# APPENDIX C: LONG-TERM MONITORING 2010 CAM-F DEW LINE SITE, NU

# Long-Term Monitoring, 2010
# CAM-F, Sarcpa Lake, Nunavut

**FINAL REPORT**

Prepared for:

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## EXECUTIVE SUMMARY

Franz Environmental Inc. (FRANZ) was retained by Indian and Northern Affairs Canada (INAC) to conduct the third year of long-term monitoring activities at the former CAM-F Distant Early Warning (DEW) Line site at Sarcpa Lake, Nunavut as prescribed by INAC's CAM-F Sarcpa Lake Long-Term Monitoring Plan. This project was completed under INAC standing offer number 01-09-6038, call-up number 02, file number 1632-11/01-09-6038.

The CAM-F Sarcpa Lake site is located on the Melville Peninsula in the Baffin Region of Nunavut, 110 km southwest of Igloolik and 85 km west of Hall Beach. The site was constructed in 1957 as an intermediate (i.e., between main stations) DEW line site and operated as such until 1963. It was used as a scientific research station between 1977 and 1988.

An environmental remediation project was conducted at the site between 2005 and 2008. Activities included the demolition and disposal of buildings, structures and other debris, as well as the cleanup of hazardous materials. A secure soil disposal facility (SSDF) and non-hazardous waste landfill (NHWL) were constructed during remediation to contain some of the demolished materials and excavated soils. These structures remain present at the site.

FRANZ conducted the field activities for the third year of the CAM-F long-term monitoring program on September 7 and 8, 2010, while based in the nearby community of Igloolik.

Physical observations from the 2010 field activities suggest that there has been little significant change over the last three years at the CAM-F DEW Line site and that both the SSDF and the NHWL are performing as designed and are containing the enclosed waste. Temperature data suggest that the SSDF is reaching equilibrium, and that the active layer is no longer penetrating to the depth of the contaminated material.

In addition to physical and temperature observations, FRANZ collected soil and groundwater samples to assess the performance of the SSDF. Analytical results for soil samples collected in the vicinity of the SSDF satisfy guidelines for contaminants of potential concern at the site. Concentrations of contaminants of concern in groundwater samples are below the acceptable maximum when compared with historical results.

As a result of the physical and thermal observations and analytical results of the 2010 field program, FRANZ believes that the site is little changed from the last monitoring event, in August 2009, that its facilities continue to operate as designed and that the site poses no imminent threat to the natural environment. Based on field observations, FRANZ recommends that:

1. a soil sample collection be added to the monitoring program for one of the seepage points on the SSDF should seepage persist or new signs of landfill deterioration appear near any of these points;
2. a new lock be brought for the monitoring well MW0601, near the NHWL; and
3. the desiccant cartridges inside the thermistor data loggers be replaced during the next site visit.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 9.0.

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# 1.0 INTRODUCTION

Franz Environmental Inc. (FRANZ) was retained by Indian and Northern Affairs Canada – Nunavut Regional Office (INAC) to complete year three of the CAM-F DEW Line long-term monitoring plan. This project was completed under INAC standing offer number 01-09-6038, call-up number 02, file number 1632-11/01-09-6038.

This report describes the monitoring activities completed in 2010 at the former DEW Line station, Sarcpa Lake, Nunavut. It was prepared in accordance with the INAC Request for Proposal (RFP) dated April 14, 2010, the FRANZ Proposal No. P-3262, dated June 3, 2010, the Call-up Details, dated April 15, 2010 and the Project Initiating Meeting Minutes, dated July 6, 2010.

Throughout this report the former DEW Line site, CAM-F, at Sarcpa Lake, Nunavut, will be referenced as "the site".

## 1.1 Project Objectives

The principal objective of the third year of the long-term monitoring program was to evaluate the performance of the SSDF and NHWL to ensure that they are performing as intended. To achieve this objective, visual observation, landfill temperature data collection, groundwater samples, test pitting and soil sampling activities were conducted at the site.

## 1.2 Scope of Work

The scope of work as described in the 2007 CAM-F Sarcpa Lake Long-Term Monitoring Plan (INAC, 2007) was as follows:

1. Visual Monitoring of the Non-Hazardous Waste Landfill (NHWL) and Secure Soil Disposal Facility (SSDF), including:
    - Checking the physical integrity of the SSDF and NHWL and observing any evidence of erosion, ponding, frost action, settlement and lateral movement and completing a Visual Monitoring Checklist.
    - Taking photographs to document the condition of the SSDF/NHWL and substantiate the recorded observations.
2. Active Layer Water Monitoring of the SSDF, including:
    - Collection of samples from the two monitoring wells installed downgradient of the SSDF and the one well installed upgradient.
    - Examination and analysis of the samples for colour, odour, hardness, pH, conductivity, temperature, total and dissolved metals (arsenic, cadmium,

chromium, cobalt, copper, lead, nickel, and zinc), polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), major ions, total dissolved solids (TDS) and total suspended solids (TSS).

3. Soil Monitoring in the area around the SSDF, including:
    - The collection of soil samples from the toe of the SSDF in the vicinity of the monitoring wells.
    - Analysis of the soil samples for metals (arsenic, cadmium, chromium, cobalt, copper, lead, nickel, and zinc), PCBs and TPH.
4. Thermal Monitoring of the SSDF, including:
    - Collection of data from automatic data loggers attached to 4 thermistor strings with beads at selected intervals to provide ground temperature profiles at various locations within the SSDF.
5. Natural Environment Monitoring
6. Preparation of a report documenting the 2010 monitoring program.

To fulfill the scope of work as described above, FRANZ along with INAC, devised a work plan that included the following tasks:

a) Preparation of a health and safety plan;
b) Preparation of a sampling plan for soil and groundwater;
c) Excavation of test pits;
d) Collection of soil samples for chemical analysis;
e) Obtaining groundwater samples from wells for chemical analysis;
f) Inspection of thermistor installations and collection of data logger information;
g) Interpretation of analytical data;
h) Visual inspection and photo documentation of the site;
i) Interviewing local residents and officials to understand land use and wildlife trends; and
j) Reporting.

The work plan for the 2010 field work was based mainly on the following documents: CAM-F Sarcpa Lake Long-Term Monitoring Plan (INAC, 2007), the 2008 and 2009 monitoring program reports (UMA, 2008 and FRANZ, 2009), the UMA/AECOM borehole logs and well installation records and the Biogénie thermistor installation records.

## 1.3 Report Format

The long-term monitoring report presented herein is structured as follows:

*Chapter 1 – Introduction:* Provides general background information and outlines the scope and objectives of this study.

*Chapter 2 – Background Information:* Describes the history, the regional and physical setting and the general characteristics of the site..

*Chapter 3 – Regulatory Guidelines:* Presents the evaluation guidelines used for the assessment of chemical impacts and provides context for the use of certain environmental quality guidelines to assess impacts and screen chemicals of concern.

*Chapter 4 – Investigative Methodology:* Presents the methodology, level of effort and details of the field investigations.

*Chapters 5 – Summary of SSDF Conditions:* Describes the physical characteristics and the chemical impacts and distribution above applicable regulatory guidelines of the SSDF.

*Chapters 6 – Summary of NHWL Conditions:* Describes the physical characteristics of the NHWL.

*Chapter 7 – Surrounding Areas and Natural Environment:* Describes the physical conditions of the remainder of the study area, including flora and fauna.

*Chapter 8 – Conclusions and Recommendations:* Presents main findings and conclusions as well as recommendations for the next site visit.

*Chapter 9 – Limitations*

*Chapter 10 – References*

*Chapter 11 – Closure*

# 2.0 BACKGROUND INFORMATION

## 2.1 Site Description

CAM-F Sarcpa Lake, Nunavut was an Intermediate Distant Early Warning (DEW) Line site, constructed in 1957 and later abandoned in 1963. It was converted into a scientific research station in 1977 under the Science Institute of the Northwest Territories and Canada, Department of Indian and Northern Affairs, and operated seasonally until 1988. A remediation project was conducted at the site between 2005 and 2008. The remediation involved the demolition and disposal of buildings, structures and other debris, as well as the cleanup of hazardous materials. Contaminated soil was excavated and either shipped off site or placed in a secure soil disposal facility on site.

The CAM-F site consists of two main parts - the station area and the former construction camp area at Sarcpa Lake. Before remediation was completed in 2008, site facilities consisted of an airstrip, small module train, warehouse, garage, a Quonset hut, an Inuit house, two former landfill areas, and petroleum, oil and lubricants (POL) storage facilities. Before the remediation was completed, the site contained approximately 10,000 barrels of unknown contents, a radar tower that had been dismantled, other site debris and contaminated soil. There were also some miscellaneous waste and chemical leftovers from the time the site was a research facility. The beach area at Sarcpa Lake included a former construction camp that consisted primarily of scattered barrels of unknown contents (in and around the lake), abandoned construction equipment, and a small machine shop and generator pad.

A Secure Soil Disposal Facility (SSDF) and Non-hazardous Waste Landfill (NHWL) were constructed during remediation from July 2006 to September 2007 (Figures A-2 and A-3, Appendix A, respectively).

The SSDF was designed to contain non-hazardous, contaminated soils. The design was based on the characteristics of the contaminants in the soil and the local geothermal and permafrost properties. The design uses permafrost as the primary containment barrier with both the contents and perimeter berms remaining in a frozen state. It was assumed that the SSDF would reach a frozen state within 3-4 years of construction, and ground temperature data loggers were installed at each of the four corners of the facility to monitor the freeze back of the contents and berms. The thickness of the cover material was calculated to prevent the thaw of the contaminated soil even after 10 consecutive 1-in-100 warm years. The initial design was modified in 2007 and an additional metre of cover was added increasing the total cover material from 2.3 to 3.3 metres, in response to Arctic climate change studies. The SSDF contains the following:

- Tier II contaminated soil (as defined by the DEW Line Cleanup Criteria, presented in INAC's Abandoned Military Site Remediation Protocol, AMSRP.); and
- Petroleum hydrocarbon (PHC) contaminated soils (benzene, toluene, ethylbenzene and xylenes (BTEX), PHC fractions F1 and F2).

The NHWL was designed to contain non-hazardous materials only. It was constructed on the natural ground surface with the organic matter stripped and consists of four perimeter berms constructed of granular material. The non-hazardous waste was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill. Once all the layers were completed a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content between 200 and 500 parts per million (ppm) and PCB content between 1 and 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

Groundwater at the site is not used for water supply purposes. The area is used by hunters, who often make use of the Inuit house.

## 2.2 Previous Monitoring Programs

Prior to the field program, FRANZ reviewed the following reports pertaining to the CAM-F DEW Line site, which include previous site investigations and remedial activities:

- CAM-F Sarcpa Lake Long-Term Monitoring Plan, January 23, 2007, Indian and Northern Affairs Canada.
- CAM-F Borehole Logs, UMA/AECOM, July 24, 2006.
- CAM-F SSDF Monitoring Well Installations, February 17, 2005, UMA Engineering Ltd.
- Long Term Monitoring 2008, CAM-F DEW Line Site, NU, January 8, 2009, UMA Engineering Ltd.
- Long Term Monitoring 2009, CAM-F Sarcpa Lake, Nunavut, November 27, 2009, Franz Environmental Inc.
- FOX-C Ekaluguad Fjord Long-Term Monitoring Plan, March 23, 2008, Indian and Northern Affairs Canada.

- Abandoned Military Site Remediation Protocol, December 2008, Indian and Northern Affairs Canada, Contaminated Sites Program.

### 2.3 CAM-F Long-Term Monitoring Plan

The 2010 monitoring program was the third of a proposed 10 that are scheduled over a 25 year period. Information from the 2008 and 2009 investigations were incorporated into this year's sampling plan. Data collected in 2008 and 2009 were combined with the latest data, as well as that from pre-landfill construction in 2006 and 2007, and analyzed.

As part of the investigation, information was gathered though a member of the Iqaluit Hunters and Trappers Association, from those knowledgeable about surrounding areas in the nearby community of Igloolik. Land use by both humans and wildlife were discussed.

Monitoring procedures adopted by INAC for this site are based on those defined in the INAC Abandoned Military Site Remediation Protocol.

# 3.0 REGULATORY AND OTHER GUIDELINES

## 3.1 Guideline Review

Where guidelines were developed, criteria presented in the CAM-F Sarcpa Lake Long-Term Monitoring Plan (INAC, 2007) 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 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) present 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 ($nC_6$-$nC_{10}$); F2 ($nC_{10}$-$nC_{16}$); F3 ($nC_{16}$-$nC_{34}$) and F4 ($nC_{34}$+)).

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 in conducting a risk assessment.

The CAM-F former DEW Line site is a federal site, 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 expect that there are any discrepancies between the federal standards applied to the site and the Nunavut guidelines.

## 3.2 Groundwater

There are no groundwater guidelines provided in the CAM-F 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 ± 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 ± 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

FRANZ has used historical data presented in previous reports to obtain the mean and standard deviation of monitoring conducted from 2006 to 2009 for comparison with results from the 2010 field program. This data is collected in Tables B-8 and B-9 for groundwater and B-10 for soil, presented in Appendix B.

FRANZ obtained acceptable values for groundwater results from these tables (calculated as mean plus or minus three standard deviations). Maximum acceptable values from these ranges are presented in groundwater analytical tables in Appendix B.

For some parameters, specifically BTEX, sufficient data to support calculations of mean and standard deviation were not available.

### 3.3 Soil

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

- CAM-F Sarcpa Lake Long-Term Monitoring Plan (INAC, 2007) – Table 2, DEW Line Cleanup Criteria Tier II Contaminant Criteria for metals and PCBs.
- *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 commercial land use, 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 Sarcpa Lake 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 either the NHWL or the SSDF (the house used as a hunting shelter is sufficiently far from both that it is not likely to be affected by vapour intrusion). 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 CAM-F DEW Line site on September 7 and 8, 2010. During the field investigations, weather conditions were cloudy with sporadic drizzle on the first day, with temperatures around $10^{o}$ C, while clear skies and cooler temperatures prevailed on the second day. Overnight temperatures had dropped to freezing, as evidenced by ice at the site on the second morning. The monitoring program included the following tasks:

- Completing a Health & Safety Plan;
- Visually observing and photographically documenting the physical integrity of the landfill and the reporting on the observable conditions over the rest of the site;
- Natural environment monitoring and gathering information from knowledgeable persons regarding local wildlife and human activity;
- Collecting landfill temperature data from previously installed thermistor strings;
- Sampling of groundwater and soil from designated locations at the site;
- Measuring headspace vapour concentrations in the soil samples and various physical parameters in the water samples; and
- Submission of soil and groundwater samples, including duplicates, for applicable laboratory analysis.

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 work required to complete the site monitoring program. Emergency provisions such as extra food and shelter were included given the site's remoteness. A wildlife monitor with a valid firearm license was also hired and constantly present on site. The HASP 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 INAC for their review and agreement before site activities began. Prior to conducting any work on-site, the HASP was distributed and discussed with all personnel involved in the monitoring program. A copy of the HASP has been retained on file at FRANZ.

### 4.2 Visual Inspections

The Secure Soil Disposal Facility (SSDF), Non-Hazardous Waste Landfill (NHWL) and surrounding areas were visually inspected to assess the landfill's physical integrity, including evidence for erosion, ponding, frost action, settlement and lateral movement. A visual monitoring checklist, using the format prescribed in the CAM-F Long-Term Monitoring Plan

(INAC, 2007), was completed for each landfill (refer to Table 5-1 and Table 6-1 in Sections 5.3 and 6.3, respectively). Photographs were taken from the viewpoints indicated on Figures A-2 and A-3, Appendix A. These viewpoints are the same as those taken during previous site monitoring programs in order maintain consistency and facilitate the assessment of any temporal changes.

### 4.3 Wildlife Survey

FRANZ recorded observations of the natural environment made during the site visit including 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, information was gathered though our wildlife monitor, a member of the Iqaluit Hunters and Trappers Association, from those knowledgeable about surrounding areas in the nearby community of Igloolik. Land use by both humans and wildlife were discussed.

A discussion of the recorded observations and information obtained is presented in Section 7.0 of this report. Records of observation can be found in the field notes taken while on site (Appendix G).

### 4.4 Thermistor Monitoring

A thermistor string was installed at each of the four corners of the SSDF in September 2007. Each string consists of 11 or 12 temperature sensing beads connected to a Lakewood Systems UltraLogger data logger that is programmed to record values twice daily – at 0h00 and 12h00 – on a continual basis.

At the time of inspection all thermistor strings appeared to be functioning well. Thermistor data for the period from August 2009 to September 2010 were downloaded from each logger, using a laptop and portable power supply, and inspected on site to ensure completeness. Data logger battery voltages were noted and a visual inspection of the housing equipment was performed. Two new batteries were installed on each of three of the four thermistors, while the complete data logger was replaced for the other one (VT02) as recommended in the previous monitoring report (FRANZ, 2009). Each logger was then restarted to begin collecting temperature information anew.

The SSDF ground temperature record, containing continuous information since September 2007, was updated and trends highlighted. A discussion, along with plots of temperature versus depth and time, is presented in section 5.4. The annual maintenance report, which also contains a basic description of the data logger systems, can be found in Table B-11, Appendix B. Raw data is provided on the attached CD-ROM.

### 4.5 Groundwater and Soil 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 *CAM-F Sarcpa Lake Long-Term Monitoring Plan* (INAC, 2009); and
- INAC *Abandoned Military Site Remediation Protocol*, Contaminated Sites Program (INAC, 2008).

#### 4.5.1 Groundwater Sampling

Groundwater was sampled at three predetermined locations: one upgradient and two downgradient of the SSDF. A Geopump brand persistaltic pump was used to purge the designated monitoring wells. Wells were purged of three well volumes as specified in the ToR except where poor recharge rates made it necessary to sample sooner. Following 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 metals analyses were not field-filtered. A summary of the status of the monitoring wells is found in Table 5-1, Section 5.3.

Sampling locations were selected as described in *CAM-F Sarcpa Lake Long-Term Monitoring Plan* and were the same as those sampled during the previous years' monitoring events. Although it was previously requested in the ToR, sampling upgradient of the SSDF is not stipulated in the long-term monitoring plan. It is therefore not recommended to sample at this location during the next monitoring event.

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 SSDF.

| SSDF Area | Sample | Analytical Parameters |
|---|---|---|
| Upgradient | MW1004 | - total and dissolved metals<br>- PCBs<br>- petroleum hydrocarbon fractions F1-F4 and BTEX<br>- inorganics (major ions, TDS, TSS, colour, pH, conductivity, hardness) |
| | DUP-1* | |
| Downgradient | MW1005 | |
| | MW1006 | |

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

All samples were stored immediately in laboratory prepared sample bottles (for future laboratory analysis). 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.

### 4.5.2 Test Pitting and Soil Sampling

Soil sampling was completed by manual test pitting. Three test pits, identified as TP10-1, TP10-2 and TP10-3 were manually advanced in the vicinity of the SSDF at the locations specified in the long-term monitoring plan. Samples were collected within a two to four metre radius of the monitoring wells. Background samples located at the benchmarks to the east and west of the SSDF were not sampled this year as they were in 2009, in accordance with the long-term monitoring plan and written confirmation from INAC. All locations were the same as those sampled during the previous years' monitoring events.

Test pitting was performed using a shovel, decontaminated with Alconox between sample collections. Composite soil samples were collected from the side wall of each test pit at two discrete intervals: 0 – 15 cm and 40 to 50 cm below ground surface. The soil sample interval was specified by further identifying samples as (0-15) or (40-50). Soil samples were collected from each test pit and placed into laboratory prepared jars for potential 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. A photoionization detector (PID) was available for use at the site to measure combustible gas concentrations in collected soil samples, although given that sampling locations were preselected and that no evidence of contamination was observed, PID readings were deemed unnecessary. Soil stratigraphy was logged and photos taken before backfilling the test pits with excavated soil.

A total of six 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). Two field duplicate samples (DUP-1 and DUP-2) were also submitted for analysis for QA/QC purposes. Professional judgment and visual observations were used to select the samples 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.

A summary of the samples that were collected and submitted for laboratory analysis during the test pitting activities is provided in Table 4-2 below.

Table 4-2: Summary of soil sample collection near the SSDF.

| SSDF Area | Sample | Depth (mbgs) |
|---|---|---|
| Upgradient | TP10-1 (0-15) | 0 – 0.15 |
| | TP10-1 (40-50) | 0.4 – 0.5 |
| Downgradient | TP10-2 (0-15) | 0 – 0.15 |
| | TP10-2 (40-50) | 0.4 – 0.5 |
| | DUP-1* | 0.4 – 0.5 |
| | TP10-3 (0-15) | 0 – 0.15 |
| | DUP-2* | 0 – 0.15 |
| | TP10-3 (40-50) | 0.4 – 0.5 |

Note: * indicates a blind field duplicate of the sample listed above.
mbgs = metres below ground surface.

Test pit locations for the SSDF area are indicated on Figure A-2, Appendix A and additional details on the soil samples collected are presented in the test pit logs provided in Appendix C. No test pits were excavated as part of the NHWL monitoring program.

## 4.6 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.

### 4.6.1 Field

Soil samples collected for potential laboratory analysis were placed in polyethylene bags and laboratory prepared 60 mL and 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, two 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 additional parameters, such as major ions, colour, pH, conductivity, total dissolved solids, etc.

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.

Analytical results from these samples were compared with the analytical results from previous annual monitoring events.

### 4.6.2 Laboratory

To assess the reliability of the laboratory data, duplicate samples were taken for approximately every five samples collected by FRANZ. Two 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. The field staff continued placing 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 *TP10-2 (40-50)* (primary) and *DUP-1* (soil duplicate), and *TP10-3 (0-15)* (primary) and *DUP-2* (soil duplicate) were analyzed for total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs) and metals.
- Groundwater sample MW1004 (primary) and DUP-1 (water duplicate) was analyzed TPH, 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 4-3 below. When both concentrations are less than the MDL, no calculation/evaluation criterion is required.

Table 4-3: 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.

### 4.7 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 SUMMARY OF SSDF CONDITIONS

## 5.1 Area Summary

Monitoring of the SSDF consisted in part of a visual inspection to assess its physical integrity, and by collecting evidence of erosion, ponding, frost action, settlement and lateral movement. Groundwater and soil samples were also collected at locations up- and downgradient of the SSDF.

The SSDF soil and groundwater sample locations and photographic viewpoints are shown on Figure A-2, Appendix A. The visual inspection report, including supporting photos and drawing, is presented in Sections 5.2 and 5.3 below.

## 5.2 Photographic Record

The photographic record of the SSDF was completed as per the Terms of Reference. Copies of the photographs that are referenced in the body of this document are provided in Appendix F, where photograph captions provide the landfill viewpoint number (as seen on Figure A-2, Appendix A) where applicable. The complete photographic record, including full-sized photographs, is contained in the attached CD-ROM.

## 5.3 Visual Inspection Report

The visual inspection of the SSDF and surrounding area was conducted on September 7 and 8, 2010. The visual monitoring checklist was completed using the format requested by INAC and is presented as Table 5-1 of this report. Field notes relating to the visual inspection are included in Appendix G.

<u>Settlement</u>

The minor settlement that was observed over most of the southern half of the SSDF in 2009 was not evident during the 2010 site inspection visit, suggesting that the complete top of the SSDF has settled more evenly. The depth of settling over the area appears small; it has taken place to approximately the same depth as in 2008 and 2009. There is again no evidence of significant infiltration. As in previous years, no ponding was observed on top of the landfill.

Ponding was observed in areas set back from the toe of the SSDF by several metres in multiple locations on all sides (refer to Figure A-2, Appendix A).

<u>Erosion</u>

The small preferred-drainage channels observed in previous years at the toe on the southeast side of the SSDF are still apparent. Based on a comparison with photo documentation from 2008 and 2009, there does not appear to be an appreciable increase in the size of these channels.

Rip rap is has been exposed in a small, localized amounts, where fine-grained fill have been washed out on some of the structure's slopes and top, although no significant change from previous years is apparent. A few new, small, scattered potholes have formed in one area on the eastern side of the SSDF. Potholes elsewhere over the structure were observed in 2008 and 2009, and it would appear that the top and sides of the SSDF have not appreciably worsened in this respect. The large section of exposed rip rap along the southern edge roughly coincides with the area where Type 1 Granular Fill was used to construct the SSDF; the presumably smaller diameter, Type 2 Granular Fill was used to cover the remainder of the SSDF surface. It is unlikely, therefore, that this exposed rip rap is due to erosion.

The erosion observed in 2010 has not increased significantly since the 2008 and 2009 landfill inspection.

Frost Action

No evidence of heaving or cracking was observed on the top or on the berms of the SSDF. Additionally, no frost action was observed at any of the thermistor housing units nor at the surface (0-10 cm depth) or subsurface (40-50 cm depth) near the monitoring wells.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed on or around the SSDF.

Staining

No staining on or around the SSDF was observed.

Seepage Points

Seven seepage points, A to G, were identified on the eastern, southern and western sides of the SSDF (refer to Figure A-2, Appendix A). Points B, C, D and F were very moist but not saturated while points A, E and G were saturated with small amounts of surface water visible at each point. No rivulets or erosion channels had yet formed, however. On the second day of the site assessment, conditions were cold enough that seepage from points A, E and G had frozen water on the surface.

Given that these seepage points were roughly half way up the SSDF sides, and therefore at or below the depth of permafrost within the landfill (as established from temperature data in section 5.4), at least in part, it is worth paying special attention to these points during the next site visit. New rivulets, erosion channels, washing of fine-grain material and settlement should all be noted in these areas. Consideration should be given to collecting a soil sample in one of these locations should the seepage persist.

Although evidence of seepage (as a visible line around the landfill sides) was first observed in 2008, 2010 marks the first time it was observed as active and localised. Small erosion rills and potholes observed in 2009 on the side slopes also suggested seepage had occurred. Little to no erosion rills were observed, however, in connection with the newly observed seepage points A to G.

One lone piece of vegetation was taking root in seepage point F on the southern face of the SSDF, which blatantly stood out from its barren rock surroundings, suggesting the seepage is not necessarily a recent event.

Debris

Other than the same small wooden bench on top of the landfill surface observed in previous site inspections, exposed debris was not observed.

Discussion

Although no survey equipment was used, it is estimated that at least some of the seepage points may be below the depth of permafrost (as established from temperature data in section 5.4) and the depth to the contaminated soil (3.3 m below landfill top). It is not expected, however, that this is a sign of failure. At the landfill sides it should be expected that the active layer penetrate as deep as on the landfill top and so some thawing on the sides is not unexpected. Secondly, except for seepage point B, which likely occurs below 3.3 m below the SSDF top, the observed seepage may be originating from the active layer and seeping downward, wetting the landfill faces at lower elevations. Thirdly, temperature data from the four corners of the SSDF suggest that even at these relatively outer portions of the landfill, the contaminated soil lies within a zone that remains frozen throughout the year (see section 5.4).

Based on the minimal or non-existent erosion, settlement, frost action, burrowing, staining and seepage observed, the performance of the SSDF, with respect to containment, was rated as satisfactory. The evidence observed suggests the structure is performing as designed. The moist to saturated seepage points on the sides of the SSDF, however, should be carefully observed for evidence of increasing seepage and erosion during future site inspections. The visual inspection report, including supporting photos and drawing, is presented in Table 5-1 below.

Table 5-1: CAM-F Sarcpa Lake – Landfill Visual Inspection

| | |
|---|---|
| **Date:** | September 8, 2010 |
| **Landfill:** | Secure Soil Disposal Facility (SSDF) |

| **1. Erosion** | Answer |
|---|---|
| **a) Is erosion occurring on the surface or berms of the landfill?** | Yes |
| **i) Are there preferred drainage channels?** | Yes |
| **ii) Is there sloughing of material?** | Minor |
| **b) What is the extent of the erosion? *(percentage of surface area)*** | < 5% |
| **i) Is it localized or continuous?** | Localized |
| **c) Where is the erosion occurring?** South facing slope and possibly the southern half of the surface (little change observed from 2009 site inspection). | |
| **d) Explanation:** The three main preferred drainage channels are same as those photographed in 2008 and 2009, extending southward from the southern toe. Two headed south, away from the SSDF (refer to Photo 2, Appendix F) while a third is present off the southwest corner (refer to Photo 3, Appendix F), as seen on Figure A-2, Appendix A. Based on a comparison with photo documentation from 2008 and 2009, there does not appear to be significant change in any of these channels from 2008 to present.<br><br>Minor erosion on the southwest facing slope and the southern corner is again observed, with small amounts of exposed rip rap scattered potholes. Minor erosion of fine-grained fill on the top, exposing larger sized material can again be seen in Photos 4 and 5 (Appendix F) but is relatively insignificant. | |
| **2. Settlement** | Answer |
| **a) Is there differential settlement occurring on the surface?** | No |
| **i) Are there low areas or depressions?** | Yes |
| **ii) Are voids forming?** | No |
| **b) What is the extent of the settlement? *(percentage of surface area)*** | 5 – 10 % |
| **i) Is it localized or continuous?** | Localized |
| **ii) How deep is it?** | ≤ 0.3 m |
| **c) Where is the settlement occurring?** The southern half of the top of the SSDF and a few minor, isolated areas on the sides of the SSDF (Figure A-2, Appendix A). | |
| **d) Explanation:** The area of minor settlement on the surface of the SSDF observed in 2008 and 2009 is less obvious and may have occurred relatively uniformly over the entire surface. Settling is minor, and no deeper than that observed in 2009. There is no evidence of significant infiltration, although the same minor erosion and very slight settlement appears sporadically on top of the SSDF.<br><br>Ponding was again observed along several sides of the SSDF in areas set back from the toe by several metres in multiple locations (refer to Photo 3, Appendix F and Figure A-2, Appendix A, for all locations). No ponding was observed on top of the SSDF. | |
| **3. Frost Action** | Answer |
| **a) Is there frost action/damage to the landfill?** | No |
| **i) Is there exposed debris due to uplift?** | No |
| **ii) Is there tension cracking along the berms?** | No |
| **iii) Is there sorting of granular fill?** | Yes |

| | |
|---|---|
| **b) What is the extent of the frost action? *(percentage of surface area)*** | --- |
| **i) Is it localized or continuous?** | --- |
| **c) Where is the heaving/cracking occurring?** Major cracking not observed on any surface of the SSDF nor in the immediately surrounding area. | |
| **d) Explanation:** No apparent frost damage. Sorting of granular fill is obvious, as in 2009, especially on south facing slope where the area of exposed riprap is slightly larger than last year. | |

**4. Monitoring Instruments**

**a) What is the condition of the monitoring wells and thermistor strings?** There was no worsening of the minor upwelling and cracking of the internal bentonite seals reported in 2009. The MW06-04 casing was slightly skewed to one side, as first observed in 2008. Unlike 2009, there was no ponding around this well in 2010. Thermistors and casings were in good condition. Batteries were replaced at three of the thermistors while the entire data logger was replaced at location VT02 as recommended in the 2009 monitoring report.

**5. Others**

Animal Burrows: none observed.

Exposed debris: other than the same, small wooden bench on top of the SSDF, none observed.

Seepage points: Seven seepage points, A to G, were identified on the eastern, southern and western sides of the SSDF (refer to Figure A-2, Appendix A and Photos 7, 8, 9 and 10, Appendix F). Points B, C, D and F were very moist, while points A, E and G were saturated with a small amount of surface water visible. No rivulets or erosion channels had yet formed, however. On the second day of the site assessment, conditions were cold enough that seepage from points A, E and G had frozen water on the surface.

Staining: none observed.

Vegetation: no significant regrowth evident, other than a few very small grasses growing out of a couple of the newly observed seepage points on the landfill sides.

Vegetation stress: none observed.

**6. Sketch**

See Figure A-2, Appendix A

**7. General Comments**

The SSDF is in similar condition as in 2009. The same minor deviations in physical structure were evident, but the settlement on the top of the SSDF seemed less so. No worsening of the small rivulets/erosion channels on the southern side was apparent. Although several saturated seepage points were observed for the first time, the structure continues to function as designed.

### 5.4 Thermal Monitoring Data

As described in the initial annual monitoring report (UMA, 2008), two thermistor strings (01-VT and 02-VT) are installed from the SSDF surface to the top of the key trench, while two strings (03-VT and 04-VT) are installed from 1.5 m below the surface to the middle of the key trench. To compensate for predictions made in the most recent (at the time of installation) global warming study, an additional one metre (1 m) of fill was placed on top of the landfill in 2007, raising the elevation of the thermistors accordingly. Despite the raised elevation of each of the thermistor strings from the original design, their current depths seem to provide sufficient information to evaluate the essential thermal conditions within the facility.

A complete memory transfer was successfully performed on each thermistor data logger. The position of the 0 ºC isotherm was calculated at each location from ground temperatures collected on August 24, 2010 and compared to the position as determined from the previous years' data (Table 5-2). The maximum depth of the active layer – depth to the 0 ºC isotherm, or permafrost – was also interpolated from the deepest points during the year at which temperatures straddled the freezing point. A sample plot of depth versus temperature (at each thermistor bead for string 01-VT) for a day at the end of each month over the previous year is presented in Figure A-4, Appendix A, while the temperature variation at depth over the life of the landfill for thermistor 01-VT is shown on Figure A-5, Appendix A.

Table 5-2 Depths to active layer in the SSDF (m). All values interpolated.

| Thermistor | 01-VT | 02-VT | 03-VT | 04-VT |
|---|---|---|---|---|
| **Aug 24, 2008** | 1.7 | 2.2 | 2.4 | 2.0 |
| **Aug 24, 2009** | 1.8 | 2.2 | 2.3 | 2.2 |
| **Aug 24, 2010** | 1.7 | 2.2 | 2.3 | 2.2 |
| **Max between Sept 19, 2007 and Aug 24, 2008 (date established)** | Permafrost not yet established. | | 6.8 (2007-09-19) | 6.0 (2007-09-19) |
| **Max between Aug 25, 2008 and Aug 24, 2009 (date established)** | 1.8 (2009-08-22) | 2.3 (2008-09-07) | 2.5 (2008-09-07) | 2.2 (2009-08-24) |
| **Max between Aug 25, 2009 and Aug 24, 2010 (date established)** | 1.8 (2009-09- 5 to 7) | 2.2 (2009-09-07) | 2.4 (2009-09- 6 to 11) | 2.2 (2009-09-03) |

From the data in Table 5-2, it would appear that the active layer has been relatively stable over the past year. Note that maximum active layer depth since the 2009 monitoring program was actually 2.3 mbgs at 02-VT, set on August 26, 2010. At 03-VT, 2.4 mbgs was reattained on September 5 to 7, 2010 and at 04-VT, 2.2 mbgs was reattained on September 7, 2010. These values are not included in the table above as they occurred outside the "monitoring year" beginning each August 25.

Despite a warming atmospheric trend over the past three years in the CAM-F area (i.e. temperature data from both the nearest weather station at Hall Beach and the SSDF surface beads), the contaminated soil within the SSDF, below 3.3 mbgs, remains constantly frozen (Table 5-3). FRANZ has not reviewed the design drawings for the landfill and is therefore not aware of the intended final level of permafrost.

Table 5-3: Average annual temperatures at various locations for the period from August 25 to August 24 (ºC).

| Year | | 2007-2008 | 2008-2009 | 2009-2010 |
|---|---|---|---|---|
| **Hall Beach** | | -13.3 | -12.8 | -10.8 |
| **SSDF surface (bead 1 of 01-VT & 02-VT)** | | N/A | -11.1 | -9.3 |
| **Thermistor avgerage at 3.3 m below SSDF surface.** | **01-VT** | N/A | -8.7 | -8.1 |
| | **02-VT** | N/A | -8.0 | -7.4 |
| | **03-VT*** | N/A | -8.7 | -7.8 |
| | **04-VT*** | N/A | -10.0 | -8.7 |
| **Thermistor maximum at 3.3 m below SSDF surface.** | **01-VT** | N/A | -1.4 | -1.7 |
| | **02-VT** | N/A | -0.9 | -1.4 |
| | **03-VT*** | N/A | -1.0 | -1.4 |
| | **04-VT*** | N/A | -1.5 | -1.6 |

*interpolated values.

Results presented in Table 5-2 and Table 5-3 do not indicate significant change over the past year, suggesting that the landfill may be close to equilibrium conditions. Annual atmospheric temperatures (Table 5-3) along with plots of depth below the top of the SSDF versus temperature, averaged over the period of October 1 to August 31 (Figure A-6, Appendix A), suggest temperature variation within the SSDF is now more a function of climate conditions rather than freezeback. Despite warmer climate conditions during 2008-2009, freezeback continued within the SSDF. Warmer conditions during 2009-2010, however, led to a slightly warmer profile within the SSDF. Nevertheless the maximum temperature reached at 3.3 mbgs, the depth of the top of the contaminated soil within the SSDF, was slightly colder during the past year than during the previous one (Table 5-3). Note that the dates over which the annual termparatures were averaged, as selected in Figure A-6, Appendix A, were selected to allow comparison of the maximum of three years worth of data, the first reliable data being logged around October 1, 2007.

Note that factors other than annual surface temperatures will affect landfill freezeback rates, including snow cover, data for which is difficult to collect. Additionally, Environment Canada records have incomplete climate data for the nearby weather stations (eg Hall Beach, Kugaaruk and Igloolik). A winter with a thicker snow cover on the ground would provide additional insulation and slow freezeback.

Although all of the 2009-2010 data recorded by the 02-VT data logger appeared uncorrupted, the data logger was replaced during this year's monitoring program as suggested in the 2009 monitoring report (due to partial failure in 2008). Batteries for the remaining three thermistors were also replaced. Note that corrupted data on 02-VT (from August, September and December 2008 only) were not included in the calculations of results presented in Table 5-2 and Table 5-3.

Additional details can be found in the thermistor annual maintenance monitoring report (Table B-11, Appendix B). Field notes relating to the thermistor inspection are included in Appendix G.

A manual verification of the data collected by the thermistors was performed in the field using equipment provided by the data logger manufacturer. Results indicate that all temperature sensing beads of the four thermistor strings are functioning well. A comparison of manually recorded temperatures indicated good agreement between the remaining beads and their automatically logged values. All thermistor beads were found to yield temperatures within the standard 0.2 ºC margin of error. Details of the tests can be seen in Table B-12, Appendix B.

Additional thermistor inspection details, concerning field monitoring issues, field verification options and data cable pin-out, are included in Appendix H.

