christian LORAN site was in poor condition with large ruts filled with standing water. The site is only accessible by all terrain vehicle, as damage from machinery and weathering has rendered the road impassable by traditional road vehicles.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 10.0.

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1.0 INTRODUCTION

Franz Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada – Nunavut Regional Office (AANDC) to conduct long-term monitoring activities at the former Long Range Navigation (LORAN) communication station at Cape Christian. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01; file number 1632-11/01-11-6001/5.

This report describes the monitoring activities completed for AANDC at Cape Christian and was prepared in accordance with the FRANZ Proposal No. P-3756, dated June 30, 2011, the Call-up Details, dated July 11, 2011 and the Project Initiating Meeting Minutes, dated July 19, 2011.

Throughout this report the AANDC LORAN site Cape Christian will be referred to as “the Site”.

1.1 Project Objectives

The objective of the 2011 Long-Term Monitoring (LTM) was to complete the first-year monitoring program at the Cape Christian site as described in the Cape Christian LTM plan. This included visual observations, chemical analyses (where warranted and possible) and interviews with members of the nearby community knowledgeable of local activities at the site to determine the condition of the natural environment and whether the site infrastructure is performing as designed.

1.2 Scope of Work

The scope of work as described in the 2009 Cape Christian LTM plan was as follows:

1. Visual Monitoring of the Non-Hazardous Waste Landfill (NHWL), including
 - Visually checking the physical integrity of the NHWL and looking for evidence of settlement, erosion, frost action, animal burrows, vegetation, staining, vegetation stress, seepage points, exposed debris, and the condition of wells; and
 - Taking photographs to document the condition of the NHWL and substantiate the recorded observations.
2. Active Layer Water Monitoring, including
 - The collection of samples from the 4 monitoring wells installed around the NHWL. These samples were to be analysed and the results compiled in table form for future comparison.
3. Soil Monitoring (as required)
 - Soil sampling was to be limited to locations where seepage or staining was identified as part of the visual inspection.

4. Natural Environment Monitoring, including
 - The collection of direct and indirect evidence of wildlife presence and activity; and
 - Making observations regarding the re-vegetation of disturbed areas.
5. Preparation of a 2011 monitoring program report.

The following tasks were assessed as necessary to fulfill the scope:

- a) Review of the Cape Christian LTM Plan and the AANDC Abandoned Military Site Remediation Protocol;
- b) Preparation of a health and safety plan;
- c) Preparation of a sampling plan for soil and groundwater;
- d) Collection of water level data and observation of monitoring well conditions at the site;
- e) Visual inspection, measurement, and photo documentation of the site;
- f) Interviewing local residents and officials to understand land use and wildlife trends; and
- g) Reporting.

2.0 BACKGROUND INFORMATION

2.1 Site Description

According to AANDC's Cape Christian LTM plan, from 1954 to 1974, the United States Coast Guard operated a Long Range Navigation (LORAN) communications station at the Cape Christian site. The station was comprised of five (5) buildings: the main station, garage, hazmat building, terminal building, and the survival hut. Six (6), Aboveground Storage Tanks (AST) (102,600L each) with associated piping for fuel transfer and storage were also part of the station infrastructure. In addition, a number of barrels containing various petroleum, oils, lubricants (POL), and other chemicals were also supplied to the station during its years of operation. Used barrels were buried or partially buried at the site.

The site was abandoned in 1975 without decommissioning. While some remedial works were carried out at the site by different federal and provincial government teams, after it was abandoned, there were still significant environmental concerns at the site, prompting remediation by AANDC. AANDC led the remediation of the site between 2008 and 2011. The remediation involved removal and off-site disposal of hazardous materials, demolition of buildings and structures, excavation of non-hazardous metals and petroleum hydrocarbon contaminated soils, and clean-up of other site debris. All of the non-hazardous wastes were placed in a non-hazardous waste landfill (NHWL) constructed on-site for that purpose.

The NHWL was constructed at the site between 2009 and 2010, and was closed in 2010. It was designed to contain non-hazardous materials. Based on reference to the 1:5000 basemap topographic contour lines as viewed on the INAC spatial database, GeoViewer v1.0.49, the landfill is situated at approximately 25 m asl. AMSRP generic design plans for NHWLs describe construction on natural ground surface with the organic matter stripped, and consisting of four perimeter berms constructed of granular material. It is assumed that the non-hazardous waste at Cape Christian was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill, that the waste layers were compacted, and that a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill, as per the AMSRP. The cap of the NHWL at Cape Christian was armoured with large cobble and boulders to provide additional protection against weathering. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content up to 500 parts per million (ppm) and PCB content up to 5 ppm)
- Petroleum hydrocarbon fractions F3 and F4 contaminated soil
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal
- Non-hazardous site debris, such as scrap metal and wood
- Non-hazardous debris/soil excavated from landfills
- Creosote timbers

- Double-bagged asbestos

The site is not regularly inhabited; in addition, wells at the site would tend to freeze due to the presence of permafrost, therefore groundwater is not considered to be used for water supply purposes. The area is reported to be used by hunters and fishermen. Interviews with residents of the nearby hamlet of Clyde River suggest that hunting is still popular in the area. Fishing and whaling in the area are considered good.

2.2 Previous Monitoring Programs

The 2011 monitoring program was the first of the proposed monitoring schedule for the site.

The post construction landfill monitoring frequency will follow the schedule recommended in the INAC AMSRP (2009). The three phases recommended by the protocol are:

- Phase I: years 1, 3 and 5.
- Phase II (*if required*): Years 7, 10, 15 and 25
- Phase III (*if required*): beyond 25 years

The monitoring program will conclude if after Phase I monitoring (5 years post remediation) an evaluation of the program confirms that there are no stability or environmental issues. Otherwise, monitoring will continue into Phase II. (i.e., up to 25 years post remediation). Another evaluation will be conducted at the end of 25 years to determine if monitoring should be concluded or enter phase III. If required, the Phase III monitoring requirements will be determined based on results of the previous monitoring program evaluations.

To become familiar with the site, FRANZ reviewed the following reports pertaining to the LORAN and DEW Lines sites:

- Cape Christian Long-Term Monitoring Plan, February 10, 2009, AANDC (Formerly INAC); and
- Abandoned Military Site Remediation Protocol, December 2009, Indian and Northern Affairs Canada (now AANDC), Contaminated Sites Program.

3.0 REGULATORY AND OTHER GUIDELINES

3.1 Guideline Review

Where guidelines were developed, criteria presented in the Abandoned Military Sites Remediation Protocol (AMSRP), Volume I – Main Report (INAC, 2009) were used to compare both soil and groundwater analytical results. Federal and select provincial guidelines were applied where site-specific criteria were absent and/or were less strict than the federal and provincial standards.

Soil analytical results were compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines, specifically the *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CSQGs) and the *Canada-Wide Standards for Petroleum Hydrocarbons in Soil* (CWS-PHC). These guidelines are applied to most federal contaminated sites. The guidelines are numerical limits intended to maintain, improve or protect environmental quality and human health at contaminated sites. They are derived using toxicological data and aesthetic considerations.

The CSQGs (CCME, 1999) are a subsection of the Canadian Environmental Quality Guidelines. The CSQGs are derived to approximate a no- to low- effect level (or threshold level) based only on scientific data, including toxicology, fate, and behaviour. The CSQGs are based on direct contact, ingestion, and inhalation toxicity data, and were developed to protect receptors exposed indirectly to contaminants of concern. Fact sheets are provided for 32 compounds. The benzene, toluene, ethylbenzene and xylenes fact sheets were used to obtain regulatory criteria for this report.

The CWS-PHC (CCME, 2008a) provide criteria for petroleum hydrocarbons in soil. These numerical standards are based on the assessment and consistent management of risks posed to humans, plants, animals and environmental processes under four common land uses (agricultural, residential/parkland, commercial and industrial). Under Tier 1 of the CWS, specific numerical levels are presented for the four land uses, two soil textures (coarse and fine) and the four defined petroleum hydrocarbon fractions (F1 (nC₆-nC₁₀); F2 (nC₁₀-nC₁₆); F3 (nC₁₆-nC₃₄) and F4 (nC₃₄+)).

The CWS-PHC also include the option to generate Tier 2 levels where site-specific information indicates that site conditions exist that modify human or ecological exposure to PHC contamination. Such conditions may alter risks significantly relative to the generic conditions that were used to derive Tier 1 levels. A third tier in the CWS-PHC involves developing site-specific cleanup levels and management options using general and site-specific information gathered by conducting a risk assessment.

The Cape Christian former LORAN site is a federal site located on land owned by the Municipality of Clyde River and is therefore exempt from territorial regulation; however, the future disposition of the site may make it subject to territorial environmental guidelines. Because the Nunavut environmental guidelines are based on the work of the CCME, the federal and territorial guidelines often coincide.

The governing guideline for soil at contaminated sites in Nunavut is the *Environmental Guideline for Contaminated Site Remediation* (EGCSR), published by the Government of Nunavut in March, 2009. The criteria for Petroleum Hydrocarbons (PHC) in soil are found in Section 2.4, and are adapted from the CCME's CWS-PHC. The criteria for other compounds in soil are found in Table A-4 of Appendix 4 of the EGCSR, and are obtained from the CSQGs, published in the *Canadian Environmental Quality Guidelines* (CCME, 1999, updated 2007). The criteria are numerical limits intended to maintain, improve or protect environmental quality and human health at contaminated sites. Because the EGCSR is based on federal standards and has been updated recently, FRANZ does not anticipate discrepancies between the federal standards applied to the site and the Nunavut guidelines.

3.2 Groundwater

There were no groundwater guidelines provided in the Cape Christian LTM plan. In the absence of site-specific guidelines, the AMSRP guidance on post-construction monitoring indicates that "comparison to background and baseline values is recommended." The AMSRP provides the following table for the assessment of analytical data in groundwater.

Table 3-1: Groundwater Assessment

Geochemical Assessment	Acceptable	Marginal	Significant	Unacceptable
Groundwater concentrations within average $\pm$ three standard deviations or within analytical variability	Performing as expected			
Increasing trend in contaminant data over 2 or more successive monitoring events (variation in excess of average $\pm$ three standard deviations or analytical variability)		Low risk of failure		
Groundwater concentrations in excess of three times average baseline concentrations in more than one monitoring event			Moderate risk of failure	
Where applicable , surface water concentrations in excess of surface water quality guidelines for the protection of aquatic life				Failure

Geochemical Assessment	Acceptable	Marginal	Significant	Unacceptable
Required Actions	Monitor as per schedule	Increase monitoring frequency. Monitor surface water quality, if applicable, in downgradient water bodies within 300 m.	Assess causes of increasing contaminant concentrations. Evaluate whether remediation is required.	Assess cause of contaminant concentrations. Develop remedial plan. Implement remedial plan.

This table is reproduced from AMSRP Chapter 11, Table 4.2

Since this is the first year for the long-term monitoring plan to be implemented at Cape Christian, FRANZ does not have any historical or baseline data to obtain the mean and standard deviations for comparison to the analytical results obtained in during the 2011 monitoring activities presented in this report. Instead, the average concentration of each parameter was calculated using the results from all of the wells sampled, as has been done at other DEW line sites lacking post construction baseline data. The duplicate was not included in the average calculation. If the result was a non-detect, it was converted to the detection limit for the purpose of the average calculation.

3.3 Soil

The soil standards or guidelines adopted for this evaluation are as follows:

- Abandoned Military Sites Remediation Protocol (AMSRP), Volume I – Main Report (INAC, 2009).
- *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CCME, 1999, with updates) for residential/parkland use, including fact sheets for benzene, toluene, ethylbenzene, and xylenes. Non-potable groundwater is stipulated and coarse grain material is assumed based on a 2009 grain-size analysis, field observation (generally sandy material) as well as for conservative reasons – being that coarse grain criteria are more stringent than those applied to fine grain.
- *Canada-Wide Standards for Petroleum Hydrocarbons in Soil* (CCME, 2008a) - Tier 1 Residential/Parkland, coarse-grained soil, non-potable groundwater.

As a preliminary and conservative determination of protection of human health and the environment at the site, Tier 1 levels of the CWS are applied to all analytical results where site specific values are not specified. The appropriate levels are presented with the laboratory analytical data in tables. The rationale for the selection of the appropriate criteria is discussed below.

BTEX Compounds

For the BTEX compounds specifically, the CSQGs were used to determine the appropriate pathway-specific guidelines. For benzene, for example, the 2004 update was used, with the following assumptions:

- Residential/Parkland land use
- Coarse-grained soils
- 10^{-5} acceptable incremental risk
- With applicable guidelines the most conservative of:
 - Soil dermal contact guideline
 - Soil ingestion guideline
 - Eco soil contact

The groundwater check (drinking water) pathway was excluded, as groundwater in the area of Cape Christian is not used as a source of potable water. With its exclusion, the most conservative guideline for benzene applicable at the site is related to the protection of the pathway for the inhalation of indoor air (slab on grade), at 0.095 mg/kg; however, there are no buildings near the NHWL. The most conservative remaining guideline is therefore the ecological soil contact guideline, at 31 mg/kg. A similar process was used to determine the most conservative applicable guideline value for toluene, ethylbenzene and xylenes.

Petroleum Hydrocarbons

For petroleum hydrocarbons, the CWS-PHC was used to determine the appropriate pathway-specific guidelines. Pathway-specific guidelines can be found in the CWS-PHC Technical Supplement (CCME, 2008c).

4.0 INVESTIGATIVE METHODOLOGY

The monitoring program was carried out at the Cape Christian LORAN site on August 24, 2011. During the field investigations, weather conditions consisted of rainy periods, drizzle and light wind with temperatures between 3 and 4 degrees Celsius. The program consisted of the following:

- Completing a Health & Safety kick-off meeting;
- Visually observing and photographically documenting the physical integrity of the landfill;
- Collection of ground water samples from existing wells;
- Collection of soil samples; and
- Gathering information through first hand observation as well as through knowledgeable persons regarding local wildlife and human activity.

The field investigation procedures are described below.

4.1 Health & Safety Plan

Before commencing with site activities, a site-specific health and safety plan (HASP) was developed. The HASP identified and provided mitigative actions for potential physical and chemical hazards associated with the monitoring work. The HASP also contained a listing of emergency contact numbers and provided protocols to follow in the event of an emergency.

A copy of the HASP was presented to AANDC for review and approval before site activities began. This plan was distributed and discussed with all personnel involved in the investigative program prior to conducting any work on-site. A copy of the HASP has been retained on file at FRANZ and in the AANDC Nunavut Regional Office.

4.2 Visual Inspections

The physical integrity of the NHWL and surrounding areas were assessed using systematic visual observations and empirical measurements to record evidence of erosion, ponding, frost action, settlement and lateral movement of the landfill. A visual monitoring checklist, presented in the LTM plan, was completed for the landfill. A photographic record was completed to document the condition of the structures and substantiate the visual observations. A portion of this photographic record appears in Appendix F; and is presented in its entirety on the accompanying CD ROM.

The 2011 visual inspection was conducted with the aid of a Trimble Pro XRT GPS unit to locate features of note and to collect GIS information to be used in report preparation. A detailed data dictionary (Trimble file) was created prior to the site visit to capture all required information as outlined in the long-term monitoring plan. An SSF file and the data dictionary (Trimble files) is included in the appended CD ROM to be used in future site investigations.

4.3 Wildlife Survey

FRANZ made observations of the natural environment at the time of the site visit and recorded these observations in field notes. Observations included direct sightings of wildlife, other evidence of wildlife (e.g., droppings, tracks, feathers/fur), wildlife activities (migrating, nesting, etc.), numerical estimates of wildlife, and vegetation observations.

As part of the investigation, a FRANZ representative interviewed people knowledgeable about surrounding areas. Land uses by humans and wildlife, as well as changes in use over previous years by each, were discussed and pertinent information is documented in this report.

4.4 Sampling

The groundwater and soil sampling methodology conformed to guidance provided in the following documents:

- CCME EPC-NCS62E *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites - Volume I: Main Report*, Dec 93 (CCME catalogue - http://www.ccme.ca/assets/pdf/pn_1101_e.pdf);
- CCME EPC-NCS66E *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites - Volume II: Analytical Method Summaries*, Dec 93 (CCME catalogue - http://www.ccme.ca/assets/pdf/pn_1103_e.pdf);
- INAC *Cape Christian Long-Term Monitoring Plan* (INAC, 2009); and
- INAC *Abandoned Military Site Remediation Protocol*, Contaminated Sites Program (INAC, 2009).

4.4.1 Groundwater Sampling

Groundwater present in the active layer was sampled from the four monitoring wells installed around the NHWL. A Geopump brand peristaltic pump was used to purge the monitoring wells prior to sample collection. Wells were purged of three well volumes except where poor recharge rates made it necessary to sample sooner or not at all. During purging, a Horiba U-22 water quality meter was calibrated and used to measure in situ field parameters including temperature, conductivity, dissolved oxygen, turbidity, pH and oxidation-reduction potential. Sampling took place when these parameters stabilized. Water samples submitted for total metals analyses were not field-filtered.

A summary of the samples that were collected and submitted for laboratory analysis during the groundwater sampling activities is provided in Table 4-1 below. Groundwater sample logs are included in Appendix C.

Table 4-1: Summary of groundwater sample collection near the NHWL.

Sample	Analytical Parameters
MW-1	- total and dissolved metals - PCBs - petroleum hydrocarbon fractions F1-F4 and BTEX - inorganics (major ions, TDS, TSS, colour, pH, conductivity)
CEL-1*	
MW-2	
MW-3	
MW-4	

Note: * indicates a blind field duplicate of the sample listed directly above.

All samples were collected in laboratory prepared sample bottles appropriate for the specified analyses. Water samples for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Additional details on the groundwater sampling are presented in the groundwater sample records provided in Appendix C.

4.4.2 Test Pitting and Soil Sampling

Soil sampling was completed by manual test pitting. Three test pits, identified as CC1, CC2, and CC3 were manually advanced in the vicinity of the NHWL in areas of suspected staining. The background sample, CC4 was collected approximately 220 m southeast of the NHWL.

Test pitting was performed using a shovel, which was decontaminated with Alconox between sample collections. Surface soil samples were collected at a maximum depth of 0.15 m. Soil samples were collected from each test pit and placed in laboratory prepared jars for chemical analyses. Discrete soil samples and blind duplicates were collected as grab samples using disposable nitrile gloves for each sample. Fresh, sterile gloves were used at each sample location. Soil stratigraphy was logged and photos taken before backfilling the test pits with excavated soil.

A total of five soil samples were collected and submitted for laboratory analysis for petroleum hydrocarbons (PHCs) fractions F1-F4 and benzene, toluene, ethylbenzene and xylenes (BTEX) as well as metals and polychlorinated biphenyls (PCBs). One field duplicate sample (D1) was analyzed for QA/QC purposes. Professional judgment and visual observations were used to select the locations sampled and submitted for laboratory analysis. Samples submitted for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Test pit locations are indicated on Figure A-1; Appendix A and additional details on the soil samples collected are presented in the test pit logs provided in Appendix C.

4.5 Quality Assurance and Quality Control

Field personnel employed FRANZ's Quality Assurance/Quality Control (QA/QC) protocols, including appropriate techniques for soil sampling, sample storage, shipping and handling, as well as collection of duplicates. Additional discussion of QA/QC methodology is provided in Appendix E.

4.5.1 Field

Soil samples collected for potential laboratory analysis were placed in polyethylene bags and laboratory prepared 125 mL glass jars fitted with screw-tight Teflon-lined lids. Groundwater samples were collected from monitoring wells and placed in a variety of appropriately sized and prepared laboratory vessels. Sample numbers were clearly marked on the containers. The soil jars and water bottles were filled to capacity with minimum headspace and stored in coolers with cold packs to moderate temperature fluctuations during transport to the laboratory. To prevent cross contamination, samples were collected with fresh nitrile gloves. Where soil samples were impossible to obtain by hand, a stainless steel trowel or shovel was used and decontaminated between samples.

As a quality control measure, one soil and one groundwater blind field duplicate samples were collected and analyzed for PHC fractions F1-F4, BTEX, metals and PCBs. The water samples were also analyzed for colour, pH, conductivity, total dissolved solids and major ions.

The samples were transported to the project laboratory accompanied by a Chain of Custody form. Copies of the Chain of Custody forms are provided in Appendix D.

4.5.2 Laboratory

To assess the reliability of the laboratory data, duplicate samples were taken for approximately every five samples collected by FRANZ. One blind field duplicates were collected in the soil sampling program, and one blind field duplicate was collected in the groundwater sampling program.

For soil duplicates, FRANZ personnel generated the duplicate samples by alternately placing approximately 50 percent of the sample volume into the primary sample container and then placing the same amount into the duplicate container. Similarly, for duplicated water samples, field staff placed aliquots of approximately 50 percent of the container volume into each container until both containers were filled.

Analytical data quality was assessed by submission of the following:

- Soil samples CC3 (primary) and D1 (soil duplicate), were analyzed for petroleum hydrocarbons (PHC), polychlorinated biphenyls (PCBs) and metals.
- Groundwater samples MW-1 (primary) and CEL-1 (water duplicate) were analyzed for PHC, PCBs, metals, conductivity, pH, colour and temperature.

Sampling procedures and laboratory analytical precision are evaluated by calculating the relative percent difference (RPD) for a sample and duplicate pair according the following equation:

$$RPD = |X_1 - X_2| / X_{avg} \times 100$$

where: X_1 and X_2 are the duplicate concentrations and X_{avg} is the mean of these two values. The duplicate results were evaluated using criteria developed by Zeiner (1994), which draws from several data validation guidelines developed by the United States Environmental Protection Agency (USEPA). According to these criteria, the RPD for duplicate samples should be less than 20% for aqueous samples, and less than 40% for solid samples. RPDs can only be calculated when the compound is detected in both the original and the duplicate sample at a concentration five times above the reportable detection limit (or method detection limit - MDL). Alternative criteria are used to evaluate duplicate pairs where one or both of the results are less than five times the MDL, or where one or both of the results is less than the MDL (i.e. nd or 'not-detected'). The alternative criteria used for the evaluation of the data, adapted from Zeiner (1994), are presented in Table 4-2 below. When both concentrations are less than the MDL, no calculation/evaluation criterion is required.

Table 4-2: Criteria for the Evaluation of Blind and Duplicate Sample Results

Scenario	Result A	Result B	Criteria for Acceptance	
			Aqueous (water)	Soil (Soil)
A	nd	nd	Acceptable precision; no evaluation required	
B	nd	positive	result B – 0.5 x MDL < MDL	result B – 0.5 x MDL < 2 x MDL
C	positive and > 5 x MDL	positive and > 5 x MDL	RPD < 20%	RPD < 40%
D	positive and < or = 5 x MDL	positive	result B – result A < MDL ¹	result B – result A < 2 x MDL ¹

Source: Zeiner, S.T., Realistic Criteria for the Evaluation of Field Duplicate Sample Results, Proceedings of Superfund XV, November 29-December 1, 1994, Sheraton Washington Hotel, Washington, D.C. – modified to use Method Detection Limit (MDL) or Reportable Detection Limit (RDL) in lieu of the Quantitation Limit (QL), the Instrument Detection Limit (IDL) and/or Laboratory Reporting Limit (LRL).

Notes:

nd – not detected

RPD – relative percent difference, $|result A - result B| / [(result A + result B)/2]$

1. When result reported was less than half the quantitation limit, half the limit was used in the equation.

The precision is considered acceptable when the evaluation criteria are met or when both results are below the MDL. When the evaluation criteria are not satisfied, the following apply:

- nd vs. positive – unacceptable precision: the positive result is considered an estimate and the nd result is considered inconclusive.
- Positive vs. positive – unacceptable precision: the results are considered an estimate.

Refer to Appendix E for a discussion on QA/QC results.

4.6 Laboratory Analytical Program

Soil and groundwater samples were sent to Maxxam Analytics in Ottawa, Ontario for chemical analyses of the target compounds previously identified. Maxxam is certified by the Canadian Association for Laboratory Accreditation, Inc. (CALA) and has an internal QA/QC protocol. The laboratory QA/QC documentation is provided with the analytical report and was reviewed by FRANZ as part of the QA/QC protocol. The laboratory Certificates of Analysis and Chain of Custody forms are presented in Appendix D.

5.0 NON-HAZARDOUS WASTE LANDFILL (NHWL)

5.1 Area Summary

The NHWL is located in the Lower Site Landfill Area, between the Beach and Lake Areas of the Cape Christian LORAN site. Monitoring of the landfill included visual observations to assess its physical integrity including evidence of erosion, ponding, frost action, settlement and lateral movement. Groundwater was collected at locations up- and downgradient of the NHWL. Soil samples were collected in areas of staining near the NHWL and one background sample was collected for comparison purposes. The visual inspection report, including supporting photos and drawing, is presented in the following pages.

5.2 Photographic Record

The photographic record of the NHWL has been completed as per the Statement of Work (Photographs 1 to 76; CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix F. The complete record of full-resolution photographs is provided in the attached CD-ROM.

5.3 Visual Inspection Report

Monitoring consisted of visual observations and empirical measurements of the NHWL to assess its physical integrity. Evidence of erosion, ponding, frost action, settlement and lateral movement were investigated. A plan view of the NHWL indicating photographic viewpoints, observed salient features, and locations of ground water monitoring wells is presented in Figure A-1; Appendix A. The visual monitoring checklist provided in the Cape Christian LTM plan has been completed and is included in Table 5-3 of this report. Table 5-1 and Table 5-2 present the preliminary visual inspection results for the NHWL at Cape Christian.

Table 5-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill

Feature	Presence (Y/N)	Severity Rating	Extent
Settlement	Y	Acceptable	Occasional
Erosion	N	Not Observed	None
Frost Action	N	Not Observed	None
Animal Borrows	N	Not Observed	None
Vegetation	N	Not Observed	None
Staining	N	Not Observed	None
Vegetation Stress	N	Not Observed	None
Seepage / Poned Water	Y	Acceptable	Occasional
Debris Exposure	N	Not Observed	None
Monitoring Well Condition	Y	Good condition - Acceptable	
Overall Landfill Performance	Acceptable		

Table 5-2: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill - Definitions

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: - Debris exposed in erosion channels or areas of differential settlement. - Liner exposed. - Slope failure.
Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

Settlement

There were six areas of minor settlement observed at the toe of the landfill (see Features A, C, E, G, H, and K, Figure A-1; Appendix A). Three of these areas (A, G, and K) also had orange staining. Feature E did not contain ponded water, but the soil was fully saturated. These settlement areas do not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Six areas of ponded water were observed near the NHWL: Two were adjacent to the toe of the NHWL (see Features J and O, Figure A-1; Appendix A and Photographs 65 and 73 to 75; CD-ROM); three of these areas (see Features L, M, and N, Figure A-1; Appendix A and Photographs 67 to 72; CD-ROM) are likely the result of the equipment used to construct the NHWL. Water was pooled in what appear to be tracks left by the heavy equipment; though these three features are not believed to be the result of settlement, they are noted for comparison to future observations. A final area of depression has occurred northeast of NHWL in a drainage area with vegetation. The depression contained ponded water (see Feature I, Figure A-1; Appendix A and Photographs 63 and 64; CD-ROM).

These settlement and ponding areas do not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Some minor settlement cracks were observed near the northwest corner of the NHWL (see Feature B, Figure A-1; Appendix A and Photographs 52 to 53; CD-ROM). Two sinkholes were observed near the toe of the NHWL (see Features D and F, Figure A-1; Appendix A and Photographs 55 and 59; CD-ROM). Neither of the sinkholes contained water during the site visit despite the rainy conditions.

There were no areas of settlement observed on the top the NHWL; however several areas of ponded water and saturated soils were observed on top of the landfill cap (see discussion on Page 18 for further details).

Erosion

No evidence of erosion was observed in the area of the NHWL.

Frost Action

Some minor cracking was observed surrounding the landfill on the native soils suggesting some minor frost action outside of the landfill extents. No evidence of any frost action on the landfill or the landfill berms was observed.

Evidence of Burrowing Animals

No evidence of burrowing animals was observed in the area of the NHWL.

Re-establishment of Vegetation

Based on the regional setting of this landfill and the very course materials used to construct the landfill cap, reestablishment of vegetation is likely to take a significant amount of time. No growth was observed on the top or sides of the landfill.

Staining

Several areas of orange staining were observed in the area surrounding the landfill (see Photographs 60, 61, and 63 to 75, CD-ROM). Soil was collected from around Features L, N, and O where the staining was observed. Similar orange staining was observed in areas away from the landfill and a soil sample was collected as a reference (see Photograph 76, CD-ROM).

Seepage Points

One potential seepage point was observed at the southwest corner of the NHWL. This feature was identified as feature E and did not contain any evidence of staining or product seepage from the landfill. This feature contained fully saturated soil. Feature E may alternatively be a

result of settlement, and is noted under that heading, but is also listed under this observation heading to track progress in future monitoring assessments.

Exposed Debris

No exposed debris was observed in the area of the NHWL.

Discussion

The features noted under this heading are currently considered to be of little consequence to the physical integrity of the NHWL. All physical observations indicate that the NHWL is performing as designed and is containing the enclosed waste. Care should be taken during future monitoring events to observe the condition of Feature E at the southwest corner of the NHWL for further evidence of settlement or potential seepage.

Although the overall performance of the landfill is presently considered acceptable, it was noted during the visual inspection that the grading of the landfill cap was poor, inconsistent, and did not appear to maintain a consistent grade. It was also observed that the landfill cap consisted of many different particle sizes (i.e., small cobbles to fines) and that, in many instances, the fines are being eroded away and washed into the voids created by the larger particles. The inconsistent grading and particle size selection has lead to many small undulations on the cap that may trap rain and melt water, potentially increasing the volume of water infiltration into the center of the landfill each year. This potential increase in water infiltration, over time, may cause excessive erosion, possible settlement issues, and potential seepage issues around the landfill perimeter in subsequent years.

Table 5-3 below summarizes the results of the visual inspection.

Table 5-3: Cape Christian – Visual Monitoring Checklist

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Settlement	A	8 m south of the northwest corner of the NHWL	22.7	0.8	0.02	<1%	Ponded water with staining	Area of ponded water had orange staining	51
Settlement	B	15 m south of the northwest corner of the NHWL	11.8	0.03	0	<1%	Minor settlement cracks		52-53
Settlement	C	23 m south of the northwest corner of the NHWL	8.9 m ²			<1%	Ponded water at toe of NHWL		54
Settlement	D	22 m south of the northwest corner of the NHWL	0.8 m ³			<1%	Sinkhole	Volume calculated using maximum depth	55
Settlement	E	Southwest corner of the NHWL	66.4 m ²			<1%	Possible seepage area	Fully saturated soil	56-58
Settlement	F	Southwest corner of the NHWL	1.6 m ³			<1%	Sinkhole	Volume calculated using maximum depth	59
Settlement	G	6 m east of the southwest corner of the NHWL	35.4 m ²			<1%	Ponded water at toe of NHWL with staining		60-61
Settlement	H	Northeast corner of the NHWL	45.6 m ²			<1%	Standing water, localized low point		62
Settlement	I	11 m northeast of the northeast corner of the NHWL	14.6 m ²			<1%	Drainage area with staining	Area of vegetation	63-64
Settlement	J	20 m west of the northeast corner of the NHWL	4.9 m ²			<1%	Ponded water with staining		65
Settlement	K	13 m east of the northeast corner of the NHWL	7.2 m ²			<1%	Ponded water with staining		66
Settlement	L	22 m east of the northeast corner of the NHWL	18.2 m ²			<1%	Ponded water with staining may be due to equipment tracks	Soil sample CC2 collected from this area	67-68
Settlement	M	32 m east of the northeast corner of the NHWL	38.4 m ²			<1%	Ponded water with staining may be due to equipment tracks		69-70
Settlement	N	15 m east of the southwest corner of the NHWL	27.7 m ²			<1%	Ponded water with staining may be due to equipment tracks	Soil sample CC1 collected from this area	71-72
Settlement	O	21 m east of the southeast corner of the NHWL	85.2 m ²			<1%	Ponded water with staining	Soil sample CC3/D1 collected from this area	73-75

5.4 Analytical Results – Groundwater Samples

As described in section 4.4.1, a total of five groundwater samples (four samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of petroleum hydrocarbons (PHCs), metals, PCBs and inorganic parameters. Analytical results are discussed below. The AMSRP Chapter 11 “Post-Construction Monitoring,” suggests that analytical results be compared to the mean of previous data. The AMSRP indicates that where groundwater concentrations are within the range of the average $\pm$ three standard deviations, the landfill is performing acceptably. Historical analytical information was not available as this was the first round of long-term monitoring. Results were compared to the average of the parameter concentration of all the wells, not including the duplicate sample. Should AANDC make additional (baseline) analytical data for the monitoring wells at Cape Christian available, Franz will include this data in future statistical analyses to increase the robustness of ground water monitoring analytical results interpretation.

PHCs

Concentrations for all parameters were below laboratory reportable detection limits (see Table B-1; Appendix B). The average concentrations were not calculated as all parameters were below the detection limit.

Metals

Total and dissolved metals concentrations in water sampled from MW-1 were all below the detection limit with the exception of arsenic, copper, and nickel. All metals parameters from MW-1 had concentrations below the average. (see Table B-2; Appendix B).

Water sampled from MW-2 had concentrations above the detection limit for total and dissolved arsenic, cadmium, cobalt, copper, nickel, and zinc. Total lead was also above the detection limit. The concentration of total and dissolved cobalt, copper, nickel, and zinc were above the average concentrations for those parameters, as were total arsenic and cadmium. All other metals concentrations were below the average (see Table B-2; Appendix B).

Water sampled from MW-3 had concentrations above the detection limit for total and dissolved cadmium, cobalt, copper, nickel, and zinc. Total chromium and total lead concentrations were also above the detection limit. Dissolved cadmium, total chromium, and total and dissolved copper concentrations were above the average (see Table B-2; Appendix B). All other metals concentrations were below the detection limit.

Water sampled from MW-4 had concentrations of cadmium, copper, nickel, and zinc above the detection limit (see Table B-2; Appendix B). The concentration of dissolved cadmium was above the average. All other metals concentrations were below the detection limit.

PCBs

The PCBs concentrations for all samples were below the detection limit (see Table B-3; Appendix B). Average concentrations and standard deviations were not calculated as all parameters were below the detection limit.

Inorganics

Water sampled from MW-1 had conductivity, total dissolved solids, fluoride, dissolved sulphate, and dissolved chloride concentrations above the average. All other parameters were below the average concentration (see Table B-4; Appendix B).

Water sampled from MW-2 had colour, conductivity, total dissolved solids, total suspended solids, and dissolved chloride above the average concentration. The pH of water in MW-2 was also lower than the pH of water from the other wells. Concentrations of all other parameters were below the average (see Table B-4; Appendix B).

Water sampled from MW-3 had concentration of total suspended solids, nitrate, and nitrate + nitrite above the average concentration. All other parameters were below the average concentration (see Table B-4; Appendix B).

Water sampled from MW-4 had dissolved sulphate above the average concentration. All other parameters were below the average concentration (see Table B-4; Appendix B).

Laboratory certificates of analyses for the 2011 groundwater samples are provided in Appendix D.

5.5 Analytical Results – Soil Samples

As described in section 4.4.2, a total of five soil samples (four samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of PHCs, metals and PCBs. Analytical results are discussed below.

PHCs

Laboratory analytical results and selected provincial standards and federal guidelines for PHCs are shown in Table B-5; Appendix B. As shown in the table, most soil PHC concentrations were below the reportable detection limit. PHCs which were detected in samples were limited to the F2 and F3 fractions, with concentrations well below the selected standards and guidelines applied to the site.

Metals

Laboratory analytical results and selected federal and site specific criteria for metals are shown in Table B-6; Appendix B. As shown in the table, concentrations satisfied the guideline criteria applied to the site.

PCBs

Laboratory analytical results and selected federal guidelines for PCBs are shown in Table B-7; Appendix B. Neither provincial nor site-specific guidelines exist for PCBs and federal guidelines provide a criterion for total PCBs only. As shown in the table, concentrations satisfied the guideline criterion applied to the site.

Laboratory certificates of analyses for the 2011 soil samples are provided in Appendix D.

6.0 SURROUNDING AREAS

Due to poor weather conditions (rain), difficulty accessing the site, and time restraints on site, only a limited inspection of outlying areas on site could be observed during the 2011 monitoring event.

The road from Clyde River to Cape Christian was in poor condition with deep ruts filled with mud and standing water.

Areas surrounding the landfill site were visually scarred from the remediation activities of previous years and this past summer. The areas directly surrounding the landfill site were mostly void of vegetation due to the fore mentioned remediation activities. A low drainage area was present directly south of the landfill site and contained some flowing water, which eventually terminated at the ocean shoreline.