## 5.5 Analytical Results – Groundwater Samples

As described in section 4.5.1, a total of four groundwater samples (three 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. As suggested in AMSRP Chapter 11 "Post-Construction Monitoring," FRANZ compared analytical results to the mean of previous data. The AMSRP indicates that where groundwater concentrations are within the range of the average ± three standard deviations, the landfill is performing acceptably. Historical averages and standard deviations for groundwater are presented in Table B-8 and B-9.

*PHCs*

Laboratory analytical results and the maximum acceptable concentration (based on historical results) for PHCs are shown in Table B-1. Concentrations for all parameters were below laboratory reportable detection limits and thus fall below the maximum acceptable concentrations. While historical data does not permit the meaningful calculation of mean and standard deviations for BTEX compounds, none of these compounds exceeded detection limits.

*Metals*

Laboratory analytical results and the maximum acceptable concentration (based on historical results) for dissolved and total metals are shown in Table B-2. None of the samples collected in 2010 is above the mean of previous samples plus three standard deviations.

*PCBs*

Laboratory analytical results and the maximum acceptable concentration (based on historical results) for PCBs. As shown in the table, concentrations were below the RDLs and thus satisfy the standards applied to the site.

*Inorganics*

Laboratory analytical results and selected provincial standards and federal guidelines for inorganics are shown in Table B-4. Concentrations were within maximum acceptable concentrations where values were available.

There was no significant groundwater chemistry change since previous monitoring events (refer to Tables B-8 and B-9). The following minor changes were observed:

- new historical minima for colour (value of < 2 TCU from the previous minimum of 3 TCU at MW1006) and total Co (value of 0.77 µg/L at MW1004 from the previous minimum of 1.5 µg/L at MW1005).
- new historical maxima for dissolved Co (value of 0.7 at MW1006 from the previous, RDL maximum of 0.1), dissolved Cr (value of 6 µg/L from the previous, RDL maximum of < 1 µg/L at MW1006) and Ni and dissolved Ni (values of 49 and 38.3 µg/L from the previous maxima of 30 and 15 µg/L, respectively, at MW1006).

Although samples were analysed for dissolved mercury in 2009, it is not part of the long-term monitoring plan. Samples were therefore not analysed for this parameter this year.

Laboratory certificates of analyses for the 2010 groundwater samples are provided in Appendix D.

### 5.6 Analytical Results – Soil Samples

As described in section 4.5.2, a total of eight soil samples (six samples plus two blind duplicates) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of PHCs, metals and PCBs. Obtained analytical results are discussed below.

*PHCs*

Laboratory analytical results and selected provincial standards and federal guidelines for PHCs are shown in Table B-5. As shown in the table, concentrations satisfied 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. 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. Nether 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.

There was no significant soil chemistry change since previous monitoring events (refer to Table B-10).

Laboratory certificates of analyses for the 2010 soil samples are provided in Appendix D.

# 6.0 SUMMARY OF NHWL CONDITIONS

## 6.1 Area Summary

The NHWL is located to the northwest of the SSDL. The monitoring of the landfill included visual inspection to assess its physical integrity, including evidence of erosion, ponding, frost action, settlement and lateral movement. It was not recommended that groundwater and soil samples be taken unless physical observation warranted a more detailed investigation, according to the long-term monitoring plan.

A plan view of the NHWL indicating photographic viewpoints can be seen in Figure A-3, Appendix A. The visual inspection report, including supporting photos and drawing, is presented in sections 6.2 and 6.3 below.

## 6.2 Photographic Record

The photographic record of the NHWL was completed as per the Terms of Reference. Copies of the photographs that are referenced in the body of this document are provided in Appendix F, where photograph captions provide the landfill viewpoint number (as seen on Figure A-3, Appendix A) where applicable. The complete photographic record, including full-sized photographs, is contained in the attached CD-ROM.

## 6.3 Visual Inspection Report

The visual inspection of the NHWL and surrounding area was conducted on September 8, 2010. The visual monitoring checklist was completed using the format requested by INAC and is presented as Table 6-1 of this report. Field notes relating to the visual inspection are included in Appendix G.

<u>Settlement</u>

Settlement on the landfill top is similar to that described in 2009 (two small locations on the northwest sector; refer to Figure A-3, Appendix A). As with the SSDF, there is no obvious cause. There is no evidence of significant water infiltration and no ponding was observed at or around the NHWL.

The same settlement areas were also observed beyond the toe of the NHWL between the NW corner and the SW side (see Figure A-3, Appendix A) where maximum depth of settlement of 0.3 to 0.4 m is reached.

<u>Erosion</u>

Erosional evidence is also similar to that observed in 2009: there exists minor erosion on the sideslopes of the NHWL, likely due to downslope washing of fine-grained fill between cobbles and boulders. Small preferred drainage channels were observed on top and the southeast corner in 2009. The southeast corner toe remains unaffected. The minor erosion on top is not significant, revealing only a thin layer of larger grade stone. There is no apparent downgradient erosion.

Frost Action

No evidence of heaving or cracking was observed on the top or sides of the NHWL. Other than a slight sorting of granular fill on certain areas of landfill slope faces, there were no apparent signs of frost action.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed.

Staining

Indications of staining on or around the NHWL were not observed on or around the NHWL.

Seepage Points

It is apparent from the small rills or erosional channels on the sideslopes, observed in 2009, that seepage has occurred on all sideslopes. No ponding within the vicinity of the NHWL was evident. Conditions seem relatively unchanged since the 2008 inspection.

Debris

No debris within the vicinity of the NHWL was observed.

Discussion

Based on the very minimal erosion, settlement, frost action, burrowing, staining and seepage observed, the performance of the NHWL, with respect to containment, was again rated as satisfactory. The visual inspection report, including supporting photos and drawing, is presented in the following pages.

Table 6-1: CAM-F Sarcpa Lake – Landfill Visual Inspection

| | |
|---|---|
| **Date:** | September 8, 2010 |
| **Landfill:** | Non-Hazardous Waste Landfill (NHWL) |

| **1. Erosion** | **Answer** |
|---|---|
| **a) Is erosion occurring on the surface or berms of the landfill?** | Yes |
| **i) Are there preferred drainage channels?** | Yes |
| **ii) Is there sloughing of material?** | No |
| **b) What is the extent of the erosion? *(percentage of surface area)*** | 10 % |
| **i) Is it localized or continuous?** | Localized |
| **c) Where is the erosion occurring?** Sideslopes of berms. | |
| **d) Explanation:** Similar status as 2009: minor erosion on sideslopes, likely due to downslope washing of fine-grained fill between cobbles and boulders. No significant erosion apparent downgradient. Slight preferred drainage channels on top and southeast corner; SE corner toe unaffected. Minor erosion on top not significant – i.e. only revealing larger stone (Photos 13 and 14, Appendix F). | |
| **2. Settlement** | **Answer** |
| **a) Is there differential settlement occurring on the surface?** | Yes |
| **i) Are there low areas or depressions?** | Yes |
| **ii) Are voids forming?** | No |
| **b) What is the extent of the settlement? *(percentage of surface area)*** | < 5% |
| **i) Is it localized or continuous?** | Localized |
| **ii) How deep is it?** | 0.3 – 0.4 m |
| **c) Where is the settlement occurring?** On top with small areas beyond the toe between the NW corner and the SW side where the maximum depth of settlement 0.3 to 0.4 m is reached, the same as in 2009. See Figure A-3, Appendix A. | |
| **d) Explanation:** No obvious cause other than subsurface material; it is presumed that surface water infiltrates through the cobbly and bouldery cover material, possibly carrying small amounts of fine-grained fill, and seeps along the frozen-thawed soil interface through the landfill body and side slopes.<br><br>No ponding was observed on or around the NHWL. | |
| **3. Frost Action** | **Answer** |
| **a) Is there frost action/damage to the landfill?** | No |
| **i) Is there exposed debris due to uplift?** | No |
| **ii) Is there tension cracking along the berms?** | No |
| **iii) Is there sorting of granular fill?** | No |
| **b) What is the extent of the frost action? *(percentage of surface area)*** | --- |
| **i) Is it localized or continuous?** | --- |
| **c) Where is the heaving/cracking occurring?** None visible on any surface of the NHWL. | |

**d) Explanation:** No apparent signs of frost action on any surface of the NHWL other than slight sorting of granular fill on certain areas of landfill slope faces.

**4. Monitoring Instruments**

**a) What is the condition of the monitoring wells?** The surface seals that were deteriorating around all three wells during the 2009 site visit have remained stable, as has the minor casing shift. Guard, 40 mm, No. 834 (key number 102) universal-key padlocks were installed on two of the three monitoring wells missing locks. A lock should be installed on well MW0601 during the next site visit. Because the well casing lid is bent, some hammering and reshaping will first be required.

**5. Others**

Animal Burrows: none observed.

Exposed debris: none observed.

Seepage points: none observed.

Staining: none observed.

Vegetation: no significant regrowth evident.

Vegetation stress: none observed.

**6. Sketch**

See Figure A-3, Appendix A

**7. General Comments**

The NHWL is in similar condition as in 2009. The same minor deviations in physical structure are still present, such as minor settlement on the landfill surface and minor erosion. No new, significant changes were observed. The structure is still acceptable and continues to function as designed. A new lock should be installed on the monitoring well MW0601.

## 7.0 SURROUNDING AREAS AND NATURAL ENVIRONMENT

The rest of the CAM-F DEW Line site was also inspected, including the borrow and regraded areas. With the exception of the cabin area between the NHWL and SSDF which is in constant use, the site was found to be clean and in good order. It was thought, however, that the borrow areas to the west of the NHWL could have been regarded with a little more care at the time of completion of work at the site, making for a tidier final appearance.

Long-Term Monitoring plans for other, similarly managed INAC sites recommend monitoring the following parameters to better understand the presence and temporal changes to wildlife and the natural environment:

- 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

Information regarding these parameters were either gathered directly, through personal observation while on site or indirectly, through our wildlife monitor, a member of the Hunters and Trappers Association, Iqaluit, who consultated knowledgeable local persons in the nearby community of Igloolik.

<u>Wildlife and Human Activity</u>

From information gathered in Cambridge Bay, it seems that the site is used for hunting and fishing, although additional details were not well known. During the monitoring, the following signs of wildlife were observed on site between late morning and late afternoon on September 7 and 8, 2010:

- Snow geese flew over (multiple occasions).
- Snow geese tracks and scat all over site.
- Caribou tracks near the SSDF.
- Sandpipers (several) near the SSDF.
- Small sparrow-like birds neat the NHWL

Human activity was summarized as follows:

- Sarcpa lake is apparently used for fishing.
- ATV tracks are found all over the site.
- Cabin is well used. The entrance was very dirty, being covered with several uncleaned caribou pelts. Pelts were also strewn across the area outside the cabin.

- Many empty barrels were observed outside the Inuit house. Several barrels with small amounts of gasoline were also noted. Most of these barrels have accumulated since the last long-term monitoring site visit.

It seems clear that the site is used frequently by both local hunters and a variety of wildlife.

Re-establishment of Vegetation

Major site remedial work, comprised of excavation and construction activities, was completed in the summer of 2007, approximately three years prior to the site monitoring visit. Little evidence of revegetation in August 2010 was observed. Given the regional setting of the CAM-F DEW Line site and growth observed at other, similar sites in the Nunavut region, it is reasonable to assume that it will take some time for native vegetation to become re-established at the site.

A couple of lone pieces of vegetation were taking root, however, in seepage point F on the southern face of the SSDF.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

All physical observations suggest that there has been little significant change over the last three years at the CAM-F Distant Early Warning (DEW) Line site and that both the secure soil disposal facility (SSDF) and the non-hazardous waste (NHWL) landfill are performing as designed and are containing the enclosed waste. Temperature data suggest that the SSDF is reaching equilibrium, and that the active layer is no longer penetrating to the depth of the contaminated material.

FRANZ conducted the field activities for the third year of the CAM-F long-term monitoring program on September 7 and 8, 2010, while based in the nearby community of Igloolik.

Physical observations from the 2010 field activities suggest that there has been little significant change over the last three years at the CAM-F DEW Line site and that both the SSDF and the NHWL are performing as designed and are containing the enclosed waste. Temperature data suggest that the SSDF is reaching equilibrium, and that the active layer is no longer penetrating to the depth of the contaminated material.

In addition to physical and temperature observations, FRANZ collected soil and groundwater samples to assess the performance of the SSDF. Analytical results for soil samples collected in the vicinity of the SSDF satisfy guidelines for contaminants of potential concern at the site. Concentrations of contaminants of concern in groundwater samples are below the acceptable maximum when compared with historical results.

As a result of the physical and thermal observations and analytical results of the 2010 field program, FRANZ believes that the site is little changed from the last monitoring event, in August 2009, that its facilities continue to operate as designed and that the site poses no imminent threat to the natural environment. Based on field observations, FRANZ recommends that:

1. a soil sample collection be added to the monitoring program for one of the seepage points on the SSDF should seepage persist or new signs of landfill deterioration appear near any of these points;
2. a new lock be brought for the monitoring well MW0601, near the NHWL; and
3. the desiccant cartridges inside the thermistor data loggers be replaced during the next site visit.

## 9.0 LIMITATIONS

This report has been prepared exclusively for Indian and Northern Affairs Canada. Any other person or entity may not rely upon the report without the express written consent from Franz Environmental Inc. and Indian and Northern Affairs 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 September 7 and 8, 2010. 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.

## 10.0 REFERENCES

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## 11.0 CLOSURE

We trust that this information satisfies 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.**

Tina Ranger

Tina Ranger, Dipl. Tech.
Field Assessor

Matthew Cyr, M.Sc.
Field Assessor

Andrew Henderson, B.Eng., P.Eng.
Project Manager

Mike Grinnell, P.Eng.
Senior Environmental Engineer/Reviewer

Distribution: Addressee (2 paper, 1 electronic)
FRANZ (2 paper)

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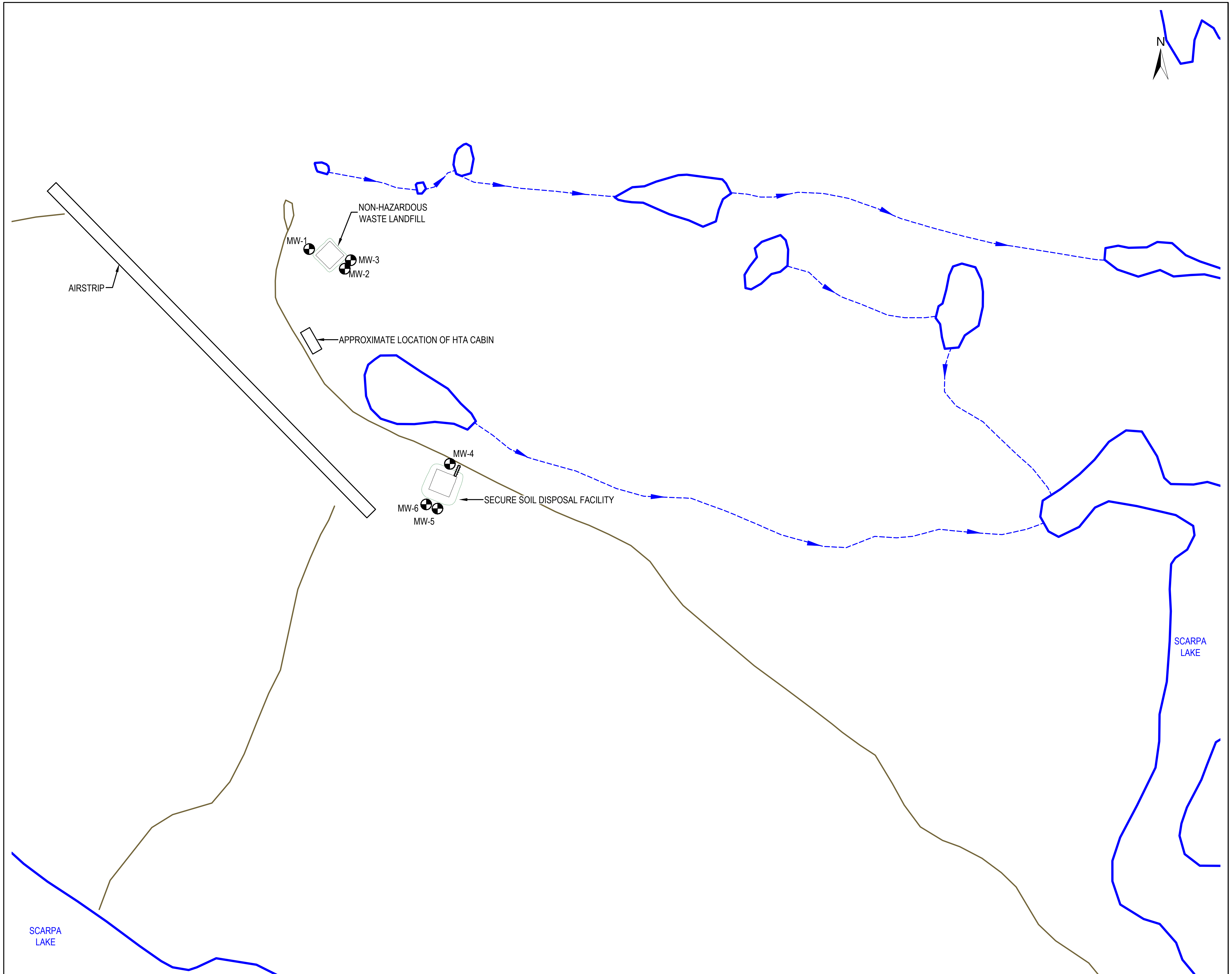
# APPENDIX A

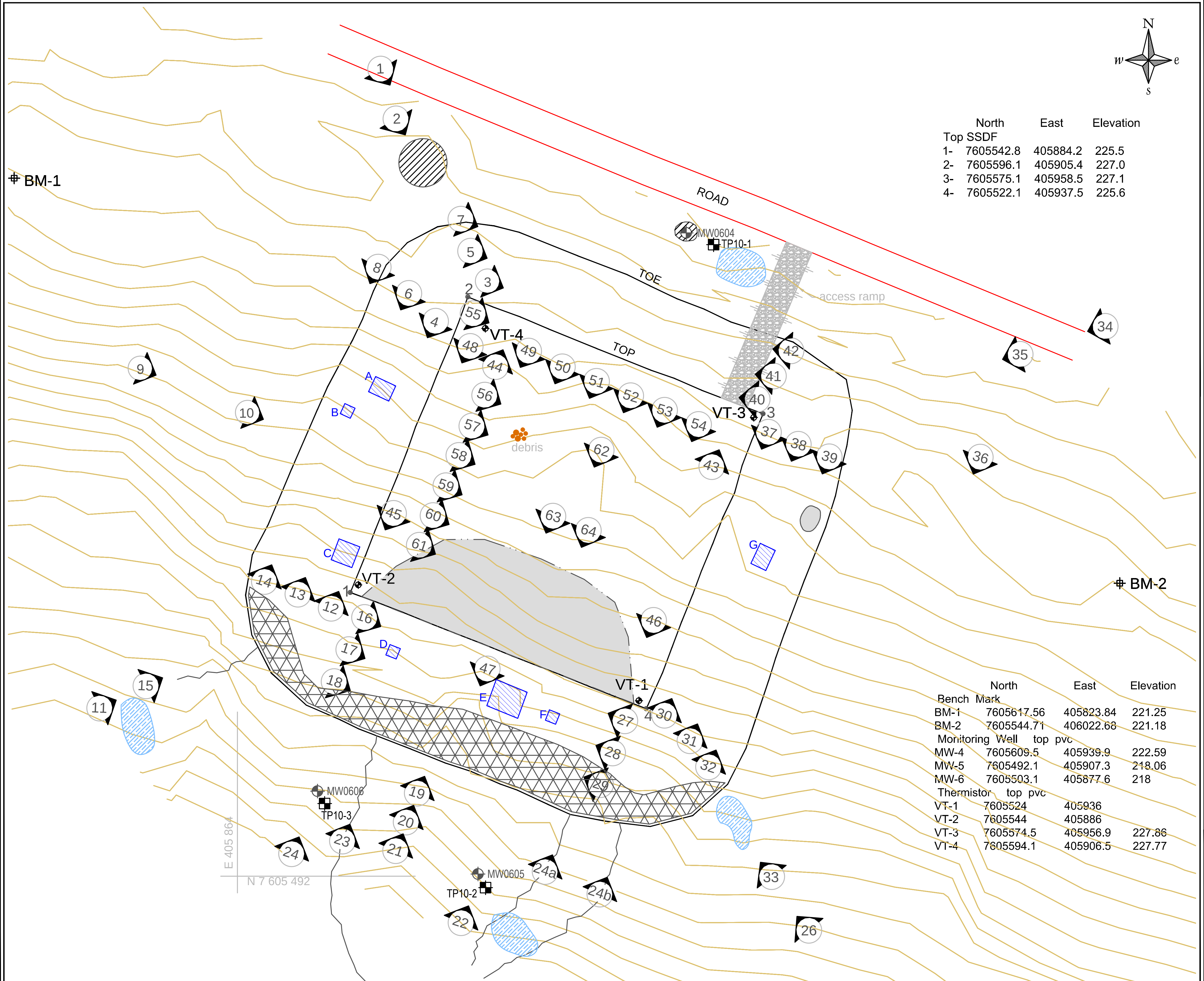
# Figures




LEGEND
EDGE OF NATURAL BOUNDARY (LAKE)
RIVER
TRAIL

| | |
|---|---|
| Title: SITE FEATURES | |
| FRANZ ENVIRONMENTAL INC. ♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦ | Project: CAM-F, SARCPA LAKE, NU 1697-1001 |
| Date: NOVEMBER 2010 | Client: INDIAN AND NORTHERN AFFAIRS CANADA |
| Scale: 1:10,000 100 0 100 200 400m | FIGURE A-1 |

1697-1001/CAD/SG/A-1.dwg




| | North | East | Elevation |
|---|---|---|---|
| Top SSDF | | | |
| 1- | 7605542.8 | 405884.2 | 225.5 |
| 2- | 7605596.1 | 405905.4 | 227.0 |
| 3- | 7605575.1 | 405958.5 | 227.1 |
| 4- | 7605522.1 | 405937.5 | 225.6 |

| | North | East | Elevation |
|---|---|---|---|
| Bench Mark | | | |
| BM-1 | 7605617.56 | 405823.84 | 221.25 |
| BM-2 | 7605544.71 | 406022.68 | 221.18 |
| Monitoring Well | | | top pvc |
| MW-4 | 7605609.5 | 405939.9 | 222.59 |
| MW-5 | 7605492.1 | 405907.3 | 218.06 |
| MW-6 | 7605503.1 | 405877.6 | 218 |
| Thermistor | | | top pvc |
| VT-1 | 7605524 | 405936 | |
| VT-2 | 7605544 | 405886 | |
| VT-3 | 7605574.5 | 405956.9 | 227.86 |
| VT-4 | 7605594.1 | 405906.5 | 227.77 |

## LEGEND

- TP TEST PIT LOCATIONS
- MW MONITORING WELL LOCATIONS
- BM-2 BENCH MARK LOCATIONS
- 22 PICTURE VIEWPOINT NUMBER
- EXPOSED RIPRAP
- PONDED SURFACE WATER
- EROSION CHANNEL
- SETTLEMENT
- AREA OF DEPRESSION
- ACTIVE SEEPAGE POINTS
- VT-4 VERTICAL THERMISTOR

| Viewpoint # | Picture # | Viewpoint # | Picture # | Viewpoint # | Picture # |
|---|---|---|---|---|---|
| 1 | P9090649 | 23 | P9090561 | 43 | P9090593 |
| 2 | P9090651 | 24 | P9090559 | 44 | N/A |
| 3 | P9090637 | 24a | P9090571 | 45 | P9090669 |
| 4 | P9090647 | 24b | P9090573 | 46 | P9090591 |
| 5 | P9090639 | 25 | N/A | 47 | N/A |
| 6 | P9090645 | 26 | P9090575 | 48 | N/A |
| 7 | P9090641 | 27 | P9090579 | 49 | P9090632 |
| 8 | P9090643 | 28 | P9090581 | 50 | P9090630 |
| 9 | P9090653 | 29 | P9090583 | 51 | P9090628 |
| 10 | P9090655 | 30 | P9090589 | 52 | P9090626 |
| 11 | IMG_2499 | 31 | P9090587 | 53 | P9090624 |
| 12 | IMG_2507 | 32 | P9090585 | 54 | P9090622 |
| 13 | IMG_2505 | 33 | P9090577 | 55 | P9090634 |
| 14 | IMG2503 | 34 | P9090601 | 56 | P9090677 |
| 15 | IMG_2501 | 35 | P9090603 | 57 | P9090675 |
| 16 | P9090553 | 36 | P9090605 | 58 | P9090673 |
| 17 | P9090555 | 37 | P9090615 | 59 | P9090671 |
| 18 | P9090556 | 38 | P9090613 | 60 | P9090667 |
| 19 | P9090567 | 39 | P9090611 | 61 | P9090665 |
| 20 | P9090565 | 40 | P9090595 | 62 | P9090620 |
| 21 | P9090563 | 41 | P9090597 | 63 | P9090617 |
| 22 | PP9090569 | 42 | P9090599 | 64 | P9090618 |

NOTE:
PICTURE NUMBERS REFER TO PHOTOGRAPH NAMES AS THEY APPEAR ON THE ATTACHED CD-ROM.

Title: SECURE SOIL DISPOSAL FACILITY

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: CAM-F, SARCPA LAKE, NU
1697-1001

Date: NOVEMBER 2010

Client: INDIAN AND NORTHERN AFFAIRS CANADA

Scale: 0 5 25

FIGURE A-2

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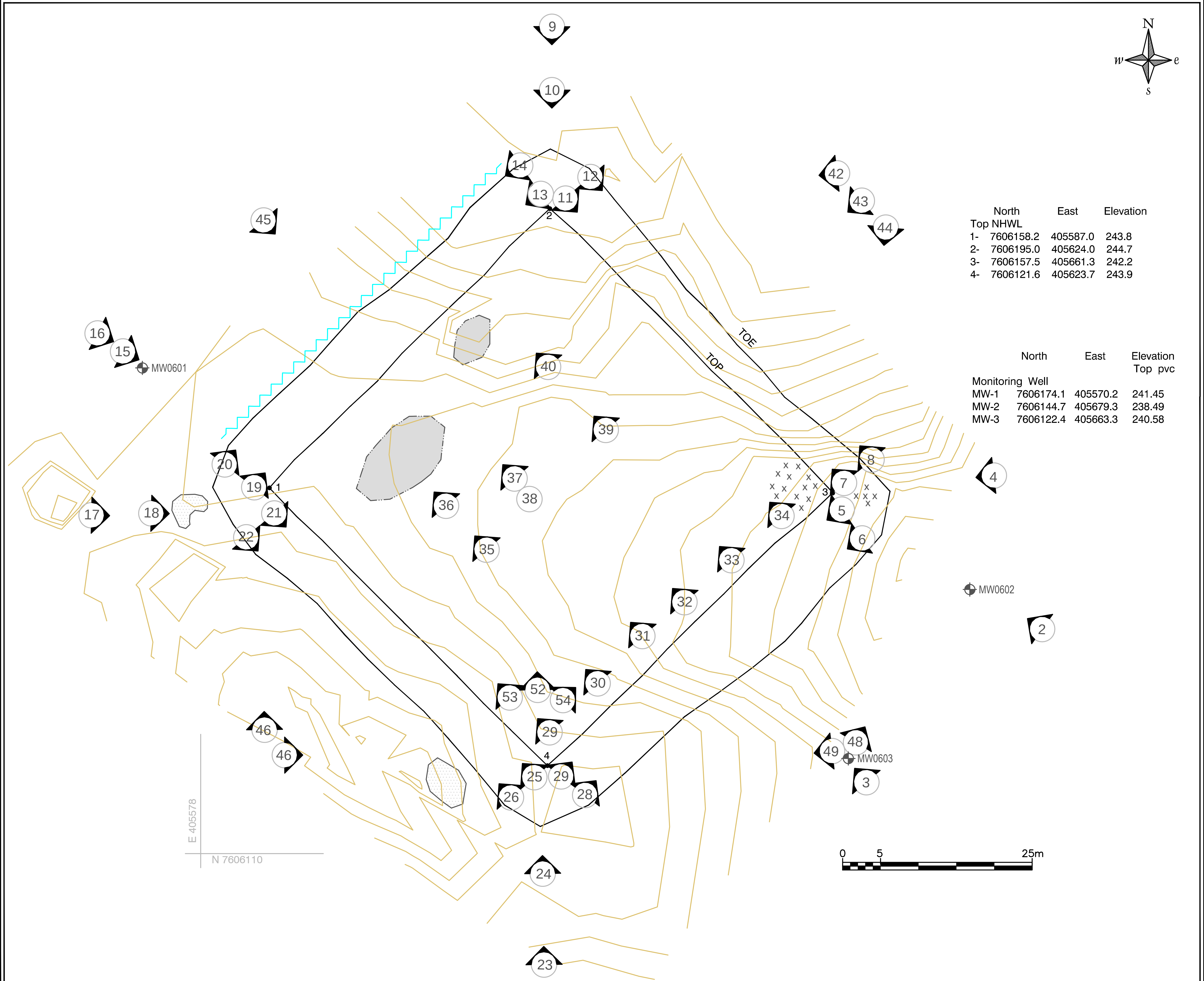


| | North | East | Elevation |
|---|---|---|---|
| Top NHWL | | | |
| 1- | 7606158.2 | 405587.0 | 243.8 |
| 2- | 7606195.0 | 405624.0 | 244.7 |
| 3- | 7606157.5 | 405661.3 | 242.2 |
| 4- | 7606121.6 | 405623.7 | 243.9 |

| | North | East | Elevation Top pvc |
|---|---|---|---|
| Monitoring Well | | | |
| MW-1 | 7606174.1 | 405570.2 | 241.45 |
| MW-2 | 7606144.7 | 405679.3 | 238.49 |
| MW-3 | 7606122.4 | 405663.3 | 240.58 |

## LEGEND

- MW MONITORING WELL LOCATIONS
- 22 PICTURE VIEWPOINT NUMBER
- SETTLEMENT
- AREA OF DEPRESSION
- POOR GRADING
- SMALL COLLECTION OF LARGE STONE AT TOE

| Viewpoint # | Picture # | Viewpoint # | Picture # | Viewpoint # | Picture # |
|---|---|---|---|---|---|
| 1 | N/A | 23 | P9080513 | 45 | P90980487 |
| 2 | IMG_2472 | 24 | P9080515 | 46a | IMG_2488 |
| 3 | IMG_2482 | 25 | P9080517 | 46b | IMG_2490 |
| 4 | IMG_2474 | 26 | P9080519 | 48 | IMG_2484 |
| 5 | P9080543 | 27 | P9050521 | 49 | IMG_2486 |
| 6 | P9080545 | 28 | P9080523 | 50 | N/A |
| 7 | P9080547 | 29 | P9080525 | 51 | N/A |
| 8 | P9080549 | 30 | P9080533 | 52 | P9080527 |
| 9 | P9080471 | 31 | P9080535 | 53 | P9080529 |
| 10 | P9080473 | 32 | P9080537 | 54 | P9080531 |
| 11 | P9080475 | 33 | P9080539 | | |
| 12 | P9080477 | 34 | PP90805441 | | |
| 13 | P9080479 | 35 | P9080503 | | |
| 14 | P9080481 | 36 | P9080501 | | |
| 5 | P9080483 | 37 | P9080505 | | |
| 16 | P9080485 | 38 | P9080507 | | |
| 17 | P9080489 | 39 | P9080511 | | |
| 18 | P9080491 | 40 | P9080509 | | |
| 19 | P90800493 | 41 | N/A | | |
| 20 | P9080495 | 42 | IMG_2476 | | |
| 21 | P9080496 | 43 | IMG_2478 | | |
| 22 | P9080499 | 44 | IMG_2480 | | |

NOTE:
PICTURE NUMBERS REFER TO PHOTOGRAPH NAMES AS THEY APPEAR ON THE ATTACHED CD-ROM.

Title: NON-HAZARDOUS WASTE LANDFILL

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: CAM-F SARCPA LAKE, NU
1697-1001

Date: NOVEMBER 2010

Client: INDIAN AND NORTHERN AFFAIRS CANADA

SCALE AS SHOWN

FIGURE A-3

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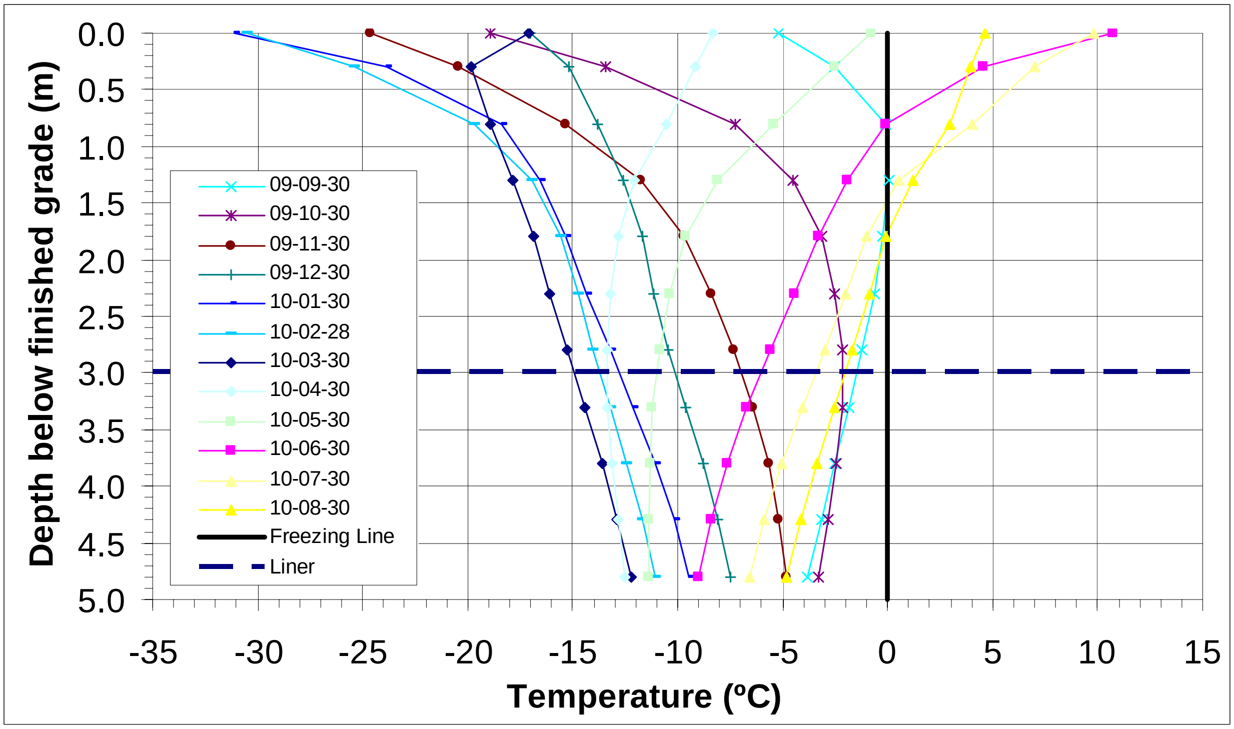


Figure A-4: Example of thermal monitoring data at the Secure Soil Disposal Facility on the 30th of each month for the period September 2009-August 2010 at thermistor VT01.

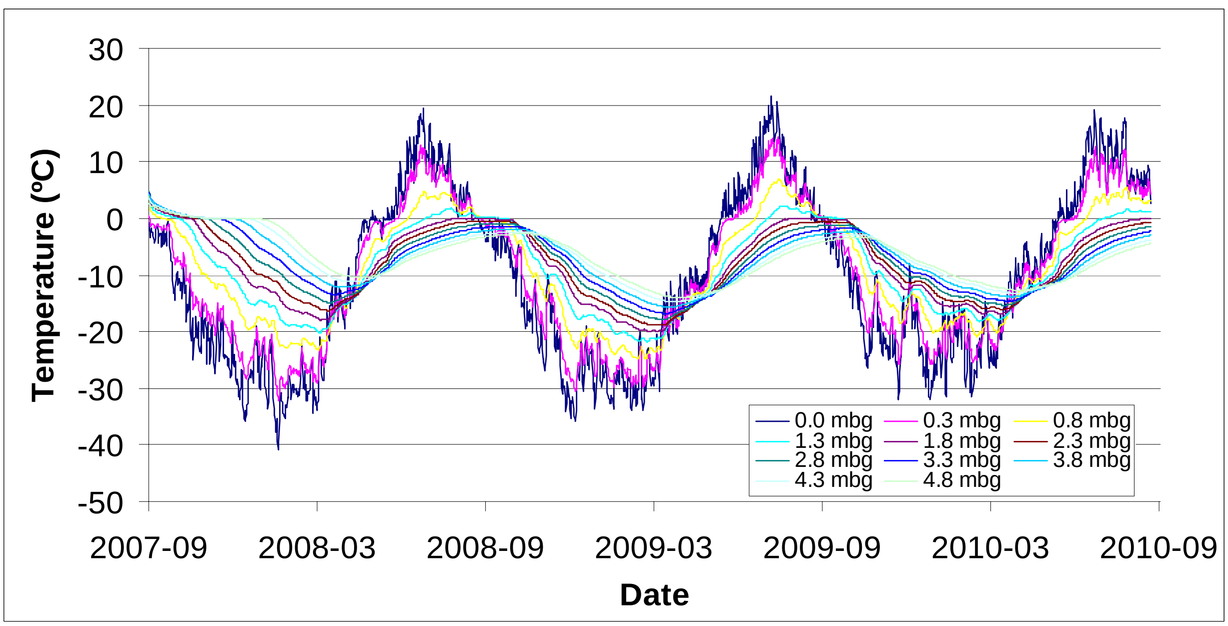


Figure A-5: Example of thermal monitoring data at the Secure Soil Disposal Facility (September 2007-September 2010) for Thermistor VT01

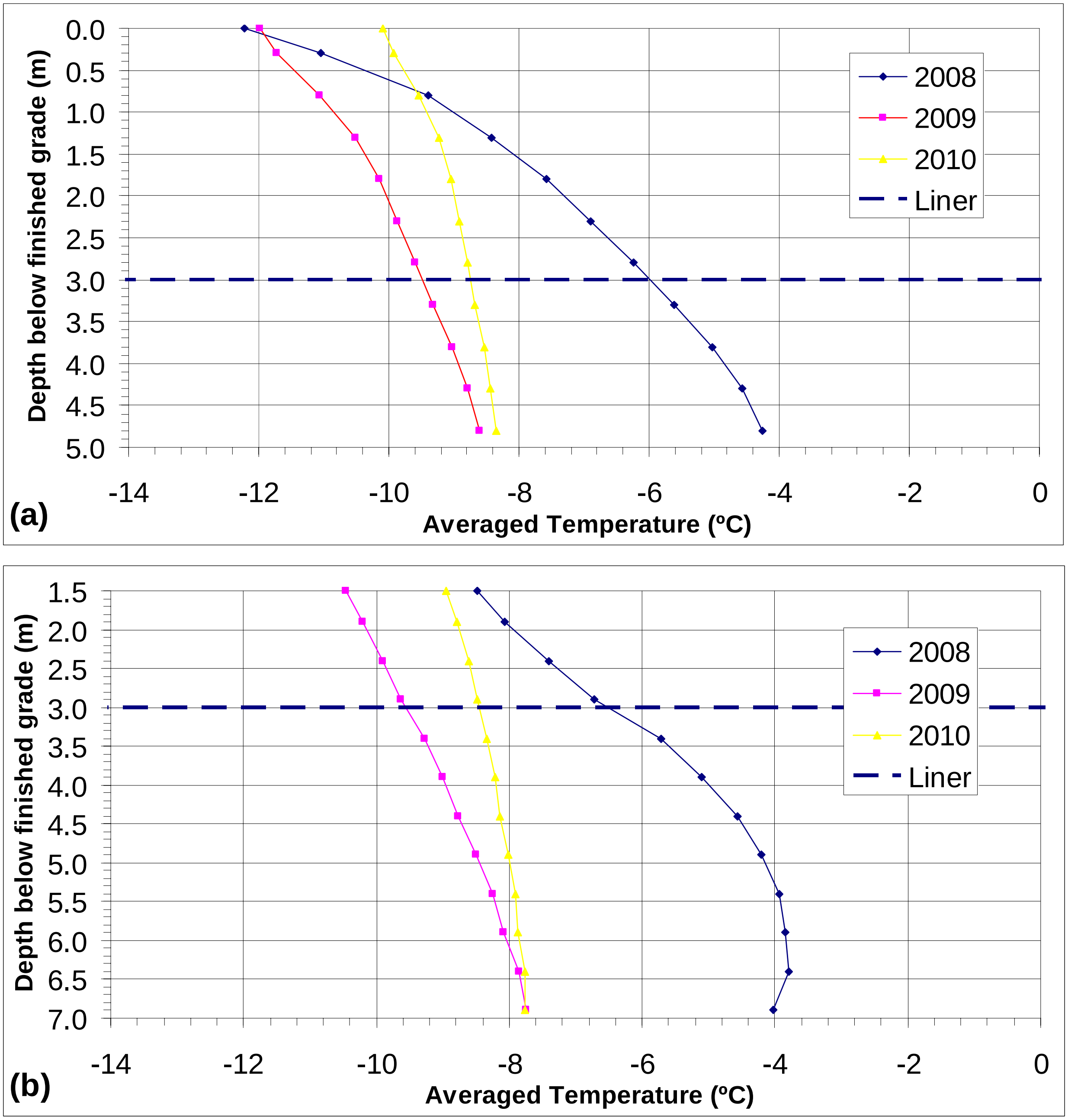


Figure A-6: Vertical profile of temperature (averaged over the annual periods of October 1 to August 31) with increasing depth below the top of the Secure Soil Disposal Facility for thermistor data (a) VT01 and (b) VT03.

# APPENDIX B

## Tables

# Table B-1
## Ground Water Chemical Concentrations - PHCs

| PARAMETER | Upper Limit of Acceptability[1] | RDL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | MW1004 | DUP-1 | Duplicate Evaluation | | | | MW1005 | MW1006 |
| Date | | | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/L) | Acceptable | 07/09/2010 | 07/09/2010 |
| **BTEX & F1 Hydrocarbons (ug/L)** | | | | | | | | | | |
| Benzene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | --- | Y | <0.2 | <0.2 |
| Toluene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | --- | Y | <0.2 | <0.2 |
| Ethylbenzene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | --- | Y | <0.2 | <0.2 |
| o-Xylene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | --- | Y | <0.2 | <0.2 |
| p+m-Xylene | Not Available | 0.4 | <0.4 | <0.4 | A | --- | --- | Y | <0.4 | <0.4 |
| Total Xylenes | Not Available | 0.4 | <0.4 | <0.4 | A | --- | --- | Y | <0.4 | <0.4 |
| F1 (C6-C10) | 219 | 100 | <100 | <100 | A | --- | --- | Y | <100 | <100 |
| F1 (C6-C10) - BTEX | 219 | 100 | <100 | <100 | A | --- | --- | Y | <100 | <100 |
| **F2-F4 Hydrocarbons (ug/L)** | | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | 202 | 100 | <100 | <100 | A | --- | --- | Y | <100 | <100 |
| F3 (C16-C34 Hydrocarbons) | 202 | 100 | <100 | <100 | A | --- | --- | Y | <100 | <100 |
| F4 (C34-C50 Hydrocarbons) | 202 | 100 | <100 | <100 | A | --- | --- | Y | <100 | <100 |
| Reached Baseline at C50 | Not Applicable | | Yes | Yes | NC | NC | NC | NC | Yes | Yes |

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. 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 | | Lowest RDL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Upper Limit of Acceptability[1] | | MW1004 | DUP-1 | Duplicate Evaluation | | | | MW1005 | MW1006 |
| Date | | | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/L) | Acceptable | 07/09/2010 | 07/09/2010 |
| **Metals (ug/L)** | | | | | | | | | | |
| Dissolved Arsenic (As) | NC | 1 | <1 | <1 | A | --- | --- | Y | <1 | <1 |
| Total Arsenic (As) | 3 | 0.5 | <0.5 | <0.5 | A | --- | --- | Y | 0.5 | <0.5 |
| Dissolved Cadmium (Cd) | 1 | 0.1 | <0.1 | <0.1 | A | --- | --- | Y | 0.1 | 0.7 |
| Total Cadmium (Cd) | 1 | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | 0.11 | 0.09 |
| Dissolved Cobalt (Co) | 3 | 0.5 | 0.8 | 0.6 | D | --- | 0.200 | Y | 0.7 | 0.7 |
| Total Cobalt (Co) | 7 | 0.25 | 0.77 | 0.82 | D | --- | 0.050 | Y | 1.02 | 0.90 |
| Dissolved Chromium (Cr) | NC | 5 | <5 | <5 | A | --- | --- | Y | <5 | 6 |
| Total Chromium (Cr) | 95 | 2.5 | <2.5 | <2.5 | A | --- | --- | Y | <2.5 | <2.5 |
| Dissolved Copper (Cu) | 17 | 1 | 6 | 7 | C | 15 | --- | Y | 7 | 8 |
| Total Copper (Cu) | 52 | 0.5 | 5.9 | 6.3 | C | 7 | --- | Y | 7.2 | 7.8 |
| Dissolved Nickel (Ni) | 60 | 1 | 4 | 4 | D | --- | 0.000 | Y | 7 | 49 |
| Total Nickel (Ni) | 33 | 0.5 | 4.4 | 4.7 | C | 7 | --- | Y | 7.0 | 38.8 |
| Dissolved Lead (Pb) | 7646 | 0.5 | <0.5 | <0.5 | A | --- | --- | Y | <0.5 | <0.5 |
| Total Lead (Pb) | NC | 0.25 | <0.25 | <0.25 | A | --- | --- | Y | 0.37 | 0.37 |
| Dissolved Zinc (Zn) | 5641 | 5 | 10 | 9 | D | --- | 1.000 | Y | 73 | 70 |
| Total Zinc (Zn) | 5782 | 2.5 | 9.9 | 10.1 | D | --- | 0.200 | Y | 63.5 | 96.9 |

Notes:

1 = 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.

α = Total value assumed same as dissolved value.

β = Dissolved value assumed same total value.

γ = Value a function of water hardness.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

# Table B-3
## Ground Water Chemical Concentrations - PCBs

| **PARAMETER** | | **RDL** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | **Upper Limit of Acceptability**[1] | | **MW1004** | **DUP-1** | **Duplicate Evaluation** | | | | **MW1005** | **MW1006** |
| **Date** | | | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/L) | Acceptable | 07/09/2010 | 07/09/2010 |
| **PCBs (ug/L)** | | | | | | | | | | |
| Aroclor 1016 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1221 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1232 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1242 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1248 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1254 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1260 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1262 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Aroclor 1268 | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |
| Total PCB | NC | 0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 | <0.05 |

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. 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 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | | Upper Limit of Acceptability[1] | | **MW1004** | **DUP-1** | **Duplicate Evaluation** | | | | **MW1005** | **MW1006** |
| **Date** | | | | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/L) | Acceptable | 07/09/2010 | 07/09/2010 |
| **Inorganics** | **Units** | | | | | | | | | | |
| Hardness (CaCO3) | mg/L | NC | 1 | 700 | 690 | C | 1 | --- | Y | 870 | 780 |
| Colour | TCU | 123 | 2 | 4 | 3 | D | --- | 1.000 | Y | 2 | <2 |
| Conductivity | umho/cm | 4661 | 1 | 1980 | 1950 | C | 2 | --- | Y | 1650 | 1510 |
| Total Dissolved Solids | mg/L | NC | 10 | 1280 | 1300 | C | 2 | --- | Y | 1050 | 980 |
| Fluoride (F-) | mg/L | NC | 0.1 | 0.5 | 0.5 | D | --- | 0.000 | Y | 0.6 | 0.9 |
| Orthophosphate (P) | mg/L | NC | 0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 |
| pH | pH | 7.55 < 8.43 | NC | 8.0 | 8.0 | C | 0 | --- | Y | 8.0 | 8.0 |
| Total Suspended Solids | mg/L | NC | 10 | 16 | 24 | D | --- | 8.000 | Y | 10 | 10 |
| Dissolved Sulphate (SO4) | mg/L | NC | 5 | 800 | 790 | C | 1 | --- | Y | 680 | 620 |
| Dissolved Chloride (Cl) | mg/L | NC | 1 | 40 | 40 | C | 0 | --- | Y | 49 | 30 |
| Nitrite (N) | mg/L | NC | 0.01 | 0.03 | 0.04 | D | --- | 0.010 | N | <0.01 | <0.01 |
| Nitrate (N) | mg/L | NC | 0.1 | 2.9 | 2.8 | C | 4 | --- | Y | <0.1 | <0.1 |
| Nitrate + Nitrite | mg/L | NC | 0.1 | 2.9 | 2.9 | C | 0 | --- | Y | <0.1 | <0.1 |

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** | **CCME [1] Residential/ Parkland** | **CWS for PHC in Soil (<1.5m)[2]** | | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **DUP-1** | **Duplicate Evaluation** | | | | **TP10-3 (0-15)** | **DUP-2** | **Duplicate Evaluation** | | | | **TP10-3 (40-50)** |
| **Date** | | | | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 |
| **Depth (m)** | | | | 0 - 0.15 | 0.4 - 0.5 | 0 - 0.15 | 0.4 - 0.5 | 0.4 - 0.5 | | | | | 0 - 0.15 | 0 - 0.15 | | | | | 0.4 - 0.5 |
| **BTEX & F1 Hydrocarbons (ug/g)** | | | | | | | | | | | | | | | | | | | |
| Benzene | **31** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | --- | Y | <0.02 | <0.02 | A | --- | --- | Y | <0.02 |
| Toluene | **75** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | --- | Y | <0.02 | <0.02 | A | --- | --- | Y | <0.02 |
| Ethylbenzene | **55** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | --- | Y | <0.02 | <0.02 | A | --- | --- | Y | <0.02 |
| o-Xylene | NC | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | --- | Y | <0.02 | <0.02 | A | --- | --- | Y | <0.02 |
| p+m-Xylene | NC | NC | 0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | A | --- | --- | Y | <0.04 | <0.04 | A | --- | --- | Y | <0.04 |
| Total Xylenes | **95** | NC | 0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | A | --- | --- | Y | <0.04 | <0.04 | A | --- | --- | Y | <0.04 |
| F1 (C6-C10) | NC | NC | 10 | <10 | <10 | <10 | <10 | <10 | A | --- | --- | Y | <10 | <10 | A | --- | --- | Y | <10 |
| F1 (C6-C10) - BTEX | NC | **30** (210) | 10 | <10 | <10 | <10 | <10 | <10 | A | --- | --- | Y | <10 | <10 | A | --- | --- | Y | <10 |
| **F2-F4 Hydrocarbons (ug/g)** | | | | | | | | | | | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | NC | **150** (150) | 10 | <10 | <10 | <10 | <10 | <10 | A | --- | --- | Y | <10 | <10 | A | --- | --- | Y | <10 |
| F3 (C16-C34 Hydrocarbons) | NC | **300** (300) | 10 | 69 | <10 | <10 | <10 | <10 | A | --- | --- | Y | 18 | 12 | D | --- | 6.000 | Y | 14 |
| F4 (C34-C50 Hydrocarbons) | NC | **2800** (2800) | 10 | <10 | <10 | <10 | <10 | <10 | A | --- | --- | Y | <10 | <10 | A | --- | --- | Y | <10 |
| Reached Baseline at C50 | N/A | N/A | N/A | Yes | Yes | Yes | Yes | Yes | NC | NC | NC | NC | Yes | Yes | NC | 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.
2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 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** | **Federal** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | **CCME[1] Residential/ Parkland** | **CCME[2] Human Health Ingestion (H) / Eco Soil Contact (E)** | **INAC DEW Line Cleanup Criteria, Tier II** | **RDL** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **DUP-1** | **Duplicate Evaluation** | | | | **TP10-3 (0-15)** |
| **Date** | | | | | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 |
| **Depth (m)** | | | | | 0 - 0.15 | 0.4 - 0.5 | 0 - 0.15 | 0.4 - 0.5 | 0.4 - 0.5 | | | | | 0 - 0.15 |
| **Metals (ug/g)** | | | | | | | | | | | | | | |
| Arsenic (As) | **12** | 12H 17E | 30 | 1 | 1 | 1 | 1 | 1 | 1 | D | --- | 0.000 | Y | 1 |
| Cadmium (Cd) | 10 | NC | **5** | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | A | --- | --- | Y | <0.1 |
| Cobalt (Co) | 50** | NC | **50** | 0.1 | 6 | 6.3 | 6.9 | 7 | 7.3 | C | 4 | --- | Y | 6.7 |
| Chromium (Cr) | **64** | 220H 64E | 250 | 1 | 23 | 23 | 27 | 28 | 28 | C | 0 | --- | Y | 26 |
| Copper (Cu) | **63** | 1100H 63E | 100 | 0.5 | 19 | 19 | 20 | 21 | 21 | C | 0 | --- | Y | 19 |
| Nickel (Ni) | **50**** | 50E | 100 | 0.5 | 15 | 16 | 19 | 19 | 20 | C | 5 | --- | Y | 18 |
| Lead (Pb) | **140** | 140H 300E | 500 | 1 | 12 | 13 | 7 | 7 | 7 | C | 0 | --- | Y | 7 |
| Zinc (Zn) | **200** | 200E | 500 | 5 | 51 | 48 | 47 | 45 | 46 | C | 2 | --- | Y | 43 |
| Mercury (Hg) | 6.6 | 6.6H 12E | **2** | 0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | A | --- | --- | Y | <0.05 |
| **Physical Properties** | | | | | | | | | | | | | | |
| Moisture (%) | NC | NC | NC | 0.2 | 12 | 12 | 8.7 | 9.1 | 13 | C | 35 | --- | Y | 18 |

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.

** = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Interim remediation criteria for soil that have not yet been replaced by canadian soil quality guidelines.

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 | Federal | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | CCME[1] Residential/ Parkland | CCME[2] Human Health Ingestion (H) / Eco Soil Contact (E) | INAC DEW Line Cleanup Criteria, Tier II | RDL | DUP-2 | Duplicate Evaluation | | | | TP10-3 (40-50) |
| Date | | | | | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 |
| Depth (m) | | | | | 0 - 0.15 | | | | | 0.4 - 0.5 |
| **Metals (ug/g)** | | | | | | | | | | |
| Arsenic (As) | **12** | 12H 17E | 30 | 1 | 1 | D | --- | 0.000 | Y | 1 |
| Cadmium (Cd) | 10 | NC | **5** | 0.1 | <0.1 | A | --- | --- | Y | <0.1 |
| Cobalt (Co) | 50** | NC | **50** | 0.1 | 6.6 | C | 2 | --- | Y | 6.8 |
| Chromium (Cr) | **64** | 220H 64E | 250 | 1 | 27 | C | 4 | --- | Y | 28 |
| Copper (Cu) | **63** | 1100H 63E | 100 | 0.5 | 21 | C | 10 | --- | Y | 21 |
| Nickel (Ni) | **50**** | 50E | 100 | 0.5 | 18 | C | 0 | --- | Y | 20 |
| Lead (Pb) | **140** | 140H 300E | 500 | 1 | 8 | C | 13 | --- | Y | 7 |
| Zinc (Zn) | **200** | 200E | 500 | 5 | 46 | C | 7 | --- | Y | 44 |
| Mercury (Hg) | 6.6 | 6.6H 12E | **2** | 0.05 | <0.05 | A | --- | --- | Y | <0.05 |
| **Physical Properties** | | | | | | | | | | |
| Moisture (%) | NC | NC | NC | 0.2 | 19 | C | 5 | --- | Y | 19 |

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.

** = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Interim remediation criteria for soil that have not yet been replaced by canadian soil quality guidelines.

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 | Federal | INAC DEW Line Cleanup Criteria, Tier II | RDL | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | TP10-1 (0-15) | TP10-1 (40-50) | TP10-2 (0-15) | TP10-2 (40-50) | DUP-1 | Duplicate Evaluation | | | | TP10-3 (0-15) | DUP-2 | Duplicate Evaluation | | | | TP10-3 (40-50) |
| Date | CCME[1] | | | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 | 07/09/2010 | Scenario* | RPD (%) | Value (ug/g) | Acceptable | 07/09/2010 |
| Depth (m) | Residential/ Parkland | | | 0 - 0.15 | 0.4 - 0.5 | 0 - 0.15 | 0.4 - 0.5 | 0.4 - 0.5 | | | | | 0 - 0.15 | 0 - 0.15 | | | | | 0.4 - 0.5 |
| **Polychlorinated Biphenyls (ug/g)** | | | | | | | | | | | | | | | | | | | |
| Aroclor 1262 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1016 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1221 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1232 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1242 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1248 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1254 | NC | NC | 0.01 | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1260 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Aroclor 1268 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |
| Total PCB | **1.3** | 50 | 0.01 | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | A | --- | --- | Y | <0.01 | <0.01 | A | --- | --- | Y | <0.01 |

Notes:
1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.
*= See Quality Assurance and Quality Control section for scenario rationale.
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds selected guideline.

## Table B-8
## Ground water chemical concentrations – 2006 to 2010 (PCBs, PHCs, Inorganics)

| Sample # | Location | Date | PCBs [ug/L] | TPH Identity | | | | Conductivity [µmho/cm] | pH | Colour |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F1 [ug/L] | F2 [ug/L] | F3 [ug/L] | F4 [ug/L] | | | |
| **Upgradient Groundwater Samples** | | | | | | | | | | |
| MW06-04 | MW06-04 | 2006 | <0.05 | | | | | 3110 | 7.9 | |
| MW06-04 | MW06-04 | 2008 | <0.01 | <100 | <100 | <100 | <100 | 630 | 8.2 | >70 |
| MW0604-1 | MW06-04 | 2009 | <0.05 | <100 | <100 | <100 | <100 | 3740 | 7.8 | 4 |
| MW1004 | MW06-04 | 2010 | <0.05 | <100 | <100 | <100 | <100 | 1980 | 8.0 | 4 |
| DUP-1 | MW06-04 | 2010 | <0.05 | <100 | <100 | <100 | <100 | 1950 | 8.0 | 3 |
| | | | | | | | | | | |
| DowngradientGroundwaterSamples | | | | | | | | | | |
| MW06-05 | MW06-05 | 2006 | <0.05 | | | | | 847 | 7.8 | |
| MW06-05 | MW06-05 | 2007 | <0.10 | <25000 | <100 | <100 | <100 | | | |
| MW06-05 | MW06-05 | 2008 | <0.01 | <100 | <100 | <100 | <100 | 1010 | 8.1 | 60 |
| MW06-07 | MW06-05 | 2008 | <0.01 | <100 | <100 | <100 | <100 | 1000 | 8.1 | 60 |
| MW0605-1 | MW06-05 | 2009 | <0.05 | <100 | <100 | <100 | <100 | 1520 | 7.8 | 3 |
| MW1005 | MW06-05 | 2010 | <0.05 | <100 | <100 | <100 | <100 | 1650 | 8.0 | 2 |
| MW06-06 | MW06-06 | 2006 | <0.05 | | | | | 2260 | 8.1 | |
| MW06-06 | MW06-06 | 2007 | <0.10 | <25000 | <100 | <100 | <100 | | | |
| MW06-06 | MW06-06 | 2008 | <0.01 | 200 | 200 | 200 | 200 | 1060 | 8.0 | >70 |
| MW0606-1 | MW06-06 | 2009 | <0.05 | <100 | <100 | <100 | <100 | 1530 | 8.1 | 3 |
| DUP-01 | MW06-06 | 2009 | <0.05 | <100 | <100 | <100 | <100 | 1650 | 7.9 | 5 |
| MW1006 | MW06-06 | 2010 | <0.05 | <100 | <100 | <100 | <100 | 1510 | 8.0 | < 2 |
| | | | | | | | | | | |
| **Statistics** | | | | | | | | | | |
| N Value | | | 17 | 14 | 14 | 14 | 14 | 15 | 15.0 | 12 |
| N Value [2006-2009 only] | | | 13 | 10 | 10 | 10 | 10 | 11 | 11 | 8 |
| Average | | | <0.1 | 108 | 107 | 107 | 107 | 1696 | 8.0 | 24 |
| Average [2006-2009 only] | | | <0.1 | 112.5 | 110 | 110 | 110 | 1669 | 8 | 34 |
| Minimum | | | <0.01 | 100 | 100 | 100 | 100 | 630 | 7.8 | 2 |
| Maximum | | | <0.1 | 25000 | 200 | 200 | 200 | 3740 | 8.2 | 70 |
| Standard Deviation (s)* [2006-2009 only] | | | NC | 35 | 32 | 32 | 32 | 988 | 0 | 33 |
| Acceptable Range (Average +/- 3s) [2006-2009 only] | | | NC | 6 < 219 | 12 < 202 | 12 < 202 | 12 < 202 | 0 < 4661 | 7.55 < 8.43 | 0 < 123 |

Sample duplicates underlined (primary sample listed above duplicate)

Detection limits are converted to results to calculate average and standard deviation

*Note that very high detection limits (25,000) for F1 are excluded from average and standard deviation calculations as outliers

Zero is substituted for negative values where average minus 3s is less than zero

NC: Not calculated. Where there are no values other than "non-detect," no standard deviation is calculated. The acceptable range for these samples should be close to the detection limit.

## Table B-9
## Ground water chemical concentrations – 2006 to 2010 (Metals)

| Sample # | Location | Date | Diss. As | As | Diss. Cd | Cd | Diss. Co | Co | Diss. Cr | Cr | Diss. Cu | Cu | Ni | Diss. Ni | Pb | Diss. Pb | Zn | Diss. Zn | Hg | Diss. Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] | [ug/l] |
| **Upgradient Groundwater Samples** | | | | | | | | | | | | | | | | | | | | |
| MW06-04 | MW06-04 | 2006 | <1 | | <0.1 | | 1 | | <5 | | 2 | | | 4 | | <0.5 | | <5 | | |
| MW06-04 | MW06-04 | 2008 | <1 | 1 | <0.025 | 0.163 | 1 | 3 | <1 | 19 | 8 | 32 | 40 | <3 | 3710 | <1 | 234 | 50 | <0.025 | <0.025 |
| MW0604-1 | MW06-04 | 2009 | <1 | <1 | <0.1 | <0.1 | 2.1 | 2.5 | <5 | <5 | 1 | 7 | 8 | 9 | 1.1 | <0.5 | 60 | 24 | | <0.1 |
| MW1004 | MW06-04 | 2010 | <1 | <0.5 | <0.1 | <0.05 | 0.8 | 0.77 | <5 | <2.5 | 6 | 5.9 | 4 | 4.4 | <0.5 | <0.25 | 10 | 9.9 | | |
| DUP-1 | MW06-04 | 2010 | <1 | <0.5 | <0.1 | <0.05 | 0.6 | 0.82 | <5 | <2.5 | 7 | 6.3 | 4 | 4.7 | <0.5 | <0.25 | 9 | 10.1 | | |
| | | | | | | | | | | | | | | | | | | | | |
| DowngradientGroundwaterSamples | | | | | | | | | | | | | | | | | | | | |
| MW06-05 | MW06-05 | 2006 | 1 | | 0.1 | | 1.7 | | <5 | | 8 | | | 15 | | <0.5 | | 47 | | |
| MW06-05 | MW06-05 | 2007 | | <1 | | <1 | | 2 | | 6 | | 6 | 9 | | 1 | | 30 | | | |
| MW06-05 | MW06-05 | 2008 | <1 | 2 | <0.025 | 0.261 | 2 | 3 | <1 | 11 | 12 | 12 | 20 | 6 | 807 | <1 | 43 | 347 | <0.025 | <0.025 |
| MW06-07 | MW06-05 | 2008 | <1 | 2 | <0.025 | 0.307 | 2 | 2 | <1 | 16 | 10 | 16 | 20 | 6 | 1100 | <1 | 63 | 40 | <0.025 | <0.025 |
| MW0605-1 | MW06-05 | 2009 | <1 | <1 | <0.1 | <0.1 | 1.2 | 1.5 | <5 | <5 | 6 | 9 | 18 | 9 | <0.5 | <0.5 | 9 | 18 | | <0.1 |
| MW1005 | MW06-05 | 2010 | <1 | 0.5 | 0.1 | 0.11 | 0.7 | 1.02 | <5 | <2.5 | 7 | 7.2 | 7 | 7 | <0.5 | 0.37 | 73 | 63.5 | | |
| MW06-06 | MW06-06 | 2006 | <1 | | <0.1 | | <0.5 | | <5 | | 4 | | | 3 | | <0.5 | | 9 | | |
| MW06-06 | MW06-06 | 2007 | | <1 | | <1 | | 2 | | 25 | | 13 | 22 | | 1 | | 170 | | | |
| MW06-06 | MW06-06 | 2008 | <1 | 2 | <0.025 | 0.453 | 1 | 6 | <1 | 97 | 13 | 46 | 30 | 8 | 7390 | <1 | 6210 | 6650 | <0.025 | <0.025 |
| MW0606-1 | MW06-06 | 2009 | <1 | 1 | <0.1 | 0.1 | 0.5 | 2.3 | <5 | 21 | 3 | 21 | 20 | 5 | 3.3 | <0.5 | 330 | 120 | | <0.1 |
| DUP-01 | MW06-06 | 2009 | <1 | <1 | <0.1 | <0.1 | 0.6 | 2.3 | <5 | 11 | 5 | 12 | 13 | 6 | 2.5 | <0.5 | 170 | 170 | | <0.1 |
| MW1006 | MW06-06 | 2010 | <1 | <0.5 | 0.7 | 0.09 | 0.7 | 0.9 | 6 | <2.5 | 8 | 7.8 | 49 | 38.8 | <0.5 | 0.37 | 70 | 96.9 | | |
| | | | | | | | | | | | | | | | | | | | | |
| **Statistics** | | | | | | | | | | | | | | | | | | | | |
| N Value | | | 15 | 14 | 15 | 14 | 15 | 14 | 15 | 14 | 15 | 14 | 14 | 15 | 14 | 15 | 14 | 15 | 4 | 8 |
| N Value [2006-2009 only] | | | 11 | 10 | 11 | 10 | 11 | 10 | 11 | 10 | 11 | 10 | 10 | 11 | 10 | 11 | 10 | 11 | 4 | 8 |
| Average | | | 1 | 1 | 0.120 | 0.277 | 1.1 | 2 | 4 | 16 | 7 | 14 | 19 | 9 | 930 | 1 | 534 | 511 | <0.025 | <0.1 |
| Average [2006-2009 only] | | | 1 | 1 | 0 | 0 | 1 | 3 | <5 | 22 | 7 | 17 | 20 | 7 | 1302 | <1 | 732 | 680 | <0.025 | <0.1 |
| Minimum | | | 1 | 1 | 0.025 | 0.050 | 0.5 | 0.77 | 1 | 3 | 1 | 5.9 | 4 | 3 | 0.5 | 0.3 | 9 | 5 | <0.025 | <0.025 |
| Maximum | | | 1 | 2 | 0.700 | 1.000 | 2.1 | 6 | 6 | 97 | 13 | 46 | 49 | 38.8 | 7390 | 1 | 6210 | 6650 | <0.025 | <0.1 |
| Standard Deviation (s)* [2006-2009 only] | | | NC | 0.55 | 0.16 | 0.33 | 0.58 | 1.3 | 2 | 24 | 3 | 12 | 13 | 9 | 2115 | 0.27 | 1636 | 1701 | NC | NC |
| Acceptable Range (Average +/- 3s) [2006-2009 only] | | | NC | 0 < 3 | 0 < 1 | 0 < 1 | 0 < 3 | 0 < 7 | NC | 0 < 95 | 0 < 17 | 0 < 52 | 0 < 60 | 0 < 33 | 0 < 7646 | NC | 0 < 5641 | 0 < 5782 | NC | NC |

Sample duplicates underlined (primary sample listed above duplicate)
Detection limits are converted to results to calculate average and standard deviation except where there are no detections - in this case "NC" is substituted
Zero is substituted for negative values where average minus 3s is less than zero
NC: Not calculated. Where there are no values other than "non-detect," no standard deviation is calculated. The acceptable range for these samples should be close to the detection limit.

## Table B-10
## Soil chemical concentrations – 2006 to 2010

| Sample # | Location | Date | Depth (cm) | As [ug/g] | Cd [ug/g] | Co [ug/g] | Cr [ug/g] | Cu [ug/g] | Ni [ug/g] | Pb [ug/g] | Zn [ug/g] | Hg [ug/g] | PCBs [ug/g] | TPH Identity [ug/g] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | F1 | F2 | F3 | F4 |
| **Upgradient Groundwater Samples** | | | | | | | | | | | | | | | | | |
| MW06-04 | MW06-04 | 2006 | | 1 | <0.3 | 7.4 | 30 | 20 | 20 | 6 | 42 | <0.05 | <0.01 | <10 | <10 | 11 | <10 |
| 952 | MW06-04 | 2007 | 0 | <0.7 | <0.9 | 4 | 17 | 10 | 12 | <10 | 28 | | <0.1 | <10 | <20 | <20 | <20 |
| 953 | MW06-04 | 2007 | 30 | <0.7 | <0.9 | 4 | 18 | 12 | 13 | <10 | 29 | | <0.1 | <10 | <20 | <20 | <20 |
| MW06-04 | MW06-04 | 2008 | 0 | 0.8 | 0.5 | 6.4 | 29 | 16 | 19 | 9 | 39 | <0.5 | <0.005 | <10 | <10 | <10 | <10 |
| MW06-04 | MW06-04 | 2008 | 30 | 0.7 | <0.5 | 6 | 27 | 16 | 17 | 13 | 38 | <0.5 | <0.005 | <10 | <10 | <10 | <10 |
| TP0904-1 | MW06-04 | 2009 | 0 to 10 | <1 | <0.1 | 5.6 | 21 | 15 | 15 | 7 | 35 | <0.05 | 0.05 | 10 | 10 | 10 | 10 |
| TP0904-2 | MW06-04 | 2009 | 40 to 50 | <1 | <0.1 | 8.1 | 31 | 19 | 20 | 7 | 43 | <0.05 | <0.01 | <10 | <10 | 21 | <10 |
| TP10-1 (0-15) | MW06-04 | 2010 | 0 to 10 | 1 | 0.1 | 6 | 23 | 19 | 15 | 12 | 51 | <0.05 | 0.09 | <10 | <10 | 69 | <10 |
| TP10-1 (40-50) | MW06-04 | 2010 | 40 to 50 | 1 | <0.1 | 6.3 | 23 | 19 | 16 | 13 | 48 | <0.05 | 0.04 | <10 | <10 | <10 | <10 |
| TP-BM1-01 | BM1 | 2009 | 0 to 10 | <1 | <0.1 | 6.8 | 26 | 20 | 19 | 7 | 46 | <0.05 | <0.01 | <10 | <10 | 25 | <10 |
| TP-BM1-02 | BM1 | 2009 | 40 to 50 | <1 | <0.1 | 7.6 | 33 | 19 | 22 | 7 | 41 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP-BM2-01 | BM2 | 2009 | 0 to 10 | <1 | <0.1 | 6.9 | 26 | 16 | 17 | 6 | 38 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP-BM2-02 | BM2 | 2009 | 40 to 50 | <1 | <0.1 | 7.4 | 31 | 20 | 20 | 7 | 43 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| | | | | | | | | | | | | | | | | | |
| **Downgradient Groundwater Samples** | | | | | | | | | | | | | | | | | |
| MW06-05 | MW06-05 | 2006 | | 1 | <0.3 | 7.6 | 28 | 23 | 20 | 7 | 41 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| 949 | MW06-05 | 2007 | 0 | <0.7 | <0.9 | 4 | 19 | 12 | 13 | <10 | 33 | | <0.1 | <10 | <20 | <20 | <20 |
| 950 | MW06-05 | 2007 | 30 | <0.7 | <0.9 | 4 | 17 | 11 | 12 | <10 | 29 | | <0.1 | <10 | <20 | <20 | <20 |
| 951 | MW06-05 | 2007 | 30 | <0.7 | <0.9 | 4 | 18 | 13 | 13 | <10 | 31 | | <0.1 | <10 | <20 | <20 | <20 |
| MW06-05 | MW06-05 | 2008 | 0 | 0.6 | <0.5 | 6 | 26 | 14 | 16 | 9 | 41 | <0.5 | <0.005 | <10 | <10 | 61 | 22 |
| MW06-07 | MW06-05 | 2008 | 0 | 0.6 | <0.5 | 5.5 | 25 | 15 | 16 | 8 | 37 | <0.5 | <0.005 | <10 | <10 | 18 | <10 |
| MW06-05 | MW06-05 | 2008 | 30 | 0.6 | <0.5 | 5.2 | 24 | 17 | 14 | 8 | 36 | <0.5 | <0.005 | <10 | <10 | 72 | 61 |
| MW06-07 | MW06-05 | 2008 | 30 | 0.5 | <0.5 | 5.2 | 24 | 15 | 15 | 8 | 34 | <0.5 | <0.005 | <10 | <10 | 58 | 42 |
| TP0905-1 | MW06-05 | 2009 | 0 to 10 | <1 | <0.1 | 6.8 | 27 | 19 | 19 | 8 | 44 | <0.05 | <0.01 | <10 | <10 | 13 | <10 |
| TP0905-2 | MW06-05 | 2009 | 40 to 50 | <1 | <0.1 | 7.3 | 29 | 19 | 19 | 7 | 40 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| DUP-02 | MW06-05 | 2009 | 40 to 50 | <1 | <0.1 | 7.2 | 28 | 19 | 19 | 7 | 40 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP10-2 (0-15) | MW06-05 | 2010 | 0 to 10 | 1 | <0.1 | 6.9 | 27 | 20 | 19 | 7 | 47 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP10-2 (40-50) | MW06-05 | 2010 | 40 to 50 | 1 | <0.1 | 7 | 28 | 21 | 19 | 7 | 45 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| DUP-1 | MW06-05 | 2010 | 40 to 50 | 1 | <0.1 | 7.3 | 28 | 21 | 20 | 7 | 46 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| MW06-06 | MW06-06 | 2006 | | 1 | <0.3 | 8 | 30 | 18 | 20 | 6 | 42 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| 947 | MW06-06 | 2007 | 0 | <0.7 | <0.9 | 4 | 17 | 9 | 11 | <10 | 29 | | <0.1 | <10 | <20 | <20 | <20 |
| 948 | MW06-06 | 2007 | 30 | <0.7 | <0.9 | 5 | 19 | 14 | 14 | <10 | 33 | | <0.1 | <10 | <20 | <20 | <20 |
| MW06-06 | MW06-06 | 2008 | 0 | 0.8 | <0.5 | 6.8 | 30 | 17 | 20 | 10 | 42 | <0.5 | <0.005 | <10 | <10 | <10 | <10 |
| MW06-06 | MW06-06 | 2008 | 30 | 0.8 | 0.5 | 6.4 | 29 | 26 | 19 | 9 | 38 | <0.5 | <0.005 | <10 | <10 | <10 | <10 |
| TP0906-01 | MW06-06 | 2009 | 0 to 10 | <1 | <0.1 | 6.7 | 25 | 35 | 18 | 6 | 40 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| DUP-01 | MW06-06 | 2009 | 0 to 10 | <1 | <0.1 | 6.7 | 27 | 17 | 18 | 7 | 40 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP0906-02 | MW06-06 | 2009 | 40 to 50 | <1 | <0.1 | 7.3 | 28 | 19 | 19 | 7 | 40 | <0.05 | <0.01 | <10 | <10 | <10 | <10 |
| TP10-3 (0-15) | MW06-06 | 2010 | 0 to 10 | 1 | <0.1 | 6.7 | 26 | 19 | 18 | 7 | 43 | <0.05 | <0.01 | <10 | <10 | 18 | <10 |
| DUP-2 | MW06-06 | 2010 | 0 to 10 | 1 | <0.1 | 6.6 | 27 | 21 | 18 | 8 | 46 | <0.05 | <0.01 | <10 | <10 | 12 | <10 |
| TP10-3 (40-50) | MW06-06 | 2010 | 40 to 50 | 1 | <0.1 | 6.8 | 28 | 21 | 20 | 7 | 44 | <0.05 | <0.01 | <10 | <10 | 14 | <10 |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| **Statistics** | | | | | | | | | | | | | | | | | |
| | N Value | | | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 31 | 38 | 38 | 38 | 38 | 38 |
| | Average | | | 0.9 | 0.4 | 6.2 | 25 | 18 | 17 | 8 | 39 | <0.5 | 0 | 10 | 12 | 19 | 15 |
| | Minimum | | | 0.5 | 0.1 | 4.0 | 17 | 9 | 11 | 6 | 28 | <0.05 | 0.005 | 10 | 10 | 10 | 10 |
| | Maximum | | | 1.0 | 0.9 | 8.1 | 33 | 35 | 22 | 13 | 51 | <0.5 | 0.1 | 10 | 20 | 72 | 61 |

Sample duplicates underlined (primary sample listed above duplicate)

Table B-11: Thermistor Annual Maintenance Report

| | |
|---|---|
| **Contractor name:** Franz Environmental Inc. | **Inspection date:** 2010-09-07 & 08 |
| **Prepared by:** Matthew D. Cyr | |

## Thermistor Information

| **Thermistor Number** | **CAMF 01-VT** | **CAMF 02-VT** | **CAMF 03-VT** | **CAMF 04-VT** |
|---|---|---|---|---|
| **Install date** | 2007-09-21 | 2010-09-07 | 2007-09-16 | 2007-09-17 |
| **Location** | CAM-F (SSDF) | CAM-F (SSDF) | CAM-F (SSDF) | CAM-F (SSDF) |
| **Inclination** | Vertical | Vertical | Vertical | Vertical |
| **Cable length (m)** | 7.8 | 7.8 | 8.4 | 8.4 |
| **Cable length (m) above ground** | 3 | 3 | 1.5 | 1.5 |
| **No. of beads** | 11 | 11 | 12 | 12 |
| **Bead type** | 44007 | 44007 | 44007 | 44007 |
| **Coordinates (m)** | N:7605524<br>E: 405936 | N:7605544<br>E: 405886 | N:7605574.5<br>E: 405956.9 | N:7605594.1<br>E: 405906.5 |
| **Serial no.** | 07060039 | 09010147 | 05070006 | 05070020 |
| **Logger model** | Lakewood Systems Ultralogger | | | |

## Thermistor inspection

| **Thermistor Number** | **CAMF 01-VT** | **CAMF 02-VT** | **CAMF 03-VT** | **CAMF 04-VT** |
|---|---|---|---|---|
| **Casing** | Good condition | Good condition | Good condition | Good condition |
| **Cover** | Good condition | Good condition | Good condition | Good condition |
| **Data logger** | Good condition | Good condition | Good condition | Good condition |
| **Cable** | Good condition | Good condition | Good condition | Good condition |
| **Beads** | Operational | Operational | Operational | Operational |
| **Battery installation date** | 2010-09-08 | 2010-09-07 | 2010-09-07 | 2010-09-07 |
| **Main battery (V)** | | | | |
| • **Old (2009)** | 11.34 | 11.34 | 11.34 | 11.34 |
| • **Old (2010)** | 11.34 | 11.34 (old logger) | 11.34 | 11.34 |
| • **New (2010)** | 11.34 | 11.34 | 11.34 | 11.34 |
| **Aux battery (V)** | | | | |
| • **Old (2009)** | 13.26 | 13.50 | 12.90 | 13.02 |
| • **Old (2010)** | 12.90 | 13.26 (old logger) | 12.77 | 12.90 |
| • **New (2010)** | 13.38 | 13.14 | 13.02 | 13.38 |

## Observations and proposed maintenance

- Based on the previous monitoring report, the data logger at CAMF 02-VT (serial number 05070003) was replaced with a new logger of the same make (serial number 09010147) and programmed with the identical parameters including name, reading frequency (twice daily at 0h00 and 12h00), warm-up time (0.210 s), power option (pulsed), wrap-around memory (enabled), clock (set to local time), multiplexor on (enabled) on the 2.5 V scale. The old logger was returned to Lakewood Systems for repairs. If repairable, it is recommended that the batteries be replaced with the spare set purchased as part of the 2010 field program and that the logger be brought to all monitoring sites as a diagnostic tool or replacement for faulty loggers.