One building remained intact to the southeast of the landfill site and is presumed to act as an emergency shelter for trappers and hunters frequenting the area. Evidence of all terrain vehicle traffic was observed in the form of tracks on the roadways and tundra on-site, as well as on surrounding lands.

7.0 NATURAL ENVIRONMENT

Information regarding the natural environment was gathered directly through observation, and indirectly through consultation with knowledgeable local persons in order to better understand the presence and temporal change in human and wildlife use of the site. The Cape Christian Long-Term Monitoring Plan recommends monitoring the following parameters:

- Wildlife sightings
- Other evidence of recent presence of wildlife (e.g. droppings, tracks)
- Wildlife activity (e.g. nesting, migration)
- Qualitative assessment of relative numbers versus previous years
- Revegetation of disturbed areas versus previous years

Wildlife and Human Activity

According to Esa Qillaq, a community member of Clyde River, human activities at the site usually consist of hunting of ptarmigans, polar bear (depending on quota) and seals. Hunting for bowhead whales and narwhal occur along the coast. Only one or two wolves are in the area ever year and it was over three years ago since one was caught. Caribou are rare in the area. In the spring, geese are in the area.

During the site visit, the FRANZ field assessors observed evidence (e.g. scat, tracks or visual observation) that ravens, Canada geese, polar bears and ducks are present on the site.

Re-establishment of Vegetation

Based on the regional setting of this site and material used on the site, reestablishment of vegetation is likely to take a significant amount of time. No growth was observed on any of the regraded areas.

8.0 LIMITATIONS

This report has been prepared exclusively for Aboriginal Affairs and Northern Development Canada. Any other person or entity may not rely upon the report without express written consent from Aboriginal Affairs and Northern Development Canada.

Any use, which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Franz Environmental Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions 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, Franz Environmental Inc., in certain instances, has been required to assume that the information provided is accurate.

The conclusions presented represent the best judgment of the assessors based on current environmental standards and on the site conditions observed on August 24, 2011. Due to the nature of the investigation and the limited data available, the assessors cannot warrant against undiscovered environmental liabilities.

Should additional information become available, Franz Environmental Inc. requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

There is no warranty, expressed or implied that the work reported herein has uncovered all potential environmental liabilities, nor does the report preclude the possibility of contamination outside of the areas of investigation. The findings of this report were developed in a manner consistent with a level of care and skill normally exercised by members of the environmental science and engineering profession currently practicing under similar conditions in the area.

A potential remains for the presence of unknown, unidentified, or unforeseen surface and sub-surface contamination. Any evidence of such potential site contamination would require appropriate surface and sub-surface exploration and testing.

If new information is developed in future work (which may include excavations, borings, or other studies), Franz Environmental Inc. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

9.0 REFERENCES

Indian and Northern Affairs Canada, February 10, 2009. *Cape Christian Long-Term Monitoring Plan*

Indian and Northern Affairs Canada. December 2009. *Abandoned Military Site Remediation Protocol*, Contaminated Sites Program.

10.0 CLOSURE

We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours truly,

Franz Environmental Inc.



Ryan Fletcher, C.Tech., EP
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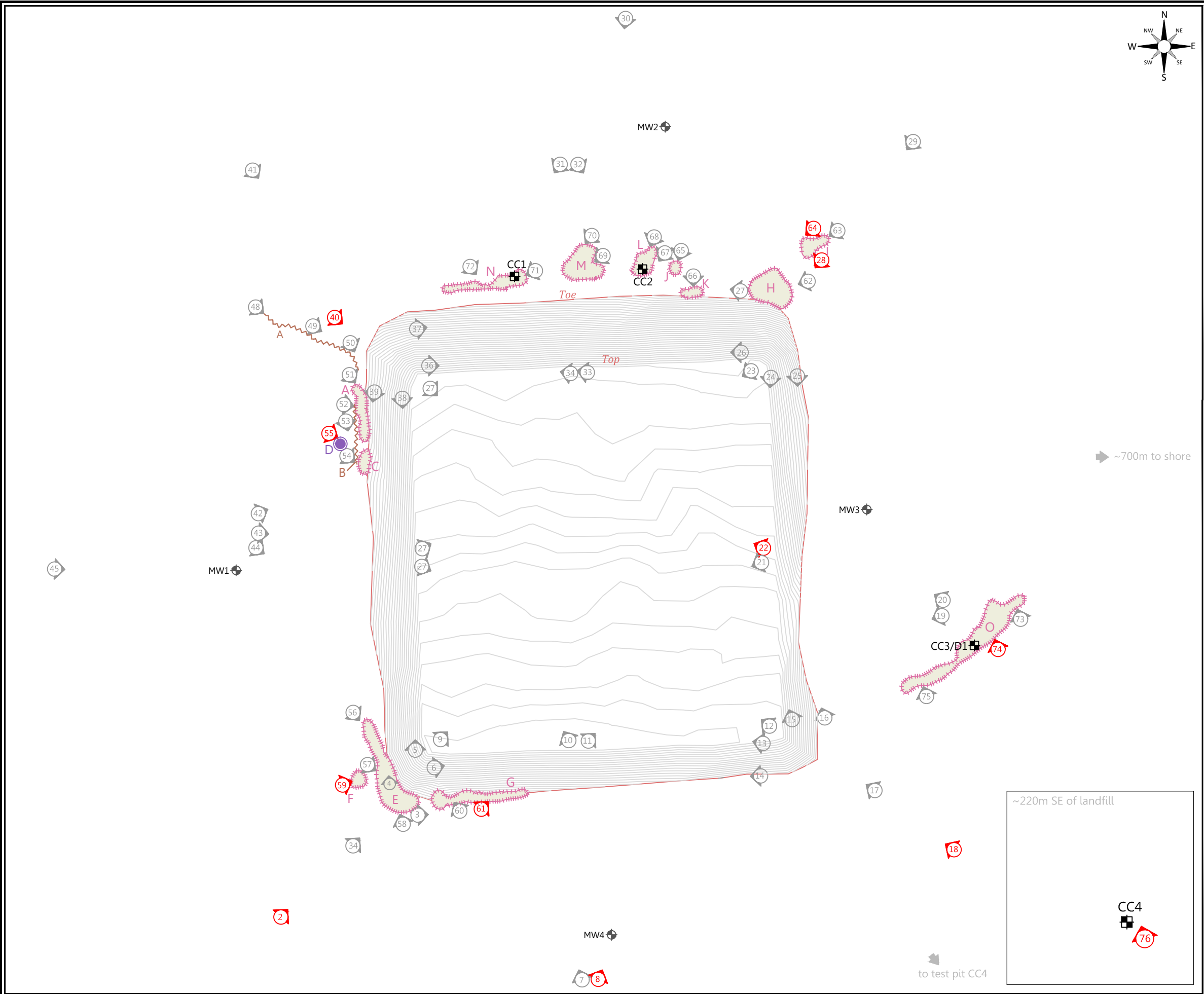
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APPENDIX A

Figures



Legend

- MW Monitoring Well Locations
- TP Test Pit Locations
- 25 Picture Viewpoint Number
- 8 Viewpoint Photograph Included in Appendix F
- A Staining or Seepage
- Sinkhole
- Settlement
- A Feature Reference Letter

Note:
Picture numbers refer to photograph names as they appear on the attached cd-rom.

Title: Non-Hazardous Waste Landfill	
 CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦	Project: Cape Christian 1697-1101
Date: January 2012	Client: Aboriginal Affairs and Northern Development Canada
Scale 1:750 20 15 10 5 0 metres	

Figure A-1

APPENDIX B

Tables

Table B-1
Ground Water Chemical Concentrations - PHCs

PARAMETER	Upper Limit of Acceptability ¹	RDL	MW-1	CEL-1	Duplicate Evaluation			MW-2	MW-3	MW-4
Sample ID										
Date			24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011	24/08/2011	24/08/2011
BTEX & F1 Hydrocarbons (ug/L)										
Benzene	Not Available	0.2	<0.2	<0.2	A	---	Y	<0.2	<0.2	<0.2
Toluene	Not Available	0.2	<0.2	<0.2	A	---	Y	<0.2	<0.2	<0.2
Ethylbenzene	Not Available	0.2	<0.2	<0.2	A	---	Y	<0.2	<0.2	<0.2
o-Xylene	Not Available	0.2	<0.2	<0.2	A	---	Y	<0.2	<0.2	<0.2
p+m-Xylene	Not Available	0.4	<0.4	<0.4	A	---	Y	<0.4	<0.4	<0.4
Total Xylenes	Not Available	0.4	<0.4	<0.4	A	---	Y	<0.4	<0.4	<0.4
F1 (C6-C10)	Not Available	25	<25	<25	A	---	Y	<25	<25	<25
F1 (C6-C10) - BTEX	Not Available	25	<25	<25	A	---	Y	<25	<25	<25
F2-F4 Hydrocarbons (ug/L)										
F2 (C10-C16 Hydrocarbons)	Not Available	100	<100	<100	A	---	Y	<100	<100	<100
F3 (C16-C34 Hydrocarbons)	Not Available	100	<100	<100	A	---	Y	<100	<100	<100
F4 (C34-C50 Hydrocarbons)	Not Available	100	<100	<100	A	---	Y	<100	<100	<100
Reached Baseline at C50	Not Applicable		Yes	Yes	NC	NC	NC	Yes	Yes	Yes

Notes:

Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-8, using mean of previous sampling rounds +3 standard deviations. Previous results for BTEX are insufficient to provide upper limits.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

Table B-2
Ground Water Chemical Concentrations - Metals

PARAMETER	Upper Limit of Acceptability ¹	Lowest RDL	MW-1	CEL 1	Duplicate Evaluation			MW-2	MW-3	MW-4	Average Concentration
Sample ID			24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011	24/08/2011	24/08/2011	
Date											
Metals (ug/L)											
Dissolved Arsenic (As)	Not Available	1	1	1	D	---	Y	1	<1	<1	1
Total Arsenic (As)	Not Available	1	1	2	D	---	N	2	<1	<1	1
Dissolved Cadmium (Cd)	Not Available	0.1	<0.1	<0.1	A	---	Y	0.1	0.6	0.7	0.4
Total Cadmium (Cd)	Not Available	0.1	<0.1	<0.1	A	---	Y	0.3	0.1	0.1	0.2
Dissolved Cobalt (Co)	Not Available	0.5	<0.5	<0.5	A	---	Y	72	0.5	<0.5	24.3
Total Cobalt (Co)	Not Available	0.5	<0.5	<0.5	A	---	Y	85	3.4	<0.5	29.6
Dissolved Chromium (Cr)	Not Available	5	<5	<5	A	---	Y	<5	<5	<5	<5
Total Chromium (Cr)	Not Available	5	<5	<5	A	---	Y	<5	7	<5	6
Dissolved Copper (Cu)	Not Available	1	1	1	D	---	Y	5	4	2	3
Total Copper (Cu)	Not Available	1	1	1	D	---	Y	11	14	3	7
Dissolved Nickel (Ni)	Not Available	1	3	2	D	---	N	56	3	2	16
Total Nickel (Ni)	Not Available	1	2	3	D	---	N	60	7	3	18
Dissolved Lead (Pb)	Not Available	0.5	<0.5	<0.5	A	---	Y	<0.5	<0.5	<0.5	<0.5
Total Lead (Pb)	Not Available	0.5	<0.5	<0.5	A	---	Y	1.5	3.5	<0.5	1.5
Dissolved Zinc (Zn)	Not Available	5	<5	<5	A	---	Y	130	10	8	38
Total Zinc (Zn)	Not Available	5	<5	<5	A	---	Y	120	38	5	42

Notes:

Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-9, using mean of previous sampling rounds +3 standard deviations.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

Table B-3
Ground Water Chemical Concentrations - PCBs

PARAMETER	Upper Limit of Acceptability ¹	RDL	MW-1	CEL 1	Duplicate Evaluation			MW-2	MW-3	MW-4
Sample ID			24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011	24/08/2011	24/08/2011
Date										
PCBs (ug/L)										
Aroclor 1016	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1221	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1232	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1242	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1248	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1254	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1260	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1262	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Aroclor 1268	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05
Total PCB	Not Available	0.05	<0.05	<0.05	A	---	Y	<0.05	<0.05	<0.05

Notes:

Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-

1 = 8, using mean of previous sampling rounds +3 standard deviations. There have been no historical detections of PCB components, indicating that results within sampling variance are acceptable.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

Table B-4
Ground Water Chemical Concentrations - Inorganics

PARAMETER		Groundwater Criteria	Lowest RDL	MW-1	CEL 1	Duplicate Evaluation			MW-2	MW-3	MW-4	Average Concentration
		Upper Limit of Acceptability ¹										
Sample ID				24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011	24/08/2011	24/08/2011	
Date												
Inorganics	Units											
Colour	TCU	Not Available	2	6	6	D	---	Y	350	7	6	92
Conductivity	umho/cm	Not Available	1	1500	1500	C	0	Y	1890	179	703	1068
Total Dissolved Solids	mg/L	NC	10	1070	1060	C	1	Y	1440	128	802	860
Fluoride (F-)	mg/L	NC	0.1	0.3	0.3	D	---	Y	<0.1	0.1	0.2	0.2
Orthophosphate (P)	mg/L	NC	0.01	<0.01	<0.01	A	---	Y	<0.01	<0.01	<0.01	<0.01
pH	pH	Not Available	NC	7.82	7.86	C	1	Y	6.50	7.30	7.54	7.29
Total Suspended Solids	mg/L	NC	1	6	5	D	---	N	14	9	3	8
Dissolved Sulphate (SO4)	mg/L	NC	10	50	50	D	---	Y	20	11	63	36
Dissolved Chloride (Cl)	mg/L	NC	1	300	300	C	0	Y	490	23	120	233
Nitrite (N)	mg/L	NC	0.01	<0.01	<0.01	A	---	Y	0.01	<0.01	<0.01	0.01
Nitrate (N)	mg/L	NC	0.1	0.2	0.2	D	---	Y	<0.1	1	<0.1	0.4
Nitrate + Nitrite	mg/L	NC	0.1	0.2	0.2	D	---	Y	<0.1	1	<0.1	0.4

Notes:

1 = Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-8, using mean of previous sampling rounds +3 standard deviations.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

Table B-5
Soil Chemical Concentrations - PHCs

PARAMETER	Federal		RDL								
Sample ID				CC1	CC2	CC3	D1	Duplicate Evaluation			CC4
Date	CCME ¹ Residential/ Parkland	CWS for PHC in Soil ($<1.5m$) ²		24/08/2011	24/08/2011	24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011
Depth (m)				0 - 0.15	0 - 0.15	0 - 0.15	0 - 0.15				0 - 0.15
BTEX & F1 Hydrocarbons (ug/g)											
Benzene	31	NC	0.02	<0.02	<0.02	<0.02	<0.02	A	---	Y	<0.02
Toluene	75	NC	0.02	<0.02	<0.02	<0.02	<0.02	A	---	Y	<0.02
Ethylbenzene	55	NC	0.02	<0.02	<0.02	<0.02	<0.02	A	---	Y	<0.02
o-Xylene	NC	NC	0.02	<0.02	<0.02	<0.02	<0.02	A	---	Y	<0.02
p+m-Xylene	NC	NC	0.04	<0.04	<0.04	<0.04	<0.04	A	---	Y	<0.04
Total Xylenes	95	NC	0.04	<0.04	<0.04	<0.04	<0.04	A	---	Y	<0.04
F1 (C6-C10)	NC	NC	10	<10	<10	<10	<10	A	---	Y	<10
F1 (C6-C10) - BTEX	NC	30 (210)	10	<10	<10	<10	<10	A	---	Y	<10
F2-F4 Hydrocarbons (ug/g)											
F2 (C10-C16 Hydrocarbons)	NC	150 (150)	10	30	12	<10	<10	A	---	Y	<10
F3 (C16-C34 Hydrocarbons)	NC	300 (300)	10	19	21	21	18	D	---	Y	<10
F4 (C34-C50 Hydrocarbons)	NC	2800 (2800)	10	<10	<10	<10	<10	A	---	Y	<10
Reached Baseline at C50	N/A	N/A	N/A	Yes	Yes	Yes	Yes	NC	NC	NC	Yes

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1
2 = levels for PHCs, Residential / Parkland Use in coarse-grained surface soils. (Brackets)
Protection of Eco Soil Contact from Table 1 - Technical Supplement.

*= See Quality Assurance and Quality Control section for scenario rationale.

N/A = Not applicable

NC = No Criteria

RDL= Reportable Detection Limit

20 = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

Table B-6
Soil Chemical Concentrations - Metals

PARAMETER				RDL									
	Federal				INAC DEW Line Cleanup Criteria, Tier II	CC1	CC2	CC3	D1	Duplicate Evaluation			CC4
Sample ID	CCME ¹ Residential/ Parkland	CCME ² Human Health Ingestion (H) / Eco Soil Contact (E)	24/08/2011			24/08/2011	24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011	
Date			0 - 0.15			0 - 0.15	0 - 0.15	0 - 0.15				0 - 0.15	
Depth (m)													
Metals (ug/g)													
Arsenic (As)	12	12H 17E	30	1	<1	<1	<1	<1	A	---	Y	<1	
Cadmium (Cd)	10	NC	5	0.1	<0.1	<0.1	<0.1	<0.1	A	---	Y	<0.1	
Cobalt (Co)	50	NC	50	0.1	3.1	4.1	1.8	1.9	C	5	Y	3.0	
Chromium (Cr)	64	220H 64E	250	1	24	35	10	11	C	10	Y	38	
Copper (Cu)	63	1100H 63E	100	0.5	3.8	4.3	3.2	3	C	6	Y	1.1	
Nickel (Ni)	50	50E	100	0.5	4.2	5.2	2.5	2.6	D	---	Y	4	
Lead (Pb)	140	140H 300E	500	1	3	3	2	2	D	---	Y	2	
Zinc (Zn)	200	200E	500	5	15	17	9	10	D	---	Y	7	
Mercury (Hg)	6.6	6.6H 12E	2	0.05	<0.05	<0.05	<0.05	<0.05	A	---	Y	<0.05	
Physical Properties													
Moisture (%)	NC	NC	NC	0.2	17.0	15.0	17	16	C	6	Y	17.0	

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

2 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Human health soil ingestion and Eco Soil Contact.

* = See Quality Assurance and Quality Control section for scenario rationale.