- Batteries were replaced in data loggers 01, 03 and 04 and should not need replacing until 2013. Given that no scheduled monitoring event is scheduled for 2013, it should be acceptable to replace the batteries in four years, at the following monitoring event in 2014, given the acceptable voltages measured on the 3 year old batteries swapped out this year as well as Lakewood Systems' suggested battery life of 3 to 5 years. The batteries in data logger 02 were not replaced, but instead a new unit – containing new batteries – was installed.

- A note on battery voltages: The battery voltage levels are particularly meaningful when rechargeable batteries are used. With lithium batteries, as is the case at CAM-F, the discharge curve is extremely flat until total failure, when voltage levels drop off abruptly. Because voltage readings are not a good predictor of failure, lithium batteries should be replaced based on their date stickers.

- It was noticed that the desiccant cartridges within each data logger unit had turned a light pink, indicating that they should be changed. It is therefore recommended to bring new desiccant cartridges to replace the old ones during the next site inspection. It is also recommended that spare desiccant cartridges be brought to all thermistor sites to be used as needed.

- A Lakewood resistance meter and switchbox were employed to compare manual (taken directly from thermistor beads) and logged readings. It was determined that the beads and data loggers were functioning correctly.

- Additional diagnostic and repair equipment may also be brought to the site (e.g. multimeter, soldering kit, shrink wrap, etc) although feasible repair is highly unlikely and will be useless if affected on areas around the thermistor beads (since repairs may alter string resistance, necessitating factory recalibration).

Table B-12: Manual Thermistor Readings

| Analog Channel | | Thermistor R (Ohms) | Temperature (ºC) | | |
|---|---|---|---|---|---|
| | | | Manual | Logged | Difference |
| VT01 | 1 | 14934 | 1.7847 | 1.7088 | 0.1 |
| | 2 | 13982 | 3.0893 | 3.2144 | 0.1 |
| | 3 | 14077 | 2.9547 | 3.0193 | 0.1 |
| | 4 | 15372 | 1.2156 | 1.2587 | 0.0 |
| | 5 | 16381 | -0.0292 | -0.0318 | 0.0 |
| | 6 | 17048 | -0.8057 | -0.7178 | 0.1 |
| | 7 | 17681 | -1.5118 | -1.4688 | 0.0 |
| | 8 | 18392 | -2.2718 | -2.2554 | 0.0 |
| | 9 | 19130 | -3.0267 | -2.9933 | 0.0 |
| | 10 | 19881 | -3.7622 | -3.7684 | 0.0 |
| | 11 | 20510 | -4.3546 | -4.3996 | 0.0 |
| | | ***maximum*** | -- | -- | ***0.1*** |
| VT02 | 1 | 11839 | 6.4319 | 6.6668 | 0.2 |
| | 2 | 11787 | 6.5213 | 6.5893 | 0.1 |
| | 3 | 12953 | 4.6165 | 4.67 | 0.1 |
| | 4 | 14328 | 2.6039 | 2.654 | 0.1 |
| | 5 | 15472 | 1.0882 | 1.1152 | 0.0 |
| | 6 | 16512 | -0.1844 | -0.1586 | 0.0 |
| | 7 | 17158 | -0.9305 | -0.8656 | 0.1 |
| | 8 | 17954 | -1.8076 | -1.7998 | 0.0 |
| | 9 | 18676 | -2.5663 | -2.5836 | 0.0 |
| | 10 | 19356 | -3.2514 | -3.2692 | 0.0 |
| | 11 | 19987 | -3.8635 | -3.9362 | 0.1 |
| | | ***maximum*** | -- | -- | ***0.2*** |
| VT03 | 1 | 14800 | 1.9626 | 2.0476 | 0.1 |
| | 2 | 15578 | 0.9541 | 1.027 | 0.1 |
| | 3 | 16409 | -0.0625 | -0.0597 | 0.0 |
| | 4 | 17128 | -0.8965 | -0.8554 | 0.0 |
| | 5 | 18124 | -1.9893 | -1.9643 | 0.0 |
| | 6 | 18926 | -2.8214 | -2.8298 | 0.0 |
| | 7 | 19720 | -3.6072 | -3.6034 | 0.0 |
| | 8 | 20370 | -4.2245 | -4.2967 | 0.1 |
| | 9 | 21060 | -4.8562 | -4.932 | 0.1 |
| | 10 | 21740 | -5.4565 | -5.5271 | 0.1 |
| | 11 | 22200 | -5.8509 | -6.0028 | 0.2 |
| | 12 | 22800 | -6.3517 | -6.4791 | 0.1 |
| | | ***maximum*** | -- | -- | ***0.2*** |
| VT04 | 1 | 15089 | 1.5812 | 1.6711 | 0.1 |
| | 2 | 15882 | 0.5753 | 0.6134 | 0.0 |
| | 3 | 16662 | -0.3605 | -0.2957 | 0.1 |
| | 4 | 17339 | -1.1339 | -1.0825 | 0.1 |
| | 5 | 18270 | -2.1438 | -2.1446 | 0.0 |
| | 6 | 19139 | -3.0357 | -3.0427 | 0.0 |
| | 7 | 19934 | -3.8129 | -3.8365 | 0.0 |
| | 8 | 20810 | -4.6301 | -4.6773 | 0.0 |
| | 9 | 21590 | -5.3259 | -5.3959 | 0.1 |
| | 10 | 22350 | -5.9775 | -6.0676 | 0.1 |
| | 11 | 23490 | -6.9097 | -7.093 | 0.2 |
| | 12 | 23160 | -6.6451 | -6.6286 | 0.0 |
| | | ***maximum*** | -- | -- | ***0.2*** |

# APPENDIX C

# Test Pit Logs

TP10-1 → MW1004

| Project #: 1697-1001 | Photos | Easting/Northing | Personnel: |
|---|---|---|---|
| Project Name: CAM-F | Y / N | | Weather: |

| |
|---|
| Work Area: SSDF |
| Sector: |
| DEPTH (m) |

**TEST PIT IDENTIFICATION:**

| DEPTH (m) | Stratigraphic Description | Sample I.D. | Organic Vapours | Analysis |
|---|---|---|---|---|
| 0 - 0.90 | Clay some sand, with cobbles, wet, grey, no HC odour | TP10-1 0-15 | no | 2x120mL F2-F4<br>1x60mL F1 BTEX<br>1xbag metals |
| | | 40-50 | | " " |
| Indicate depth of each major stratigraphic unit | Colour, grain size, major constituent, minor constituents, organics, staining, moisture content (dry, damp, moist, wet), odour | Indicate depth and range of samples | Measurements in PPM | Indicate analysis completed on each sample |

Sketch:

X— (8)/09/10 TP10-2 - Dup of 1

| Project #: 1697-1001 | Photos | Easting/Northing | Personnel: TR |
| --- | --- | --- | --- |
| Project Name: CAM-F | (Y)/ N | | Weather: Windy, Sun |
| Work Area: | | | |
| Sector: | | | |
| DEPTH (m) | | | |

**TEST PIT IDENTIFICATION:**

| DEPTH (m) | Stratigraphic Description | Sample I.D. | Organic Vapours | Analysis |
| --- | --- | --- | --- | --- |
| | | | | |
| Indicate depth of each major stratigraphic unit | Colour, grain size, major constituent, minor constituents, organics, staining, moisture content (dry, damp, moist, wet), odour | Indicate depth and range of samples | Measurements in PPM | Indicate analysis completed on each sample |

Sketch:

TP10-3-Dup of 2

| Project #: 1697-1001 | Photos | Easting/Northing | Personnel: |
|---|---|---|---|
| | | — | TR |
| Project Name: CAM-F | Y / N | — | Weather: Sunny/windy |
| Work Area: SSDF | | | |
| Sector: | | | |
| DEPTH (m) | | | |

**TEST PIT IDENTIFICATION:**

| DEPTH (m) | Stratigraphic Description | Sample I.D. | Organic Vapours | Analysis |
|---|---|---|---|---|
| 0.-0.50 | Clayey sand with cobbles, brown, loose, dry | TP10-3<br>0-0.15<br>40-50<br>0.15-0.15 | | 2x 120mL<br>1x 60mL<br>1x bag metals<br>3 2x 120mL<br>1x 60mL<br>1x bag metals<br>" "<br>Dup |
| Indicate depth of each major stratigraphic unit | Colour, grain size, major constituent, minor constituents, organics, staining, moisture content (dry, damp, moist, wet), odour | Indicate depth and range of samples | Measurements in PPM | Indicate analysis completed on each sample |

Sketch:

Project: 1697-1001

Franz Personnel: TR + SH
Weather: overcast

## Development of Monitoring Wells

| | | | | |
|---|---|---|---|---|
| Name of Area: SSFD | | | Sector: | |
| Date of Sampling: | Day: 7 | Month: 09 | Year: 2010 | |
| Monitoring Well ID: | MW10-4 DUP-I | | | |
| 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: | YSI + Geopump | | | |

### Measured Data

| | | | | | | |
|---|---|---|---|---|---|---|
| Well Depth (m): | | | Sample Analysis | Y/N | # of Bottles | Duplicate Information |
| Water Depth (m): | | | | | | |
| Stick Up (m): | | | | | | |
| **Field Chemistry** | | | | | | |
| **Name and # unit:** | **Readings *** | | | | | |
| pH: 7. 7.88 8. 9. | 1 | 8.57 | PHC | | | |
| | 2 | 8.33 | | | | |
| | 3 | 8.21 | | | | |
| | 4 | 8.11 | | | | |
| | 5 | 8.05 | | | | |
| | 6 | 7.96 | PCB Total | | | |
| Temperature (°C): 7. 2.92 8. 9. | 1 | 3.46 | | | | |
| | 2 | 3.15 | | | | |
| | 3 | 3.17 | | | | |
| | 4 | 2.98 | | | | |
| | 5 | 2.97 | VOC | | | |
| | 6 | 2.94 | | | | |
| Conductivity (mS/cm): 7. 1.013 8 9. | 1 | 0.543 | | | | |
| | 2 | 1.047 | | | | |
| | 3 | 1.031 | PAH | | | |
| | 4 | 1.020 | | | | |
| | 5 | 1.017 | | | | |
| | 6 | 1.015 | | | | |
| DO: 7. 24.8 8 9 | 1 | 135.2 | | | | |
| | 2 | 83.2 | Hardness | | | |
| | 3 | 41.3 | | | | |
| | 4 | 31.0 | | | | |
| | 5 | 27.5 | | | | |
| | 6 | 25.4 | | | | |
| ORP: 7. 37.8 | 1 | 32.1 | Other | | | |
| | 2 | 32.5 | | | | |
| | 3 | 32.0 | | | | |
| | 4 | 35.6 | | | | |
| | 5 | 37.8 | | | | |
| | 6 | 38.6 | | | | |
| Turbidity: | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |

**Comments/ Notes:**

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

Project:

Franz Personnel:
Weather: WINDY, COLD O/C

## Development of Monitoring Wells

| | | | |
|---|---|---|---|
| Name of Area: CAM-F | | | Sector: |
| Date of Sampling: | Day: 07 | Month: 09 | Year: 10 |
| Monitoring Well ID: | MW 10-5 | | |
| 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): | | | |
| Sampling Equipment: | YSI + 660 PUMP | | |

WELL CASING
74cm from ground

### Measured Data

| | | |
|---|---|---|
| Well Depth (m): | 2.11m (from stick up) | |
| Water Depth (m): | 1.20m (from stick up) | |
| Stick Up (m): | | |

**Field Chemistry**

| **Name and # unit:** | **Readings *** | |
|---|---|---|
| pH: | 1 | 8.16 |
| | 2 | 8.08 |
| | 3 | 7.96 |
| | 4 | 7.91 |
| | 5 | 7.87 |
| | 6 | |
| Temperature (°C): | 1 | 2.60 |
| | 2 | 2.25 |
| | 3 | 2.23 |
| | 4 | 2.31 |
| | 5 | 2.37 |
| | 6 | |
| Conductivity (mS/cm): | 1 | 0.519 |
| | 2 | 0.934 |
| | 3 | 0.962 |
| | 4 | 0.964 |
| | 5 | 0.964 |
| | 6 | |
| DO: | 1 | 138.7 |
| | 2 | 131.2 |
| | 3 | 88.2 |
| | 4 | 55.3 |
| | 5 | 44.0 |
| | 6 | |
| ORP: | 1 | 47.3 |
| | 2 | 42.1 |
| | 3 | 37.1 |
| | 4 | 36.5 |
| | 5 | 37.3 |
| | 6 | |
| Turbidity: | 1 | |
| | 2 | |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |

| **Sample Analysis** | **Y/N** | **# of Bottles** | **Duplicate Information** |
|---|---|---|---|
| PHC | | | |
| PCB Total | | | |
| VOC | | | |
| PAH | | | |
| Hardness | | | |
| Other | | | |

**Comments/ Notes:**

2.11 m [illegible] to depth

1.20 m water

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

Project:

Franz Personnel:
Weather:

MW10066

## Development of Monitoring Wells

| | | | | |
|---|---|---|---|---|
| Name of Area: | | | Sector: | |
| Date of Sampling: | Day: 8 | Month: 09 | Year: 2010 | |
| Monitoring Well ID: | #6 | | | |
| 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): | 500 mL | | | |
| Sampling Equipment: | YSI + Geopump | | | |

### Measured Data

| | | |
|---|---|---|
| Well Depth (m): | 1.940 (from top of stick-up) | |
| Water Depth (m): | 1.438 (from top stickup) | |
| Stick Up (m): | | |
| **Field Chemistry** | | |
| **Name and # unit:** | **Readings *** | |
| pH: | 1 | 8.51 |
| | 2 | 8.39 |
| | 3 | 8.35 |
| | 4 | 8.40 |
| | 5 | 8.44 |
| | 6 | 8.45 |
| Temperature (°C): | 1 | 2.61 |
| | 2 | 2.13 |
| | 3 | 2.14 |
| | 4 | 2.18 |
| | 5 | 2.23 |
| | 6 | 2.33 |
| Conductivity (mS/cm): | 1 | 0.491 |
| | 2 | 0.546 |
| | 3 | 0.867 |
| | 4 | 0.886 |
| | 5 | 0.884 |
| | 6 | 0.882 |
| DO: | 1 | 255.7 |
| | 2 | 167.9 |
| | 3 | 130.1 |
| | 4 | 89.2 |
| | 5 | 60.1 |
| | 6 | 41.5 |
| ORP: | 1 | 39.9 |
| | 2 | 65.0 |
| | 3 | 54.5 |
| | 4 | 32.0 |
| | 5 | 19.0 |
| | 6 | 11.3 |
| Turbidity: | 1 | |
| | 2 | |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |

| **Sample Analysis** | **Y/N** | **# of Bottles** | **Duplicate Information** |
|---|---|---|---|
| PHC | | | |
| PCB Total | | | |
| VOC | | | |
| PAH | | | |
| Hardness | | | |
| Other | | | |

**Comments/ Notes:**

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

**Monitoring Well Sampling Record**

| | | | |
|---|---|---|---|
| Site Name: | CAM-1B | | |
| Date of Sampling Event: | Sept 7, 2010 | Time: | 1100 pm |
| Names of Samplers: | Tina [illegible] | | |
| | S. Honey | | |
| Landfill Name: | SSDR | | |
| Monitoring Well ID: | 4 | | |
| Sample Number: | | | |
| Condition of Well: | Good | | |
| | | | |
| **Measured Data** | | | |
| Well pipe height above ground (cm)= | | | |
| Diameter of well (cm)= | 6" casing / 2" | | |
| Depth of well installation (cm)= (from ground surface) | | | |
| Length screened section (cm)= | | | |
| Depth to top of screen (cm)= (from ground surface) | | | |
| | | | |
| Depth to water surface (cm)= inner pipe (from top of pipe) | 0.69 m | Measurement method: (meter, tape, etc) | |
| Static water level (cm)= (below ground surface) | | | |
| Measured well refusal depth (cm)= (i.e. depth to frozen ground) | 1.652 m | Evidence of sludge or siltation: | |
| | | | |
| Thickness of water column (cm)= | | | |
| Static volume of water in well (mL)= | | | |
| | | | |
| Free product thickness (mm)= | | Measurement method: (meter, paste, etc) | |
| | | | |
| Purging: (Y/N) | | Purging/Sampling Equipment: | |
| Volume Purged Water= | | | |
| Decontamination required: (Y/N) | | | |
| Number washes: | | | |
| Number rinses: | | | |
| | | | |
| Final pH= | | | |
| Final Conductivity (uS/cm)= | | | |
| Final Temperature (degC)= | | | |
| | | | |

# APPENDIX D

## Laboratory Reports and Chain of Custody Forms

Your P.O. #: 2216

Your Project #: 1697-1001A, Long-Term Monitor
Site: CAM-F, SARCPA LAKE,NU
Your C.O.C. #: 20486801, 204868-01-01

**Attention: Matthew Cyr**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2010/09/20**

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B0C5981**
**Received: 2010/09/10, 18:00**

Sample Matrix: Water
# Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | 4 | N/A | 2010/09/14 | CAM SOP-00463 | SM 4500 Cl E |
| Colour | 4 | N/A | 2010/09/14 | CAM SOP-00412 | APHA 2120 |
| Conductivity | 4 | N/A | 2010/09/14 | CAM SOP-00448 | SM 2510 |
| Petroleum Hydro. CCME F1 & BTEX in Water (1) | 4 | N/A | 2010/09/14 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Water (1) | 4 | 2010/09/13 | 2010/09/13 | CAM SOP-00316 | CCME Hydrocarbons |
| Fluoride | 4 | 2010/09/14 | 2010/09/14 | CAM SOP-00448 | APHA 4500FC |
| Hardness (calculated as CaCO3) | 4 | N/A | 2010/09/15 | CAM SOP 00102 | SM 2340 B |
| Dissolved Metals by ICPMS | 4 | N/A | 2010/09/14 | CAM SOP-00447 | EPA 6020 |
| Metals in Water by ICPMS (low level) | 4 | 2010/09/14 | 2010/09/15 | CAM SOP-00447 | EPA 6020 |
| Nitrate (NO3) and Nitrite (NO2) in Water (2) | 4 | N/A | 2010/09/14 | CAM SOP-00440 | SM 4500 NO3I/NO2B |
| Polychlorinated Biphenyl in Water | 4 | 2010/09/13 | 2010/09/14 | CAM SOP-00309 | SW846 8082 |
| pH | 4 | N/A | 2010/09/14 | CAM SOP-00448 | SM 4500H |
| Orthophosphate | 4 | N/A | 2010/09/14 | CAM SOP-00461 | SM 4500 P-F |
| Sulphate by Automated Colourimetry | 4 | N/A | 2010/09/14 | CAM SOP-00464 | EPA 375.4 |
| Total Dissolved Solids | 4 | N/A | 2010/09/14 | CAM SOP-00428 | APHA 2540C |
| Total Suspended Solids | 4 | N/A | 2010/09/14 | CAM SOP-00428 | SM 2540D |

(1) This test was performed by Maxxam Ottawa
(2) 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: Julie.Clement@maxxamanalytics.com
Phone# (613) 274-3549

====================================================================

Your P.O. #: 2216

Your Project #: 1697-1001A, Long-Term Monitor
Site: CAM-F, SARCPA LAKE,NU
Your C.O.C. #: 20486801, 204868-01-01

**Attention: Matthew Cyr**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2010/09/20**

## CERTIFICATE OF ANALYSIS

-2-

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Total cover pages: 2

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | HD0638 | HD0639 | HD0640 | | HD0641 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | | 2010/09/07 | | |
| COC Number | | 204868-01-01 | 204868-01-01 | 204868-01-01 | | 204868-01-01 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **QC Batch** | **DUP-1** | **RDL** | **QC Batch** |
| **Calculated Parameters** | | | | | | | | |
| Hardness (CaCO3) | mg/L | 700 | 870 | 780 | 2263416 | 690 | 1 | 2263416 |
| **Inorganics** | | | | | | | | |
| Colour | TCU | 4 | 2 | <2 | 2264413 | 3 | 2 | 2264413 |
| Conductivity | umho/cm | 1980 | 1650 | 1510 | 2264877 | 1950 | 1 | 2264877 |
| Total Dissolved Solids | mg/L | 1280 | 1050 | 980 | 2264752 | 1300 | 10 | 2264752 |
| Fluoride (F-) | mg/L | 0.5 | 0.6 | 0.9 | 2264868 | 0.5 | 0.1 | 2264868 |
| Orthophosphate (P) | mg/L | <0.01 | <0.01 | <0.01 | 2264166 | <0.01 | 0.01 | 2264166 |
| pH | pH | 8.0 | 8.0 | 8.0 | 2264875 | 8.0 | | 2264875 |
| Total Suspended Solids | mg/L | 16 | 10 | 10 | 2264097 | 24 | 10 | 2264097 |
| Dissolved Sulphate (SO4) | mg/L | 800 | 680 | 620 | 2264167 | 790 | 5 | 2264167 |
| Dissolved Chloride (Cl) | mg/L | 40 | 49 | 30 | 2264162 | 40 | 1 | 2264162 |
| Nitrite (N) | mg/L | 0.03 | <0.01 | <0.01 | 2264594 | 0.04 | 0.01 | 2264096 |
| Nitrate (N) | mg/L | 2.9 | <0.1 | <0.1 | 2264594 | 2.8 | 0.1 | 2264096 |
| Nitrate + Nitrite | mg/L | 2.9 | <0.1 | <0.1 | 2264594 | 2.9 | 0.1 | 2264096 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

# ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204868-01-01 | 204868-01-01 | 204868-01-01 | 204868-01-01 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **Metals** | | | | | | | |
| . Arsenic (As) | ug/L | <0.5 | 0.5 | <0.5 | <0.5 | 0.5 | 2264419 |
| . Cadmium (Cd) | ug/L | <0.05 | 0.11 | 0.09 | <0.05 | 0.05 | 2264419 |
| . Chromium (Cr) | ug/L | <2.5 | <2.5 | <2.5 | <2.5 | 2.5 | 2264419 |
| . Cobalt (Co) | ug/L | 0.77 | 1.02 | 0.90 | 0.82 | 0.25 | 2264419 |
| . Copper (Cu) | ug/L | 5.9 | 7.2 | 7.8 | 6.3 | 0.5 | 2264419 |
| . Lead (Pb) | ug/L | <0.25 | 0.37 | 0.37 | <0.25 | 0.25 | 2264419 |
| . Nickel (Ni) | ug/L | 4.4 | 7.0 | 38.8 | 4.7 | 0.5 | 2264419 |
| . Zinc (Zn) | ug/L | 9.9 | 63.5 | 96.9 | 10.1 | 2.5 | 2264419 |
| Dissolved Arsenic (As) | ug/L | <1 | <1 | <1 | <1 | 1 | 2264526 |
| Dissolved Cadmium (Cd) | ug/L | <0.1 | 0.1 | 0.7 | <0.1 | 0.1 | 2264526 |
| Dissolved Chromium (Cr) | ug/L | <5 | <5 | 6 | <5 | 5 | 2264526 |
| Dissolved Cobalt (Co) | ug/L | 0.8 | 0.7 | 0.7 | 0.6 | 0.5 | 2264526 |
| Dissolved Copper (Cu) | ug/L | 6 | 7 | 8 | 7 | 1 | 2264526 |
| Dissolved Lead (Pb) | ug/L | <0.5 | <0.5 | <0.5 | <0.5 | 0.5 | 2264526 |
| Dissolved Nickel (Ni) | ug/L | 4 | 7 | 49 | 4 | 1 | 2264526 |
| Dissolved Zinc (Zn) | ug/L | 10 | 73 | 70 | 9 | 5 | 2264526 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## PETROLEUM HYDROCARBONS (CCME)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204868-01-01 | 204868-01-01 | 204868-01-01 | 204868-01-01 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | | | |
| Benzene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| Toluene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| Ethylbenzene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| o-Xylene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| p+m-Xylene | ug/L | <0.4 | <0.4 | <0.4 | <0.4 | 0.4 | 2259360 |
| Total Xylenes | ug/L | <0.4 | <0.4 | <0.4 | <0.4 | 0.4 | 2259360 |
| F1 (C6-C10) | ug/L | <100 | <100 | <100 | <100 | 100 | 2259360 |
| F1 (C6-C10) - BTEX | ug/L | <100 | <100 | <100 | <100 | 100 | 2259360 |
| **F2-F4 Hydrocarbons** | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| F3 (C16-C34 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| F4 (C34-C50 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| Reached Baseline at C50 | ug/L | Yes | Yes | Yes | Yes | | 2263434 |
| **Surrogate Recovery (%)** | | | | | | | |
| 1,4-Difluorobenzene | % | 100 | 101 | 100 | 103 | | 2259360 |
| 4-Bromofluorobenzene | % | 104 | 104 | 100 | 101 | | 2259360 |
| D10-Ethylbenzene | % | 97 | 107 | 101 | 108 | | 2259360 |
| D4-1,2-Dichloroethane | % | 119 | 121 | 121 | 124 | | 2259360 |
| o-Terphenyl | % | 68 | 72 | 71 | 79 | | 2263434 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204868-01-01 | 204868-01-01 | 204868-01-01 | 204868-01-01 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **PCBs** | | | | | | | |
| Aroclor 1016 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1221 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1232 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1242 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1248 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1254 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1260 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1262 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1268 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Total PCB | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| **Surrogate Recovery (%)** | | | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 65 | 60 | 61 | 59 | | 2263749 |
| Decachlorobiphenyl | % | 64 | 58 | 62 | 62 | | 2263749 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## Test Summary

**Maxxam ID** HD0638 **Collected** 2010/09/07
**Sample ID** MW1004 **Shipped**
**Matrix** Water **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2264162 | N/A | 2010/09/14 | DRM |
| Colour | SPEC | 2264413 | N/A | 2010/09/14 | CP |
| Conductivity | COND | 2264877 | N/A | 2010/09/14 | YPA |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2259360 | N/A | 2010/09/14 | STE |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2263434 | 2010/09/13 | 2010/09/13 | PRB |
| Fluoride | F | 2264868 | 2010/09/14 | 2010/09/14 | YPA |
| Hardness (calculated as CaCO3) | | 2263416 | N/A | 2010/09/15 | ASC |
| Dissolved Metals by ICPMS | ICP/MS | 2264526 | N/A | 2010/09/14 | JBW |
| Metals in Water by ICPMS (low level) | ICP1/MS | 2264419 | 2010/09/14 | 2010/09/15 | HRE |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2264594 | N/A | 2010/09/14 | C_N |
| Polychlorinated Biphenyl in Water | GC/ECD | 2263749 | 2010/09/13 | 2010/09/14 | LPG |
| pH | PH | 2264875 | N/A | 2010/09/14 | YPA |
| Orthophosphate | AC | 2264166 | N/A | 2010/09/14 | DRM |
| Sulphate by Automated Colourimetry | AC | 2264167 | N/A | 2010/09/14 | DRM |
| Total Dissolved Solids | SLDS | 2264752 | N/A | 2010/09/14 | HAG |
| Total Suspended Solids | SLDS | 2264097 | N/A | 2010/09/14 | HAG |

**Maxxam ID** HD0639 **Collected** 2010/09/07
**Sample ID** MW1005 **Shipped**
**Matrix** Water **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2264162 | N/A | 2010/09/14 | DRM |
| Colour | SPEC | 2264413 | N/A | 2010/09/14 | CP |
| Conductivity | COND | 2264877 | N/A | 2010/09/14 | YPA |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2259360 | N/A | 2010/09/14 | STE |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2263434 | 2010/09/13 | 2010/09/13 | PRB |
| Fluoride | F | 2264868 | 2010/09/14 | 2010/09/14 | YPA |
| Hardness (calculated as CaCO3) | | 2263416 | N/A | 2010/09/15 | ASC |
| Dissolved Metals by ICPMS | ICP/MS | 2264526 | N/A | 2010/09/14 | JBW |
| Metals in Water by ICPMS (low level) | ICP1/MS | 2264419 | 2010/09/14 | 2010/09/15 | HRE |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2264594 | N/A | 2010/09/14 | C_N |
| Polychlorinated Biphenyl in Water | GC/ECD | 2263749 | 2010/09/13 | 2010/09/14 | LPG |
| pH | PH | 2264875 | N/A | 2010/09/14 | YPA |
| Orthophosphate | AC | 2264166 | N/A | 2010/09/14 | DRM |
| Sulphate by Automated Colourimetry | AC | 2264167 | N/A | 2010/09/14 | DRM |
| Total Dissolved Solids | SLDS | 2264752 | N/A | 2010/09/14 | HAG |
| Total Suspended Solids | SLDS | 2264097 | N/A | 2010/09/14 | HAG |

**Maxxam ID** HD0639 Dup **Collected** 2010/09/07
**Sample ID** MW1005 **Shipped**
**Matrix** Water **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Polychlorinated Biphenyl in Water | GC/ECD | 2263749 | 2010/09/13 | 2010/09/14 | LPG |
| Total Dissolved Solids | SLDS | 2264752 | N/A | 2010/09/14 | HAG |

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## Test Summary

**Maxxam ID** HD0640
**Sample ID** MW1006
**Matrix** Water

**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2264162 | N/A | 2010/09/14 | DRM |
| Colour | SPEC | 2264413 | N/A | 2010/09/14 | CP |
| Conductivity | COND | 2264877 | N/A | 2010/09/14 | YPA |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2259360 | N/A | 2010/09/14 | STE |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2263434 | 2010/09/13 | 2010/09/13 | PRB |
| Fluoride | F | 2264868 | 2010/09/14 | 2010/09/14 | YPA |
| Hardness (calculated as CaCO3) | | 2263416 | N/A | 2010/09/15 | ASC |
| Dissolved Metals by ICPMS | ICP/MS | 2264526 | N/A | 2010/09/14 | JBW |
| Metals in Water by ICPMS (low level) | ICP1/MS | 2264419 | 2010/09/14 | 2010/09/15 | HRE |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2264594 | N/A | 2010/09/14 | C_N |
| Polychlorinated Biphenyl in Water | GC/ECD | 2263749 | 2010/09/13 | 2010/09/14 | LPG |
| pH | PH | 2264875 | N/A | 2010/09/14 | YPA |
| Orthophosphate | AC | 2264166 | N/A | 2010/09/14 | DRM |
| Sulphate by Automated Colourimetry | AC | 2264167 | N/A | 2010/09/14 | DRM |
| Total Dissolved Solids | SLDS | 2264752 | N/A | 2010/09/14 | HAG |
| Total Suspended Solids | SLDS | 2264097 | N/A | 2010/09/14 | HAG |

**Maxxam ID** HD0641
**Sample ID** DUP-1
**Matrix** Water

**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2264162 | N/A | 2010/09/14 | DRM |
| Colour | SPEC | 2264413 | N/A | 2010/09/14 | CP |
| Conductivity | COND | 2264877 | N/A | 2010/09/14 | YPA |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2259360 | N/A | 2010/09/14 | STE |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2263434 | 2010/09/13 | 2010/09/13 | PRB |
| Fluoride | F | 2264868 | 2010/09/14 | 2010/09/14 | YPA |
| Hardness (calculated as CaCO3) | | 2263416 | N/A | 2010/09/15 | ASC |
| Dissolved Metals by ICPMS | ICP/MS | 2264526 | N/A | 2010/09/14 | JBW |
| Metals in Water by ICPMS (low level) | ICP1/MS | 2264419 | 2010/09/14 | 2010/09/15 | HRE |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2264096 | N/A | 2010/09/14 | C_N |
| Polychlorinated Biphenyl in Water | GC/ECD | 2263749 | 2010/09/13 | 2010/09/14 | LPG |
| pH | PH | 2264875 | N/A | 2010/09/14 | YPA |
| Orthophosphate | AC | 2264166 | N/A | 2010/09/14 | DRM |
| Sulphate by Automated Colourimetry | AC | 2264167 | N/A | 2010/09/14 | DRM |
| Total Dissolved Solids | SLDS | 2264752 | N/A | 2010/09/14 | HAG |
| Total Suspended Solids | SLDS | 2264097 | N/A | 2010/09/14 | HAG |

**GENERAL COMMENTS**

Sample HD0638-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0639-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0640-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0641-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

**Results relate only to the items tested.**

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE,NU

# Quality Assurance Report

Maxxam Job Number: MB0C5981

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2259360 STE | Matrix Spike | 1,4-Difluorobenzene | 2010/09/13 | | 75 | % | 70 - 130 |
| | | 4-Bromofluorobenzene | 2010/09/13 | | 114 | % | 70 - 130 |
| | | D10-Ethylbenzene | 2010/09/13 | | 119 | % | 70 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/13 | | 88 | % | 70 - 130 |
| | | Benzene | 2010/09/13 | | 85 | % | 70 - 130 |
| | | Toluene | 2010/09/13 | | 100 | % | 70 - 130 |
| | | Ethylbenzene | 2010/09/13 | | 116 | % | 70 - 130 |
| | | o-Xylene | 2010/09/13 | | 121 | % | 70 - 130 |
| | | p+m-Xylene | 2010/09/13 | | 107 | % | 70 - 130 |
| | | F1 (C6-C10) | 2010/09/13 | | 79 | % | 70 - 130 |
| | Spiked Blank | 1,4-Difluorobenzene | 2010/09/13 | | 75 | % | 70 - 130 |
| | | 4-Bromofluorobenzene | 2010/09/13 | | 113 | % | 70 - 130 |
| | | D10-Ethylbenzene | 2010/09/13 | | 115 | % | 70 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/13 | | 88 | % | 70 - 130 |
| | | Benzene | 2010/09/13 | | 81 | % | 70 - 130 |
| | | Toluene | 2010/09/13 | | 91 | % | 70 - 130 |
| | | Ethylbenzene | 2010/09/13 | | 102 | % | 70 - 130 |
| | | o-Xylene | 2010/09/13 | | 108 | % | 70 - 130 |
| | | p+m-Xylene | 2010/09/13 | | 96 | % | 70 - 130 |
| | | F1 (C6-C10) | 2010/09/13 | | 92 | % | 70 - 130 |
| | Method Blank | 1,4-Difluorobenzene | 2010/09/13 | | 74 | % | 70 - 130 |
| | | 4-Bromofluorobenzene | 2010/09/13 | | 107 | % | 70 - 130 |
| | | D10-Ethylbenzene | 2010/09/13 | | 115 | % | 70 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/13 | | 90 | % | 70 - 130 |
| | | Benzene | 2010/09/13 | <0.2 | | ug/L | |
| | | Toluene | 2010/09/13 | <0.2 | | ug/L | |
| | | Ethylbenzene | 2010/09/13 | <0.2 | | ug/L | |
| | | o-Xylene | 2010/09/13 | <0.2 | | ug/L | |
| | | p+m-Xylene | 2010/09/13 | <0.4 | | ug/L | |
| | | Total Xylenes | 2010/09/13 | <0.4 | | ug/L | |
| | | F1 (C6-C10) | 2010/09/13 | <100 | | ug/L | |
| | | F1 (C6-C10) - BTEX | 2010/09/13 | <100 | | ug/L | |
| | RPD - Sample/Sample Dup | Benzene | 2010/09/13 | 1.4 | | % | 40 |
| | | Toluene | 2010/09/13 | NC | | % | 40 |
| | | Ethylbenzene | 2010/09/13 | NC | | % | 40 |
| | | o-Xylene | 2010/09/13 | NC | | % | 40 |
| | | p+m-Xylene | 2010/09/13 | NC | | % | 40 |
| | | Total Xylenes | 2010/09/13 | NC | | % | 40 |
| | | F1 (C6-C10) | 2010/09/13 | NC | | % | 40 |
| | | F1 (C6-C10) - BTEX | 2010/09/13 | NC | | % | 40 |
| 2263434 PRB | Matrix Spike | o-Terphenyl | 2010/09/14 | | 74 | % | 30 - 130 |
| | Matrix Spike (HD0638) | F2 (C10-C16 Hydrocarbons) | 2010/09/14 | | 86 | % | 60 - 130 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/14 | | 86 | % | 60 - 130 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/14 | | 86 | % | 60 - 130 |
| | Spiked Blank | o-Terphenyl | 2010/09/14 | | 78 | % | 30 - 130 |
| | | F2 (C10-C16 Hydrocarbons) | 2010/09/14 | | 89 | % | 60 - 130 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/14 | | 89 | % | 60 - 130 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/14 | | 89 | % | 60 - 130 |
| | Method Blank | o-Terphenyl | 2010/09/13 | | 73 | % | 30 - 130 |
| | | F2 (C10-C16 Hydrocarbons) | 2010/09/13 | <100 | | ug/L | |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/13 | <100 | | ug/L | |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/13 | <100 | | ug/L | |