N/A = Not applicable

NC = No Criteria

RDL= Reportable Detection Limit

20 = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

Table B-7
Soil Chemical Concentrations - PCBs

PARAMETER			RDL								
Sample ID	Federal	INAC DEW Line Cleanup Criteria, Tier II		CC1	CC2	CC3	D1	Duplicate Evaluation			CC4
Date	CCME ¹			24/08/2011	24/08/2011	24/08/2011	24/08/2011	Scenario*	RPD (%)	Acceptable	24/08/2011
Depth (m)	Residential/ Parkland			0 - 0.15	0 - 0.15	0 - 0.15	0 - 0.15				0 - 0.15
Polychlorinated Biphenyls (ug/g)											
Aroclor 1262	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1016	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1221	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1232	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1242	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1248	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1254	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1260	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Aroclor 1268	NC	NC	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01
Total PCB	1.3	50	0.01	<0.01	<0.01	<0.01	<0.01	A	---	Y	<0.01

Notes:

1 = CCME (2007), Canadian Soil
 Quality Guidelines, Update 7.0

*= See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

APPENDIX C

Test Pit Logs and Monitoring Well Sampling Records

Date: 24-Aug-11 Logged by: RF Method: Hand Excavation Location: Cape Christian			Test Pit: CC1		Type	Analysis & Depth of Sample (m)	COMMENTS
Issue	Depth (m)	Description					
Orange Staining	0 - 0.15	Fine to coarse sand and gravel, some organics, orange staining, no odour, moist to wet	GR			PHCs, Metals, PCBs	
Date: 24-Aug-11 Logged by: RF Method: Hand Excavation Location: Cape Christian			Test Pit: CC2		Type	Analysis & Depth of Sample (m)	COMMENTS
Issue	Depth (m)	Description					
Orange Staining	0 - 0.15	Fine to coarse sand and gravel, some organics, orange staining, no odour, moist to wet	GR			PHCs, Metals, PCBs	
Date: 24-Aug-11 Logged by: RF Method: Hand Excavation Location: Cape Christian			Test Pit: CC3		Type	Analysis & Depth of Sample (m)	COMMENTS
Issue	Depth (m)	Description					
Orange Staining	0 - 0.15	Fine to coarse sand and gravel, some organics, orange staining, no odour, moist to wet	GR			PHCs, Metals, PCBs	Duplicate D1 collected here
Date: 24-Aug-11 Logged by: RF Method: Hand Excavation Location: Cape Christian			Test Pit: CC4		Type	Analysis & Depth of Sample (m)	COMMENTS
Issue	Depth (m)	Description					
Background	0 - 0.15	Fine to coarse sand and gravel, some organics, orange staining, no odour, moist to wet	GR			PHCs, Metals, PCBs	

Groundwater Sampling

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

Development of Monitoring Wells

Name of Area: NHWL			Sector:
Date of Sampling:	Day: 24	Month: 08	Year: 2011
Monitoring Well ID:	MW-1		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):	2 L		
Sampling Equipment:	Geopump brand peristaltic pump and Horiba U-22 water quality meter		

Measured Data

Well Depth (m):	1.65		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	0.99					
Stick Up (m):	0.58					
Field Chemistry						
Name and # unit:	Readings *					
pH:	1	7.01	PHC	Y	13	CEL-1
	2	7.19				
	3	7.24				
	4	7.29	PCB Total	Y		CEL-1
	5	7.34				
	6	7.38				
	7	7.40				
Temperature (°C):	1	2.66	Total Metals	Y	CEL-1	
	2	2.60				
	3	2.61				
	4	2.55	Dissolved Metals	Y		CEL-1
	5	2.53				
	6	2.49				
	7	2.45				
Conductivity (mS/cm):	1	1.99	General	Y	CEL-1	
	2	1.80				
	3	1.68				
	4	1.65	Other			
	5	1.61				
	6	1.62				
	7	1.63				
DO:	1	0.53	Turbidity:			
	2	0				
	3	0				
	4	0				
	5	0				
	6	0				
	7	0				
ORP:	1	-122				
	2	-145				
	3	-150				
	4	-149				
	5	-143				
	6	-138				
	7	-133				
Comments/ Notes:						

(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize

Groundwater Sampling

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

Development of Monitoring Wells

Name of Area: NHWL			Sector:
Date of Sampling:	Day: 24	Month: 08	Year: 2011
Monitoring Well ID:	MW-2		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):	2 L		
Sampling Equipment:	Geopump brand peristaltic pump and Horiba U-22 water quality meter		

Measured Data

Well Depth (m):	1.52		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	0.64					
Stick Up (m):	0.56					
Field Chemistry						
Name and # unit:	Readings *					
pH:	1	6.27	PHC	Y	13	
	2	6.41				
	3	6.42				
	4	6.20	PCB Total	Y		
	5	6.21				
	6	6.20				
	7					
Temperature (°C):	1	2.28	Total Metals	Y		
	2	2.29				
	3	2.11				
	4	1.58				
	5	1.57	Dissolved Metals	Y		
	6	1.58				
	7					
Conductivity (mS/cm):	1	2.04	General	Y		
	2	1.99				
	3	1.97				
	4	2.25	Other			
	5	3.04				
	6	2.94				
	7					
DO:	1	0.2	Other			
	2	0				
	3	0				
	4	1.48				
	5	0				
	6	0				
	7					
ORP:	1	-33	Other			
	2	-56				
	3	-55				
	4	-13				
	5	-28				
	6	-28				
	7					
Turbidity:	1	32.1	Other			
	2	27.8				
	3	29.8				
	4	30.1				
	5	39.1				
	6	32.7				
	7					
Comments/ Notes:						
Tried to dup here but ran out of water. Duplicated not submitted to lab. Purged Dry						
(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize						

Groundwater Sampling

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

Development of Monitoring Wells

Name of Area: NHWL			Sector:
Date of Sampling:	Day: 24	Month: 08	Year: 2011
Monitoring Well ID:	MW-3		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):	0.5		
Sampling Equipment:	Geopump brand persistaltic pump and Horiba U-22 water quality meter		

Measured Data

Well Depth (m):	1.75		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	1.62					
Stick Up (m):	0.56					
Field Chemistry						
Name and # unit:	Readings *					
pH:	1	6.72	PHC	Y	13	
	2	6.74				
	3					
	4		PCB Total	Y		
	5					
	6					
	7					
Temperature (°C):	1		Total Metals	Y		
	2	1.56				
	3	1.30				
	4					
	5		Dissolved Metals	Y		
	6					
	7					
Conductivity (mS/cm):	1	0.234	General	Y		
	2	0.232				
	3					
	4		Other			
	5					
	6					
	7					
DO:	1	9.19	Other			
	2	5.70				
	3					
	4					
	5		ORP:			
	6					
	7					
Turbidity:	1	172	Other			
	2	175				
	3					
	4					
	5		Comments/ Notes:			
	6					
	7					
Pumped dry						
(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize						

Groundwater Sampling

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

Development of Monitoring Wells

Name of Area: NHWL			Sector:
Date of Sampling:	Day: 24	Month: 08	Year: 2011
Monitoring Well ID:	MW-4		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):	2 L		
Sampling Equipment:	Geopump brand persistaltic pump and Horiba U-22 water quality meter		

Measured Data

Well Depth (m):	1.78		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	1.33					
Stick Up (m):	0.39					
Field Chemistry						
Name and # unit:	Readings *					
pH:	1	5.69	PHC	Y	13	
	2	2.84				
	3	5.96				
	4	5.99	PCB Total	Y		
	5	6.12				
	6					
	7					
Temperature (°C):	1	3.25	Total Metals	Y		
	2	2.84				
	3	2.80				
	4	2.94				
	5	3.04	Dissolved Metals	Y		
	6					
	7					
Conductivity (mS/cm):	1	0.48	General	Y		
	2	0.42				
	3	0.41				
	4	0.41	Other			
	5	0.44				
	6					
	7					
DO:	1	9.68	Other			
	2	9.44				
	3	7.23				
	4	8.46				
	5	8.35				
	6					
	7					
ORP:	1	285	Other			
	2	278				
	3	272				
	4	262				
	5	246				
	6					
	7					
Turbidity:	1	22.8	Other			
	2	17.8				
	3	78.9				
	4	16.6				
	5	17.5				
	6					
	7					
Comments/ Notes:						

(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize

APPENDIX D

Laboratory Reports and Chain of Custody Forms

Your Project #: 1697-1101
Your C.O.C. #: 27401201, 274012-01-01

Attention: Catherine LeBlanc

Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2011/09/13

This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1D2533
Received: 2011/08/29, 18:00

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Chloride by Automated Colourimetry	3	N/A	2011/09/06	CAM SOP-00463	SM 4500 Cl E
Colour	3	N/A	2011/09/01	CAM SOP-00412	APHA 2120
Conductivity	3	N/A	2011/08/31	CAM SOP-00448	SM 2510
Petroleum Hydro. CCME F1 & BTEX in Water	3	N/A	2011/09/01	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water	3	2011/08/31	2011/09/01	CAM SOP-00316	CCME Hydrocarbons
Fluoride	3	2011/08/31	2011/08/31	CAM SOP-00448	APHA 4500FC
Mercury (low level)	1	2011/08/31	2011/08/31	CAM SOP-00453	EPA 7470
Mercury (low level)	2	2011/09/02	2011/09/02	CAM SOP-00453	EPA 7470
Dissolved Metals by ICPMS	2	N/A	2011/09/06	CAM SOP-00447	EPA 6020
Dissolved Metals by ICPMS	1	N/A	2011/09/07	CAM SOP-00447	EPA 6020
Total Metals Analysis by ICPMS	3	N/A	2011/09/08	CAM SOP-00447	EPA 6020
Nitrate (NO3) and Nitrite (NO2) in Water	3	N/A	2011/09/01	CAM SOP-00440	SM 4500 NO3/NO2B
Polychlorinated Biphenyl in Water	3	2011/08/31	2011/09/01	CAM SOP-00309	SW846 8082
pH	3	N/A	2011/08/31	CAM SOP-00448	SM 4500H
Orthophosphate	3	N/A	2011/09/06	CAM SOP-00461	SM 4500 P-F
Sulphate by Automated Colourimetry	3	N/A	2011/09/06	CAM SOP-00464	EPA 375.4
Total Dissolved Solids	3	N/A	2011/09/02	CAM SOP-00428	APHA 2540C
Low Level Total Suspended Solids	3	N/A	2011/08/31	CAM SOP-00428	SM 2540D

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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

../2

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

-2-

* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: JClement@maxxam.ca
Phone# (613) 274-3549

=====

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 #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

RESULTS OF ANALYSES OF WATER

Maxxam ID		KS3332		KS3333	KS3334		
Sampling Date		2011/08/24		2011/08/24	2011/08/24		
	Units	MW 2	RDL	MW 3	MW 4	RDL	QC Batch
Inorganics							
Colour	TCU	350	8	7	6	2	2600569
Conductivity	umho/cm	1890	1	179	703	1	2600471
Total Dissolved Solids	mg/L	1440	10	128	802	10	2601612
Fluoride (F-)	mg/L	<0.1	0.1	0.1	0.2	0.1	2600472
Orthophosphate (P)	mg/L	<0.01	0.01	<0.01	<0.01	0.01	2602453
pH	pH	6.50		7.30	7.54		2600465
Total Suspended Solids	mg/L	14	1	9	3	1	2600012
Dissolved Sulphate (SO4)	mg/L	20	1	11	63	1	2602454
Dissolved Chloride (Cl)	mg/L	490	5	23	120	1	2602452
Nitrite (N)	mg/L	0.01	0.01	<0.01	<0.01	0.01	2600446
Nitrate (N)	mg/L	<0.1	0.1	1.0	<0.1	0.1	2600446
Nitrate + Nitrite	mg/L	<0.1	0.1	1.0	<0.1	0.1	2600446

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		KS3332		KS3333			KS3334		
Sampling Date		2011/08/24		2011/08/24			2011/08/24		
	Units	MW 2	RDL	MW 3	RDL	QC Batch	MW 4	RDL	QC Batch
Metals									
Mercury (Hg)	ug/L	<0.01	0.01	<0.01	0.01	2602563	0.01	0.01	2599825
Dissolved Aluminum (Al)	ug/L	50	5	54	5	2605513	140	5	2605513
Total Aluminum (Al)	ug/L	580	5	7800	5	2607496	210	5	2607496
Dissolved Antimony (Sb)	ug/L	<0.5	0.5	<0.5	0.5	2605513	<0.5	0.5	2605513
Total Antimony (Sb)	ug/L	<0.5	0.5	<0.5	0.5	2607496	<0.5	0.5	2607496
Dissolved Arsenic (As)	ug/L	1	1	<1	1	2605513	<1	1	2605513
Total Arsenic (As)	ug/L	2	1	<1	1	2607496	<1	1	2607496
Dissolved Barium (Ba)	ug/L	46	2	3	2	2605513	25	2	2605513
Total Barium (Ba)	ug/L	58	2	57	2	2607496	27	2	2607496
Dissolved Beryllium (Be)	ug/L	<0.5	0.5	<0.5	0.5	2605513	<0.5	0.5	2605513
Total Beryllium (Be)	ug/L	<0.5	0.5	<0.5	0.5	2607496	<0.5	0.5	2607496
Dissolved Boron (B)	ug/L	37	10	26	10	2605513	63	10	2605513
Total Boron (B)	ug/L	38	10	32	10	2607496	69	10	2607496
Dissolved Cadmium (Cd)	ug/L	0.1	0.1	0.6	0.1	2605513	0.7	0.1	2605513
Total Cadmium (Cd)	ug/L	0.3	0.1	0.1	0.1	2607496	0.1	0.1	2607496
Dissolved Chromium (Cr)	ug/L	<5	5	<5	5	2605513	<5	5	2605513
Total Chromium (Cr)	ug/L	<5	5	7	5	2607496	<5	5	2607496
Dissolved Cobalt (Co)	ug/L	72	0.5	0.5	0.5	2605513	<0.5	0.5	2605513
Total Cobalt (Co)	ug/L	85	0.5	3.4	0.5	2607496	<0.5	0.5	2607496
Dissolved Copper (Cu)	ug/L	5	1	4	1	2605513	2	1	2605513
Total Copper (Cu)	ug/L	11	1	14	1	2607496	3	1	2607496
Dissolved Iron (Fe)	ug/L	55000	100	<100	100	2605513	<100	100	2605513
Total Iron (Fe)	ug/L	68000	100	6900	100	2607496	<100	100	2607496
Dissolved Lead (Pb)	ug/L	<0.5	0.5	<0.5	0.5	2605513	<0.5	0.5	2605513
Total Lead (Pb)	ug/L	1.5	0.5	3.5	0.5	2607496	<0.5	0.5	2607496
Dissolved Molybdenum (Mo)	ug/L	3.5	0.5	1.7	0.5	2605513	4.0	0.5	2605513
Total Molybdenum (Mo)	ug/L	2.7	0.5	2.0	0.5	2607496	4.2	0.5	2607496
Dissolved Nickel (Ni)	ug/L	56	1	3	1	2605513	2	1	2605513
Total Nickel (Ni)	ug/L	60	1	7	1	2607496	3	1	2607496
Dissolved Selenium (Se)	ug/L	<2	2	<2	2	2605513	<2	2	2605513
Total Selenium (Se)	ug/L	<2	2	<2	2	2607496	<2	2	2607496
Dissolved Silver (Ag)	ug/L	<0.1	0.1	<0.1	0.1	2605513	<0.1	0.1	2605513
Total Silver (Ag)	ug/L	<0.1	0.1	<0.1	0.1	2607496	<0.1	0.1	2607496
Dissolved Thallium (Tl)	ug/L	<0.05	0.05	<0.05	0.05	2605513	<0.05	0.05	2605513
Total Thallium (Tl)	ug/L	0.09	0.05	0.21	0.05	2607496	<0.05	0.05	2607496

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		KS3332		KS3333			KS3334		
Sampling Date		2011/08/24		2011/08/24			2011/08/24		
	Units	MW 2	RDL	MW 3	RDL	QC Batch	MW 4	RDL	QC Batch
Dissolved Titanium (Ti)	ug/L	<5	5	<5	5	2605513	<5	5	2605513
Total Titanium (Ti)	ug/L	29	5	620	30	2607496	8	5	2607496
Dissolved Uranium (U)	ug/L	0.9	0.1	1.3	0.1	2605513	2.8	0.1	2605513
Total Uranium (U)	ug/L	0.5	0.1	1.7	0.1	2607496	2.9	0.1	2607496
Dissolved Zinc (Zn)	ug/L	130	5	10	5	2605513	8	5	2605513
Total Zinc (Zn)	ug/L	120	5	38	5	2607496	5	5	2607496

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		KS3332	KS3333	KS3334		
Sampling Date		2011/08/24	2011/08/24	2011/08/24		
	Units	MW 2	MW 3	MW 4	RDL	QC Batch
PCBs						
Aroclor 1016	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1221	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1232	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1242	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1248	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1254	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1260	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1262	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Aroclor 1268	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Total PCB	ug/L	<0.05	<0.05	<0.05	0.05	2600738
Surrogate Recovery (%)						
2,4,5,6-Tetrachloro-m-xylene	%	35	33	35		2600738
Decachlorobiphenyl	%	98	103	109		2600738

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

O'REG 153 PETROLEUM HYDROCARBONS (WATER)

Maxxam ID		KS3332	KS3333		KS3334		
Sampling Date		2011/08/24	2011/08/24		2011/08/24		
	Units	MW 2	MW 3	QC Batch	MW 4	RDL	QC Batch
BTEX & F1 Hydrocarbons							
Benzene	ug/L	<0.20	<0.20	2601412	<0.20	0.20	2601412
Toluene	ug/L	<0.20	<0.20	2601412	<0.20	0.20	2601412
Ethylbenzene	ug/L	<0.20	<0.20	2601412	<0.20	0.20	2601412
o-Xylene	ug/L	<0.20	<0.20	2601412	<0.20	0.20	2601412
p+m-Xylene	ug/L	<0.40	<0.40	2601412	<0.40	0.40	2601412
Total Xylenes	ug/L	<0.40	<0.40	2601412	<0.40	0.40	2601412
F1 (C6-C10)	ug/L	<25	<25	2601412	<25	25	2601412
F1 (C6-C10) - BTEX	ug/L	<25	<25	2601412	<25	25	2601412
F2-F4 Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	2600673	<100	100	2600648
F3 (C16-C34 Hydrocarbons)	ug/L	<100	<100	2600673	<100	100	2600648
F4 (C34-C50 Hydrocarbons)	ug/L	<100	<100	2600673	<100	100	2600648
Reached Baseline at C50	ug/L	YES	YES	2600673	YES		2600648
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	100	98	2601412	101		2601412
4-Bromofluorobenzene	%	98	97	2601412	99		2601412
D10-Ethylbenzene	%	99	98	2601412	102		2601412
D4-1,2-Dichloroethane	%	104	102	2601412	104		2601412
o-Terphenyl	%	120	117	2600673	119		2600648

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Test Summary

Maxxam ID KS3332
Sample ID MW 2
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	2602452	N/A	2011/09/06	DEONARINE RAMNARINE
Colour	SPEC	2600569	N/A	2011/09/01	CHRISTINE PHAM
Conductivity	COND	2600471	N/A	2011/08/31	YOGESH PATEL
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2601412	N/A	2011/09/01	LINCOLN RAMDAHIN
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600673	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU
Fluoride	F	2600472	2011/08/31	2011/08/31	YOGESH PATEL
Mercury (low level)	CVAA	2602563	2011/09/02	2011/09/02	LAWRENCE CHEUNG
Dissolved Metals by ICPMS	ICP/MS	2605513	N/A	2011/09/06	KEVIN COMERFORD
Total Metals Analysis by ICPMS	ICP/MS	2607496	N/A	2011/09/08	GRACE BU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2600446	N/A	2011/09/01	BERNARD ANTWI
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT
pH	PH	2600465	N/A	2011/08/31	YOGESH PATEL
Orthophosphate	AC	2602453	N/A	2011/09/06	DEONARINE RAMNARINE
Sulphate by Automated Colourimetry	AC	2602454	N/A	2011/09/06	DEONARINE RAMNARINE
Total Dissolved Solids	SLDS	2601612	N/A	2011/09/02	TEJPRATAP MISHRA
Low Level Total Suspended Solids	SLDS	2600012	N/A	2011/08/31	SUBHASHCHANDRA PATEL

Maxxam ID KS3333
Sample ID MW 3
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	2602452	N/A	2011/09/06	DEONARINE RAMNARINE
Colour	SPEC	2600569	N/A	2011/09/01	CHRISTINE PHAM
Conductivity	COND	2600471	N/A	2011/08/31	YOGESH PATEL
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2601412	N/A	2011/09/01	LINCOLN RAMDAHIN
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600673	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU
Fluoride	F	2600472	2011/08/31	2011/08/31	YOGESH PATEL
Mercury (low level)	CVAA	2602563	2011/09/02	2011/09/02	LAWRENCE CHEUNG
Dissolved Metals by ICPMS	ICP/MS	2605513	N/A	2011/09/07	KEVIN COMERFORD
Total Metals Analysis by ICPMS	ICP/MS	2607496	N/A	2011/09/08	GRACE BU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2600446	N/A	2011/09/01	BERNARD ANTWI
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Test Summary

pH	PH	2600465	N/A	2011/08/31	YOGESH PATEL
Orthophosphate	AC	2602453	N/A	2011/09/06	DEONARINE RAMNARINE
Sulphate by Automated Colourimetry	AC	2602454	N/A	2011/09/06	DEONARINE RAMNARINE
Total Dissolved Solids	SLDS	2601612	N/A	2011/09/02	TEJPRATAP MISHRA
Low Level Total Suspended Solids	SLDS	2600012	N/A	2011/08/31	SUBHASHCHANDRA PATEL

Maxxam ID KS3333 Dup
Sample ID MW 3
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Mercury (low level)	CVAA	2602563	2011/09/02	2011/09/02	LAWRENCE CHEUNG

Maxxam ID KS3334
Sample ID MW 4
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	2602452	N/A	2011/09/06	DEONARINE RAMNARINE
Colour	SPEC	2600569	N/A	2011/09/01	CHRISTINE PHAM
Conductivity	COND	2600471	N/A	2011/08/31	YOGESH PATEL
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2601412	N/A	2011/09/01	LINCOLN RAMDAHIN
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600648	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU
Fluoride	F	2600472	2011/08/31	2011/08/31	YOGESH PATEL
Mercury (low level)	CVAA	2599825	2011/08/31	2011/08/31	LAWRENCE CHEUNG
Dissolved Metals by ICPMS	ICP/MS	2605513	N/A	2011/09/06	KEVIN COMERFORD
Total Metals Analysis by ICPMS	ICP/MS	2607496	N/A	2011/09/08	GRACE BU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2600446	N/A	2011/09/01	BERNARD ANTWI
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT
pH	PH	2600465	N/A	2011/08/31	YOGESH PATEL
Orthophosphate	AC	2602453	N/A	2011/09/06	DEONARINE RAMNARINE
Sulphate by Automated Colourimetry	AC	2602454	N/A	2011/09/06	DEONARINE RAMNARINE
Total Dissolved Solids	SLDS	2601612	N/A	2011/09/02	TEJPRATAP MISHRA
Low Level Total Suspended Solids	SLDS	2600012	N/A	2011/08/31	SUBHASHCHANDRA PATEL

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Test Summary

Maxxam ID KS3334 Dup
Sample ID MW 4
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600648	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Package 1	8.0°C
Package 2	9.7°C

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

GENERAL COMMENTS

Cooler custody seal was present and intact.

Revised Report: Cobalt added under Total and Dissolved Metals. 13-Sep-11

Sample KS3332-01: Results for dissolved uranium are greater than total uranium. The results have been confirmed by re-analysis.

Sample KS3333-01: All sample bottles contained visual sediment, which was included in the analysis as per the Protocol for Analytical Methods Use in the Assessment of Properties under part XV.1 of the Environmental Protection Act.

Results for dissolved cadmium are greater than total cadmium. The results have been confirmed by re-analysis.

Sample KS3334-01: Results for dissolved cadmium are greater than dissolved cadmium. The results have been confirmed by re-analysis.

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2599825	Mercury (Hg)	2011/08/31	105	80 - 120	87	80 - 120	0.01, RDL=0.01	ug/L	NC	25		
2600012	Total Suspended Solids	2011/08/31					<1	mg/L	4.1	25	97	85 - 115
2600446	Nitrite (N)	2011/09/01	110	80 - 120	104	85 - 115	<0.01	mg/L	NC	25		
2600446	Nitrate (N)	2011/09/01	101	80 - 120	96	85 - 115	<0.1	mg/L	NC	25		
2600471	Conductivity	2011/08/31					<1	umho/cm	0	25	102	85 - 115
2600472	Fluoride (F-)	2011/08/31	96	80 - 120	103	80 - 120	<0.1	mg/L	NC	20		
2600569	Colour	2011/09/01			99	85 - 115	<2	TCU	NC	25		
2600648	o-Terphenyl	2011/09/01	116	30 - 130	115	30 - 130	113	%				
2600648	F2 (C10-C16 Hydrocarbons)	2011/09/01	104	60 - 130	100	60 - 130	<100	ug/L	NC	50		
2600648	F3 (C16-C34 Hydrocarbons)	2011/09/01	107	60 - 130	102	60 - 130	<100	ug/L	NC	50		
2600648	F4 (C34-C50 Hydrocarbons)	2011/09/01	111	60 - 130	106	60 - 130	<100	ug/L	NC	50		
2600673	o-Terphenyl	2011/09/01	119	30 - 130	118	30 - 130	113	%				
2600673	F2 (C10-C16 Hydrocarbons)	2011/09/01	103	60 - 130	101	60 - 130	<100	ug/L	0.6	50		
2600673	F3 (C16-C34 Hydrocarbons)	2011/09/01	NC(1)	60 - 130	106	60 - 130	<100	ug/L	NC	50		
2600673	F4 (C34-C50 Hydrocarbons)	2011/09/01	111	60 - 130	109	60 - 130	<100	ug/L	NC	50		
2600738	2,4,5,6-Tetrachloro-m-xylene	2011/09/01	30	30 - 130	47	30 - 130	42	%				
2600738	Decachlorobiphenyl	2011/09/01	97	30 - 130	96	30 - 130	91	%				
2600738	Aroclor 1260	2011/09/01	99	30 - 130	84	30 - 130	<0.05	ug/L	NC	40		
2600738	Total PCB	2011/09/01	99	30 - 130	84	30 - 130	<0.05	ug/L	NC	40		
2600738	Aroclor 1016	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1221	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1232	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1242	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1248	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1254	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1262	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1268	2011/09/01					<0.05	ug/L	NC	40		
2601412	1,4-Difluorobenzene	2011/09/01	99	70 - 130	101	70 - 130	98	%				
2601412	4-Bromofluorobenzene	2011/09/01	98	70 - 130	100	70 - 130	99	%				
2601412	D10-Ethylbenzene	2011/09/01	97	70 - 130	100	70 - 130	96	%				
2601412	D4-1,2-Dichloroethane	2011/09/01	104	70 - 130	102	70 - 130	102	%				
2601412	Benzene	2011/09/01	88	70 - 130	86	70 - 130	<0.20	ug/L				
2601412	Toluene	2011/09/01	90	70 - 130	92	70 - 130	<0.20	ug/L				
2601412	Ethylbenzene	2011/09/01	92	70 - 130	95	70 - 130	<0.20	ug/L				
2601412	o-Xylene	2011/09/01	93	70 - 130	94	70 - 130	<0.20	ug/L				
2601412	p+m-Xylene	2011/09/01	91	70 - 130	93	70 - 130	<0.40	ug/L				
2601412	F1 (C6-C10)	2011/09/02	78	70 - 130	93	70 - 130	<25	ug/L	NC	40		
2601412	Total Xylenes	2011/09/01					<0.40	ug/L				
2601412	F1 (C6-C10) - BTEX	2011/09/02					<25	ug/L	NC	40		
2601612	Total Dissolved Solids	2011/09/02					<10	mg/L	0.6	25	98	90 - 110

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2602452	Dissolved Chloride (Cl)	2011/09/06	NC	75 - 125	105	80 - 120	<1	mg/L	0.2	20		
2602453	Orthophosphate (P)	2011/09/06	98	75 - 125	102	80 - 120	<0.01	mg/L	NC	25		
2602454	Dissolved Sulphate (SO4)	2011/09/06	NC	75 - 125	101	80 - 120	<1	mg/L	0.5	25		
2602563	Mercury (Hg)	2011/09/02	109	80 - 120	103	80 - 120	<0.01	ug/L	NC	25		
2605513	Dissolved Aluminum (Al)	2011/09/02	103	80 - 120	94	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Antimony (Sb)	2011/09/02	111	80 - 120	99	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Arsenic (As)	2011/09/02	103	80 - 120	96	80 - 120	<1	ug/L	1.3	20		
2605513	Dissolved Barium (Ba)	2011/09/02	97	80 - 120	97	80 - 120	<2	ug/L	4.7	20		
2605513	Dissolved Beryllium (Be)	2011/09/02	100	80 - 120	93	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Boron (B)	2011/09/02	99	80 - 120	94	80 - 120	13, RDL=10	ug/L	4.8	20		
2605513	Dissolved Cadmium (Cd)	2011/09/02	110	80 - 120	99	80 - 120	<0.1	ug/L	NC	20		
2605513	Dissolved Chromium (Cr)	2011/09/02	111	80 - 120	94	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Cobalt (Co)	2011/09/02	108	80 - 120	92	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Copper (Cu)	2011/09/02	109	80 - 120	93	80 - 120	<1	ug/L	NC	20		
2605513	Dissolved Iron (Fe)	2011/09/02	111	80 - 120	97	80 - 120	<100	ug/L	3.8	20		
2605513	Dissolved Lead (Pb)	2011/09/02	98	80 - 120	96	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Molybdenum (Mo)	2011/09/02	111	80 - 120	100	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Nickel (Ni)	2011/09/02	108	80 - 120	92	80 - 120	<1	ug/L	NC	20		
2605513	Dissolved Selenium (Se)	2011/09/02	104	80 - 120	95	80 - 120	<2	ug/L	NC	20		
2605513	Dissolved Silver (Ag)	2011/09/02	54(2,3)	80 - 120	94	80 - 120	<0.1	ug/L	NC	20		
2605513	Dissolved Thallium (Tl)	2011/09/02	98	80 - 120	96	80 - 120	<0.05	ug/L	NC	20		
2605513	Dissolved Titanium (Ti)	2011/09/02	114	80 - 120	96	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Uranium (U)	2011/09/02	104	80 - 120	100	80 - 120	<0.1	ug/L	NC	20		
2605513	Dissolved Zinc (Zn)	2011/09/02	111	80 - 120	95	80 - 120	<5	ug/L	NC	20		
2607496	Total Aluminum (Al)	2011/09/08	109	80 - 120	101	85 - 115	8, RDL=5	ug/L	5.5	20		
2607496	Total Antimony (Sb)	2011/09/08	114	80 - 120	106	85 - 115	<0.5	ug/L				
2607496	Total Arsenic (As)	2011/09/08	100	80 - 120	98	85 - 115	<1	ug/L	1.3	20		
2607496	Total Barium (Ba)	2011/09/08	96	80 - 120	97	85 - 115	<2	ug/L				
2607496	Total Beryllium (Be)	2011/09/08	100	80 - 120	100	85 - 115	<0.5	ug/L				
2607496	Total Boron (B)	2011/09/08	NC	80 - 120	96	85 - 115	<10	ug/L				
2607496	Total Cadmium (Cd)	2011/09/08	103	80 - 120	102	85 - 116	<0.1	ug/L	NC	20		
2607496	Total Chromium (Cr)	2011/09/08	107	80 - 120	104	85 - 115	<5	ug/L	NC	20		
2607496	Total Cobalt (Co)	2011/09/08	104	80 - 120	104	85 - 115	<0.5	ug/L				
2607496	Total Copper (Cu)	2011/09/08	98	80 - 120	103	85 - 115	<1	ug/L	NC	20		
2607496	Total Iron (Fe)	2011/09/08	109	80 - 120	107	85 - 115	<100	ug/L				
2607496	Total Lead (Pb)	2011/09/08	94	80 - 120	97	85 - 115	<0.5	ug/L	NC	20		
2607496	Total Molybdenum (Mo)	2011/09/08	112	80 - 120	99	85 - 115	<0.5	ug/L				
2607496	Total Nickel (Ni)	2011/09/08	100	80 - 120	104	85 - 115	<1	ug/L	0.8	20		
2607496	Total Selenium (Se)	2011/09/08	99	80 - 120	101	85 - 115	<2	ug/L				
2607496	Total Silver (Ag)	2011/09/08	95	80 - 120	97	85 - 115	<0.1	ug/L	NC	20		

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2607496	Total Thallium (Tl)	2011/09/08	94	80 - 120	97	85 - 115	<0.05	ug/L				
2607496	Total Titanium (Ti)	2011/09/08	112	80 - 120	106	85 - 115	<5	ug/L				
2607496	Total Uranium (U)	2011/09/08	108	80 - 120	106	85 - 115	<0.1	ug/L				
2607496	Total Zinc (Zn)	2011/09/08	95	80 - 120	104	85 - 115	<5	ug/L	NC	20		

N/A = Not Applicable

RDL = Reportable Detection Limit

RPD = Relative Percent Difference

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

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

QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) - The recovery in the matrix spike was not calculated (NC), spike level <2 X native concentration.

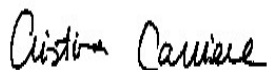
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(3) - The recovery was below the lower control limit. This may represent a low bias in some results for flagged analytes.

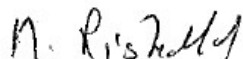
Validation Signature Page

Maxxam Job #: B1D2533

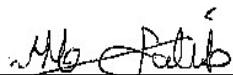
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



CRISTINA CARRIERE, Scientific Services



MEDHAT RISKALLAH, Manager, Hydrocarbon Department



MAMDOUH SALIB, Analyst, Hydrocarbons



ALINA SEGAL, Manager Main Lab - 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.

29-Aug-11 18:00

JULIE CLEMENT



B1D2533

VPA

ENV-789

Page 1 of 1

Laboratory Use Only:

BOTTLE ORDER #:



274012

PROJECT MANAGER:

JULIE CLEMENT

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:	
Company Name:	#10988 Franz Environmental Inc	Company Name:		Quotation #:	B14919
Contact Name:	Invoices, Lillian & Catherine	Contact Name:	Catherine LeBlanc	P.O. #:	
Address:	329 Churchill Ave N Suite 200 Ottawa ON K1Z 5B8	Address:		Project #:	1697-1101
Phone:	(613)721-0555 Fax: (613)721-0029	Phone:		Project Name:	
Email:	cleblanc@franzenvironmental.com; lellis@franzenvi	Email:	cleblanc@franzenvironmental.com	Site #:	
				Sampled By:	

Regulation 153 (2011)		Other Regulations		SPECIAL INSTRUCTIONS		ANALYSIS REQUESTED (Please be specific):										TURNAROUND TIME (TAT) REQUIRED:	
☐ Table 1	☐ Res/Park	☐ Medium/Fine	☐ CCME	☐ Sanitary Sewer Bylaw	See guide	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	Anions/pH/Conductivity/Color	Dissolved Metals by ICPMS	Mercury (low level)	PHC F1-F4 & BTEX in water	Polychlorinated Biphenyl in Water	Total Metals Analysis by ICPMS	TSS & TDS	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS		
☐ Table 2	☐ Ind/Comm	☐ Coarse	☐ Reg. 558	☐ Storm Sewer Bylaw													
☐ Table 3	☐ Agri/Other		☐ MISA	☐ Municipality													
☐ Table		☐ For RSC	☐ PWQO	☐ Other													
Include Criteria on Certificate of Analysis (Y/N)?																Regular (Standard) TAT:	
Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form																(will be applied if Rush TAT is not specified):	
SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM																Standard TAT = 5-7 Working days for most tests.	
																Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
																Job Specific Rush TAT (if applies to entire submission)	
																Date Required: _____ Time Required: _____	
																Rush Confirmation Number: _____ (call lab for #)	

Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	Anions/pH/Conductivity/Color	Dissolved Metals by ICPMS	Mercury (low level)	PHC F1-F4 & BTEX in water	Polychlorinated Biphenyl in Water	Total Metals Analysis by ICPMS	TSS & TDS						
1	MW2	Aug 24	PM	GW	X	X	X	X	X	X	X	X	X						
2	MW3	↓	↓	↓	X	X	X	X	X	X	X	X	X						
3	MW4	↓	↓	↓	X	X	X	X	X	X	X	X	X						
4																			
5																			
6																			
7																			
8																			
9																			
10																			

REC'D IN OTTAWA

*RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time:	# Jars Used and	Laboratory Use Only				
Ryan Flute		Aug 25/11		Josh Freeman		2011/08/29	18:00	Not Submitted	Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
										8/8/8	Present	✓	
											Intact		