Franz Environmental Inc
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Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE,NU

# Quality Assurance Report (Continued)

Maxxam Job Number: MB0C5981

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2263434 PRB | RPD - Sample/Sample Dup | F2 (C10-C16 Hydrocarbons) | 2010/09/13 | NC | | % | 50 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/13 | NC | | % | 50 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/13 | NC | | % | 50 |
| 2263749 LPG | Matrix Spike | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/14 | | 76 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/14 | | 74 | % | 40 - 130 |
| | Matrix Spike (HD0638) | Aroclor 1260 | 2010/09/14 | | 94 | % | 30 - 130 |
| | | Total PCB | 2010/09/14 | | 94 | % | 30 - 130 |
| | Spiked Blank | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/14 | | 85 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/14 | | 61 | % | 40 - 130 |
| | | Aroclor 1260 | 2010/09/14 | | 77 | % | 30 - 130 |
| | | Total PCB | 2010/09/14 | | 77 | % | 30 - 130 |
| | Method Blank | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/14 | | 78 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/14 | | 54 | % | 40 - 130 |
| | | Aroclor 1016 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1221 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1232 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1242 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1248 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1254 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1260 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1262 | 2010/09/14 | <0.05 | | ug/L | |
| | | Aroclor 1268 | 2010/09/14 | <0.05 | | ug/L | |
| | | Total PCB | 2010/09/14 | <0.05 | | ug/L | |
| | RPD - Sample/Sample Dup | Aroclor 1016 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1221 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1232 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1242 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1248 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1254 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1260 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1262 | 2010/09/14 | NC | | % | 40 |
| | | Aroclor 1268 | 2010/09/14 | NC | | % | 40 |
| | | Total PCB | 2010/09/14 | NC | | % | 40 |
| 2264096 C_N | Matrix Spike | Nitrite (N) | 2010/09/14 | | 103 | % | 80 - 120 |
| | | Nitrate (N) | 2010/09/14 | | 94 | % | 80 - 120 |
| | Spiked Blank | Nitrite (N) | 2010/09/14 | | 104 | % | 85 - 115 |
| | | Nitrate (N) | 2010/09/14 | | 103 | % | 85 - 115 |
| | Method Blank | Nitrite (N) | 2010/09/14 | <0.01 | | mg/L | |
| | | Nitrate (N) | 2010/09/14 | <0.1 | | mg/L | |
| | | Nitrate + Nitrite | 2010/09/14 | <0.1 | | mg/L | |
| | RPD - Sample/Sample Dup | Nitrite (N) | 2010/09/14 | NC | | % | 25 |
| | | Nitrate (N) | 2010/09/14 | 0.6 | | % | 25 |
| | | Nitrate + Nitrite | 2010/09/14 | 0.7 | | % | 25 |
| 2264097 HAG | QC Standard | Total Suspended Solids | 2010/09/14 | | 101 | % | 85 - 115 |
| | Method Blank | Total Suspended Solids | 2010/09/14 | <10 | | mg/L | |
| | RPD - Sample/Sample Dup | Total Suspended Solids | 2010/09/14 | NC | | % | 25 |

Franz Environmental Inc
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Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE,NU

## Quality Assurance Report (Continued)

Maxxam Job Number: MB0C5981

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2264162 DRM | Matrix Spike | Dissolved Chloride (Cl) | 2010/09/14 | | NC | % | 75 - 125 |
| | Spiked Blank | Dissolved Chloride (Cl) | 2010/09/14 | | 106 | % | 80 - 120 |
| | Method Blank | Dissolved Chloride (Cl) | 2010/09/14 | <1 | | mg/L | |
| | RPD - Sample/Sample Dup | Dissolved Chloride (Cl) | 2010/09/14 | 0.7 | | % | 20 |
| 2264166 DRM | Matrix Spike | Orthophosphate (P) | 2010/09/14 | | 108 | % | 75 - 125 |
| | Spiked Blank | Orthophosphate (P) | 2010/09/14 | | 100 | % | 80 - 120 |
| | Method Blank | Orthophosphate (P) | 2010/09/14 | <0.01 | | mg/L | |
| | RPD - Sample/Sample Dup | Orthophosphate (P) | 2010/09/14 | 3.8 | | % | 25 |
| 2264167 DRM | Matrix Spike | Dissolved Sulphate (SO4) | 2010/09/14 | | NC | % | 75 - 125 |
| | Spiked Blank | Dissolved Sulphate (SO4) | 2010/09/14 | | 99 | % | 80 - 120 |
| | Method Blank | Dissolved Sulphate (SO4) | 2010/09/14 | <1 | | mg/L | |
| | RPD - Sample/Sample Dup | Dissolved Sulphate (SO4) | 2010/09/14 | 0.02 | | % | 25 |
| 2264413 CP | Spiked Blank | Colour | 2010/09/14 | | 98 | % | 85 - 115 |
| | Method Blank | Colour | 2010/09/14 | <2 | | TCU | |
| | RPD - Sample/Sample Dup | Colour | 2010/09/14 | NC | | % | 25 |
| 2264419 HRE | Matrix Spike | . Arsenic (As) | 2010/09/15 | | NC | % | 75 - 125 |
| | | . Cadmium (Cd) | 2010/09/15 | | 104 | % | 75 - 125 |
| | | . Chromium (Cr) | 2010/09/15 | | 95 | % | 75 - 125 |
| | | . Cobalt (Co) | 2010/09/15 | | 95 | % | 75 - 125 |
| | | . Copper (Cu) | 2010/09/15 | | 94 | % | 75 - 125 |
| | | . Lead (Pb) | 2010/09/15 | | 99 | % | 75 - 125 |
| | | . Nickel (Ni) | 2010/09/15 | | 94 | % | 75 - 125 |
| | | . Zinc (Zn) | 2010/09/15 | | 99 | % | 75 - 125 |
| | Spiked Blank | . Arsenic (As) | 2010/09/15 | | 100 | % | 90 - 110 |
| | | . Cadmium (Cd) | 2010/09/15 | | 102 | % | 90 - 110 |
| | | . Chromium (Cr) | 2010/09/15 | | 98 | % | 90 - 110 |
| | | . Cobalt (Co) | 2010/09/15 | | 98 | % | 90 - 110 |
| | | . Copper (Cu) | 2010/09/15 | | 97 | % | 90 - 110 |
| | | . Lead (Pb) | 2010/09/15 | | 102 | % | 90 - 110 |
| | | . Nickel (Ni) | 2010/09/15 | | 97 | % | 90 - 110 |
| | | . Zinc (Zn) | 2010/09/15 | | 98 | % | 90 - 110 |
| | Method Blank | . Arsenic (As) | 2010/09/15 | <0.1 | | ug/L | |
| | | . Cadmium (Cd) | 2010/09/15 | <0.01 | | ug/L | |
| | | . Chromium (Cr) | 2010/09/15 | <0.5 | | ug/L | |
| | | . Cobalt (Co) | 2010/09/15 | <0.05 | | ug/L | |
| | | . Copper (Cu) | 2010/09/15 | <0.1 | | ug/L | |
| | | . Lead (Pb) | 2010/09/15 | <0.05 | | ug/L | |
| | | . Nickel (Ni) | 2010/09/15 | <0.1 | | ug/L | |
| | | . Zinc (Zn) | 2010/09/15 | <0.5 | | ug/L | |
| | RPD - Sample/Sample Dup | . Arsenic (As) | 2010/09/15 | 3.1 | | % | 25 |
| | | . Cadmium (Cd) | 2010/09/15 | NC | | % | 25 |
| | | . Chromium (Cr) | 2010/09/15 | NC | | % | 25 |
| | | . Cobalt (Co) | 2010/09/15 | 1.6 | | % | 25 |
| | | . Copper (Cu) | 2010/09/15 | 2.0 | | % | 25 |
| | | . Lead (Pb) | 2010/09/15 | NC | | % | 25 |

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE,NU

## Quality Assurance Report (Continued)

Maxxam Job Number: MB0C5981

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2264419 HRE | RPD - Sample/Sample Dup | . Nickel (Ni) | 2010/09/15 | 0.9 | | % | 25 |
| | | . Zinc (Zn) | 2010/09/15 | NC | | % | 25 |
| 2264526 JBW | Matrix Spike | Dissolved Arsenic (As) | 2010/09/14 | | 110 | % | 80 - 120 |
| | | Dissolved Cadmium (Cd) | 2010/09/14 | | 110 | % | 80 - 120 |
| | | Dissolved Chromium (Cr) | 2010/09/14 | | 112 | % | 80 - 120 |
| | | Dissolved Cobalt (Co) | 2010/09/14 | | 108 | % | 80 - 120 |
| | | Dissolved Copper (Cu) | 2010/09/14 | | 101 | % | 80 - 120 |
| | | Dissolved Lead (Pb) | 2010/09/14 | | 104 | % | 80 - 120 |
| | | Dissolved Nickel (Ni) | 2010/09/14 | | 105 | % | 80 - 120 |
| | | Dissolved Zinc (Zn) | 2010/09/14 | | 102 | % | 80 - 120 |
| | Spiked Blank | Dissolved Arsenic (As) | 2010/09/14 | | 97 | % | 90 - 110 |
| | | Dissolved Cadmium (Cd) | 2010/09/14 | | 99 | % | 90 - 110 |
| | | Dissolved Chromium (Cr) | 2010/09/14 | | 99 | % | 90 - 110 |
| | | Dissolved Cobalt (Co) | 2010/09/14 | | 99 | % | 90 - 110 |
| | | Dissolved Copper (Cu) | 2010/09/14 | | 97 | % | 90 - 110 |
| | | Dissolved Lead (Pb) | 2010/09/14 | | 98 | % | 90 - 110 |
| | | Dissolved Nickel (Ni) | 2010/09/14 | | 98 | % | 90 - 110 |
| | | Dissolved Zinc (Zn) | 2010/09/14 | | 97 | % | 90 - 110 |
| | Method Blank | Dissolved Arsenic (As) | 2010/09/14 | <1 | | ug/L | |
| | | Dissolved Cadmium (Cd) | 2010/09/14 | <0.1 | | ug/L | |
| | | Dissolved Chromium (Cr) | 2010/09/14 | <5 | | ug/L | |
| | | Dissolved Cobalt (Co) | 2010/09/14 | <0.5 | | ug/L | |
| | | Dissolved Copper (Cu) | 2010/09/14 | <1 | | ug/L | |
| | | Dissolved Lead (Pb) | 2010/09/14 | <0.5 | | ug/L | |
| | | Dissolved Nickel (Ni) | 2010/09/14 | <1 | | ug/L | |
| | | Dissolved Zinc (Zn) | 2010/09/14 | <5 | | ug/L | |
| | RPD - Sample/Sample Dup | Dissolved Lead (Pb) | 2010/09/14 | NC | | % | 25 |
| 2264594 C_N | Matrix Spike | Nitrite (N) | 2010/09/14 | | 103 | % | 80 - 120 |
| | | Nitrate (N) | 2010/09/14 | | 101 | % | 80 - 120 |
| | Spiked Blank | Nitrite (N) | 2010/09/14 | | 104 | % | 85 - 115 |
| | | Nitrate (N) | 2010/09/14 | | 102 | % | 85 - 115 |
| | Method Blank | Nitrite (N) | 2010/09/14 | <0.01 | | mg/L | |
| | | Nitrate (N) | 2010/09/14 | <0.1 | | mg/L | |
| | | Nitrate + Nitrite | 2010/09/14 | <0.1 | | mg/L | |
| | RPD - Sample/Sample Dup | Nitrite (N) | 2010/09/14 | NC | | % | 25 |
| | | Nitrate (N) | 2010/09/14 | NC | | % | 25 |
| | | Nitrate + Nitrite | 2010/09/14 | NC | | % | 25 |
| 2264752 HAG | QC Standard | Total Dissolved Solids | 2010/09/14 | | 101 | % | 90 - 110 |
| | Method Blank | Total Dissolved Solids | 2010/09/14 | <10 | | mg/L | |
| | RPD - Sample/Sample Dup | Total Dissolved Solids | 2010/09/14 | 0.9 | | % | 25 |
| 2264868 YPA | Matrix Spike | Fluoride (F-) | 2010/09/14 | | 96 | % | 80 - 120 |
| | Spiked Blank | Fluoride (F-) | 2010/09/14 | | 98 | % | 85 - 115 |
| | Method Blank | Fluoride (F-) | 2010/09/14 | <0.1 | | mg/L | |
| | RPD - Sample/Sample Dup | Fluoride (F-) | 2010/09/14 | NC | | % | 25 |
| 2264877 YPA | QC Standard | Conductivity | 2010/09/14 | | 103 | % | 85 - 115 |

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE,NU

## Quality Assurance Report (Continued)

Maxxam Job Number: MB0C5981

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2264877 YPA | Method Blank | Conductivity | 2010/09/14 | <1 | | umho/cm | |
| | RPD - Sample/Sample Dup | Conductivity | 2010/09/14 | 0.4 | | % | 25 |

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.

Driven by Service and Science

Your P.O. #: 2216
Your Project #: 1697-1001A, Long-Term Monitor
Site: CAM-F, SARCPA LAKE,NU
Your C.O.C. #: 20486801, 204868-01-01

**Attention: Matthew Cyr**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2010/09/20**

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B0C5981**
**Received: 2010/09/10, 18:00**

Sample Matrix: Water
# Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | 4 | N/A | 2010/09/14 | CAM SOP-00463 | SM 4500 Cl E |
| Colour | 4 | N/A | 2010/09/14 | CAM SOP-00412 | APHA 2120 |
| Conductivity | 4 | N/A | 2010/09/14 | CAM SOP-00448 | SM 2510 |
| Petroleum Hydro. CCME F1 & BTEX in Water (1) | 4 | N/A | 2010/09/14 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Water (1) | 4 | 2010/09/13 | 2010/09/13 | CAM SOP-00316 | CCME Hydrocarbons |
| Fluoride | 4 | 2010/09/14 | 2010/09/14 | CAM SOP-00448 | APHA 4500FC |
| Hardness (calculated as CaCO3) | 4 | N/A | 2010/09/15 | CAM SOP 00102 | SM 2340 B |
| Dissolved Metals by ICPMS | 4 | N/A | 2010/09/14 | CAM SOP-00447 | EPA 6020 |
| Metals in Water by ICPMS (low level) | 4 | 2010/09/14 | 2010/09/15 | CAM SOP-00447 | EPA 6020 |
| Nitrate (NO3) and Nitrite (NO2) in Water (2) | 4 | N/A | 2010/09/14 | CAM SOP-00440 | SM 4500 NO3I/NO2B |
| Polychlorinated Biphenyl in Water | 4 | 2010/09/13 | 2010/09/14 | CAM SOP-00309 | SW846 8082 |
| pH | 4 | N/A | 2010/09/14 | CAM SOP-00448 | SM 4500H |
| Orthophosphate | 4 | N/A | 2010/09/14 | CAM SOP-00461 | SM 4500 P-F |
| Sulphate by Automated Colourimetry | 4 | N/A | 2010/09/14 | CAM SOP-00464 | EPA 375.4 |
| Total Dissolved Solids | 4 | N/A | 2010/09/14 | CAM SOP-00428 | APHA 2540C |
| Total Suspended Solids | 4 | N/A | 2010/09/14 | CAM SOP-00428 | SM 2540D |

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

(1) This test was performed by Maxxam Ottawa
(2) 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: Julie.Clement@maxxamanalytics.com
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: 1

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## O'REG 153 PETROLEUM HYDROCARBONS (WATER)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | | | |
| Benzene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| Toluene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| Ethylbenzene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| o-Xylene | ug/L | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2259360 |
| p+m-Xylene | ug/L | <0.4 | <0.4 | <0.4 | <0.4 | 0.4 | 2259360 |
| Total Xylenes | ug/L | <0.4 | <0.4 | <0.4 | <0.4 | 0.4 | 2259360 |
| F1 (C6-C10) | ug/L | <100 | <100 | <100 | <100 | 100 | 2259360 |
| F1 (C6-C10) - BTEX | ug/L | <100 | <100 | <100 | <100 | 100 | 2259360 |
| **F2-F4 Hydrocarbons** | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| F3 (C16-C34 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| F4 (C34-C50 Hydrocarbons) | ug/L | <100 | <100 | <100 | <100 | 100 | 2263434 |
| Reached Baseline at C50 | ug/L | YES | YES | YES | YES | | 2263434 |
| **Surrogate Recovery (%)** | | | | | | | |
| 1,4-Difluorobenzene | % | 100 | 101 | 100 | 103 | | 2259360 |
| 4-Bromofluorobenzene | % | 104 | 104 | 100 | 101 | | 2259360 |
| D10-Ethylbenzene | % | 97 | 107 | 101 | 108 | | 2259360 |
| D4-1,2-Dichloroethane | % | 119 | 121 | 121 | 124 | | 2259360 |
| o-Terphenyl | % | 68 | 72 | 71 | 79 | | 2263434 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | HD0638 | HD0639 | HD0640 | | HD0641 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | | 2010/09/07 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **QC Batch** | **DUP-1** | **RDL** | **QC Batch** |
| **Calculated Parameters** | | | | | | | | |
| Hardness (CaCO3) | mg/L | 700 | 870 | 780 | 2263416 | 690 | 1 | 2263416 |
| **Inorganics** | | | | | | | | |
| Colour | TCU | 4 | 2 | <2 | 2264413 | 3 | 2 | 2264413 |
| Conductivity | umho/cm | 1980 | 1650 | 1510 | 2264877 | 1950 | 1 | 2264877 |
| Total Dissolved Solids | mg/L | 1280 | 1050 | 980 | 2264752 | 1300 | 10 | 2264752 |
| Fluoride (F-) | mg/L | 0.5 | 0.6 | 0.9 | 2264868 | 0.5 | 0.1 | 2264868 |
| Orthophosphate (P) | mg/L | <0.01 | <0.01 | <0.01 | 2264166 | <0.01 | 0.01 | 2264166 |
| pH | pH | 8.0 | 8.0 | 8.0 | 2264875 | 8.0 | | 2264875 |
| Total Suspended Solids | mg/L | 16 | 10 | 10 | 2264097 | 24 | 10 | 2264097 |
| Dissolved Sulphate (SO4) | mg/L | 800 | 680 | 620 | 2264167 | 790 | 5 | 2264167 |
| Dissolved Chloride (Cl) | mg/L | 40 | 49 | 30 | 2264162 | 40 | 1 | 2264162 |
| Nitrite (N) | mg/L | 0.03 | <0.01 | <0.01 | 2264594 | 0.04 | 0.01 | 2264096 |
| Nitrate (N) | mg/L | 2.9 | <0.1 | <0.1 | 2264594 | 2.8 | 0.1 | 2264096 |
| Nitrate + Nitrite | mg/L | 2.9 | <0.1 | <0.1 | 2264594 | 2.9 | 0.1 | 2264096 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **Metals** | | | | | | | |
| . Arsenic (As) | ug/L | <0.5 | 0.5 | <0.5 | <0.5 | 0.5 | 2264419 |
| . Cadmium (Cd) | ug/L | <0.05 | 0.11 | 0.09 | <0.05 | 0.05 | 2264419 |
| . Chromium (Cr) | ug/L | <2.5 | <2.5 | <2.5 | <2.5 | 2.5 | 2264419 |
| . Cobalt (Co) | ug/L | 0.77 | 1.02 | 0.90 | 0.82 | 0.25 | 2264419 |
| . Copper (Cu) | ug/L | 5.9 | 7.2 | 7.8 | 6.3 | 0.5 | 2264419 |
| . Lead (Pb) | ug/L | <0.25 | 0.37 | 0.37 | <0.25 | 0.25 | 2264419 |
| . Nickel (Ni) | ug/L | 4.4 | 7.0 | 38.8 | 4.7 | 0.5 | 2264419 |
| . Zinc (Zn) | ug/L | 9.9 | 63.5 | 96.9 | 10.1 | 2.5 | 2264419 |
| Dissolved Arsenic (As) | ug/L | <1 | <1 | <1 | <1 | 1 | 2264526 |
| Dissolved Cadmium (Cd) | ug/L | <0.1 | 0.1 | 0.7 | <0.1 | 0.1 | 2264526 |
| Dissolved Chromium (Cr) | ug/L | <5 | <5 | 6 | <5 | 5 | 2264526 |
| Dissolved Cobalt (Co) | ug/L | 0.8 | 0.7 | 0.7 | 0.6 | 0.5 | 2264526 |
| Dissolved Copper (Cu) | ug/L | 6 | 7 | 8 | 7 | 1 | 2264526 |
| Dissolved Lead (Pb) | ug/L | <0.5 | <0.5 | <0.5 | <0.5 | 0.5 | 2264526 |
| Dissolved Nickel (Ni) | ug/L | 4 | 7 | 49 | 4 | 1 | 2264526 |
| Dissolved Zinc (Zn) | ug/L | 10 | 73 | 70 | 9 | 5 | 2264526 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

| Maxxam ID | | HD0638 | HD0639 | HD0640 | HD0641 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| | **Units** | **MW1004** | **MW1005** | **MW1006** | **DUP-1** | **RDL** | **QC Batch** |
| **PCBs** | | | | | | | |
| Aroclor 1016 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1221 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1232 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1242 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1248 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1254 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1260 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1262 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Aroclor 1268 | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| Total PCB | ug/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2263749 |
| **Surrogate Recovery (%)** | | | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 65 | 60 | 61 | 59 | | 2263749 |
| Decachlorobiphenyl | % | 64 | 58 | 62 | 62 | | 2263749 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

| | |
|---|---|
| Package 1 | 5.3°C |
| Package 2 | 1.7°C |

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

**GENERAL COMMENTS**

Sample HD0638-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0639-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0640-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample HD0641-01: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

**QUALITY ASSURANCE REPORT**

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **QC Batch** | **Parameter** | **Date** | **% Recovery** | **QC Limits** | **% Recovery** | **QC Limits** | **Value** | **Units** | **Value (%)** | **QC Limits** | **% Recovery** | **QC Limits** |
| 2259360 | 1,4-Difluorobenzene | 2010/09/13 | 75 | 70 - 130 | 75 | 70 - 130 | 74 | % | | | | |
| 2259360 | 4-Bromofluorobenzene | 2010/09/13 | 114 | 70 - 130 | 113 | 70 - 130 | 107 | % | | | | |
| 2259360 | D10-Ethylbenzene | 2010/09/13 | 119 | 70 - 130 | 115 | 70 - 130 | 115 | % | | | | |
| 2259360 | D4-1,2-Dichloroethane | 2010/09/13 | 88 | 70 - 130 | 88 | 70 - 130 | 90 | % | | | | |
| 2259360 | Benzene | 2010/09/13 | 85 | 70 - 130 | 81 | 70 - 130 | <0.2 | ug/L | 1.4 | 40 | | |
| 2259360 | Toluene | 2010/09/13 | 100 | 70 - 130 | 91 | 70 - 130 | <0.2 | ug/L | NC | 40 | | |
| 2259360 | Ethylbenzene | 2010/09/13 | 116 | 70 - 130 | 102 | 70 - 130 | <0.2 | ug/L | NC | 40 | | |
| 2259360 | o-Xylene | 2010/09/13 | 121 | 70 - 130 | 108 | 70 - 130 | <0.2 | ug/L | NC | 40 | | |
| 2259360 | p+m-Xylene | 2010/09/13 | 107 | 70 - 130 | 96 | 70 - 130 | <0.4 | ug/L | NC | 40 | | |
| 2259360 | F1 (C6-C10) | 2010/09/13 | 79 | 70 - 130 | 92 | 70 - 130 | <100 | ug/L | NC | 40 | | |
| 2259360 | Total Xylenes | 2010/09/13 | | | | | <0.4 | ug/L | NC | 40 | | |
| 2259360 | F1 (C6-C10) - BTEX | 2010/09/13 | | | | | <100 | ug/L | NC | 40 | | |
| 2263434 | o-Terphenyl | 2010/09/13 | 74 | 30 - 130 | 78 | 30 - 130 | 73 | % | | | | |
| 2263434 | F2 (C10-C16 Hydrocarbons) | 2010/09/13 | 86 | 60 - 130 | 89 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2263434 | F3 (C16-C34 Hydrocarbons) | 2010/09/13 | 86 | 60 - 130 | 89 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2263434 | F4 (C34-C50 Hydrocarbons) | 2010/09/13 | 86 | 60 - 130 | 89 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2263749 | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/14 | 76 | 40 - 130 | 85 | 40 - 130 | 78 | % | | | | |
| 2263749 | Decachlorobiphenyl | 2010/09/14 | 74 | 40 - 130 | 61 | 40 - 130 | 54 | % | | | | |
| 2263749 | Aroclor 1260 | 2010/09/14 | 94 | 30 - 130 | 77 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Total PCB | 2010/09/14 | 94 | 30 - 130 | 77 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1016 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1221 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1232 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1242 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1248 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1254 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1262 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2263749 | Aroclor 1268 | 2010/09/14 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2264096 | Nitrite (N) | 2010/09/14 | 103 | 80 - 120 | 104 | 85 - 115 | <0.01 | mg/L | NC | 25 | | |
| 2264096 | Nitrate (N) | 2010/09/14 | 94 | 80 - 120 | 103 | 85 - 115 | <0.1 | mg/L | 0.6 | 25 | | |
| 2264096 | Nitrate + Nitrite | 2010/09/14 | | | | | <0.1 | mg/L | 0.7 | 25 | | |
| 2264097 | Total Suspended Solids | 2010/09/14 | | | | | <10 | mg/L | NC | 25 | 101 | 85 - 115 |
| 2264162 | Dissolved Chloride (Cl) | 2010/09/14 | NC | 75 - 125 | 106 | 80 - 120 | <1 | mg/L | 0.7 | 20 | | |
| 2264166 | Orthophosphate (P) | 2010/09/14 | 108 | 75 - 125 | 100 | 80 - 120 | <0.01 | mg/L | 3.8 | 25 | | |
| 2264167 | Dissolved Sulphate (SO4) | 2010/09/14 | NC | 75 - 125 | 99 | 80 - 120 | <1 | mg/L | 0.02 | 25 | | |
| 2264413 | Colour | 2010/09/14 | | | 98 | 85 - 115 | <2 | TCU | NC | 25 | | |
| 2264419 | . Arsenic (As) | 2010/09/15 | NC | 75 - 125 | 100 | 90 - 110 | <0.1 | ug/L | 3.1 | 25 | | |
| 2264419 | . Cadmium (Cd) | 2010/09/15 | 104 | 75 - 125 | 102 | 90 - 110 | <0.01 | ug/L | NC | 25 | | |
| 2264419 | . Chromium (Cr) | 2010/09/15 | 95 | 75 - 125 | 98 | 90 - 110 | <0.5 | ug/L | NC | 25 | | |

Maxxam Job #: B0C5981
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Your P.O. #: 2216

## QUALITY ASSURANCE REPORT

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | Units | Value (%) | QC Limits | % Recovery | QC Limits |
| 2264419 | . Cobalt (Co) | 2010/09/15 | 95 | 75 - 125 | 98 | 90 - 110 | <0.05 | ug/L | 1.6 | 25 | | |
| 2264419 | . Copper (Cu) | 2010/09/15 | 94 | 75 - 125 | 97 | 90 - 110 | <0.1 | ug/L | 2.0 | 25 | | |
| 2264419 | . Lead (Pb) | 2010/09/15 | 99 | 75 - 125 | 102 | 90 - 110 | <0.05 | ug/L | NC | 25 | | |
| 2264419 | . Nickel (Ni) | 2010/09/15 | 94 | 75 - 125 | 97 | 90 - 110 | <0.1 | ug/L | 0.9 | 25 | | |
| 2264419 | . Zinc (Zn) | 2010/09/15 | 99 | 75 - 125 | 98 | 90 - 110 | <0.5 | ug/L | NC | 25 | | |
| 2264526 | Dissolved Arsenic (As) | 2010/09/14 | 110 | 80 - 120 | 97 | 90 - 110 | <1 | ug/L | | | | |
| 2264526 | Dissolved Cadmium (Cd) | 2010/09/14 | 110 | 80 - 120 | 99 | 90 - 110 | <0.1 | ug/L | | | | |
| 2264526 | Dissolved Chromium (Cr) | 2010/09/14 | 112 | 80 - 120 | 99 | 90 - 110 | <5 | ug/L | | | | |
| 2264526 | Dissolved Cobalt (Co) | 2010/09/14 | 108 | 80 - 120 | 99 | 90 - 110 | <0.5 | ug/L | | | | |
| 2264526 | Dissolved Copper (Cu) | 2010/09/14 | 101 | 80 - 120 | 97 | 90 - 110 | <1 | ug/L | | | | |
| 2264526 | Dissolved Lead (Pb) | 2010/09/14 | 104 | 80 - 120 | 98 | 90 - 110 | <0.5 | ug/L | NC | 25 | | |
| 2264526 | Dissolved Nickel (Ni) | 2010/09/14 | 105 | 80 - 120 | 98 | 90 - 110 | <1 | ug/L | | | | |
| 2264526 | Dissolved Zinc (Zn) | 2010/09/14 | 102 | 80 - 120 | 97 | 90 - 110 | <5 | ug/L | | | | |
| 2264594 | Nitrite (N) | 2010/09/14 | 103 | 80 - 120 | 104 | 85 - 115 | <0.01 | mg/L | NC | 25 | | |
| 2264594 | Nitrate (N) | 2010/09/14 | 101 | 80 - 120 | 102 | 85 - 115 | <0.1 | mg/L | NC | 25 | | |
| 2264594 | Nitrate + Nitrite | 2010/09/14 | | | | | <0.1 | mg/L | NC | 25 | | |
| 2264752 | Total Dissolved Solids | 2010/09/14 | | | | | <10 | mg/L | 0.9 | 25 | 101 | 90 - 110 |
| 2264868 | Fluoride (F-) | 2010/09/14 | 96 | 80 - 120 | 98 | 85 - 115 | <0.1 | mg/L | NC | 25 | | |
| 2264877 | Conductivity | 2010/09/14 | | | | | <1 | umho/cm | 0.4 | 25 | 103 | 85 - 115 |

N/A = Not Applicable

RPD = Relative Percent Difference

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

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

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.

# Validation Signature Page

**Maxxam Job #: B0C5981**

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

CHARLES ANCKER, B.Sc., M.Sc., C.Chem, Senior Analyst

CRISTINA CARRIERE, Scientific Services

PAUL RUBINATO, Analyst, Maxxam Analytics

STEVE ROBERTS, Lab Supervisor, Ottawa

====================================================================

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics

Maxxam Analytics International Corporation o/a Maxxam Analytics
32 Colonnade Unit 1000, Nepean, Ontario Canada K2E 7J6 Tel:(613) 274-0573 Toll-free:877-480-7272 Fax:613-274-0574 www.maxxamanalytics.com

# CHAIN OF CUSTODY RECORD

Page of

**INVOICE INFORMATION:**

Company Name: #10988 Franz Environmental Inc
Contact Name: Matthew & Tina
Address: 329 Churchill Ave N Suite 200
Ottawa ON K1Z 5B8
Phone: (613)721-0555 Fax: (613)721-0029
Email: mcyr@franzenvironmental.com; tranger@franzenvir

**REPORT INFORMATION (if differs from invoice):**

Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

**PROJECT INFORMATION:**

Quotation #: A93902
P.O. #: 2216
Project #: 1697-1001A, Long-Term Monitor
Project Name:
Site #: CAM-F, Sarcpa Lake, NU
Sampled By:

**Laboratory Use Only:**

| MAXXAM JOB #: | BOTTLE ORDER #: |
|---|---|
| | 204868 |
| CHAIN OF CUSTODY #: | PROJECT MANAGER: |
| C#204868-01-01 | JULIE CLEMENT |

REGULATORY CRITERIA:

☐ MISA Reg. 153/04 Sewer Use ☐ Sanitary ☐ Storm ☐ Combined
☐ PWQO ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table 6 ☐ Residential/Parkland ☐ Industrial/Commercial ☐ Medium/Fine ☐ Coarse
☐ Reg 558 Municipality
Other (specify) Report Criteria on C of A? ☑

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SPECIAL INSTRUCTIONS

SAMPLES MUST BE KEPT COOL ( < 10ºC ) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Regulated Drinking Water ? ( Y / N ) | Metals Field Filtered ? ( Y / N ) | F1-F4 / BTEX | PCBs | Dissolved Metals by ICPMS | pH | Colour | Conductivity | Major Ions (Cl, F, NO2, NO3, PO4, SO4) | Hardness | Total Dissolved Solids | Total Suspended Solids | # of Bottles |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | MW1004 | 7/09/10 | | GW | | | X | X | X | X | X | X | X | X | X | X | 11 |
| 2 | | MW1005 | 7/09/10 | | GW | | | X | X | X | X | X | X | X | X | X | X | 11 |
| 3 | | MW1006 | 7/09/10 | | GW | | | X | X | X | X | X | X | X | X | X | X | 11 |
| 4 | | Dup-1 | 7/09/10 | | GW | | | X | X | X | X | X | X | X | X | X | X | 11 |
| 5 | | | | | GW | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

**Regular (Standard) TAT:** ☑
*(will be applied if Rush TAT is not specified):*
*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 #)*

10-Sep-10 18:00
JULIE CLEMENT
B0C5981
FW ENV-818

| *RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | # Jars Used and Not Submitted | Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|---|---|---|---|---|---|---|
| Tina Ranger | 9/09/11 | | J. Clement<br>SAHAN RAMANATHAN | 2010/09/10<br>10/09/11 | 6:00<br>11:30 | | ☒ | 3/9/4<br>1/3/1 4/4/5 c | ☐ Yes ☐ No |

White: Maxxam Yellow: Client

* 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.