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

Maxxam Analytics International Corporation o/a Maxxam Analytics

White: Maxxam Yellow: Client

DAVID CHAN 2011/08/30 10:50

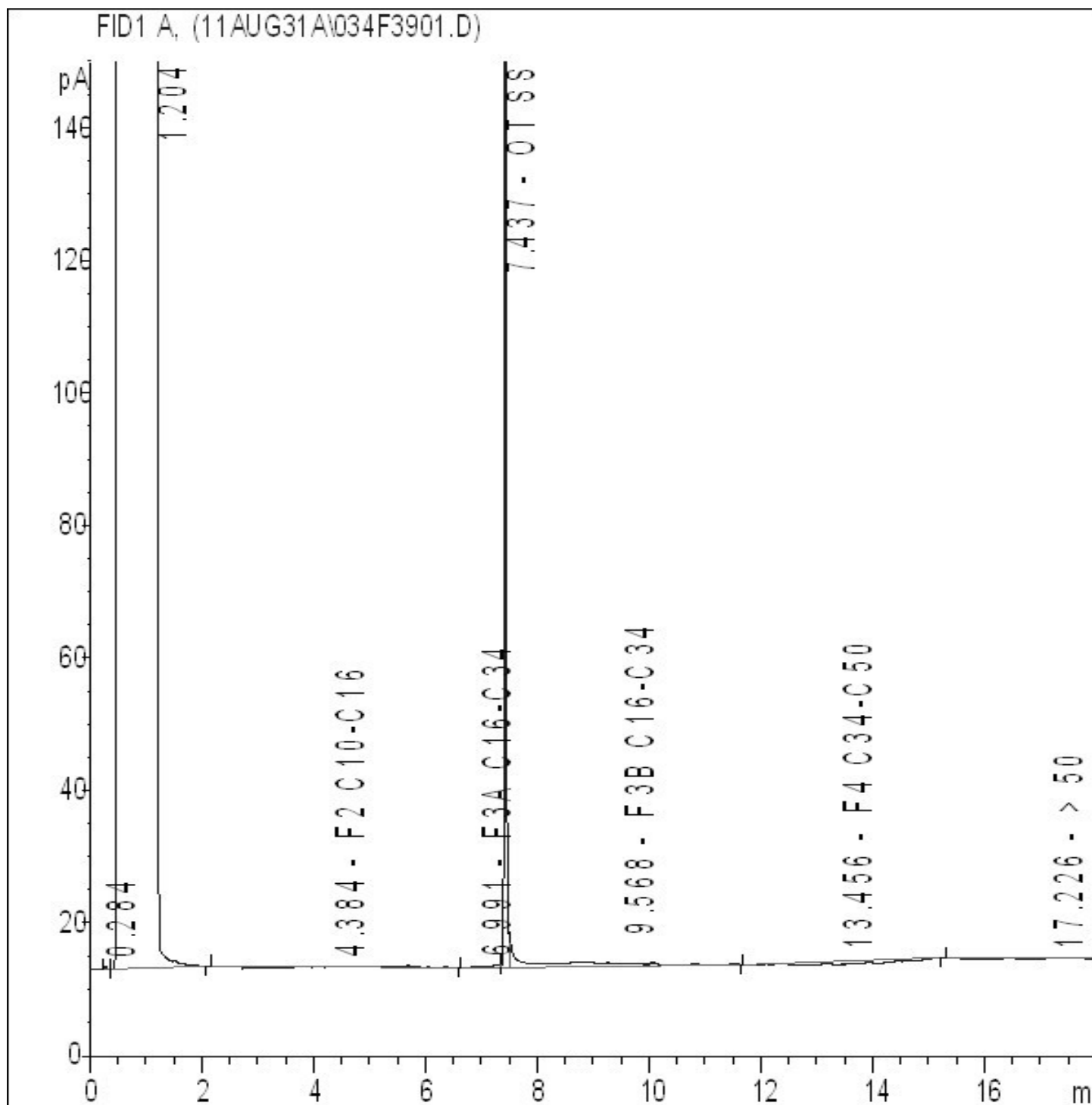
8/9/8°C 8/9/10°C 10/9/10

Report Date: 2011/09/13
 Maxxam Job #: B1D2533
 Maxxam Sample: KS3332

Franz Environmental Inc
 Client Project #: 1697-1101

Client ID: MW 2

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



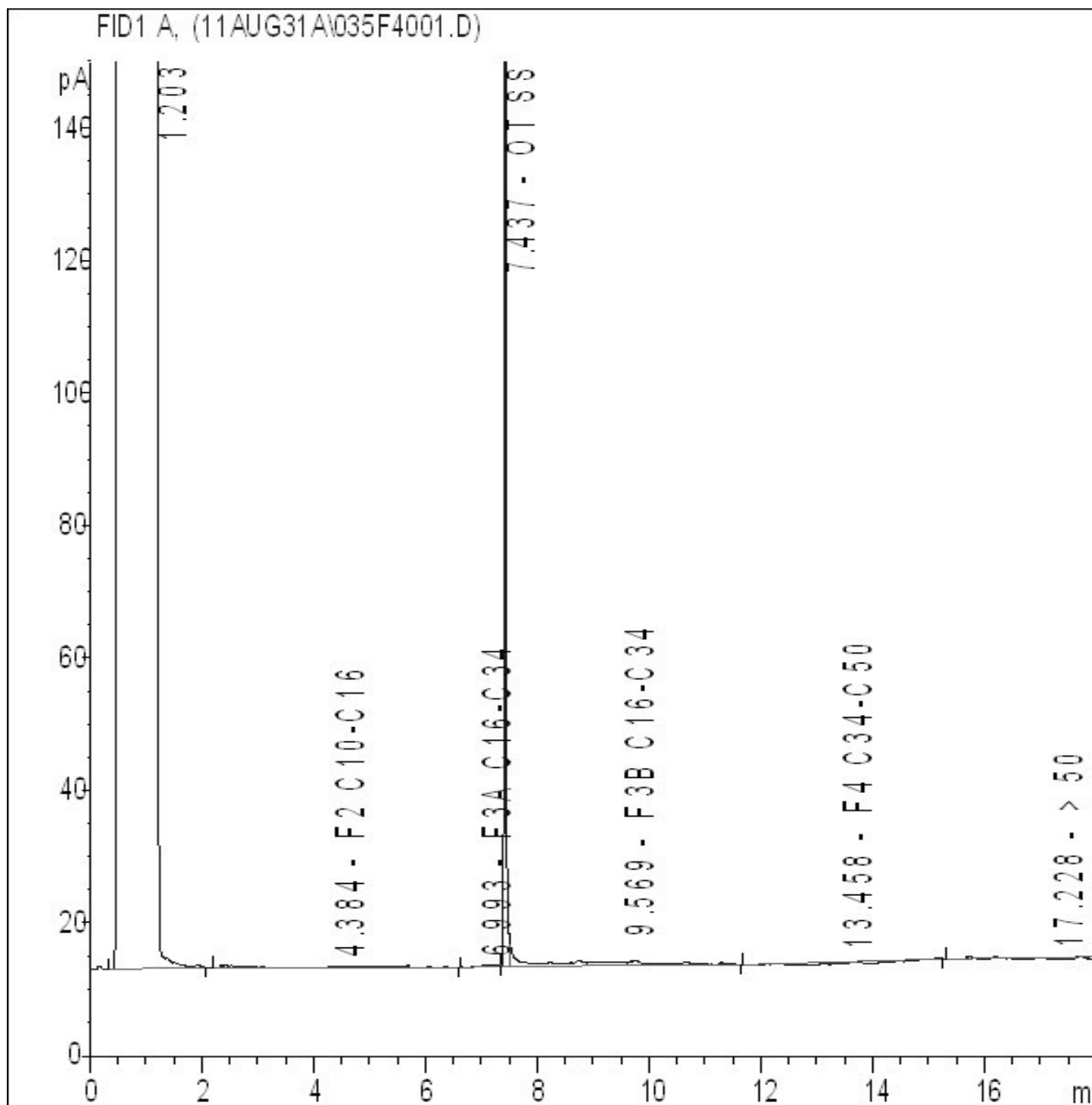
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2011/09/13
 Maxxam Job #: B1D2533
 Maxxam Sample: KS3333

Franz Environmental Inc
 Client Project #: 1697-1101

Client ID: MW 3

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



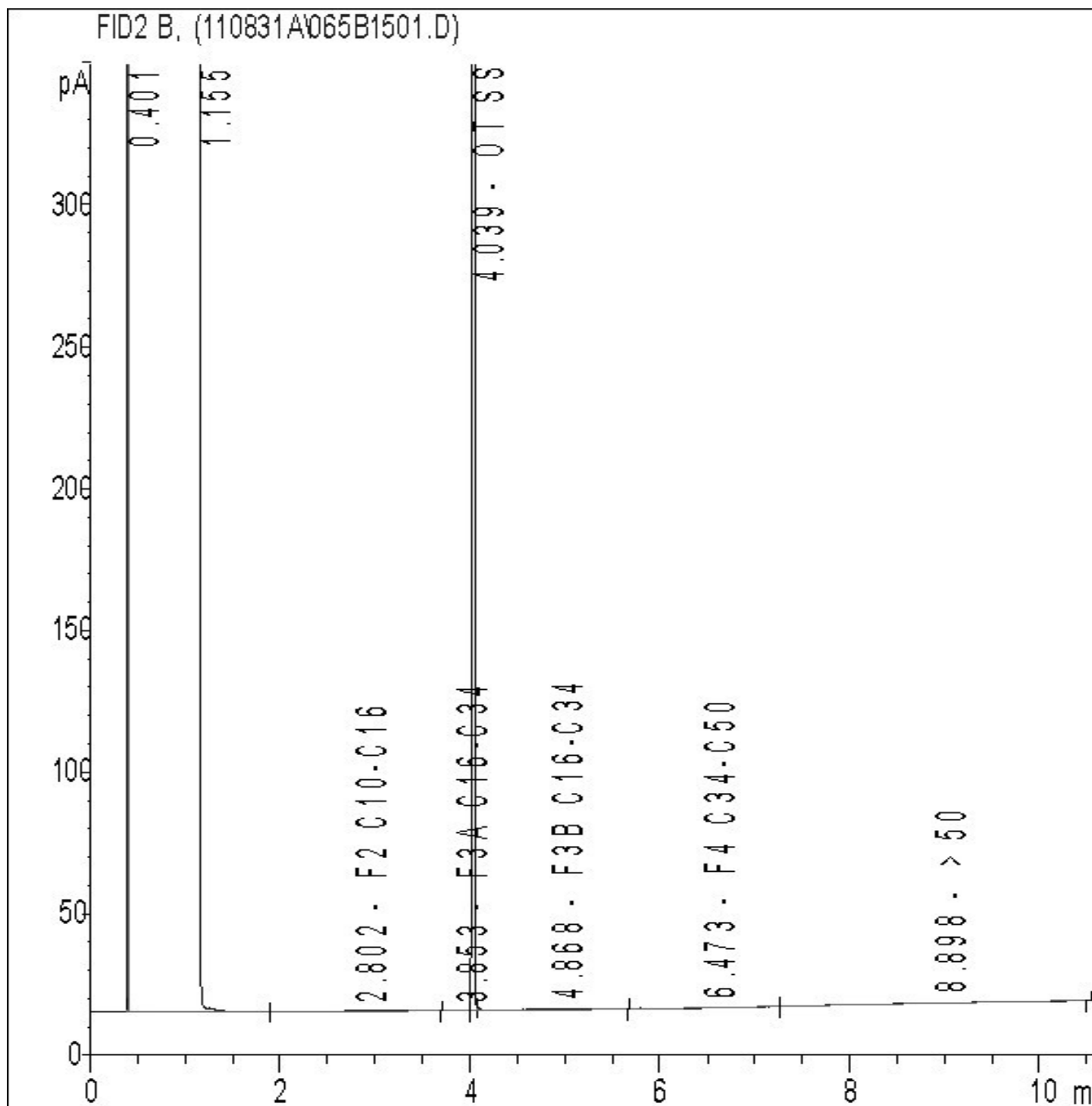
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2011/09/13
 Maxxam Job #: B1D2533
 Maxxam Sample: KS3334

Franz Environmental Inc
 Client Project #: 1697-1101

Client ID: MW 4

Petroleum Hydrocarbons F2-F4 in Water Chromatogram

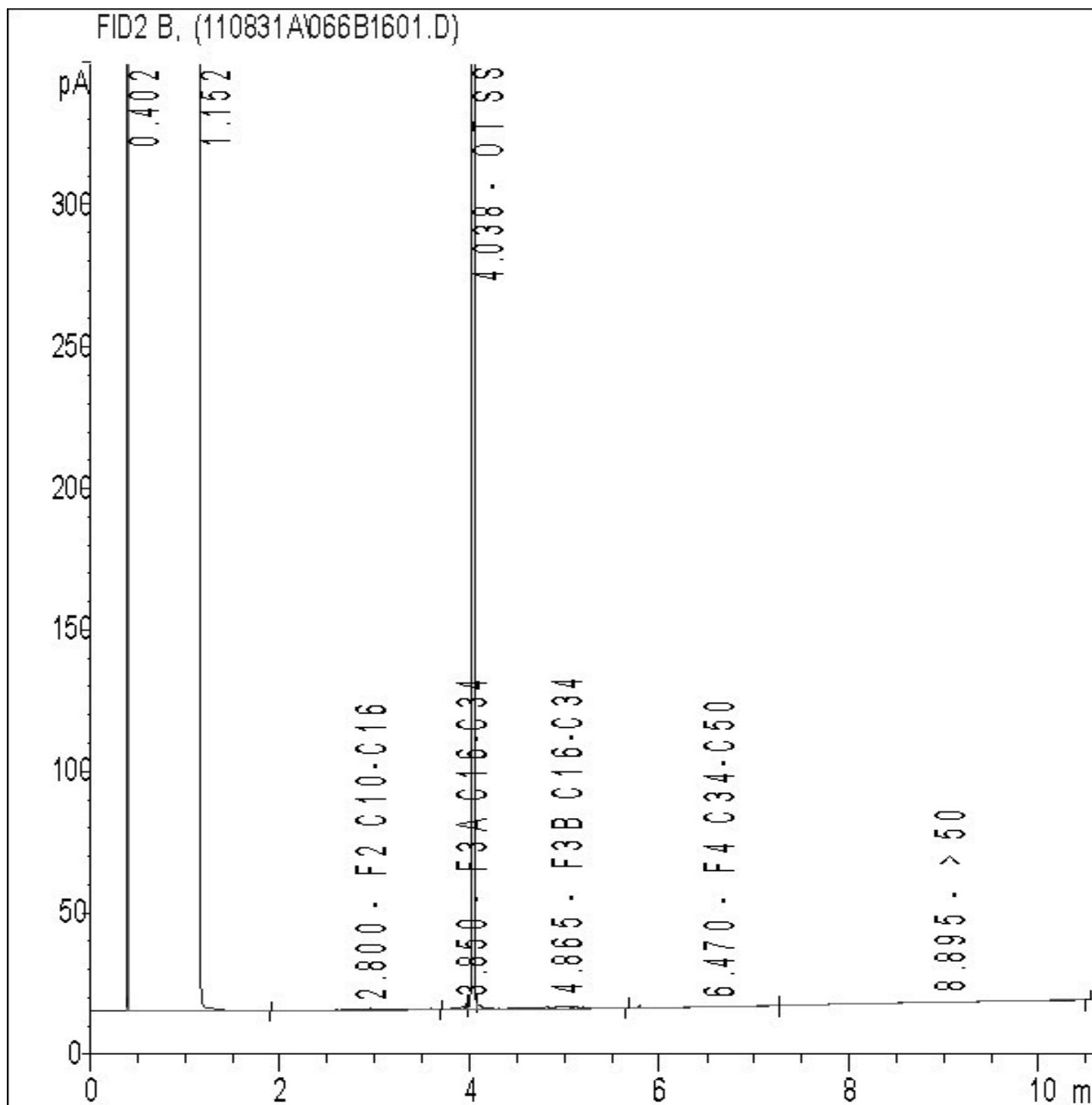


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2011/09/13
 Maxxam Job #: B1D2533
 Maxxam Sample: KS3334 Lab-Dup

Franz Environmental Inc
 Client Project #: 1697-1101
 Client ID: MW 4

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 1697-1101
Your C.O.C. #: 27401202, 274012-02-01

Attention: Catherine LeBlanc

Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2011/09/13

This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1D2546
Received: 2011/08/29, 18:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Chloride by Automated Colourimetry	1	N/A	2011/09/02	CAM SOP-00463	SM 4500 Cl E
Chloride by Automated Colourimetry	1	N/A	2011/09/06	CAM SOP-00463	SM 4500 Cl E
Colour	2	N/A	2011/09/01	CAM SOP-00412	APHA 2120
Conductivity	2	N/A	2011/08/31	CAM SOP-00448	SM 2510
Petroleum Hydro. CCME F1 & BTEX in Water	1	N/A	2011/09/01	CAM SOP-00315	CCME CWS
Petroleum Hydro. CCME F1 & BTEX in Water	1	N/A	2011/09/02	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water	2	2011/08/31	2011/09/01	CAM SOP-00316	CCME Hydrocarbons
Fluoride	2	2011/08/31	2011/08/31	CAM SOP-00448	APHA 4500FC
Mercury (low level)	1	2011/08/31	2011/08/31	CAM SOP-00453	EPA 7470
Mercury (low level)	1	2011/09/02	2011/09/02	CAM SOP-00453	EPA 7470
Dissolved Metals by ICPMS	2	N/A	2011/09/06	CAM SOP-00447	EPA 6020
Total Metals Analysis by ICPMS	2	N/A	2011/09/06	CAM SOP-00447	EPA 6020
Nitrate (NO3) and Nitrite (NO2) in Water @	2	N/A	2011/09/01	CAM SOP-00440	SM 4500 NO3/NO2B
Polychlorinated Biphenyl in Water	2	2011/08/31	2011/09/01	CAM SOP-00309	SW846 8082
pH	2	N/A	2011/08/31	CAM SOP-00448	SM 4500H
Orthophosphate	1	N/A	2011/09/02	CAM SOP-00461	SM 4500 P-F
Orthophosphate	1	N/A	2011/09/06	CAM SOP-00461	SM 4500 P-F
Sulphate by Automated Colourimetry	1	N/A	2011/09/02	CAM SOP-00464	EPA 375.4
Sulphate by Automated Colourimetry	1	N/A	2011/09/06	CAM SOP-00464	EPA 375.4
Total Dissolved Solids	2	N/A	2011/09/02	CAM SOP-00428	APHA 2540C
Low Level Total Suspended Solids	2	N/A	2011/08/31	CAM SOP-00428	SM 2540D

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

-2-

Maxxam Analytics for three weeks from receipt of data or as per contract.