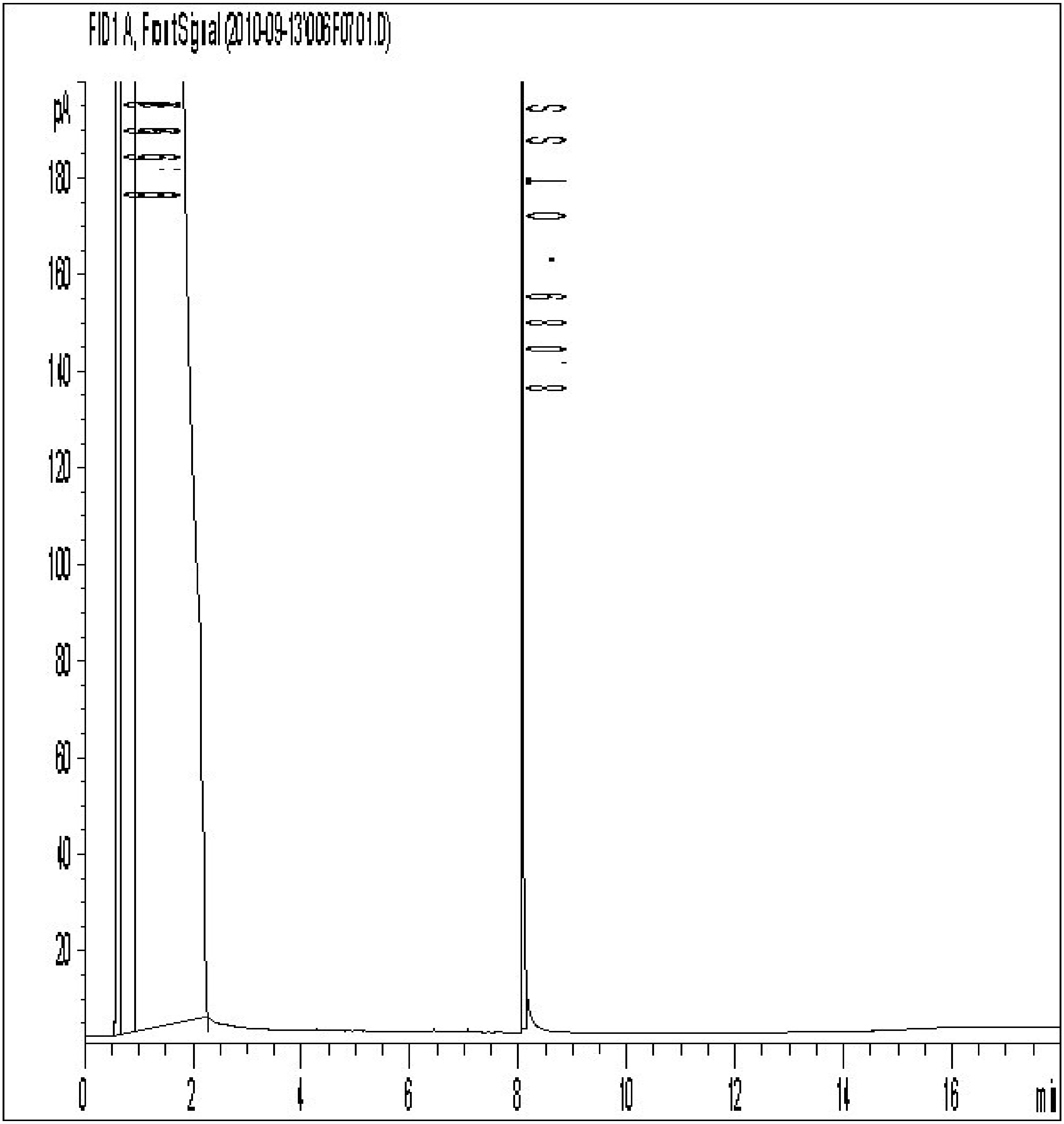
Maxxam Analytics International Corporation o/a Maxxam Analytics

RECD IN OTTAWA

Report Date: 2010/09/20
Maxxam Job #: B0C5981
Maxxam Sample: HD0638

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Client ID: MW1004

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**

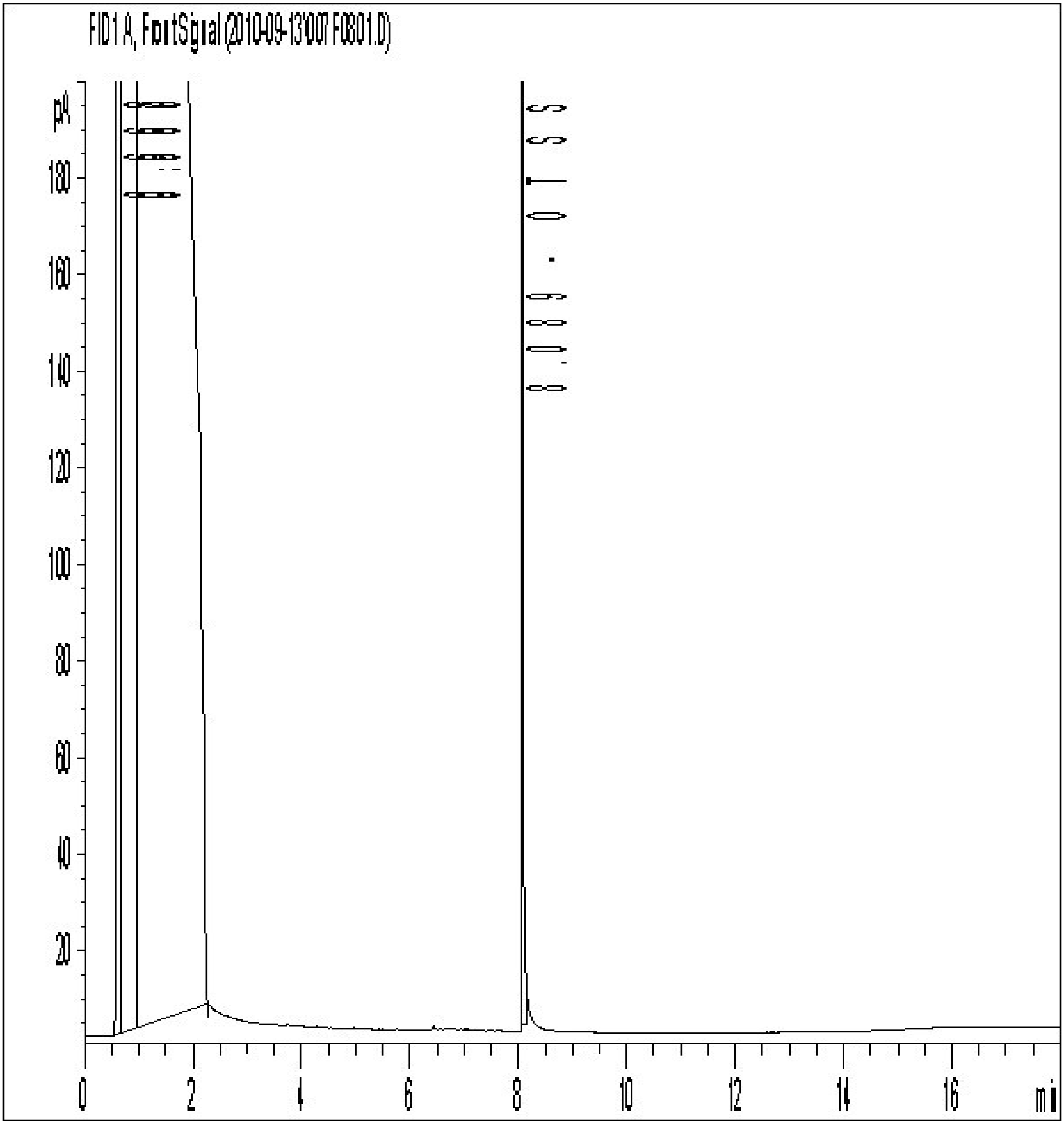



**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Report Date: 2010/09/20
Maxxam Job #: B0C5981
Maxxam Sample: HD0639

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Client ID: MW1005

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**



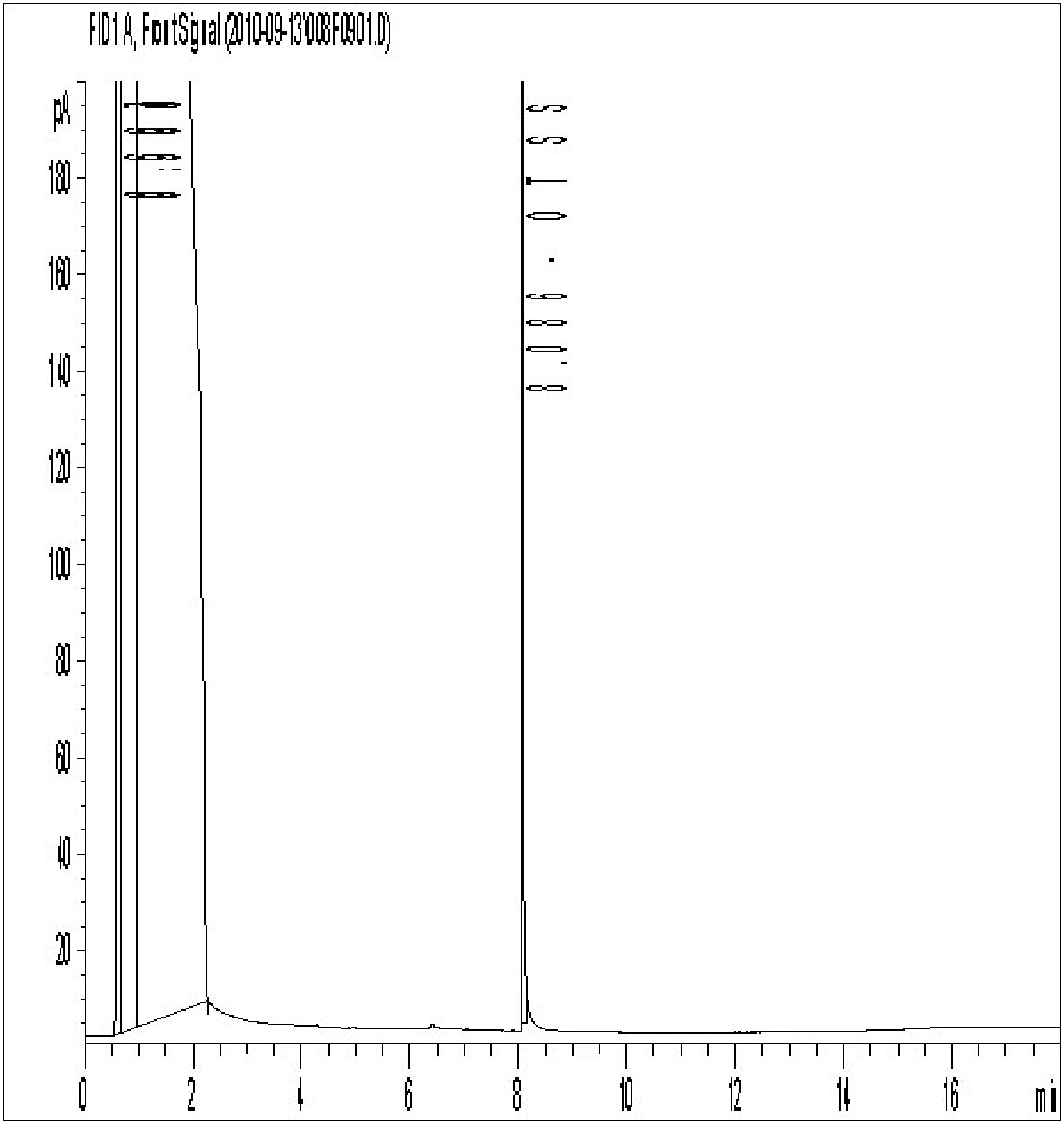

**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Driven by Service and Science

Report Date: 2010/09/20
Maxxam Job #: B0C5981
Maxxam Sample: HD0640

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Client ID: MW1006

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**



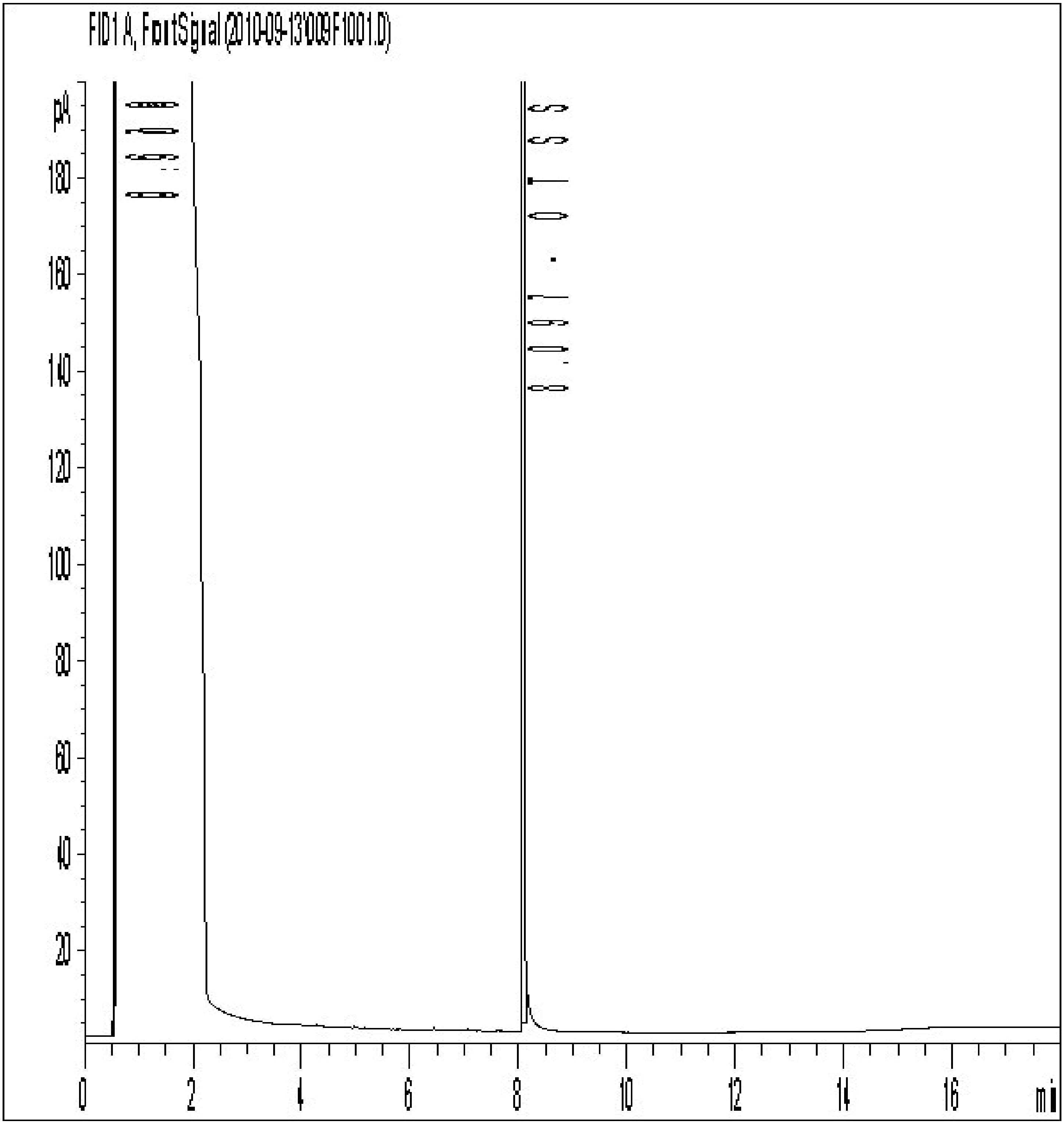

**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Driven by Service and Science

Report Date: 2010/09/20
Maxxam Job #: B0C5981
Maxxam Sample: HD0641

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE,NU
Client ID: DUP-1

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

Your P.O. #: 2216

Your Project #: 1697-1001A, Long-Term Monitor
Site: CAM-F, SARCPA LAKE, NU
Your C.O.C. #: 20486701, 204867-01-01

**Attention: Matthew Cyr**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2010/09/20**

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B0C6099**
**Received: 2010/09/10, 18:00**

Sample Matrix: Soil
# Samples Received: 8

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | 8 | 2010/09/17 | 2010/09/17 | CAM SOP-00408 | R153 Ana. Prot. 2004 |
| Hexavalent Chromium in Soil by IC (2) | 8 | N/A | 2010/09/17 | CAM SOP-00436 | EPA SW846-3060/7199 |
| Petroleum Hydro. CCME F1 & BTEX in Soil (1) | 8 | 2010/09/14 | 2010/09/15 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Soil (1) | 8 | 2010/09/14 | 2010/09/15 | CAM SOP-00316 | CCME CWS |
| Acid Extr. Metals (aqua regia) by ICPMS | 8 | 2010/09/17 | 2010/09/17 | CAM SOP-00447 | EPA 6020 |
| MOISTURE (1) | 8 | N/A | 2010/09/13 | CAM SOP-00445 | MOE HANDBOOK(1983) |
| Polychlorinated Biphenyl in Soil | 1 | 2010/09/16 | 2010/09/16 | CAM SOP-00309 | SW846 8082 |
| Polychlorinated Biphenyl in Soil | 7 | 2010/09/16 | 2010/09/17 | CAM SOP-00309 | SW846 8082 |

(1) This test was performed by Maxxam Ottawa
(2) Soils are reported on a dry weight basis unless otherwise specified.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: Julie.Clement@maxxamanalytics.com
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.

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Total cover pages: 1

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## RESULTS OF ANALYSES OF SOIL

| Maxxam ID | | HD1369 | HD1370 | | HD1371 | | HD1372 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | | 204867-01-01 | | 204867-01-01 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **QC Batch** | **TP10-2 (0-15)** | **QC Batch** | **TP10-2 (40-50)** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | | | |
| Chromium (VI) | ug/g | <0.2 | <0.2 | 2267474 | <0.2 | 2268583 | <0.2 | 0.2 | 2267474 |
| Moisture | % | 12 | 12 | 2263433 | 8.7 | 2263433 | 9.1 | 0.2 | 2263433 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| Maxxam ID | | HD1373 | | HD1374 | | HD1375 | | HD1376 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | |
| COC Number | | 204867-01-01 | | 204867-01-01 | | 204867-01-01 | | 204867-01-01 | | |
| | **Units** | **TP10-3 (0-15)** | **QC Batch** | **TP10-3 (40-50)** | **RDL** | **DUP 1** | **RDL** | **DUP 2** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | | | | |
| Chromium (VI) | ug/g | <2 | 2268583 | <2 | 2 | <0.2 | 0.2 | <2 | 2 | 2267474 |
| Moisture | % | 18 | 2263433 | 19 | 0.2 | 13 | 0.2 | 19 | 0.2 | 2263433 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

| Maxxam ID | | HD1369 | HD1370 | HD1371 | HD1372 | HD1373 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **TP10-3 (0-15)** | **RDL** | **QC Batch** |
| **Metals** | | | | | | | | |
| Hot Water Ext. Boron (B) | ug/g | 0.24 | 0.26 | 0.12 | 0.08 | 0.61 | 0.05 | 2268643 |
| Acid Extractable Aluminum (Al) | ug/g | 9200 | 8900 | 9700 | 9900 | 9500 | 50 | 2268515 |
| Acid Extractable Antimony (Sb) | ug/g | 0.5 | 0.3 | <0.2 | <0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Arsenic (As) | ug/g | 1 | 1 | 1 | 1 | 1 | 1 | 2268515 |
| Acid Extractable Barium (Ba) | ug/g | 42 | 41 | 50 | 51 | 47 | 0.5 | 2268515 |
| Acid Extractable Beryllium (Be) | ug/g | 0.3 | 0.3 | 0.2 | <0.2 | 0.2 | 0.2 | 2268515 |
| Acid Extractable Cadmium (Cd) | ug/g | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 2268515 |
| Acid Extractable Calcium (Ca) | ug/g | 34000 | 31000 | 43000 | 51000 | 13000 | 50 | 2268515 |
| Acid Extractable Chromium (Cr) | ug/g | 23 | 23 | 27 | 28 | 26 | 1 | 2268515 |
| Acid Extractable Cobalt (Co) | ug/g | 6.0 | 6.3 | 6.9 | 7.0 | 6.7 | 0.1 | 2268515 |
| Acid Extractable Copper (Cu) | ug/g | 19 | 19 | 20 | 21 | 19 | 0.5 | 2268515 |
| Acid Extractable Iron (Fe) | ug/g | 17000 | 18000 | 19000 | 19000 | 18000 | 50 | 2268515 |
| Acid Extractable Lead (Pb) | ug/g | 12 | 13 | 7 | 7 | 7 | 1 | 2268515 |
| Acid Extractable Magnesium (Mg) | ug/g | 13000 | 13000 | 15000 | 16000 | 8500 | 50 | 2268515 |
| Acid Extractable Manganese (Mn) | ug/g | 260 | 250 | 290 | 290 | 260 | 1 | 2268515 |
| Acid Extractable Molybdenum (Mo) | ug/g | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Nickel (Ni) | ug/g | 15 | 16 | 19 | 19 | 18 | 0.5 | 2268515 |
| Acid Extractable Phosphorus (P) | ug/g | 430 | 440 | 420 | 440 | 420 | 50 | 2268515 |
| Acid Extractable Potassium (K) | ug/g | 2100 | 2000 | 2800 | 2900 | 2400 | 200 | 2268515 |
| Acid Extractable Selenium (Se) | ug/g | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Silver (Ag) | ug/g | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Sodium (Na) | ug/g | 140 | 130 | 150 | 150 | 130 | 100 | 2268515 |
| Acid Extractable Strontium (Sr) | ug/g | 24 | 21 | 29 | 35 | 12 | 1 | 2268515 |
| Acid Extractable Thallium (Tl) | ug/g | 0.12 | 0.13 | 0.15 | 0.16 | 0.14 | 0.05 | 2268515 |
| Acid Extractable Tin (Sn) | ug/g | <5 | <5 | <5 | <5 | <5 | 5 | 2268515 |
| Acid Extractable Vanadium (V) | ug/g | 23 | 23 | 25 | 26 | 25 | 5 | 2268515 |
| Acid Extractable Zinc (Zn) | ug/g | 51 | 48 | 47 | 45 | 43 | 5 | 2268515 |
| Acid Extractable Mercury (Hg) | ug/g | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 2268515 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

| Maxxam ID | | HD1374 | HD1375 | HD1376 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **TP10-3 (40-50)** | **DUP 1** | **DUP 2** | **RDL** | **QC Batch** |
| **Metals** | | | | | | |
| Hot Water Ext. Boron (B) | ug/g | 0.41 | 0.12 | 0.48 | 0.05 | 2268756 |
| Acid Extractable Aluminum (Al) | ug/g | 10000 | 10000 | 9800 | 50 | 2268515 |
| Acid Extractable Antimony (Sb) | ug/g | <0.2 | <0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Arsenic (As) | ug/g | 1 | 1 | 1 | 1 | 2268515 |
| Acid Extractable Barium (Ba) | ug/g | 49 | 52 | 49 | 0.5 | 2268515 |
| Acid Extractable Beryllium (Be) | ug/g | 0.2 | 0.3 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Cadmium (Cd) | ug/g | <0.1 | <0.1 | <0.1 | 0.1 | 2268515 |
| Acid Extractable Calcium (Ca) | ug/g | 15000 | 50000 | 13000 | 50 | 2268515 |
| Acid Extractable Chromium (Cr) | ug/g | 28 | 28 | 27 | 1 | 2268515 |
| Acid Extractable Cobalt (Co) | ug/g | 6.8 | 7.3 | 6.6 | 0.1 | 2268515 |
| Acid Extractable Copper (Cu) | ug/g | 21 | 21 | 21 | 0.5 | 2268515 |
| Acid Extractable Iron (Fe) | ug/g | 19000 | 20000 | 19000 | 50 | 2268515 |
| Acid Extractable Lead (Pb) | ug/g | 7 | 7 | 8 | 1 | 2268515 |
| Acid Extractable Magnesium (Mg) | ug/g | 9900 | 16000 | 9300 | 50 | 2268515 |
| Acid Extractable Manganese (Mn) | ug/g | 280 | 300 | 270 | 1 | 2268515 |
| Acid Extractable Molybdenum (Mo) | ug/g | <0.5 | <0.5 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Nickel (Ni) | ug/g | 20 | 20 | 18 | 0.5 | 2268515 |
| Acid Extractable Phosphorus (P) | ug/g | 400 | 470 | 400 | 50 | 2268515 |
| Acid Extractable Potassium (K) | ug/g | 2600 | 3000 | 2400 | 200 | 2268515 |
| Acid Extractable Selenium (Se) | ug/g | <0.5 | <0.5 | 0.5 | 0.5 | 2268515 |
| Acid Extractable Silver (Ag) | ug/g | <0.2 | <0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Sodium (Na) | ug/g | 130 | 150 | 130 | 100 | 2268515 |
| Acid Extractable Strontium (Sr) | ug/g | 13 | 33 | 12 | 1 | 2268515 |
| Acid Extractable Thallium (Tl) | ug/g | 0.16 | 0.16 | 0.16 | 0.05 | 2268515 |
| Acid Extractable Tin (Sn) | ug/g | <5 | <5 | <5 | 5 | 2268515 |
| Acid Extractable Vanadium (V) | ug/g | 26 | 26 | 25 | 5 | 2268515 |
| Acid Extractable Zinc (Zn) | ug/g | 44 | 46 | 46 | 5 | 2268515 |
| Acid Extractable Mercury (Hg) | ug/g | <0.05 | <0.05 | <0.05 | 0.05 | 2268515 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## PETROLEUM HYDROCARBONS (CCME)

| Maxxam ID | | HD1369 | HD1370 | HD1371 | HD1372 | HD1373 | HD1374 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **TP10-3 (0-15)** | **TP10-3 (40-50)** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | | | | | |
| Benzene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| Toluene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| Ethylbenzene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| o-Xylene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| p+m-Xylene | ug/g | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.04 | 2264687 |
| Total Xylenes | ug/g | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.04 | 2264687 |
| F1 (C6-C10) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264687 |
| F1 (C6-C10) - BTEX | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264687 |
| **F2-F4 Hydrocarbons** | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264253 |
| F3 (C16-C34 Hydrocarbons) | ug/g | 69 | <10 | <10 | <10 | 18 | 14 | 10 | 2264253 |
| F4 (C34-C50 Hydrocarbons) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264253 |
| Reached Baseline at C50 | ug/g | Yes | Yes | Yes | Yes | Yes | Yes | | 2264253 |
| **Surrogate Recovery (%)** | | | | | | | | | |
| 1,4-Difluorobenzene | % | 102 | 101 | 101 | 101 | 103 | 105 | | 2264687 |
| 4-Bromofluorobenzene | % | 100 | 105 | 102 | 107 | 105 | 104 | | 2264687 |
| D10-Ethylbenzene | % | 100 | 101 | 99 | 96 | 92 | 96 | | 2264687 |
| D4-1,2-Dichloroethane | % | 122 | 124 | 119 | 118 | 124 | 124 | | 2264687 |
| o-Terphenyl | % | 99 | 90 | 86 | 98 | 100 | 89 | | 2264253 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## PETROLEUM HYDROCARBONS (CCME)

| Maxxam ID | | HD1375 | HD1376 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **DUP 1** | **DUP 2** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | |
| Benzene | ug/g | <0.02 | <0.02 | 0.02 | 2264687 |
| Toluene | ug/g | <0.02 | <0.02 | 0.02 | 2264687 |
| Ethylbenzene | ug/g | <0.02 | <0.02 | 0.02 | 2264687 |
| o-Xylene | ug/g | <0.02 | <0.02 | 0.02 | 2264687 |
| p+m-Xylene | ug/g | <0.04 | <0.04 | 0.04 | 2264687 |
| Total Xylenes | ug/g | <0.04 | <0.04 | 0.04 | 2264687 |
| F1 (C6-C10) | ug/g | <10 | <10 | 10 | 2264687 |
| F1 (C6-C10) - BTEX | ug/g | <10 | <10 | 10 | 2264687 |
| **F2-F4 Hydrocarbons** | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/g | <10 | <10 | 10 | 2264253 |
| F3 (C16-C34 Hydrocarbons) | ug/g | <10 | 12 | 10 | 2264253 |
| F4 (C34-C50 Hydrocarbons) | ug/g | <10 | <10 | 10 | 2264253 |
| Reached Baseline at C50 | ug/g | Yes | Yes | | 2264253 |
| **Surrogate Recovery (%)** | | | | | |
| 1,4-Difluorobenzene | % | 101 | 102 | | 2264687 |
| 4-Bromofluorobenzene | % | 104 | 103 | | 2264687 |
| D10-Ethylbenzene | % | 95 | 91 | | 2264687 |
| D4-1,2-Dichloroethane | % | 122 | 124 | | 2264687 |
| o-Terphenyl | % | 98 | 98 | | 2264253 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

| Maxxam ID | | HD1369 | HD1370 | HD1371 | HD1372 | HD1373 | HD1374 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **TP10-3 (0-15)** | **TP10-3 (40-50)** | **RDL** | **QC Batch** |
| **PCBs** | | | | | | | | | |
| Aroclor 1016 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1221 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1232 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1242 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1248 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1254 | ug/g | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1260 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1262 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1268 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Total PCB | ug/g | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| **Surrogate Recovery (%)** | | | | | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 77 | 81 | 72 | 71 | 80 | 73 | | 2267953 |
| Decachlorobiphenyl | % | 73 | 81 | 77 | 85 | 79 | 79 | | 2267953 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Your P.O. #: 2216

## POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

| Maxxam ID | | HD1375 | HD1376 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | | |
| COC Number | | 204867-01-01 | 204867-01-01 | | |
| | **Units** | **DUP 1** | **DUP 2** | **RDL** | **QC Batch** |
| **PCBs** | | | | | |
| Aroclor 1016 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1221 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1232 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1242 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1248 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1254 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1260 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1262 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1268 | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| Total PCB | ug/g | <0.01 | <0.01 | 0.01 | 2267953 |
| **Surrogate Recovery (%)** | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 72 | 84 | | 2267953 |
| Decachlorobiphenyl | % | 78 | 85 | | 2267953 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## Test Summary

**Maxxam ID** HD1369 | **Collected** 2010/09/07
**Sample ID** TP10-1 (0-15) | **Shipped**
**Matrix** Soil | **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268643 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/16 | JZ |

**Maxxam ID** HD1369 Dup | **Collected** 2010/09/07
**Sample ID** TP10-1 (0-15) | **Shipped**
**Matrix** Soil | **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/16 | JZ |

**Maxxam ID** HD1370 | **Collected** 2010/09/07
**Sample ID** TP10-1 (40-50) | **Shipped**
**Matrix** Soil | **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268643 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |

**Maxxam ID** HD1371 | **Collected** 2010/09/07
**Sample ID** TP10-2 (0-15) | **Shipped**
**Matrix** Soil | **Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268643 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2268583 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |



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Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## Test Summary

**Maxxam ID** HD1371 Dup
**Sample ID** TP10-2 (0-15)
**Matrix** Soil
**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2268583 | N/A | 2010/09/17 | SAC |

**Maxxam ID** HD1372
**Sample ID** TP10-2 (40-50)
**Matrix** Soil
**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268643 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |

**Maxxam ID** HD1373
**Sample ID** TP10-3 (0-15)
**Matrix** Soil
**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268643 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2268583 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |

**Maxxam ID** HD1374
**Sample ID** TP10-3 (40-50)
**Matrix** Soil
**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268756 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## Test Summary

**Maxxam ID** HD1375
**Sample ID** DUP 1
**Matrix** Soil

**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268756 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |

**Maxxam ID** HD1376
**Sample ID** DUP 2
**Matrix** Soil

**Collected** 2010/09/07
**Shipped**
**Received** 2010/09/10

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | ICP | 2268756 | 2010/09/17 | 2010/09/17 | AFZ |
| Hexavalent Chromium in Soil by IC | IC/SPEC | 2267474 | N/A | 2010/09/17 | SAC |
| Petroleum Hydro. CCME F1 & BTEX in Soil | HSGC/MSFD | 2264687 | 2010/09/14 | 2010/09/15 | STE |
| Petroleum Hydrocarbons F2-F4 in Soil | GC/FID | 2264253 | 2010/09/14 | 2010/09/15 | PRB |
| Acid Extr. Metals (aqua regia) by ICPMS | ICP/MS | 2268515 | 2010/09/17 | 2010/09/17 | VIV |
| MOISTURE | BAL | 2263433 | N/A | 2010/09/13 | S_N |
| Polychlorinated Biphenyl in Soil | GC/ECD | 2267953 | 2010/09/16 | 2010/09/17 | JZ |



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Maxxam Job #: B0C6099
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Project name: CAM-F, SARCPA LAKE, NU
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**GENERAL COMMENTS**

Hexavalent chromium: Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly.

**Results relate only to the items tested.**

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE, NU

# Quality Assurance Report

Maxxam Job Number: TB0C6099

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2263433 S_N | RPD - Sample/Sample Dup | Moisture | 2010/09/13 | 7.0 | | % | 50 |
| 2264253 PRB | Matrix Spike | o-Terphenyl | 2010/09/15 | | 83 | % | 30 - 130 |
| | Matrix Spike (HD1370) | F2 (C10-C16 Hydrocarbons) | 2010/09/15 | | 123 | % | 60 - 130 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/15 | | 123 | % | 60 - 130 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/15 | | 123 | % | 60 - 130 |
| | Spiked Blank | o-Terphenyl | 2010/09/15 | | 80 | % | 30 - 130 |
| | | F2 (C10-C16 Hydrocarbons) | 2010/09/15 | | 94 | % | 60 - 130 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/15 | | 94 | % | 60 - 130 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/15 | | 94 | % | 60 - 130 |
| | Method Blank | o-Terphenyl | 2010/09/15 | | 79 | % | 30 - 130 |
| | | F2 (C10-C16 Hydrocarbons) | 2010/09/15 | <10 | | ug/g | |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/15 | <10 | | ug/g | |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/15 | <10 | | ug/g | |
| | RPD - Sample/Sample Dup | F2 (C10-C16 Hydrocarbons) | 2010/09/15 | NC | | % | 50 |
| | | F3 (C16-C34 Hydrocarbons) | 2010/09/15 | 18.3 | | % | 50 |
| | | F4 (C34-C50 Hydrocarbons) | 2010/09/15 | NC | | % | 50 |
| 2264687 STE | Matrix Spike | 1,4-Difluorobenzene | 2010/09/15 | | 104 | % | 60 - 140 |
| | | 4-Bromofluorobenzene | 2010/09/15 | | 108 | % | 60 - 140 |
| | | D10-Ethylbenzene | 2010/09/15 | | 90 | % | 30 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/15 | | 121 | % | 60 - 140 |
| | Matrix Spike (HD1370) | Benzene | 2010/09/15 | | 67 | % | 60 - 140 |
| | | Toluene | 2010/09/15 | | 75 | % | 60 - 140 |
| | | Ethylbenzene | 2010/09/15 | | 86 | % | 60 - 140 |
| | | o-Xylene | 2010/09/15 | | 97 | % | 60 - 140 |
| | | p+m-Xylene | 2010/09/15 | | 84 | % | 60 - 140 |
| | | F1 (C6-C10) | 2010/09/15 | | 100 | % | 60 - 140 |
| | Spiked Blank | 1,4-Difluorobenzene | 2010/09/15 | | 103 | % | 60 - 140 |
| | | 4-Bromofluorobenzene | 2010/09/15 | | 110 | % | 60 - 140 |
| | | D10-Ethylbenzene | 2010/09/15 | | 98 | % | 30 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/15 | | 118 | % | 60 - 140 |
| | | Benzene | 2010/09/15 | | 73 | % | 60 - 140 |
| | | Toluene | 2010/09/15 | | 79 | % | 60 - 140 |
| | | Ethylbenzene | 2010/09/15 | | 91 | % | 60 - 140 |
| | | o-Xylene | 2010/09/15 | | 100 | % | 60 - 140 |
| | | p+m-Xylene | 2010/09/15 | | 87 | % | 60 - 140 |
| | | F1 (C6-C10) | 2010/09/15 | | 90 | % | 60 - 140 |
| | Method Blank | 1,4-Difluorobenzene | 2010/09/15 | | 99 | % | 60 - 140 |
| | | 4-Bromofluorobenzene | 2010/09/15 | | 106 | % | 60 - 140 |
| | | D10-Ethylbenzene | 2010/09/15 | | 93 | % | 30 - 130 |
| | | D4-1,2-Dichloroethane | 2010/09/15 | | 118 | % | 60 - 140 |
| | | Benzene | 2010/09/15 | <0.02 | | ug/g | |
| | | Toluene | 2010/09/15 | <0.02 | | ug/g | |
| | | Ethylbenzene | 2010/09/15 | <0.02 | | ug/g | |
| | | o-Xylene | 2010/09/15 | <0.02 | | ug/g | |
| | | p+m-Xylene | 2010/09/15 | <0.04 | | ug/g | |
| | | Total Xylenes | 2010/09/15 | <0.04 | | ug/g | |
| | | F1 (C6-C10) | 2010/09/15 | <10 | | ug/g | |
| | | F1 (C6-C10) - BTEX | 2010/09/15 | <10 | | ug/g | |
| | RPD - Sample/Sample Dup | Benzene | 2010/09/15 | NC | | % | 50 |

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE, NU

## Quality Assurance Report (Continued)

Maxxam Job Number: TB0C6099

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2264687 STE | RPD - Sample/Sample Dup | Toluene | 2010/09/15 | NC | | % | 50 |
| | | Ethylbenzene | 2010/09/15 | NC | | % | 50 |
| | | o-Xylene | 2010/09/15 | NC | | % | 50 |
| | | p+m-Xylene | 2010/09/15 | NC | | % | 50 |
| | | Total Xylenes | 2010/09/15 | NC | | % | 50 |
| | | F1 (C6-C10) | 2010/09/15 | NC | | % | 50 |
| | | F1 (C6-C10) - BTEX | 2010/09/15 | NC | | % | 50 |
| 2267474 SAC | Matrix Spike | Chromium (VI) | 2010/09/17 | | 68 (1) | % | 75 - 125 |
| | QC Standard | Chromium (VI) | 2010/09/17 | | 93 | % | 75 - 125 |
| | Spiked Blank | Chromium (VI) | 2010/09/17 | | 93 | % | 80 - 120 |
| | Method Blank | Chromium (VI) | 2010/09/17 | <0.2 | | ug/g | |
| | RPD - Sample/Sample Dup | Chromium (VI) | 2010/09/17 | NC | | % | 25 |
| 2267953 JZ | Matrix Spike | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/17 | | 77 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/17 | | 75 | % | 40 - 130 |
| | Matrix Spike (HD1369) | Aroclor 1260 | 2010/09/17 | | 86 | % | 30 - 130 |
| | | Total PCB | 2010/09/17 | | 86 | % | 30 - 130 |
| | Spiked Blank | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/16 | | 87 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/16 | | 86 | % | 40 - 130 |
| | | Aroclor 1260 | 2010/09/16 | | 97 | % | 30 - 130 |
| | | Total PCB | 2010/09/16 | | 97 | % | 30 - 130 |
| | Method Blank | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/16 | | 91 | % | 40 - 130 |
| | | Decachlorobiphenyl | 2010/09/16 | | 80 | % | 40 - 130 |
| | | Aroclor 1016 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1221 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1232 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1242 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1248 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1254 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1260 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1262 | 2010/09/16 | <0.01 | | ug/g | |
| | | Aroclor 1268 | 2010/09/16 | <0.01 | | ug/g | |
| | | Total PCB | 2010/09/16 | <0.01 | | ug/g | |
| | RPD - Sample/Sample Dup | Aroclor 1016 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1221 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1232 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1242 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1248 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1254 | 2010/09/16 | 16.4 | | % | 50 |
| | | Aroclor 1260 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1262 | 2010/09/16 | NC | | % | 50 |
| | | Aroclor 1268 | 2010/09/16 | NC | | % | 50 |
| | | Total PCB | 2010/09/16 | 16.4 | | % | 50 |
| 2268515 VIV | Matrix Spike | Acid Extractable Aluminum (Al) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Antimony (Sb) | 2010/09/17 | | 95 | % | 75 - 125 |
| | | Acid Extractable Arsenic (As) | 2010/09/17 | | 98 | % | 75 - 125 |
| | | Acid Extractable Barium (Ba) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Beryllium (Be) | 2010/09/17 | | 87 | % | 75 - 125 |
| | | Acid Extractable Cadmium (Cd) | 2010/09/17 | | 95 | % | 75 - 125 |

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE, NU

## Quality Assurance Report (Continued)

Maxxam Job Number: TB0C6099

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2268515 VIV | Matrix Spike | Acid Extractable Calcium (Ca) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Chromium (Cr) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Cobalt (Co) | 2010/09/17 | | 96 | % | 75 - 125 |
| | | Acid Extractable Copper (Cu) | 2010/09/17 | | 93 | % | 75 - 125 |
| | | Acid Extractable Iron (Fe) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Lead (Pb) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Magnesium (Mg) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Manganese (Mn) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Molybdenum (Mo) | 2010/09/17 | | 98 | % | 75 - 125 |
| | | Acid Extractable Nickel (Ni) | 2010/09/17 | | 95 | % | 75 - 125 |
| | | Acid Extractable Phosphorus (P) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Potassium (K) | 2010/09/17 | | 94 | % | 75 - 125 |
| | | Acid Extractable Selenium (Se) | 2010/09/17 | | 94 | % | 75 - 125 |
| | | Acid Extractable Silver (Ag) | 2010/09/17 | | 95 | % | 75 - 125 |
| | | Acid Extractable Sodium (Na) | 2010/09/17 | | 92 | % | 75 - 125 |
| | | Acid Extractable Strontium (Sr) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Thallium (Tl) | 2010/09/17 | | 94 | % | 75 - 125 |
| | | Acid Extractable Tin (Sn) | 2010/09/17 | | 103 | % | 75 - 125 |
| | | Acid Extractable Vanadium (V) | 2010/09/17 | | 103 | % | 75 - 125 |
| | | Acid Extractable Zinc (Zn) | 2010/09/17 | | NC | % | 75 - 125 |
| | | Acid Extractable Mercury (Hg) | 2010/09/17 | | 99 | % | 75 - 125 |
| | QC Standard | Acid Extractable Aluminum (Al) | 2010/09/17 | | 106 | % | 75 - 125 |
| | | Acid Extractable Antimony (Sb) | 2010/09/17 | | 100 | % | 75 - 125 |
| | | Acid Extractable Arsenic (As) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Barium (Ba) | 2010/09/17 | | 100 | % | 75 - 125 |
| | | Acid Extractable Beryllium (Be) | 2010/09/17 | | 91 | % | 75 - 125 |
| | | Acid Extractable Cadmium (Cd) | 2010/09/17 | | 98 | % | 75 - 125 |
| | | Acid Extractable Calcium (Ca) | 2010/09/17 | | 98 | % | 75 - 125 |
| | | Acid Extractable Chromium (Cr) | 2010/09/17 | | 102 | % | 75 - 125 |
| | | Acid Extractable Cobalt (Co) | 2010/09/17 | | 101 | % | 75 - 125 |
| | | Acid Extractable Copper (Cu) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Iron (Fe) | 2010/09/17 | | 107 | % | 75 - 125 |
| | | Acid Extractable Lead (Pb) | 2010/09/17 | | 101 | % | 75 - 125 |
| | | Acid Extractable Magnesium (Mg) | 2010/09/17 | | 97 | % | 75 - 125 |
| | | Acid Extractable Manganese (Mn) | 2010/09/17 | | 102 | % | 75 - 125 |
| | | Acid Extractable Molybdenum (Mo) | 2010/09/17 | | 100 | % | 75 - 125 |
| | | Acid Extractable Nickel (Ni) | 2010/09/17 | | 101 | % | 75 - 125 |
| | | Acid Extractable Phosphorus (P) | 2010/09/17 | | 108 | % | 75 - 125 |
| | | Acid Extractable Potassium (K) | 2010/09/17 | | 95 | % | 75 - 125 |
| | | Acid Extractable Selenium (Se) | 2010/09/17 | | 100 | % | 75 - 125 |
| | | Acid Extractable Silver (Ag) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Sodium (Na) | 2010/09/17 | | 96 | % | 75 - 125 |
| | | Acid Extractable Strontium (Sr) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Thallium (Tl) | 2010/09/17 | | 99 | % | 75 - 125 |
| | | Acid Extractable Tin (Sn) | 2010/09/17 | | 102 | % | 75 - 125 |
| | | Acid Extractable Vanadium (V) | 2010/09/17 | | 101 | % | 75 - 125 |
| | | Acid Extractable Zinc (Zn) | 2010/09/17 | | 104 | % | 75 - 125 |
| | | Acid Extractable Mercury (Hg) | 2010/09/17 | | 104 | % | 75 - 125 |
| | Method Blank | Acid Extractable Aluminum (Al) | 2010/09/17 | <50 | | ug/g | |
| | | Acid Extractable Antimony (Sb) | 2010/09/17 | <0.2 | | ug/g | |
| | | Acid Extractable Arsenic (As) | 2010/09/17 | <1 | | ug/g | |
| | | Acid Extractable Barium (Ba) | 2010/09/17 | <0.5 | | ug/g | |
| | | Acid Extractable Beryllium (Be) | 2010/09/17 | <0.2 | | ug/g | |
| | | Acid Extractable Cadmium (Cd) | 2010/09/17 | <0.1 | | ug/g | |
| | | Acid Extractable Calcium (Ca) | 2010/09/17 | <50 | | ug/g | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE, NU

## Quality Assurance Report (Continued)

Maxxam Job Number: TB0C6099

| QA/QC Batch Num Init | QC Type | Parameter | Date Analyzed yyyy/mm/dd | Value | %Recovery | Units | QC Limits |
|---|---|---|---|---|---|---|---|
| 2268515 VIV | Method Blank | Acid Extractable Chromium (Cr) | 2010/09/17 | <1 | | ug/g | |
| | | Acid Extractable Cobalt (Co) | 2010/09/17 | <0.1 | | ug/g | |
| | | Acid Extractable Copper (Cu) | 2010/09/17 | <0.5 | | ug/g | |
| | | Acid Extractable Iron (Fe) | 2010/09/17 | <50 | | ug/g | |
| | | Acid Extractable Lead (Pb) | 2010/09/17 | <1 | | ug/g | |
| | | Acid Extractable Magnesium (Mg) | 2010/09/17 | <50 | | ug/g | |
| | | Acid Extractable Manganese (Mn) | 2010/09/17 | <1 | | ug/g | |
| | | Acid Extractable Molybdenum (Mo) | 2010/09/17 | <0.5 | | ug/g | |
| | | Acid Extractable Nickel (Ni) | 2010/09/17 | <0.5 | | ug/g | |
| | | Acid Extractable Phosphorus (P) | 2010/09/17 | <50 | | ug/g | |
| | | Acid Extractable Potassium (K) | 2010/09/17 | <200 | | ug/g | |
| | | Acid Extractable Selenium (Se) | 2010/09/17 | <0.5 | | ug/g | |
| | | Acid Extractable Silver (Ag) | 2010/09/17 | <0.2 | | ug/g | |
| | | Acid Extractable Sodium (Na) | 2010/09/17 | <100 | | ug/g | |
| | | Acid Extractable Strontium (Sr) | 2010/09/17 | <1 | | ug/g | |
| | | Acid Extractable Thallium (Tl) | 2010/09/17 | <0.05 | | ug/g | |
| | | Acid Extractable Tin (Sn) | 2010/09/17 | <5 | | ug/g | |
| | | Acid Extractable Vanadium (V) | 2010/09/17 | <5 | | ug/g | |
| | | Acid Extractable Zinc (Zn) | 2010/09/17 | <5 | | ug/g | |
| | | Acid Extractable Mercury (Hg) | 2010/09/17 | <0.05 | | ug/g | |
| | RPD - Sample/Sample Dup | Acid Extractable Antimony (Sb) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Arsenic (As) | 2010/09/17 | 5.0 | | % | 35 |
| | | Acid Extractable Barium (Ba) | 2010/09/17 | 6.8 | | % | 35 |
| | | Acid Extractable Beryllium (Be) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Cadmium (Cd) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Chromium (Cr) | 2010/09/17 | 2.3 | | % | 35 |
| | | Acid Extractable Cobalt (Co) | 2010/09/17 | 4.7 | | % | 35 |
| | | Acid Extractable Copper (Cu) | 2010/09/17 | 13.1 | | % | 35 |
| | | Acid Extractable Lead (Pb) | 2010/09/17 | 5.0 | | % | 35 |
| | | Acid Extractable Molybdenum (Mo) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Nickel (Ni) | 2010/09/17 | 10.1 | | % | 35 |
| | | Acid Extractable Selenium (Se) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Silver (Ag) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Thallium (Tl) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Vanadium (V) | 2010/09/17 | NC | | % | 35 |
| | | Acid Extractable Zinc (Zn) | 2010/09/17 | 10 | | % | 35 |
| 2268583 SAC | Matrix Spike (HD1371) | Chromium (VI) | 2010/09/17 | | 34 (1) | % | 75 - 125 |
| | QC Standard | Chromium (VI) | 2010/09/17 | | 95 | % | 75 - 125 |
| | Spiked Blank | Chromium (VI) | 2010/09/17 | | 96 | % | 80 - 120 |
| | Method Blank | Chromium (VI) | 2010/09/17 | <0.2 | | ug/g | |
| | RPD - Sample/Sample Dup | Chromium (VI) | 2010/09/17 | NC | | % | 25 |
| 2268643 AFZ | QC Standard | Hot Water Ext. Boron (B) | 2010/09/17 | | 101 | % | 85 - 115 |
| | Method Blank | Hot Water Ext. Boron (B) | 2010/09/17 | <0.05 | | ug/g | |
| 2268756 AFZ | QC Standard | Hot Water Ext. Boron (B) | 2010/09/17 | | 103 | % | 85 - 115 |
| | Method Blank | Hot Water Ext. Boron (B) | 2010/09/17 | <0.05 | | ug/g | |

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.

Franz Environmental Inc
Attention: Matthew Cyr
Client Project #: 1697-1001A, Long-Term Monitor
P.O. #: 2216
Project name: CAM-F, SARCPA LAKE, NU

## Quality Assurance Report (Continued)

Maxxam Job Number: TB0C6099

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 matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample.

Your P.O. #: 2216
Your Project #: 1697-1001A, Long-Term Monitor
Site: CAM-F, SARCPA LAKE, NU
Your C.O.C. #: 20486701, 204867-01-01

**Attention: Matthew Cyr**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2010/09/20**

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B0C6099**
**Received: 2010/09/10, 18:00**

Sample Matrix: Soil
# Samples Received: 8

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Hot Water Extractable Boron | 8 | 2010/09/17 | 2010/09/17 | CAM SOP-00408 | R153 Ana. Prot. 2004 |
| Hexavalent Chromium in Soil by IC (2) | 8 | N/A | 2010/09/17 | CAM SOP-00436 | EPA SW846-3060/7199 |
| Petroleum Hydro. CCME F1 & BTEX in Soil (1) | 8 | 2010/09/14 | 2010/09/15 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Soil (1) | 8 | 2010/09/14 | 2010/09/15 | CAM SOP-00316 | CCME CWS |
| Acid Extr. Metals (aqua regia) by ICPMS | 8 | 2010/09/17 | 2010/09/17 | CAM SOP-00447 | EPA 6020 |
| MOISTURE (1) | 8 | N/A | 2010/09/13 | CAM SOP-00445 | MOE HANDBOOK(1983) |
| Polychlorinated Biphenyl in Soil | 1 | 2010/09/16 | 2010/09/16 | CAM SOP-00309 | SW846 8082 |
| Polychlorinated Biphenyl in Soil | 7 | 2010/09/16 | 2010/09/17 | CAM SOP-00309 | SW846 8082 |

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

(1) This test was performed by Maxxam Ottawa
(2) Soils are reported on a dry weight basis unless otherwise specified.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: Julie.Clement@maxxamanalytics.com
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: 1

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## O'REG 153 PETROLEUM HYDROCARBONS (SOIL)

| Maxxam ID | | HD1369 | HD1370 | HD1371 | HD1372 | HD1373 | HD1374 | HD1375 | HD1376 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **TP10-3 (0-15)** | **TP10-3 (40-50)** | **DUP 1** | **DUP 2** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | | | | | |
| Moisture | % | 12 | 12 | 8.7 | 9.1 | 18 | 19 | 13 | 19 | 0.2 | 2263433 |
| **BTEX & F1 Hydrocarbons** | | | | | | | | | | | |
| Benzene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| Toluene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| Ethylbenzene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| o-Xylene | ug/g | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | 2264687 |
| p+m-Xylene | ug/g | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.04 | 2264687 |
| Total Xylenes | ug/g | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.04 | 2264687 |
| F1 (C6-C10) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264687 |
| F1 (C6-C10) - BTEX | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264687 |
| **F2-F4 Hydrocarbons** | | | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264253 |
| F3 (C16-C34 Hydrocarbons) | ug/g | 69 | <10 | <10 | <10 | 18 | 14 | <10 | 12 | 10 | 2264253 |
| F4 (C34-C50 Hydrocarbons) | ug/g | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 10 | 2264253 |
| Reached Baseline at C50 | ug/g | YES | YES | YES | YES | YES | YES | YES | YES | | 2264253 |
| **Surrogate Recovery (%)** | | | | | | | | | | | |
| 1,4-Difluorobenzene | % | 102 | 101 | 101 | 101 | 103 | 105 | 101 | 102 | | 2264687 |
| 4-Bromofluorobenzene | % | 100 | 105 | 102 | 107 | 105 | 104 | 104 | 103 | | 2264687 |
| D10-Ethylbenzene | % | 100 | 101 | 99 | 96 | 92 | 96 | 95 | 91 | | 2264687 |
| D4-1,2-Dichloroethane | % | 122 | 124 | 119 | 118 | 124 | 124 | 122 | 124 | | 2264687 |
| o-Terphenyl | % | 99 | 90 | 86 | 98 | 100 | 89 | 98 | 98 | | 2264253 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## O'REG 153 METALS PACKAGE (SOIL)

| Maxxam ID | | HD1369 | HD1370 | | HD1371 | | HD1372 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **QC Batch** | **TP10-2 (0-15)** | **QC Batch** | **TP10-2 (40-50)** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | | | |
| Chromium (VI) | ug/g | <0.2 | <0.2 | 2267474 | <0.2 | 2268583 | <0.2 | 0.2 | 2267474 |
| **Metals** | | | | | | | | | |
| Hot Water Ext. Boron (B) | ug/g | 0.24 | 0.26 | 2268643 | 0.12 | 2268643 | 0.08 | 0.05 | 2268643 |
| Acid Extractable Aluminum (Al) | ug/g | 9200 | 8900 | 2268515 | 9700 | 2268515 | 9900 | 50 | 2268515 |
| Acid Extractable Antimony (Sb) | ug/g | 0.5 | 0.3 | 2268515 | <0.2 | 2268515 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Arsenic (As) | ug/g | 1 | 1 | 2268515 | 1 | 2268515 | 1 | 1 | 2268515 |
| Acid Extractable Barium (Ba) | ug/g | 42 | 41 | 2268515 | 50 | 2268515 | 51 | 0.5 | 2268515 |
| Acid Extractable Beryllium (Be) | ug/g | 0.3 | 0.3 | 2268515 | 0.2 | 2268515 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Cadmium (Cd) | ug/g | 0.1 | <0.1 | 2268515 | <0.1 | 2268515 | <0.1 | 0.1 | 2268515 |
| Acid Extractable Calcium (Ca) | ug/g | 34000 | 31000 | 2268515 | 43000 | 2268515 | 51000 | 50 | 2268515 |
| Acid Extractable Chromium (Cr) | ug/g | 23 | 23 | 2268515 | 27 | 2268515 | 28 | 1 | 2268515 |
| Acid Extractable Cobalt (Co) | ug/g | 6.0 | 6.3 | 2268515 | 6.9 | 2268515 | 7.0 | 0.1 | 2268515 |
| Acid Extractable Copper (Cu) | ug/g | 19 | 19 | 2268515 | 20 | 2268515 | 21 | 0.5 | 2268515 |
| Acid Extractable Iron (Fe) | ug/g | 17000 | 18000 | 2268515 | 19000 | 2268515 | 19000 | 50 | 2268515 |
| Acid Extractable Lead (Pb) | ug/g | 12 | 13 | 2268515 | 7 | 2268515 | 7 | 1 | 2268515 |
| Acid Extractable Magnesium (Mg) | ug/g | 13000 | 13000 | 2268515 | 15000 | 2268515 | 16000 | 50 | 2268515 |
| Acid Extractable Manganese (Mn) | ug/g | 260 | 250 | 2268515 | 290 | 2268515 | 290 | 1 | 2268515 |
| Acid Extractable Molybdenum (Mo) | ug/g | <0.5 | <0.5 | 2268515 | <0.5 | 2268515 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Nickel (Ni) | ug/g | 15 | 16 | 2268515 | 19 | 2268515 | 19 | 0.5 | 2268515 |
| Acid Extractable Phosphorus (P) | ug/g | 430 | 440 | 2268515 | 420 | 2268515 | 440 | 50 | 2268515 |
| Acid Extractable Potassium (K) | ug/g | 2100 | 2000 | 2268515 | 2800 | 2268515 | 2900 | 200 | 2268515 |
| Acid Extractable Selenium (Se) | ug/g | <0.5 | <0.5 | 2268515 | <0.5 | 2268515 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Silver (Ag) | ug/g | <0.2 | <0.2 | 2268515 | <0.2 | 2268515 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Sodium (Na) | ug/g | 140 | 130 | 2268515 | 150 | 2268515 | 150 | 100 | 2268515 |
| Acid Extractable Strontium (Sr) | ug/g | 24 | 21 | 2268515 | 29 | 2268515 | 35 | 1 | 2268515 |
| Acid Extractable Thallium (Tl) | ug/g | 0.12 | 0.13 | 2268515 | 0.15 | 2268515 | 0.16 | 0.05 | 2268515 |
| Acid Extractable Tin (Sn) | ug/g | <5 | <5 | 2268515 | <5 | 2268515 | <5 | 5 | 2268515 |
| Acid Extractable Vanadium (V) | ug/g | 23 | 23 | 2268515 | 25 | 2268515 | 26 | 5 | 2268515 |
| Acid Extractable Zinc (Zn) | ug/g | 51 | 48 | 2268515 | 47 | 2268515 | 45 | 5 | 2268515 |
| Acid Extractable Mercury (Hg) | ug/g | <0.05 | <0.05 | 2268515 | <0.05 | 2268515 | <0.05 | 0.05 | 2268515 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## O'REG 153 METALS PACKAGE (SOIL)

| Maxxam ID | | HD1373 | | HD1374 | | HD1375 | | HD1376 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | 2010/09/07 | | |
| | **Units** | **TP10-3 (0-15)** | **QC Batch** | **TP10-3 (40-50)** | **RDL** | **DUP 1** | **RDL** | **DUP 2** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | | | | |
| Chromium (VI) | ug/g | <2 | 2268583 | <2 | 2 | <0.2 | 0.2 | <2 | 2 | 2267474 |
| **Metals** | | | | | | | | | | |
| Hot Water Ext. Boron (B) | ug/g | 0.61 | 2268643 | 0.41 | 0.05 | 0.12 | 0.05 | 0.48 | 0.05 | 2268756 |
| Acid Extractable Aluminum (Al) | ug/g | 9500 | 2268515 | 10000 | 50 | 10000 | 50 | 9800 | 50 | 2268515 |
| Acid Extractable Antimony (Sb) | ug/g | <0.2 | 2268515 | <0.2 | 0.2 | <0.2 | 0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Arsenic (As) | ug/g | 1 | 2268515 | 1 | 1 | 1 | 1 | 1 | 1 | 2268515 |
| Acid Extractable Barium (Ba) | ug/g | 47 | 2268515 | 49 | 0.5 | 52 | 0.5 | 49 | 0.5 | 2268515 |
| Acid Extractable Beryllium (Be) | ug/g | 0.2 | 2268515 | 0.2 | 0.2 | 0.3 | 0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Cadmium (Cd) | ug/g | <0.1 | 2268515 | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 2268515 |
| Acid Extractable Calcium (Ca) | ug/g | 13000 | 2268515 | 15000 | 50 | 50000 | 50 | 13000 | 50 | 2268515 |
| Acid Extractable Chromium (Cr) | ug/g | 26 | 2268515 | 28 | 1 | 28 | 1 | 27 | 1 | 2268515 |
| Acid Extractable Cobalt (Co) | ug/g | 6.7 | 2268515 | 6.8 | 0.1 | 7.3 | 0.1 | 6.6 | 0.1 | 2268515 |
| Acid Extractable Copper (Cu) | ug/g | 19 | 2268515 | 21 | 0.5 | 21 | 0.5 | 21 | 0.5 | 2268515 |
| Acid Extractable Iron (Fe) | ug/g | 18000 | 2268515 | 19000 | 50 | 20000 | 50 | 19000 | 50 | 2268515 |
| Acid Extractable Lead (Pb) | ug/g | 7 | 2268515 | 7 | 1 | 7 | 1 | 8 | 1 | 2268515 |
| Acid Extractable Magnesium (Mg) | ug/g | 8500 | 2268515 | 9900 | 50 | 16000 | 50 | 9300 | 50 | 2268515 |
| Acid Extractable Manganese (Mn) | ug/g | 260 | 2268515 | 280 | 1 | 300 | 1 | 270 | 1 | 2268515 |
| Acid Extractable Molybdenum (Mo) | ug/g | <0.5 | 2268515 | <0.5 | 0.5 | <0.5 | 0.5 | <0.5 | 0.5 | 2268515 |
| Acid Extractable Nickel (Ni) | ug/g | 18 | 2268515 | 20 | 0.5 | 20 | 0.5 | 18 | 0.5 | 2268515 |
| Acid Extractable Phosphorus (P) | ug/g | 420 | 2268515 | 400 | 50 | 470 | 50 | 400 | 50 | 2268515 |
| Acid Extractable Potassium (K) | ug/g | 2400 | 2268515 | 2600 | 200 | 3000 | 200 | 2400 | 200 | 2268515 |
| Acid Extractable Selenium (Se) | ug/g | <0.5 | 2268515 | <0.5 | 0.5 | <0.5 | 0.5 | 0.5 | 0.5 | 2268515 |
| Acid Extractable Silver (Ag) | ug/g | <0.2 | 2268515 | <0.2 | 0.2 | <0.2 | 0.2 | <0.2 | 0.2 | 2268515 |
| Acid Extractable Sodium (Na) | ug/g | 130 | 2268515 | 130 | 100 | 150 | 100 | 130 | 100 | 2268515 |
| Acid Extractable Strontium (Sr) | ug/g | 12 | 2268515 | 13 | 1 | 33 | 1 | 12 | 1 | 2268515 |
| Acid Extractable Thallium (Tl) | ug/g | 0.14 | 2268515 | 0.16 | 0.05 | 0.16 | 0.05 | 0.16 | 0.05 | 2268515 |
| Acid Extractable Tin (Sn) | ug/g | <5 | 2268515 | <5 | 5 | <5 | 5 | <5 | 5 | 2268515 |
| Acid Extractable Vanadium (V) | ug/g | 25 | 2268515 | 26 | 5 | 26 | 5 | 25 | 5 | 2268515 |
| Acid Extractable Zinc (Zn) | ug/g | 43 | 2268515 | 44 | 5 | 46 | 5 | 46 | 5 | 2268515 |
| Acid Extractable Mercury (Hg) | ug/g | <0.05 | 2268515 | <0.05 | 0.05 | <0.05 | 0.05 | <0.05 | 0.05 | 2268515 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

| Maxxam ID | | HD1369 | HD1370 | HD1371 | HD1372 | HD1373 | HD1374 | HD1375 | HD1376 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | 2010/09/07 | | |
| | **Units** | **TP10-1 (0-15)** | **TP10-1 (40-50)** | **TP10-2 (0-15)** | **TP10-2 (40-50)** | **TP10-3 (0-15)** | **TP10-3 (40-50)** | **DUP 1** | **DUP 2** | **RDL** | **QC Batch** |
| **PCBs** | | | | | | | | | | | |
| Aroclor 1016 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1221 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1232 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1242 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1248 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1254 | ug/g | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1260 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1262 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Aroclor 1268 | ug/g | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| Total PCB | ug/g | 0.09 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 2267953 |
| **Surrogate Recovery (%)** | | | | | | | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 77 | 81 | 72 | 71 | 80 | 73 | 72 | 84 | | 2267953 |
| Decachlorobiphenyl | % | 73 | 81 | 77 | 85 | 79 | 79 | 78 | 85 | | 2267953 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

| | |
|---|---|
| Package 1 | 4.7°C |

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

**GENERAL COMMENTS**

Hexavalent chromium: Due to the sample matrix, some samples required dilution. Detection limits were adjusted accordingly.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

**QUALITY ASSURANCE REPORT**

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **QC Batch** | **Parameter** | **Date** | **% Recovery** | **QC Limits** | **% Recovery** | **QC Limits** | **Value** | **Units** | **Value (%)** | **QC Limits** | **% Recovery** | **QC Limits** |
| 2263433 | Moisture | 2010/09/13 | | | | | | | 7.0 | 50 | | |
| 2264253 | o-Terphenyl | 2010/09/15 | 83 | 30 - 130 | 80 | 30 - 130 | 79 | % | | | | |
| 2264253 | F2 (C10-C16 Hydrocarbons) | 2010/09/15 | 123 | 60 - 130 | 94 | 60 - 130 | <10 | ug/g | NC | 50 | | |
| 2264253 | F3 (C16-C34 Hydrocarbons) | 2010/09/15 | 123 | 60 - 130 | 94 | 60 - 130 | <10 | ug/g | 18.3 | 50 | | |
| 2264253 | F4 (C34-C50 Hydrocarbons) | 2010/09/15 | 123 | 60 - 130 | 94 | 60 - 130 | <10 | ug/g | NC | 50 | | |
| 2264687 | 1,4-Difluorobenzene | 2010/09/15 | 104 | 60 - 140 | 103 | 60 - 140 | 99 | % | | | | |
| 2264687 | 4-Bromofluorobenzene | 2010/09/15 | 108 | 60 - 140 | 110 | 60 - 140 | 106 | % | | | | |
| 2264687 | D10-Ethylbenzene | 2010/09/15 | 90 | 30 - 130 | 98 | 30 - 130 | 93 | % | | | | |
| 2264687 | D4-1,2-Dichloroethane | 2010/09/15 | 121 | 60 - 140 | 118 | 60 - 140 | 118 | % | | | | |
| 2264687 | Benzene | 2010/09/15 | 67 | 60 - 140 | 73 | 60 - 140 | <0.02 | ug/g | NC | 50 | | |
| 2264687 | Toluene | 2010/09/15 | 75 | 60 - 140 | 79 | 60 - 140 | <0.02 | ug/g | NC | 50 | | |
| 2264687 | Ethylbenzene | 2010/09/15 | 86 | 60 - 140 | 91 | 60 - 140 | <0.02 | ug/g | NC | 50 | | |
| 2264687 | o-Xylene | 2010/09/15 | 97 | 60 - 140 | 100 | 60 - 140 | <0.02 | ug/g | NC | 50 | | |
| 2264687 | p+m-Xylene | 2010/09/15 | 84 | 60 - 140 | 87 | 60 - 140 | <0.04 | ug/g | NC | 50 | | |
| 2264687 | F1 (C6-C10) | 2010/09/15 | 100 | 60 - 140 | 90 | 60 - 140 | <10 | ug/g | NC | 50 | | |
| 2264687 | Total Xylenes | 2010/09/15 | | | | | <0.04 | ug/g | NC | 50 | | |
| 2264687 | F1 (C6-C10) - BTEX | 2010/09/15 | | | | | <10 | ug/g | NC | 50 | | |
| 2267474 | Chromium (VI) | 2010/09/17 | 68 (1, 2) | 75 - 125 | 93 | 80 - 120 | <0.2 | ug/g | NC | 25 | 93 | 75 - 125 |
| 2267953 | 2,4,5,6-Tetrachloro-m-xylene | 2010/09/16 | 77 | 40 - 130 | 87 | 40 - 130 | 91 | % | | | | |
| 2267953 | Decachlorobiphenyl | 2010/09/16 | 75 | 40 - 130 | 86 | 40 - 130 | 80 | % | | | | |
| 2267953 | Aroclor 1260 | 2010/09/16 | 86 | 30 - 130 | 97 | 30 - 130 | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Total PCB | 2010/09/16 | 86 | 30 - 130 | 97 | 30 - 130 | <0.01 | ug/g | 16.4 | 50 | | |
| 2267953 | Aroclor 1016 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1221 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1232 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1242 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1248 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1254 | 2010/09/16 | | | | | <0.01 | ug/g | 16.4 | 50 | | |
| 2267953 | Aroclor 1262 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2267953 | Aroclor 1268 | 2010/09/16 | | | | | <0.01 | ug/g | NC | 50 | | |
| 2268515 | Acid Extractable Aluminum (Al) | 2010/09/17 | NC | 75 - 125 | | | <50 | ug/g | | | 106 | 75 - 125 |
| 2268515 | Acid Extractable Antimony (Sb) | 2010/09/17 | 95 | 75 - 125 | | | <0.2 | ug/g | NC | 35 | 100 | 75 - 125 |
| 2268515 | Acid Extractable Arsenic (As) | 2010/09/17 | 98 | 75 - 125 | | | <1 | ug/g | 5.0 | 35 | 99 | 75 - 125 |
| 2268515 | Acid Extractable Barium (Ba) | 2010/09/17 | NC | 75 - 125 | | | <0.5 | ug/g | 6.8 | 35 | 100 | 75 - 125 |
| 2268515 | Acid Extractable Beryllium (Be) | 2010/09/17 | 87 | 75 - 125 | | | <0.2 | ug/g | NC | 35 | 91 | 75 - 125 |
| 2268515 | Acid Extractable Cadmium (Cd) | 2010/09/17 | 95 | 75 - 125 | | | <0.1 | ug/g | NC | 35 | 98 | 75 - 125 |
| 2268515 | Acid Extractable Calcium (Ca) | 2010/09/17 | NC | 75 - 125 | | | <50 | ug/g | | | 98 | 75 - 125 |
| 2268515 | Acid Extractable Chromium (Cr) | 2010/09/17 | 99 | 75 - 125 | | | <1 | ug/g | 2.3 | 35 | 102 | 75 - 125 |
| 2268515 | Acid Extractable Cobalt (Co) | 2010/09/17 | 96 | 75 - 125 | | | <0.1 | ug/g | 4.7 | 35 | 101 | 75 - 125 |

Maxxam Job #: B0C6099
Report Date: 2010/09/20

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Your P.O. #: 2216

## QUALITY ASSURANCE REPORT

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | Units | Value (%) | QC Limits | % Recovery | QC Limits |
| 2268515 | Acid Extractable Copper (Cu) | 2010/09/17 | 93 | 75 - 125 | | | <0.5 | ug/g | 13.1 | 35 | 99 | 75 - 125 |
| 2268515 | Acid Extractable Iron (Fe) | 2010/09/17 | NC | 75 - 125 | | | <50 | ug/g | | | 107 | 75 - 125 |
| 2268515 | Acid Extractable Lead (Pb) | 2010/09/17 | NC | 75 - 125 | | | <1 | ug/g | 5.0 | 35 | 101 | 75 - 125 |
| 2268515 | Acid Extractable Magnesium (Mg) | 2010/09/17 | NC | 75 - 125 | | | <50 | ug/g | | | 97 | 75 - 125 |
| 2268515 | Acid Extractable Manganese (Mn) | 2010/09/17 | NC | 75 - 125 | | | <1 | ug/g | | | 102 | 75 - 125 |
| 2268515 | Acid Extractable Molybdenum (Mo) | 2010/09/17 | 98 | 75 - 125 | | | <0.5 | ug/g | NC | 35 | 100 | 75 - 125 |
| 2268515 | Acid Extractable Nickel (Ni) | 2010/09/17 | 95 | 75 - 125 | | | <0.5 | ug/g | 10.1 | 35 | 101 | 75 - 125 |
| 2268515 | Acid Extractable Phosphorus (P) | 2010/09/17 | NC | 75 - 125 | | | <50 | ug/g | | | 108 | 75 - 125 |
| 2268515 | Acid Extractable Potassium (K) | 2010/09/17 | 94 | 75 - 125 | | | <200 | ug/g | | | 95 | 75 - 125 |
| 2268515 | Acid Extractable Selenium (Se) | 2010/09/17 | 94 | 75 - 125 | | | <0.5 | ug/g | NC | 35 | 100 | 75 - 125 |
| 2268515 | Acid Extractable Silver (Ag) | 2010/09/17 | 95 | 75 - 125 | | | <0.2 | ug/g | NC | 35 | 99 | 75 - 125 |
| 2268515 | Acid Extractable Sodium (Na) | 2010/09/17 | 92 | 75 - 125 | | | <100 | ug/g | | | 96 | 75 - 125 |
| 2268515 | Acid Extractable Strontium (Sr) | 2010/09/17 | NC | 75 - 125 | | | <1 | ug/g | | | 99 | 75 - 125 |
| 2268515 | Acid Extractable Thallium (Tl) | 2010/09/17 | 94 | 75 - 125 | | | <0.05 | ug/g | NC | 35 | 99 | 75 - 125 |
| 2268515 | Acid Extractable Tin (Sn) | 2010/09/17 | 103 | 75 - 125 | | | <5 | ug/g | | | 102 | 75 - 125 |
| 2268515 | Acid Extractable Vanadium (V) | 2010/09/17 | 103 | 75 - 125 | | | <5 | ug/g | NC | 35 | 101 | 75 - 125 |
| 2268515 | Acid Extractable Zinc (Zn) | 2010/09/17 | NC | 75 - 125 | | | <5 | ug/g | 10 | 35 | 104 | 75 - 125 |
| 2268515 | Acid Extractable Mercury (Hg) | 2010/09/17 | 99 | 75 - 125 | | | <0.05 | ug/g | | | 104 | 75 - 125 |
| 2268583 | Chromium (VI) | 2010/09/17 | 34 (1, 2) | 75 - 125 | 96 | 80 - 120 | <0.2 | ug/g | NC | 25 | 95 | 75 - 125 |
| 2268643 | Hot Water Ext. Boron (B) | 2010/09/17 | | | | | <0.05 | ug/g | | | 101 | 85 - 115 |
| 2268756 | Hot Water Ext. Boron (B) | 2010/09/17 | | | | | <0.05 | ug/g | | | 103 | 85 - 115 |

N/A = Not Applicable

RPD = Relative Percent Difference

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

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

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 matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample.