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

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: JClement@maxxam.ca
Phone# (613) 274-3549

=====

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 #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

RESULTS OF ANALYSES OF WATER

Maxxam ID		KS3389		KS3390		
Sampling Date		2011/08/24		2011/08/24		
	Units	MW 1	QC Batch	CEL 1	RDL	QC Batch
Inorganics						
Colour	TCU	6	2600569	6	2	2600569
Conductivity	umho/cm	1500	2600471	1500	1	2600471
Total Dissolved Solids	mg/L	1070	2601612	1060	10	2601612
Fluoride (F-)	mg/L	0.3	2600472	0.3	0.1	2600472
Orthophosphate (P)	mg/L	<0.01	2602453	<0.01	0.01	2600718
pH	pH	7.82	2600465	7.86		2600465
Total Suspended Solids	mg/L	6	2600012	5	1	2600012
Dissolved Sulphate (SO4)	mg/L	50	2602454	50	1	2600719
Dissolved Chloride (Cl)	mg/L	300	2602452	300	5	2600710
Nitrite (N)	mg/L	<0.01	2600446	<0.01	0.01	2600446
Nitrate (N)	mg/L	0.2	2600446	0.2	0.1	2600446
Nitrate + Nitrite	mg/L	0.2	2600446	0.2	0.1	2600446

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		KS3389		KS3390		
Sampling Date		2011/08/24		2011/08/24		
	Units	MW 1	QC Batch	CEL 1	RDL	QC Batch
Metals						
Mercury (Hg)	ug/L	0.01	2599825	<0.01	0.01	2602563
Dissolved Aluminum (Al)	ug/L	27	2605513	28	5	2605513
Total Aluminum (Al)	ug/L	49	2606043	55	5	2606043
Dissolved Antimony (Sb)	ug/L	<0.5	2605513	<0.5	0.5	2605513
Total Antimony (Sb)	ug/L	<0.5	2604619	<0.5	0.5	2604619
Dissolved Arsenic (As)	ug/L	1	2605513	1	1	2605513
Total Arsenic (As)	ug/L	1	2604619	2	1	2604619
Dissolved Barium (Ba)	ug/L	14	2605513	15	2	2605513
Total Barium (Ba)	ug/L	16	2604619	17	2	2604619
Dissolved Beryllium (Be)	ug/L	<0.5	2605513	<0.5	0.5	2605513
Total Beryllium (Be)	ug/L	<0.5	2604619	<0.5	0.5	2604619
Dissolved Boron (B)	ug/L	120	2605513	120	10	2605513
Total Boron (B)	ug/L	130	2604619	130	10	2604619
Dissolved Cadmium (Cd)	ug/L	<0.1	2605513	<0.1	0.1	2605513
Total Cadmium (Cd)	ug/L	<0.1	2604619	<0.1	0.1	2604619
Dissolved Chromium (Cr)	ug/L	<5	2605513	<5	5	2605513
Total Chromium (Cr)	ug/L	<5	2604619	<5	5	2604619
Dissolved Cobalt (Co)	ug/L	<0.5	2605513	<0.5	0.5	2605513
Total Cobalt (Co)	ug/L	<0.5	2606043	<0.5	0.5	2606043
Dissolved Copper (Cu)	ug/L	1	2605513	1	1	2605513
Total Copper (Cu)	ug/L	1	2604619	1	1	2604619
Dissolved Iron (Fe)	ug/L	1000	2605513	1000	100	2605513
Total Iron (Fe)	ug/L	950	2604619	1000	100	2604619
Dissolved Lead (Pb)	ug/L	<0.5	2605513	<0.5	0.5	2605513
Total Lead (Pb)	ug/L	<0.5	2604619	<0.5	0.5	2604619
Dissolved Molybdenum (Mo)	ug/L	11	2605513	12	0.5	2605513
Total Molybdenum (Mo)	ug/L	13	2604619	13	0.5	2604619
Dissolved Nickel (Ni)	ug/L	3	2605513	2	1	2605513
Total Nickel (Ni)	ug/L	2	2604619	3	1	2604619
Dissolved Selenium (Se)	ug/L	<2	2605513	<2	2	2605513
Total Selenium (Se)	ug/L	<2	2604619	<2	2	2604619
Dissolved Silver (Ag)	ug/L	<0.1	2605513	<0.1	0.1	2605513
Total Silver (Ag)	ug/L	<0.1	2604619	<0.1	0.1	2604619
Dissolved Thallium (Tl)	ug/L	<0.05	2605513	<0.05	0.05	2605513
Total Thallium (Tl)	ug/L	<0.05	2604619	<0.05	0.05	2604619

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		KS3389		KS3390		
Sampling Date		2011/08/24		2011/08/24		
	Units	MW 1	QC Batch	CEL 1	RDL	QC Batch
Dissolved Titanium (Ti)	ug/L	<5	2605513	<5	5	2605513
Total Titanium (Ti)	ug/L	<5	2604619	<5	5	2604619
Dissolved Uranium (U)	ug/L	1.3	2605513	1.3	0.1	2605513
Total Uranium (U)	ug/L	1.7	2604619	2.0	0.1	2604619
Dissolved Zinc (Zn)	ug/L	<5	2605513	<5	5	2605513
Total Zinc (Zn)	ug/L	<5	2604619	<5	5	2604619

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		KS3389	KS3390		
Sampling Date		2011/08/24	2011/08/24		
	Units	MW 1	CEL 1	RDL	QC Batch
PCBs					
Aroclor 1016	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1221	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1232	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1242	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1248	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1254	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1260	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1262	ug/L	<0.05	<0.05	0.05	2600738
Aroclor 1268	ug/L	<0.05	<0.05	0.05	2600738
Total PCB	ug/L	<0.05	<0.05	0.05	2600738
Surrogate Recovery (%)					
2,4,5,6-Tetrachloro-m-xylene	%	33	37		2600738
Decachlorobiphenyl	%	96	103		2600738

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

O'REG 153 PETROLEUM HYDROCARBONS (WATER)

Maxxam ID		KS3389	KS3390		
Sampling Date		2011/08/24	2011/08/24		
	Units	MW 1	CEL 1	RDL	QC Batch
BTEX & F1 Hydrocarbons					
Benzene	ug/L	<0.20	<0.20	0.20	2601412
Toluene	ug/L	<0.20	<0.20	0.20	2601412
Ethylbenzene	ug/L	<0.20	<0.20	0.20	2601412
o-Xylene	ug/L	<0.20	<0.20	0.20	2601412
p+m-Xylene	ug/L	<0.40	<0.40	0.40	2601412
Total Xylenes	ug/L	<0.40	<0.40	0.40	2601412
F1 (C6-C10)	ug/L	<25	<25	25	2601412
F1 (C6-C10) - BTEX	ug/L	<25	<25	25	2601412
F2-F4 Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	100	2600648
F3 (C16-C34 Hydrocarbons)	ug/L	<100	<100	100	2600648
F4 (C34-C50 Hydrocarbons)	ug/L	<100	<100	100	2600648
Reached Baseline at C50	ug/L	YES	YES		2600648
Surrogate Recovery (%)					
1,4-Difluorobenzene	%	100	101		2601412
4-Bromofluorobenzene	%	101	99		2601412
D10-Ethylbenzene	%	102	98		2601412
D4-1,2-Dichloroethane	%	104	103		2601412
o-Terphenyl	%	114	119		2600648

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Test Summary

Maxxam ID KS3389
Sample ID MW 1
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	2602452	N/A	2011/09/06	DEONARINE RAMNARINE
Colour	SPEC	2600569	N/A	2011/09/01	CHRISTINE PHAM
Conductivity	COND	2600471	N/A	2011/08/31	YOGESH PATEL
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2601412	N/A	2011/09/01	LINCOLN RAMDAHIN
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600648	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU
Fluoride	F	2600472	2011/08/31	2011/08/31	YOGESH PATEL
Mercury (low level)	CVAA	2599825	2011/08/31	2011/08/31	LAWRENCE CHEUNG
Dissolved Metals by ICPMS	ICP/MS	2605513	N/A	2011/09/06	KEVIN COMERFORD
Total Metals Analysis by ICPMS	ICP/MS	2606043	N/A	2011/09/07	HUA REN
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2600446	N/A	2011/09/01	BERNARD ANTWI
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT
pH	PH	2600465	N/A	2011/08/31	YOGESH PATEL
Orthophosphate	AC	2602453	N/A	2011/09/06	DEONARINE RAMNARINE
Sulphate by Automated Colourimetry	AC	2602454	N/A	2011/09/06	DEONARINE RAMNARINE
Total Dissolved Solids	SLDS	2601612	N/A	2011/09/02	TEJPRATAP MISHRA
Low Level Total Suspended Solids	SLDS	2600012	N/A	2011/08/31	SUBHASHCHANDRA PATEL

Maxxam ID KS3389 Dup
Sample ID MW 1
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Total Metals Analysis by ICPMS	ICP/MS	2604619	N/A	2011/09/06	HUA REN
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Test Summary

Maxxam ID KS3390
Sample ID CEL 1
Matrix Water

Collected 2011/08/24
Shipped
Received 2011/08/29

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	2600710	N/A	2011/09/02	DEONARINE RAMNARINE
Colour	SPEC	2600569	N/A	2011/09/01	CHRISTINE PHAM
Conductivity	COND	2600471	N/A	2011/08/31	YOGESH PATEL
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2601412	N/A	2011/09/02	LINCOLN RAMDAHIN
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2600648	2011/08/31	2011/09/01	ZHIYUE (FRANK) ZHU
Fluoride	F	2600472	2011/08/31	2011/08/31	YOGESH PATEL
Mercury (low level)	CVAA	2602563	2011/09/02	2011/09/02	LAWRENCE CHEUNG
Dissolved Metals by ICPMS	ICP/MS	2605513	N/A	2011/09/06	KEVIN COMERFORD
Total Metals Analysis by ICPMS	ICP/MS	2606043	N/A	2011/09/07	HUA REN
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2600446	N/A	2011/09/01	BERNARD ANTWI
Polychlorinated Biphenyl in Water	GC/ECD	2600738	2011/08/31	2011/09/01	ALICIA RAHAMAT
pH	PH	2600465	N/A	2011/08/31	YOGESH PATEL
Orthophosphate	AC	2600718	N/A	2011/09/02	DEONARINE RAMNARINE
Sulphate by Automated Colourimetry	AC	2600719	N/A	2011/09/02	DEONARINE RAMNARINE
Total Dissolved Solids	SLDS	2601612	N/A	2011/09/02	TEJPRATAP MISHRA
Low Level Total Suspended Solids	SLDS	2600012	N/A	2011/08/31	SUBHASHCHANDRA PATEL

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

Package 1	8.0°C
Package 2	9.7°C

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

GENERAL COMMENTS

Cooler custody seal was present and intact.

All sample bottles contained visual sediment, which was included in the analysis as per the Protocol for Analytical Methods Use in the Assessment of Properties under part XV.1 of the Environmental Protection Act.

Revised Report: Cobalt added under Total and Dissolved Metals. 13-Sep-11

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2599825	Mercury (Hg)	2011/08/31	105	80 - 120	87	80 - 120	0.01, RDL=0.01	ug/L	NC	25		
2600012	Total Suspended Solids	2011/08/31					<1	mg/L	4.1	25	97	85 - 115
2600446	Nitrite (N)	2011/09/01	110	80 - 120	104	85 - 115	<0.01	mg/L	NC	25		
2600446	Nitrate (N)	2011/09/01	101	80 - 120	96	85 - 115	<0.1	mg/L	NC	25		
2600471	Conductivity	2011/08/31					<1	umho/cm	0	25	102	85 - 115
2600472	Fluoride (F-)	2011/08/31	96	80 - 120	103	80 - 120	<0.1	mg/L	NC	20		
2600569	Colour	2011/09/01			99	85 - 115	<2	TCU	NC	25		
2600648	o-Terphenyl	2011/09/01	116	30 - 130	115	30 - 130	113	%				
2600648	F2 (C10-C16 Hydrocarbons)	2011/09/01	104	60 - 130	100	60 - 130	<100	ug/L	NC	50		
2600648	F3 (C16-C34 Hydrocarbons)	2011/09/01	107	60 - 130	102	60 - 130	<100	ug/L	NC	50		
2600648	F4 (C34-C50 Hydrocarbons)	2011/09/01	111	60 - 130	106	60 - 130	<100	ug/L	NC	50		
2600710	Dissolved Chloride (Cl)	2011/09/02	NC	75 - 125	106	80 - 120	<1	mg/L	0.3	20		
2600718	Orthophosphate (P)	2011/09/02	97	75 - 125	100	80 - 120	<0.01	mg/L	NC	25		
2600719	Dissolved Sulphate (SO4)	2011/09/02	NC	75 - 125	97	80 - 120	<1	mg/L	0.8	25		
2600738	2,4,5,6-Tetrachloro-m-xylene	2011/09/01	30	30 - 130	47	30 - 130	42	%				
2600738	Decachlorobiphenyl	2011/09/01	97	30 - 130	96	30 - 130	91	%				
2600738	Aroclor 1260	2011/09/01	99	30 - 130	84	30 - 130	<0.05	ug/L	NC	40		
2600738	Total PCB	2011/09/01	99	30 - 130	84	30 - 130	<0.05	ug/L	NC	40		
2600738	Aroclor 1016	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1221	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1232	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1242	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1248	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1254	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1262	2011/09/01					<0.05	ug/L	NC	40		
2600738	Aroclor 1268	2011/09/01					<0.05	ug/L	NC	40		
2601412	1,4-Difluorobenzene	2011/09/01	99	70 - 130	101	70 - 130	98	%				
2601412	4-Bromofluorobenzene	2011/09/01	98	70 - 130	100	70 - 130	99	%				
2601412	D10-Ethylbenzene	2011/09/01	97	70 - 130	100	70 - 130	96	%				
2601412	D4-1,2-Dichloroethane	2011/09/01	104	70 - 130	102	70 - 130	102	%				
2601412	Benzene	2011/09/01	88	70 - 130	86	70 - 130	<0.20	ug/L				
2601412	Toluene	2011/09/01	90	70 - 130	92	70 - 130	<0.20	ug/L				
2601412	Ethylbenzene	2011/09/01	92	70 - 130	95	70 - 130	<0.20	ug/L				
2601412	o-Xylene	2011/09/01	93	70 - 130	94	70 - 130	<0.20	ug/L				
2601412	p+m-Xylene	2011/09/01	91	70 - 130	93	70 - 130	<0.40	ug/L				
2601412	F1 (C6-C10)	2011/09/02	78	70 - 130	93	70 - 130	<25	ug/L	NC	40		
2601412	Total Xylenes	2011/09/01					<0.40	ug/L				
2601412	F1 (C6-C10) - BTEX	2011/09/02					<25	ug/L	NC	40		
2601612	Total Dissolved Solids	2011/09/02					<10	mg/L	0.6	25	98	90 - 110
2602452	Dissolved Chloride (Cl)	2011/09/06	NC	75 - 125	105	80 - 120	<1	mg/L	0.2	20		

Maxxam Job #: B1D2546
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Franz Environmental Inc
Client Project #: 1697-1101

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2602453	Orthophosphate (P)	2011/09/06	98	75 - 125	102	80 - 120	<0.01	mg/L	NC	25		
2602454	Dissolved Sulphate (SO4)	2011/09/06	NC	75 - 125	101	80 - 120	<1	mg/L	0.5	25		
2602563	Mercury (Hg)	2011/09/02	109	80 - 120	103	80 - 120	<0.01	ug/L	NC	25		
2604619	Total Antimony (Sb)	2011/09/06	102	80 - 120	105	85 - 115	<0.5	ug/L	NC	20		
2604619	Total Arsenic (As)	2011/09/06	95	80 - 120	98	85 - 115	<1	ug/L	NC	20		
2604619	Total Barium (Ba)	2011/09/06	94	80 - 120	99	85 - 115	<2	ug/L	6.8	20		
2604619	Total Beryllium (Be)	2011/09/06	94	80 - 120	98	85 - 115	<0.5	ug/L	NC	20		
2604619	Total Boron (B)	2011/09/06	94	80 - 120	97	85 - 115	<10	ug/L	6.3	20		
2604619	Total Cadmium (Cd)	2011/09/06	99	80 - 120	105	85 - 116	<0.1	ug/L	NC	20		
2604619	Total Chromium (Cr)	2011/09/06	89	80 - 120	95	85 - 115	<5	ug/L	NC	20		
2604619	Total Copper (Cu)	2011/09/06	91	80 - 120	98	85 - 115	1, RDL=1	ug/L	NC	20		
2604619	Total Iron (Fe)	2011/09/06	93	80 - 120	97	85 - 115	<100	ug/L	8.8	20		
2604619	Total Lead (Pb)	2011/09/06	95	80 - 120	100	85 - 115	<0.5	ug/L	NC	20		
2604619	Total Molybdenum (Mo)	2011/09/06	100	80 - 120	105	85 - 115	<0.5	ug/L	4.5	20		
2604619	Total Nickel (Ni)	2011/09/06	90	80 - 120	95	85 - 115	<1	ug/L	NC	20		
2604619	Total Selenium (Se)	2011/09/06	96	80 - 120	102	85 - 115	<2	ug/L	NC	20		
2604619	Total Silver (Ag)	2011/09/06	92	80 - 120	98	85 - 115	<0.1	ug/L	NC	20		
2604619	Total Thallium (Tl)	2011/09/06	95	80 - 120	99	85 - 115	<0.05	ug/L	NC	20		
2604619	Total Titanium (Ti)	2011/09/06	92	80 - 120	96	85 - 115	<5	ug/L	NC	20		
2604619	Total Uranium (U)	2011/09/06	100	80 - 120	102	85 - 115	<0.1	ug/L	5.3	20		
2604619	Total Zinc (Zn)	2011/09/06	95	80 - 120	102	85 - 115	<5	ug/L	NC	20		
2605513	Dissolved Aluminum (Al)	2011/09/02	103	80 - 120	94	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Antimony (Sb)	2011/09/02	111	80 - 120	99	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Arsenic (As)	2011/09/02	103	80 - 120	96	80 - 120	<1	ug/L	1.3	20		
2605513	Dissolved Barium (Ba)	2011/09/02	97	80 - 120	97	80 - 120	<2	ug/L	4.7	20		
2605513	Dissolved Beryllium (Be)	2011/09/02	100	80 - 120	93	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Boron (B)	2011/09/02	99	80 - 120	94	80 - 120	13, RDL=10	ug/L	4.8	20		
2605513	Dissolved Cadmium (Cd)	2011/09/02	110	80 - 120	99	80 - 120	<0.1	ug/L	NC	20		
2605513	Dissolved Chromium (Cr)	2011/09/02	111	80 - 120	94	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Cobalt (Co)	2011/09/02	108	80 - 120	92	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Copper (Cu)	2011/09/02	109	80 - 120	93	80 - 120	<1	ug/L	NC	20		
2605513	Dissolved Iron (Fe)	2011/09/02	111	80 - 120	97	80 - 120	<100	ug/L	3.8	20		
2605513	Dissolved Lead (Pb)	2011/09/02	98	80 - 120	96	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Molybdenum (Mo)	2011/09/02	111	80 - 120	100	80 - 120	<0.5	ug/L	NC	20		
2605513	Dissolved Nickel (Ni)	2011/09/02	108	80 - 120	92	80 - 120	<1	ug/L	NC	20		
2605513	Dissolved Selenium (Se)	2011/09/02	104	80 - 120	95	80 - 120	<2	ug/L	NC	20		
2605513	Dissolved Silver (Ag)	2011/09/02	54(1, 2)	80 - 120	94	80 - 120	<0.1	ug/L	NC	20		
2605513	Dissolved Thallium (Tl)	2011/09/02	98	80 - 120	96	80 - 120	<0.05	ug/L	NC	20		
2605513	Dissolved Titanium (Ti)	2011/09/02	114	80 - 120	96	80 - 120	<5	ug/L	NC	20		
2605513	Dissolved Uranium (U)	2011/09/02	104	80 - 120	100	80 - 120	<0.1	ug/L	NC	20		

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Franz Environmental Inc
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QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2605513	Dissolved Zinc (Zn)	2011/09/02	111	80 - 120	95	80 - 120	<5	ug/L	NC	20		
2606043	Total Aluminum (Al)	2011/09/07	79 ⁽¹⁾	80 - 120	96	85 - 115	<5	ug/L	NC	20		
2606043	Total Cobalt (Co)	2011/09/07	92	80 - 120	94	85 - 115	<0.5	ug/L	NC	20		

N/A = Not Applicable

RDL = Reportable Detection Limit

RPD = Relative Percent Difference

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

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

QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) - The recovery was below the lower control limit. This may represent a low bias in some results for flagged analytes.

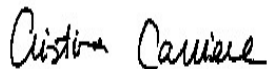
Validation Signature Page

Maxxam Job #: B1D2546

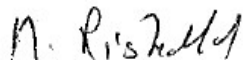
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



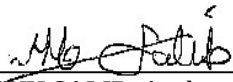
BRAD NEWMAN, Scientific Specialist



CRISTINA CARRIERE, Scientific Services



MEDHAT RISKALLAH, Manager, Hydrocarbon Department



MAMDOUH SALIB, Analyst, Hydrocarbons

Validation Signature Page

Maxxam Job #: B1D2546

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



ALINA SEGAL, Manager Main Lab - 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.

Page 1 of 1

C#274012-02-01



274012

JULIE CLEMENT

Rush Confirmation Number: _____
(call lab for #)

# of Bottles	Comments
--------------	----------

[illegible]

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt <i>8/8/8</i>	Custody Seal	Yes	No
		Present	☒	☐
		Intact	☒	☐

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

Maxxam Analytics International Corporation o/a Maxxam Analytics

DAVID CHAN 2011/08/30 10:50 8/9/8°C 8/9/10°C

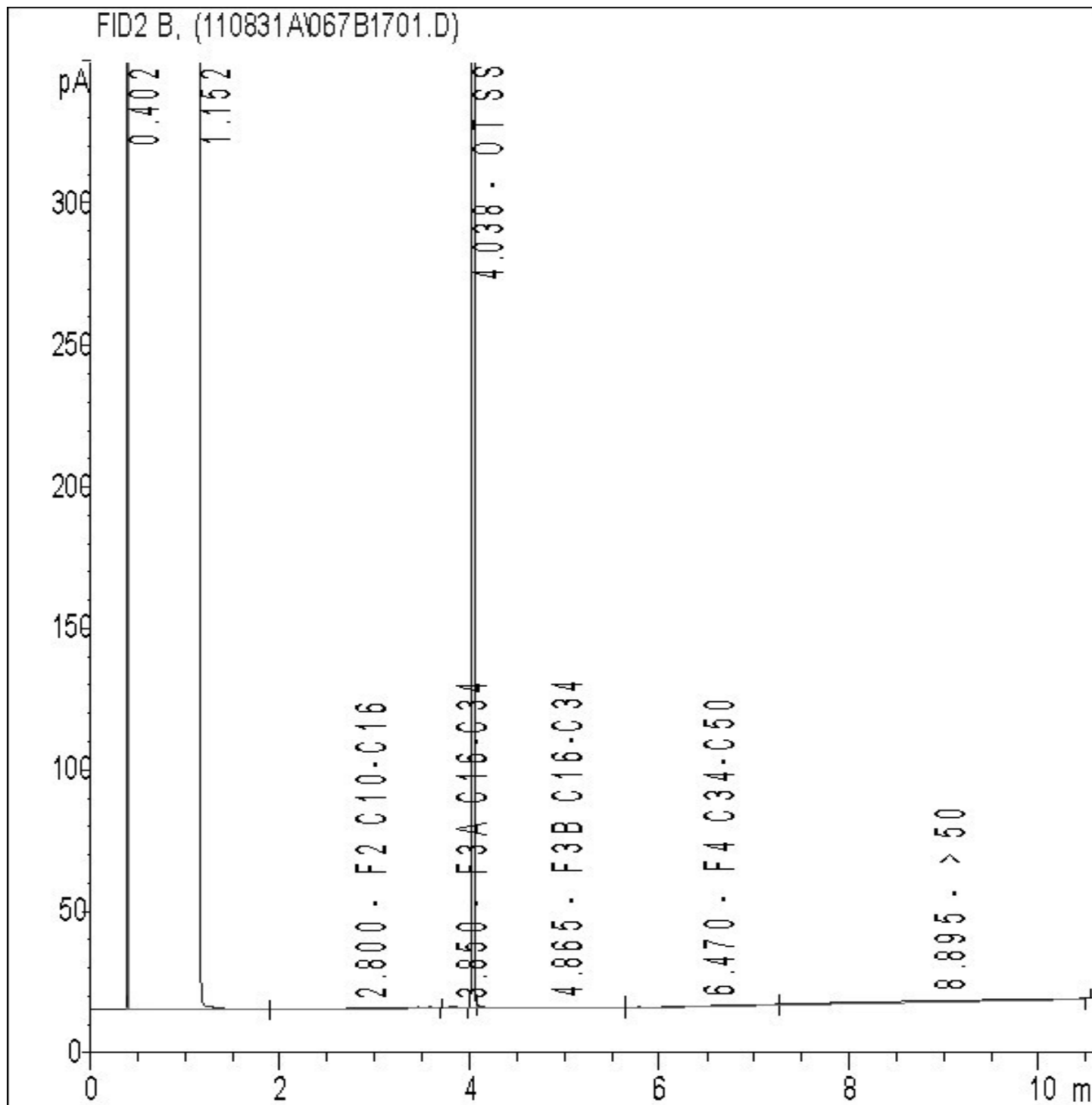
White: Maxxam Yellow: Client

Report Date: 2011/09/13
Maxxam Job #: B1D2546
Maxxam Sample: KS3389

Franz Environmental Inc
Client Project #: 1697-1101

Client ID: MW 1

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



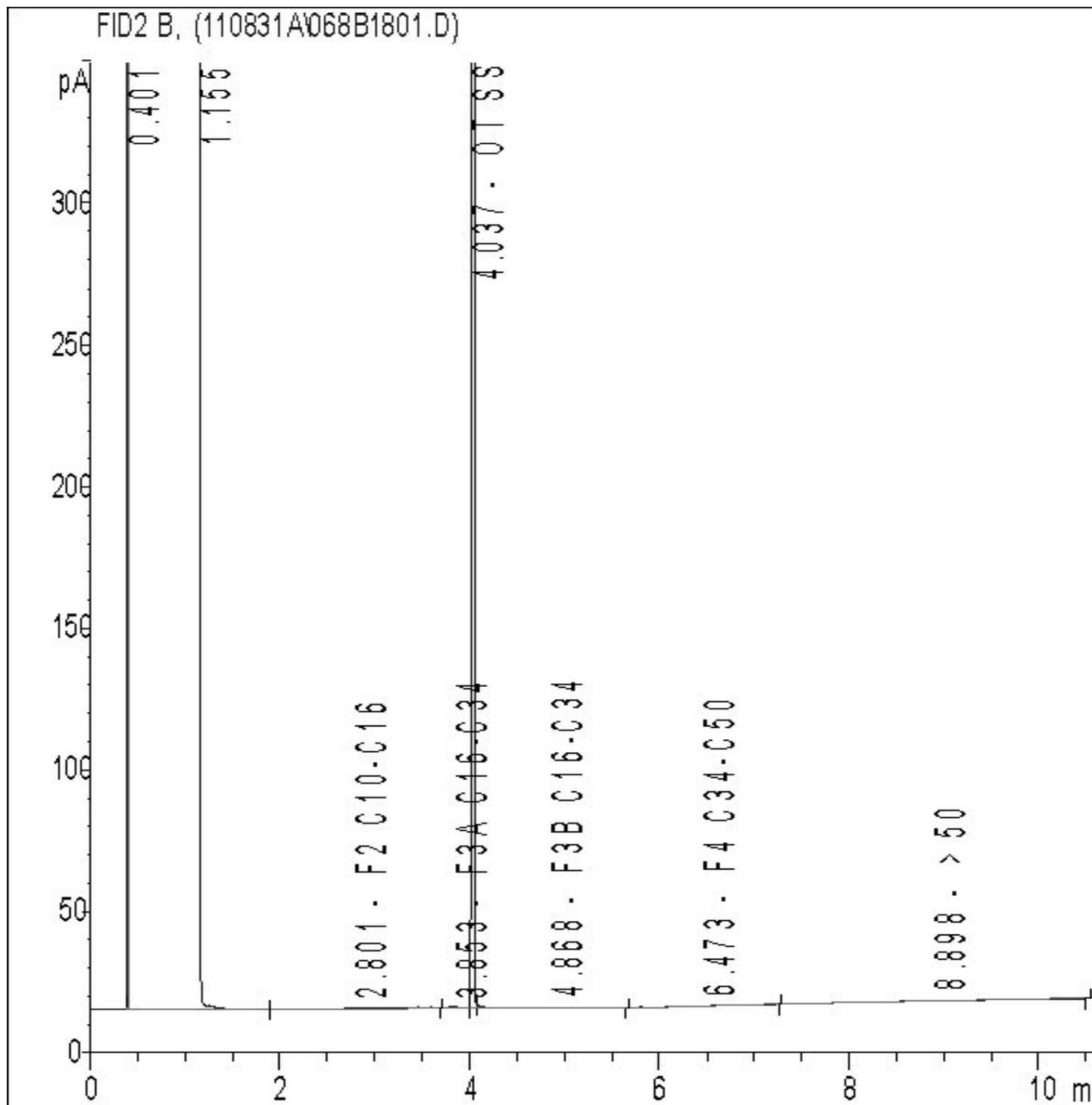
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2011/09/13
Maxxam Job #: B1D2546
Maxxam Sample: KS3390

Franz Environmental Inc
Client Project #: 1697-1101

Client ID: CEL 1

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

APPENDIX E

QA/QC Discussion

In order to obtain the required minimum of 20% duplicate samples, as stipulated in LTM plan, one duplicate soil sample and one duplicate groundwater sample were collected at the site in 2011. Analytical results for submitted samples and their duplicate pairs were compared to provide an indication of the precision of both the field sampling and laboratory analyzing methods. Results are presented along with chemical data in Appendix B, while the methodology is discussed in section 4.5.

All groundwater and soil samples analyzed for PHCs, metals, PCBs and inorganics fell within limits of QA/QC acceptability with the exception of the groundwater sample MW06-04 and AH-1 for Total Suspended Solids (TSS), total and dissolved nickel, and total arsenic. The samples exceeded the acceptable range for “Case D” samples as outlined in Table 4-2. The difference between the two concentrations for all parameters was exactly equal to the RDL, which is the margin of error on such a reading.

The internal laboratory quality control for analyses meets acceptability criteria. Therefore based on both laboratory and field QA/QC results, the data is reliable for its intended use. Laboratory QA/QC results are included in the laboratory certificates of analyses provided in Appendix D.

APPENDIX F

Site Photographs



Southwest corner of the NHL. Viewpoint 2 (Figure A-1; Appendix A). Photograph reference 2 (CD-ROM). Direction photo taken: NE



Southeast corner of the NHL. Viewpoint 17 (Figure A-1; Appendix A). Photograph reference 17 (CD-ROM). Direction photo taken: NW



Northeast corner of the NHL. Viewpoint 28 (Figure A-1; Appendix A). Photograph reference 28 (CD-ROM).
Direction photo taken: SW



Northwest corner of the NHL. Viewpoint 40 (Figure A-1; Appendix A). Photograph reference 40 (CD-ROM).
Direction photo taken: SE



Top of the NHWL. Note the undulations of the cap. Viewpoint 22 (Figure A-1; Appendix A). Photograph reference 22 (CD-ROM). Direction photo taken: W



Sinkhole near the northwest corner of the NHWL. Viewpoint 55 (Figure A-1; Appendix A). Photograph reference 55 (CD-ROM). Direction photo taken: E



Sinkhole near the southwest corner of the NHL. Viewpoint 59 (Figure A-1; Appendix A). Photograph reference 59 (CD-ROM). Direction photo taken: NE



Ponded water with staining along the toe of NHL near the southwest corner. Viewpoint 61 (Figure A-1; Appendix A). Photograph reference 61 (CD-ROM). Direction photo taken: NE



Drainage area with staining and vegetation near the northeast corner of the NHL. Viewpoint 64 (Figure A-1; Appendix A). Photograph reference 64 (CD-ROM). Direction photo taken: SW



Ponded water with staining near the north side of the NHL. Soil sample CC2 collected from this area. Viewpoint 68 (Figure A-1; Appendix A). Photograph reference 68 (CD-ROM). Direction photo taken: S



Ponded water with staining near the east side of the NHWL. Soil sample CC3/D1 collected from this area. Viewpoint 74 (Figure A-1; Appendix A). Photograph reference 74 (CD-ROM). Direction photo taken: N



Background soil sampling location. Soil sample CC4 collected from this area. Viewpoint 76 (Figure A-1; Appendix A). Photograph reference 76 (CD-ROM). Direction photo taken: N



Groundwater sampling at MW-4. Viewpoint 8 (Figure A-1; Appendix A). Photograph reference 8 (CD-ROM).
Direction photo taken: NE

Table F-1. Picture viewpoint numbers of the NHWL (as depicted in Figure A-1, Appendix A) cross-referenced with picture numbers on attached CD-ROM.

Viewpoint #	Picture #	Viewpoint #	Picture #	Viewpoint #	Picture #
1	1	28	28	55	55
2	2	29	29	56	56
3	3	30	30	57	57
4	4	31	31	58	58
5	5	32	32	59	59
6	6	33	33	60	60
7	7	34	34	61	61
8	8	35	35	62	62
9	9	36	36	63	63
10	10	37	37	64	64
11	11	38	38	65	65
12	12	39	39	66	66
13	13	40	40	67	67
14	14	41	41	68	68
15	15	42	42	69	69
16	16	43	43	70	70
17	17	44	44	71	71
18	18	45	45	72	72
19	19	46	46	73	73
20	20	47	47	74	74
21	21	48	48	75	75
22	22	49	49	76	76
23	23	50	50		
24	24	51	51		
25	25	52	52		
26	26	53	53		
27	27	54	54		

Note:

Numbers in **bold** appear in Appendix B.

APPENDIX G

Field Notes

Cape Christian

FRANZ: CEL, MID

Aug 24/11

Overcast & C

Houliha calibration

pH	temp	cond	orp	ph	DO
4.11	14.41	469	302	4.6	9.25
4.00	14.15	451	309	0	10.22

NW-4

Time	12:15	12:18	12:22	12:25	12:30
pH	5.69	5.84	5.96	5.99	6.12
cond	0.476	0.414	0.409	0.409	0.440
Turb	22.8	17.8	78.9	46.6	17.5
DO	9.68	9.44	7.23	8.46	8.35
Temp	3.25	2.84	2.30	2.94	3.04
orp	285	278	272	262	246

Level
@ 12:19 water was 1.44 cm
@ 12:24 - 1.43
12:33 - 1.41

DTW = 1.33

DTB = 1.78

Shut-up = 0.39

PUMP = 22L

LEVEL

Prints: Palau Bear & Dog.

	pH	Con	Turb	DO	Temp	ORP
12:30	6.25	0.460	42.3	8.46	30.9	227
12:40	6.33	0.490	13.7	8.30	31.6	218

- Purge 2 2L

MW 3

	pH	Con	Turb	DO	Temp	ORP
13:55	6.72	0.234	172	9.19	15.6	230
13:59	6.74	0.232	175	5.70	1.30	212

Pumped dry @ 14:02 - purge 0.5L

DTW = 1.62 Stick up = 0.56

DTB = 1.75

MW 2 + DUP 1

	pH	Con	Turb	DO	Temp	ORP
14:31	6.27	2.04	32.1	0.20	2.28	-33
14:32	6.27	2.04	32.1	0.20	2.28	-33
14:34	6.41	1.99	27.8	0	2.29	-56
14:36	6.42	1.97	29.8	0	2.11	-55
14:39	6.20	2.25	30.1	1.48	1.58	-73
14:41	6.21	3.04	39.1	0	1.57	-78
14:43	6.20	2.94	32.7	0	1.50	-78

Pumped dry 4 Purged 2L

→ Mercury & dissolved uptake

→ Mercury only dips

DTW = 0.64

Stick = 0.56

DTB = 1.52

MW 1 + C-L-1

	pH	cond	Turb	DO	Temp	ORP
15:11	7.01	1.99	18.6	0.33	2.66	-127
15:13	7.19	1.80	15.0	0	2.60	-145
15:15	7.24	1.68	14.9	0	2.61	-150
15:17	7.29	1.65	14.1	0	2.55	-149
15:19	7.34	1.61	13.7	0	2.53	-143
15:21	7.38	1.62	13.0	0	2.49	-138
15:23	7.40	1.63	13.1	0	2.45	-133

DTW = 0.99

Stick up = 0.58

DTB = 1.65

purge d. = 2L

+ DUP HERE did not continue with dup @ MW-2 due to lack of water

LEVEL