## Validation Signature Page

**Maxxam Job #: B0C6099**

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

CHARLES ANCKER, B.Sc., M.Sc., C.Chem, Senior Analyst

Eva Pranjic
CHARTERED CHEMIST

EWA PRANJIC, M.Sc., C.Chem, Scientific Specialist

PAUL RUBINATO, Analyst, Maxxam Analytics

STEVE ROBERTS, Lab Supervisor, Ottawa

====================================================================

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics

Maxxam Analytics International Corporation o/a Maxxam Analytics
32 Colonnade Unit 1000, Nepean, Ontario Canada K2E 7J6 Tel:(613) 274-0573 Toll-free:877-480-7272 Fax:613-274-0574 www.maxxamanalytics.com

# CHAIN OF CUSTODY RECORD



**INVOICE INFORMATION:**

| | |
|---|---|
| Company Name: | #10988 Franz Environmental Inc |
| Contact Name: | Matthew & Tina |
| Address: | 329 Churchill Ave N Suite 200 |
| | Ottawa ON K1Z 5B8 |
| Phone: | (613)721-0555 Fax: (613)721-0029 |
| Email: | mcyr@franzenvironmental.com; tranger@franzenvir |

**REPORT INFORMATION (if differs from invoice):**

| | |
|---|---|
| Company Name: | |
| Contact Name: | |
| Address: | |
| Phone: | Fax: |
| Email: | |

**PROJECT INFORMATION:**

| | |
|---|---|
| Quotation #: | A93902 |
| P.O. #: | 2216 |
| Project #: | 1697-1001A, Long-Term Monitor |
| Project Name: | |
| Site #: | CAM-F, Sarcpa Lake, NU |
| Sampled By: | |

**Laboratory Use Only:**

| MAXXAM JOB #: | BOTTLE ORDER #: |
|---|---|
| | 204867 |
| **CHAIN OF CUSTODY #:** | **PROJECT MANAGER:** |
| C#204867-01-01 | JULIE CLEMENT |

**REGULATORY CRITERIA:**

- [ ] MISA Reg. 153/04
- [ ] PWQO
- [ ] Reg. 558
- [ ] Table 1 [ ] Table 2 [ ] Table 3 [ ] Table 6
- [ ] Residential/Parkland [ ] Industrial/Commercial [ ] Medium/Fine [ ] Coarse
- Sewer Use: [ ] Sanitary [ ] Storm [ ] Combined
- Municipality ____
- Other (specify) ____
- Report Criteria on C of A ? ✓

**SPECIAL INSTRUCTIONS**

*Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form*

**SAMPLES MUST BE KEPT COOL ( < 10ºC ) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM**

**TURNAROUND TIME (TAT) REQUIRED:**

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

**Regular (Standard) TAT:** ✓
*(will be applied if Rush TAT is not specified):*
*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 #)*

**ANALYSIS REQUESTED (Please be specific):**

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Regulated Drinking Water ? (Y/N) | Metals Field Filtered ? (Y/N) | F1-F4 / BTEX (Soil) | PCBs | Acid Extr. Metals (aqua regia) by ICPMS | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | TP10-1 (0-15) | 7/09/10 | | SOIL | | | X | X | X | 4 | |
| 2 | | TP10-1(40-50) | | | SOIL | | | X | X | X | 4 | |
| 3 | | TP10-2 (0-15) | | | SOIL | | | X | X | X | 4 | |
| 4 | | TP10-2(40-50) | | | SOIL | | | X | X | X | 4 | |
| 5 | | TP10-3(0-15) | | | SOIL | | | X | X | X | 4 | |
| 6 | | TP10-3(40-50) | | | SOIL | | | X | X | X | 4 | |
| 7 | | Dup-1 | | | SOIL | | | X | X | X | 4 | |
| 8 | | Dup-2 | | | SOIL | | | X | X | X | 4 | |
| 9 | | | | | SOIL | | | | | | | |
| 10 | | | | | SOIL | | | | | | | |

13-Sep-10 18:00
JULIE CLEMENT
B0C6099
J_R OTT-014

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 Not Submitted |
|---|---|---|---|---|---|---|
| Tina Ranger | ~~10/09/~~ 9/09/10 | | J Clement | 2010/09/10 | 6:00 | |

**Laboratory Use Only**

| Time Sensitive | Temperature (°C) on Receipt | Custody Seal Intact on Cooler? |
|---|---|---|
| [ ] | 6/6/2 | [ ] Yes [ ] No |

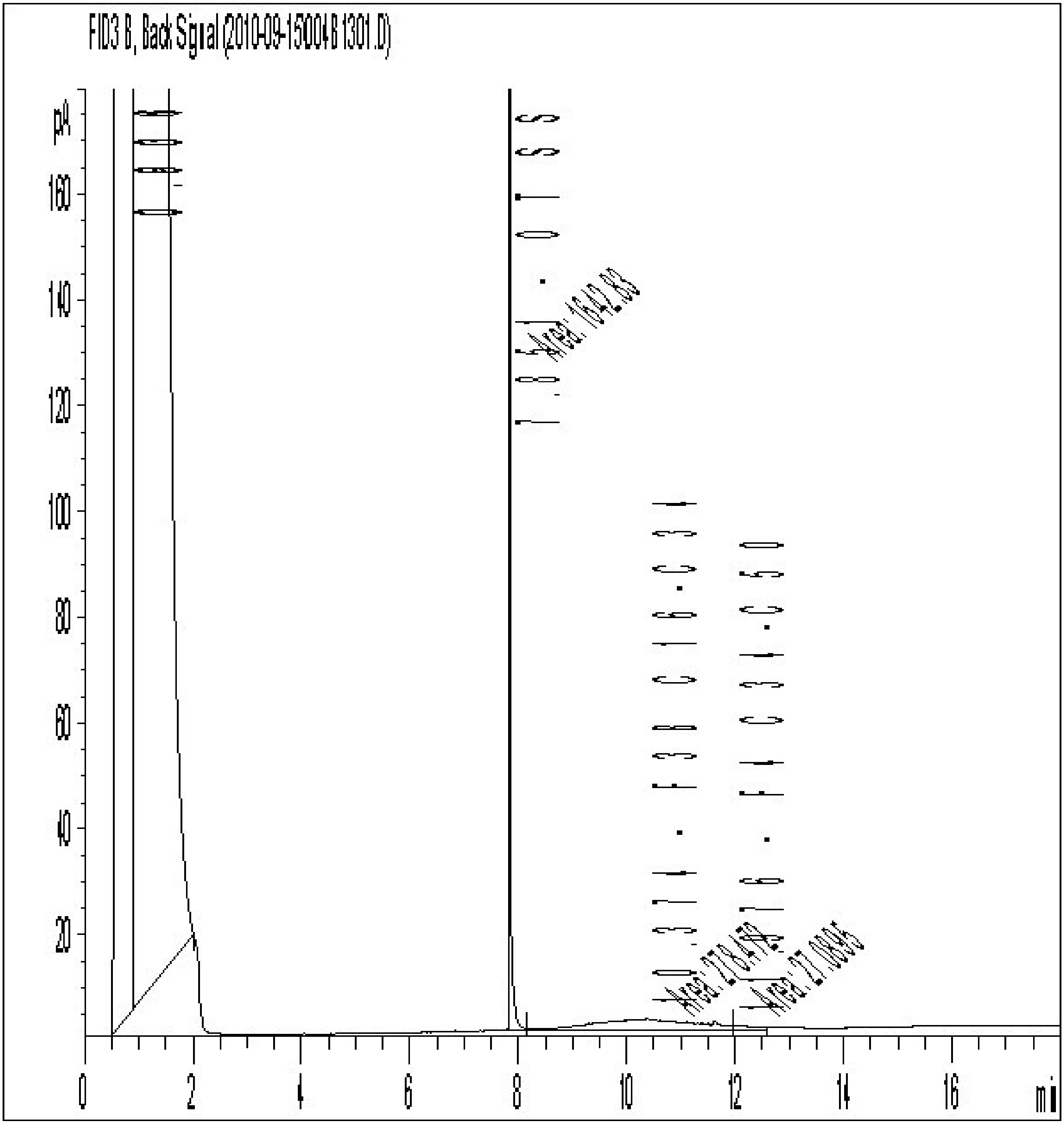
*** IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.**

White: Maxxam Yellow: Client

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1369

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-1 (0-15)

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**

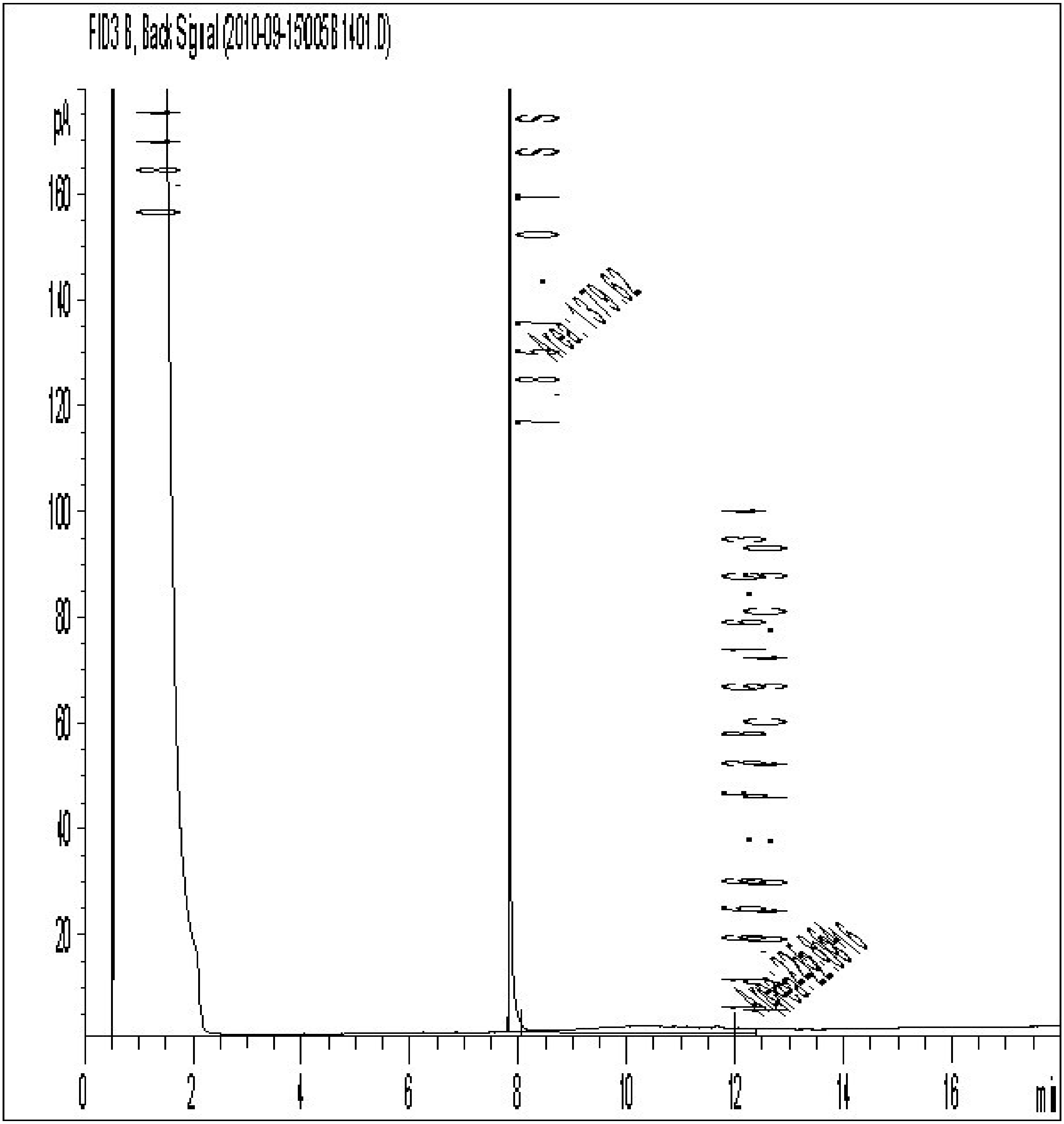



**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1369

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-1 (0-15)

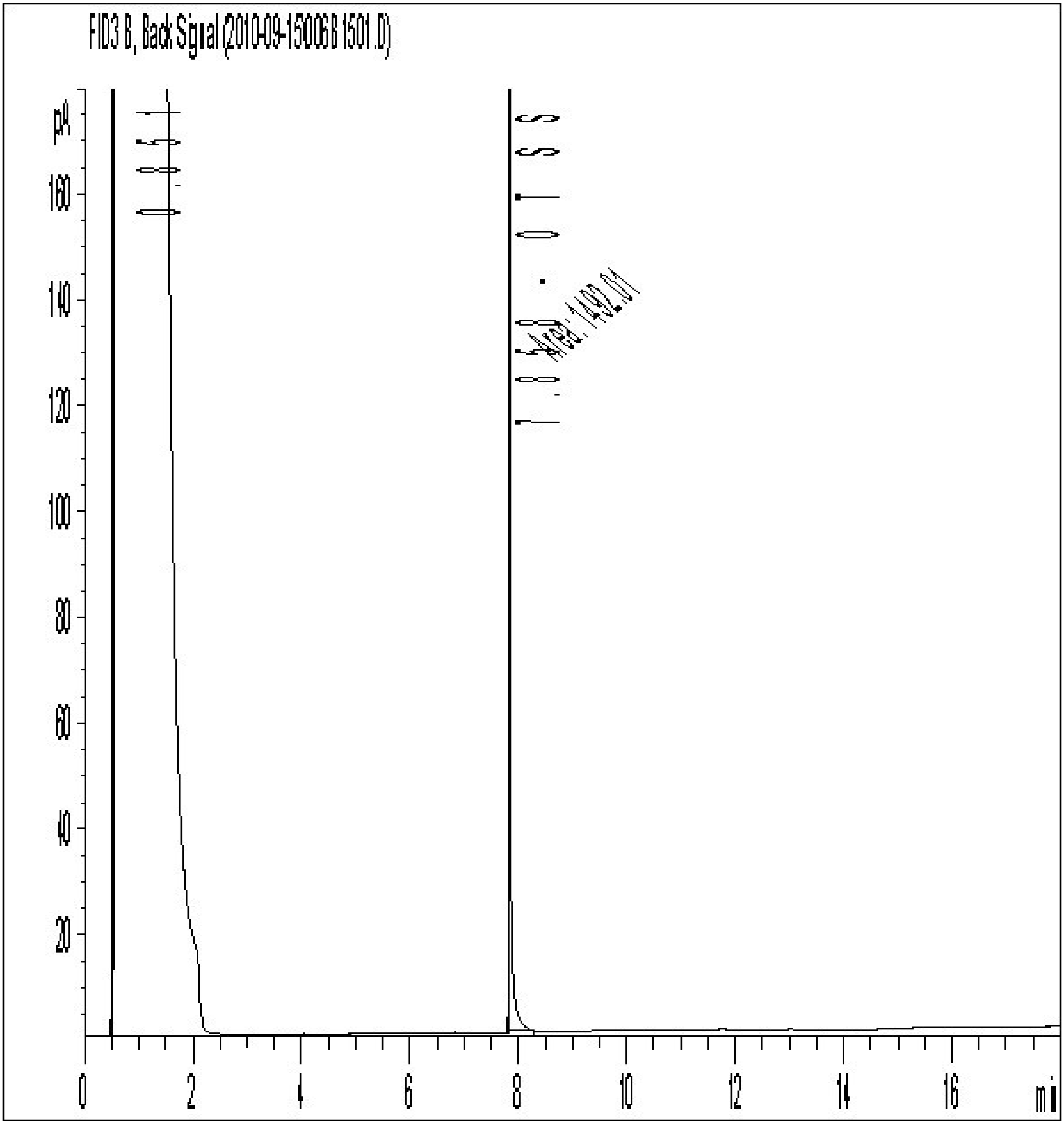
**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**




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

Franz Environmental Inc
Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1370
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-1 (40-50)

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**



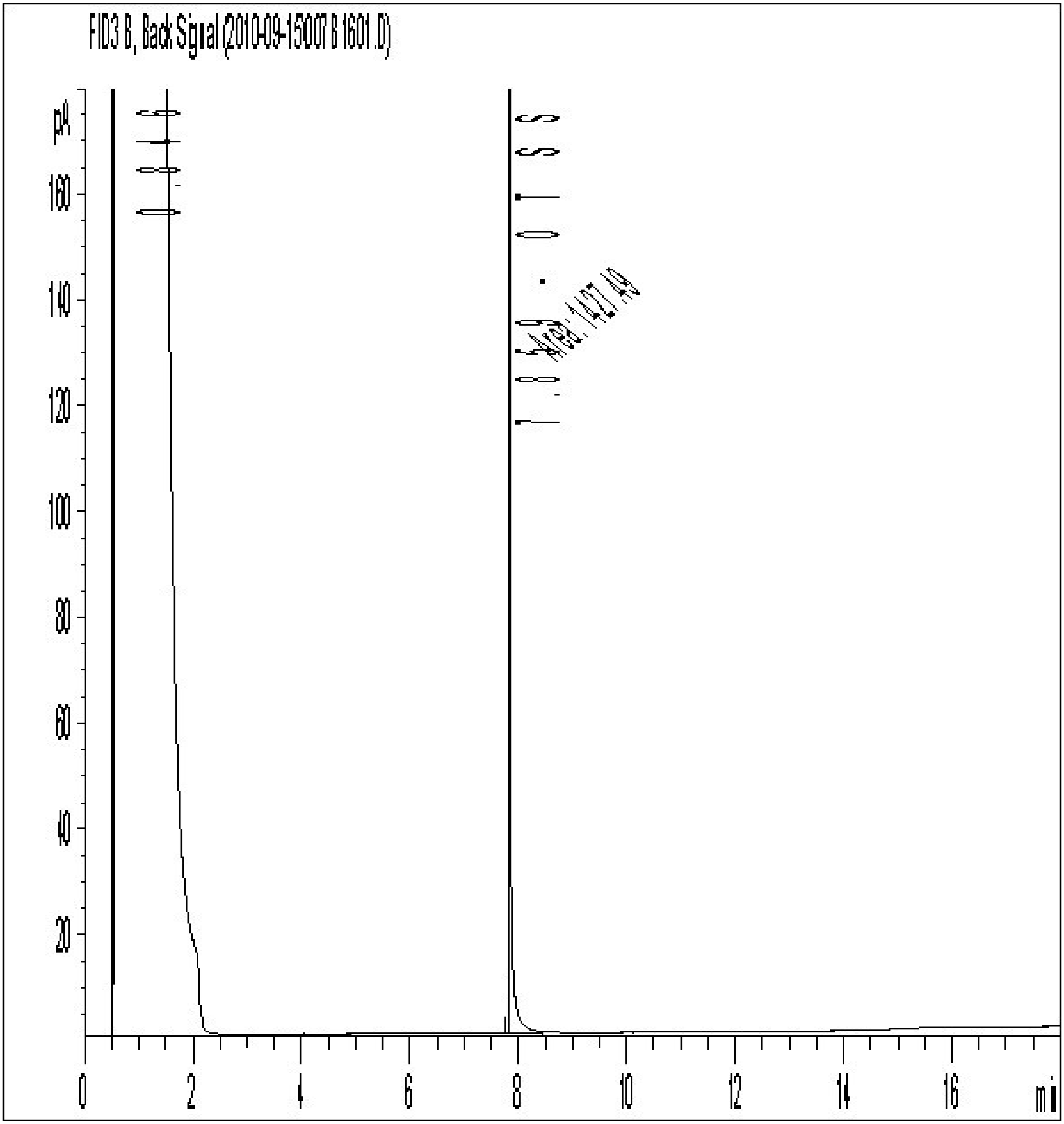

**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Driven by Service and Science

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1371

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-2 (0-15)

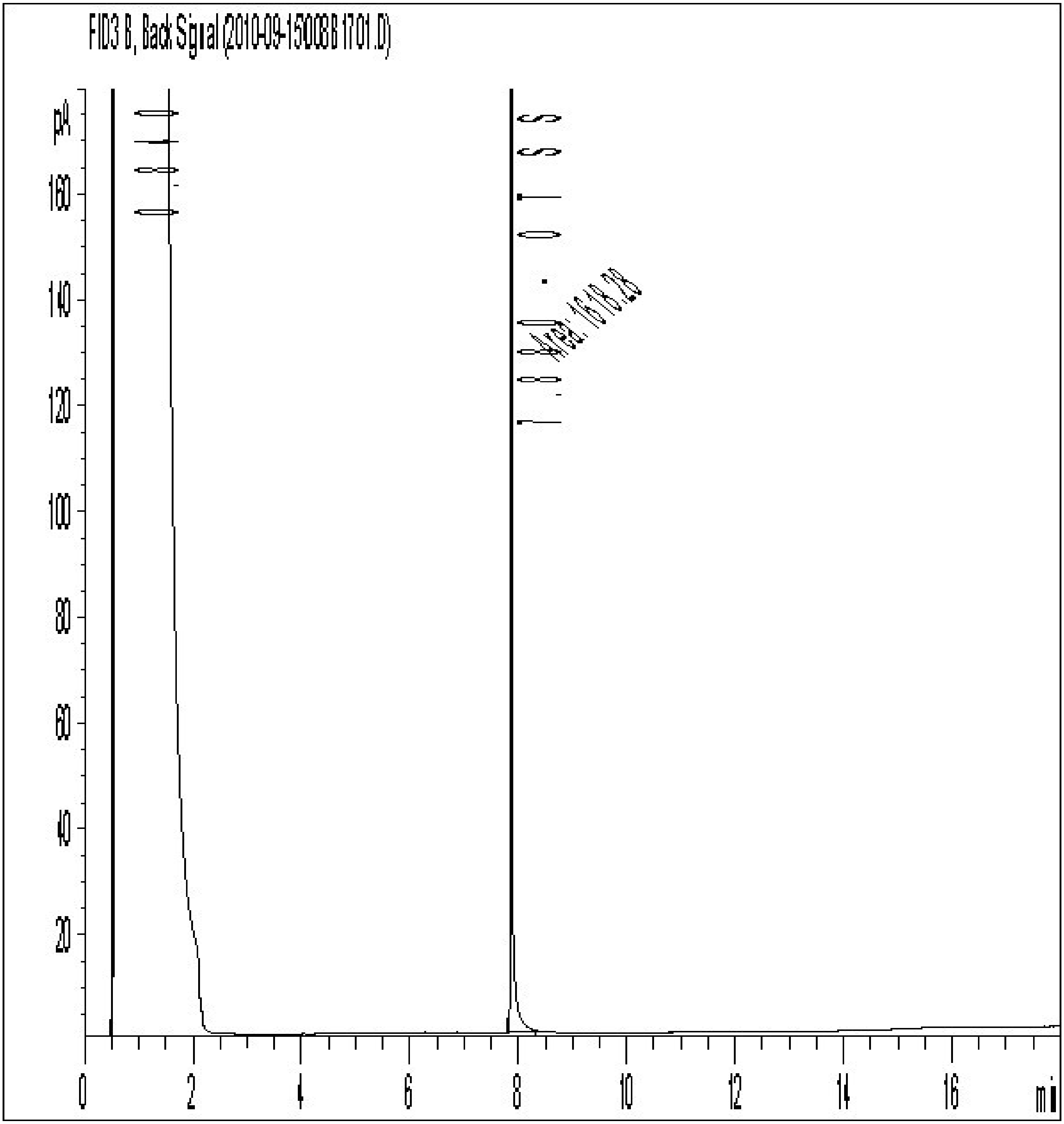
**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**




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

Franz Environmental Inc
Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1372
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-2 (40-50)

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**

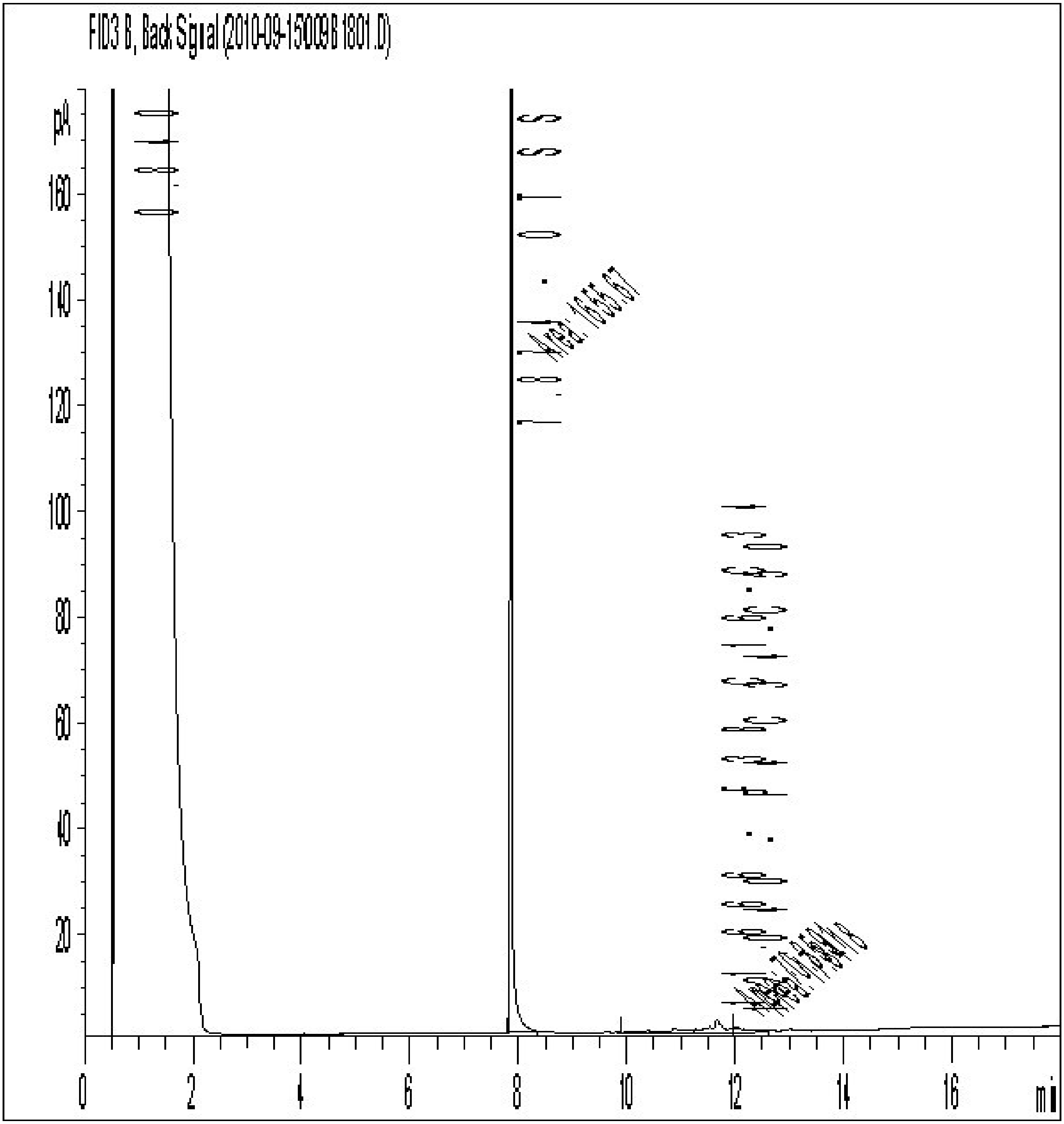



**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-3 (0-15)

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1373

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**

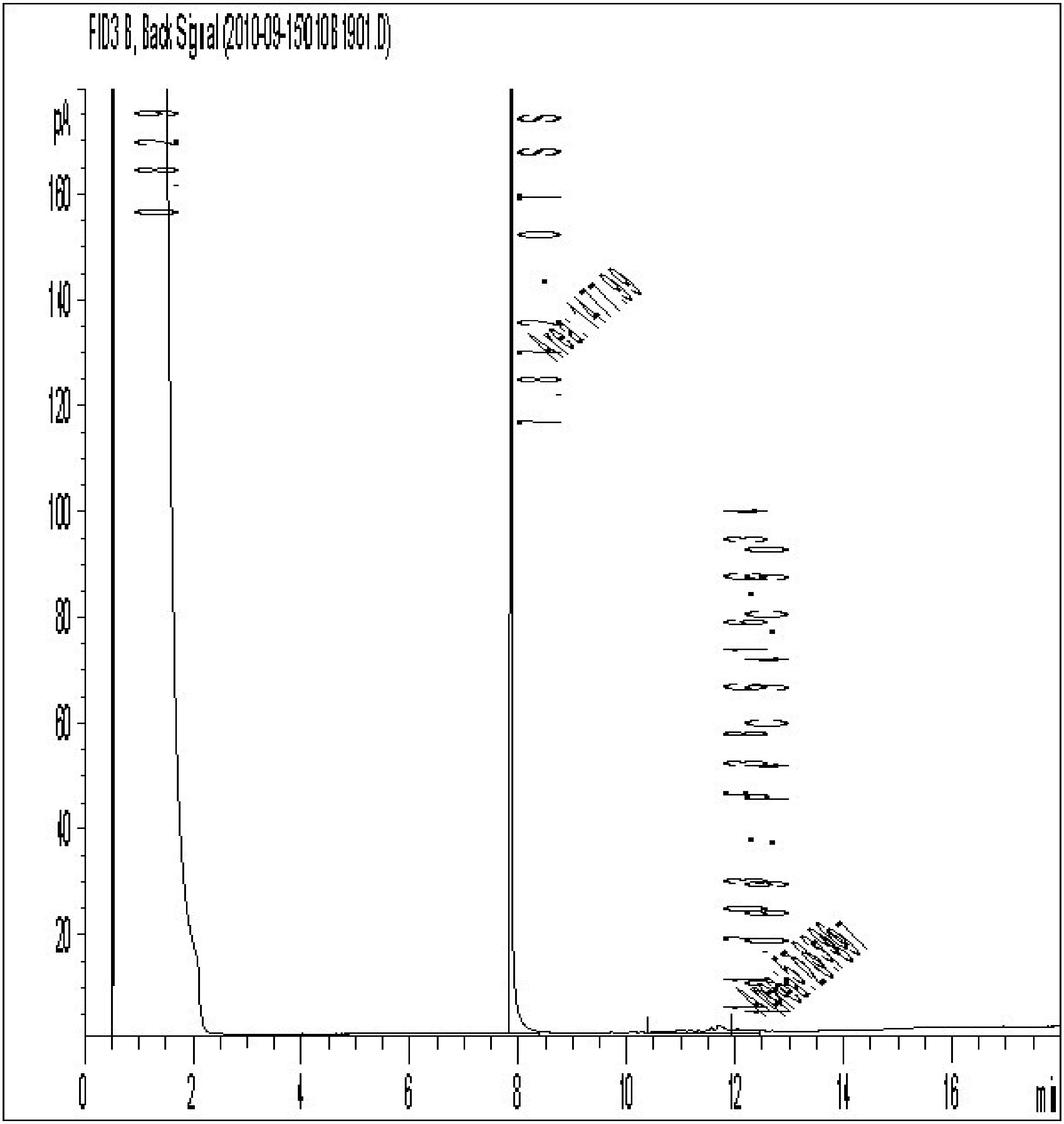



**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1374

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: TP10-3 (40-50)

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**



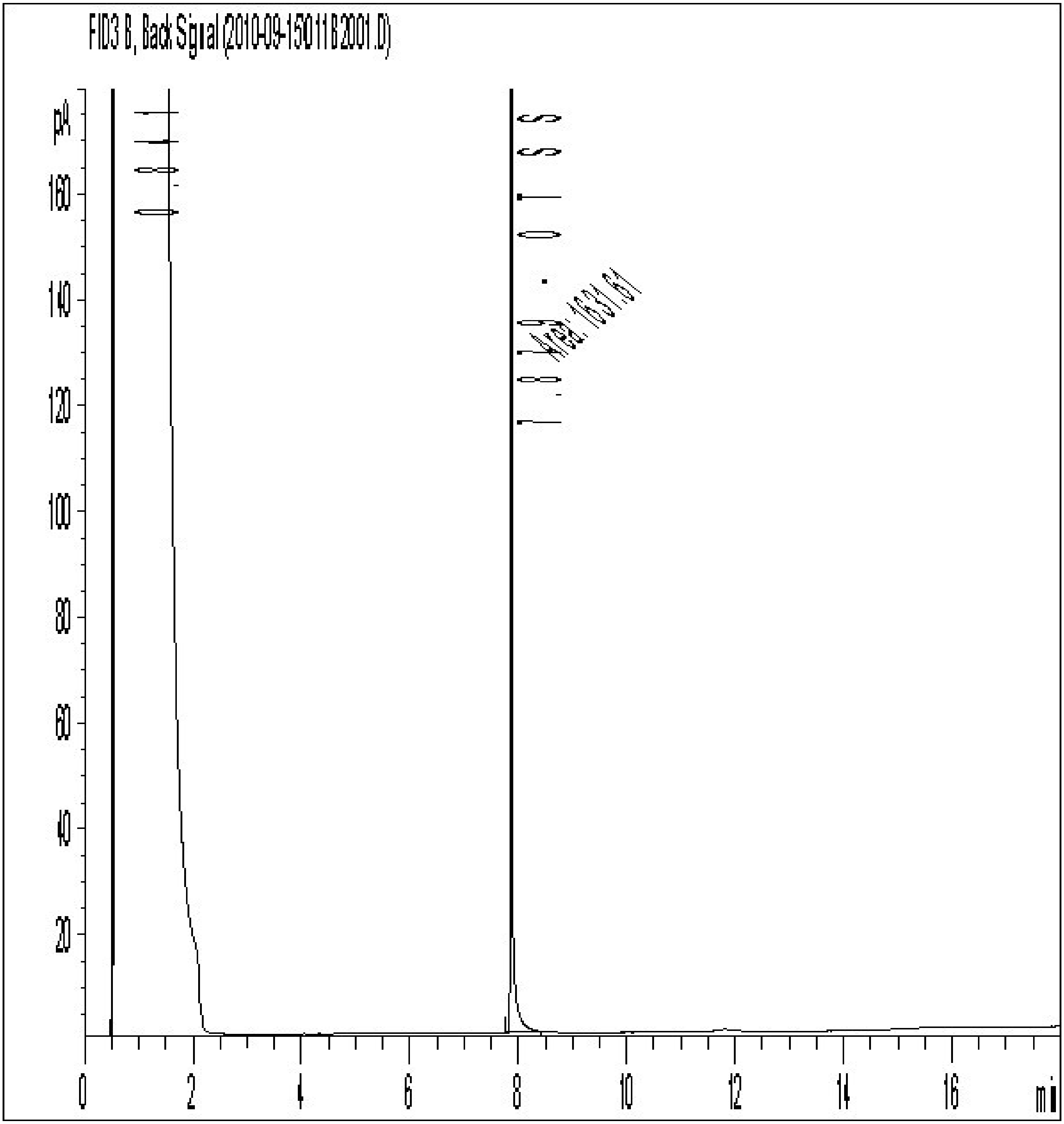

**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Driven by Service and Science

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1375

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: DUP 1

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**



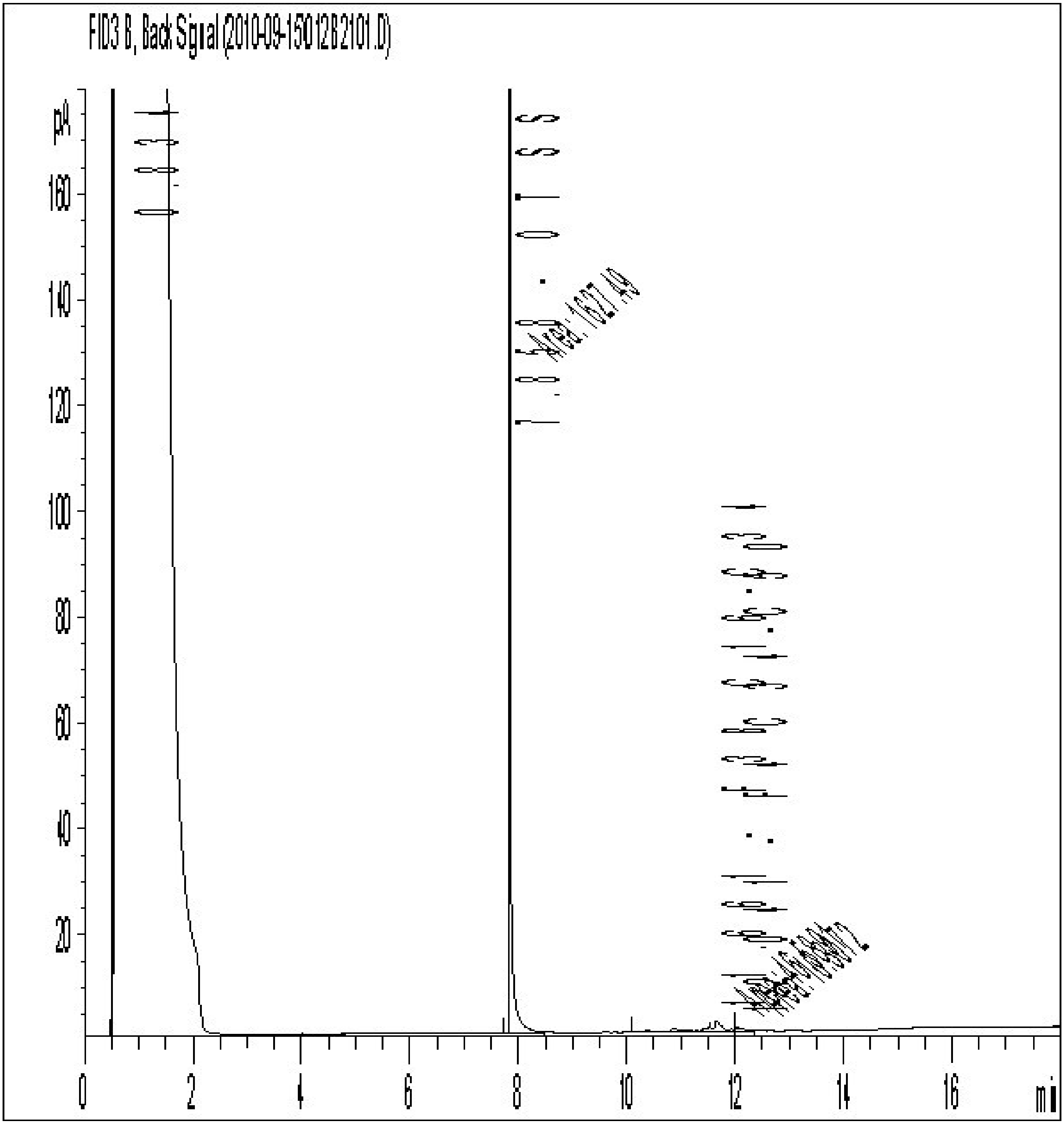

**Note: This information is provided for reference purposes only. Should detailed chemist intrepretation or fingerprinting be required to please contact the laboratory.**

Driven by Service and Science

Report Date: 2010/09/20
Maxxam Job #: B0C6099
Maxxam Sample: HD1376

Franz Environmental Inc
Client Project #: 1697-1001A, Long-Term Monitor
Project name: CAM-F, SARCPA LAKE, NU
Client ID: DUP 2

**Petroleum Hydrocarbons F2-F4 in Soil Chromatogram**




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

# APPENDIX E

# QA/QC Discussion

In order to obtain the required minimum of 20% duplicate samples, as stipulated in Long-Term Monitoring Plan, two duplicate soil samples and one duplicate groundwater sample were collected at the site in 2010. Obtained 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 4.6.

All groundwater and soil samples for PHCs, metals, PCBs and inorganics fell within limits of acceptability with the exception of the groundwater sample MW1004 and DUP-1 for Nitrite. The samples exceeded the acceptable range for “Case D” samples as outlined in Table 4-3. The difference between the two concentrations, however, 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

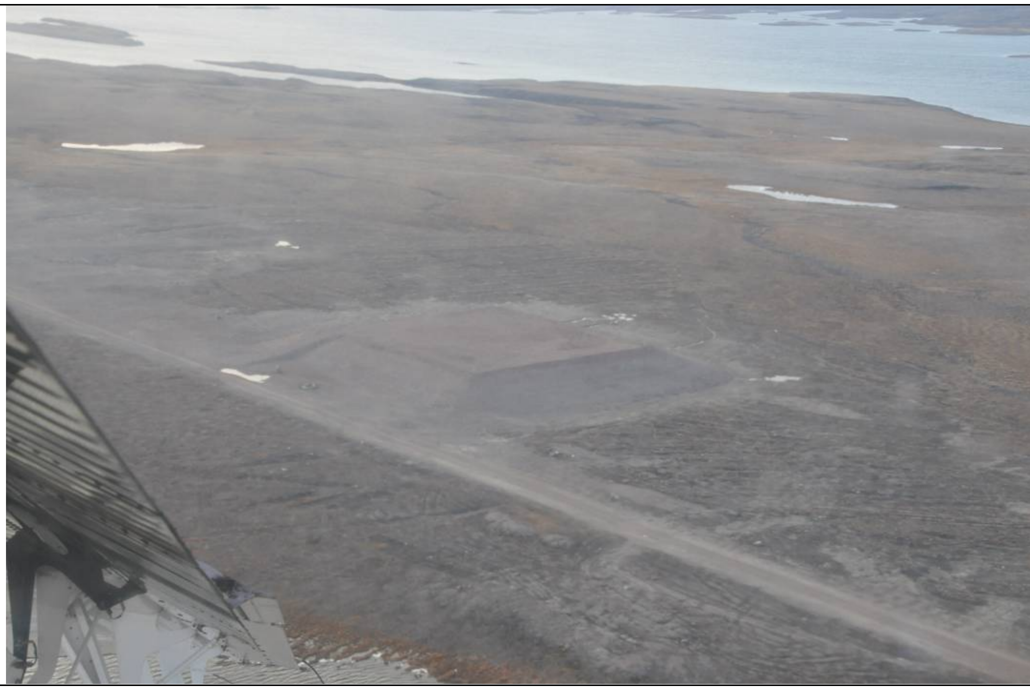


Photo 1. The CAM-F Secure Soil Disposal Facility (SSDF). Areas with ponded surface water can be seen at both the northern (left) and southern (right) toes of the SSDF. Direction photo taken: SSE (picture # DSC_0264).

Photo 2. Rivulet (erosion channel) on south side of SSDF; picture viewpoint number 24a (Figure A-1, Appendix A). Direction photo taken: N (picture # P9090571).

Photo 3. Picture viewpoint number 15 (Figure A-1,Appendix A) of the SW corner of the SSDF. Seepage points A, B and C can be seen on the far left; ponded surface appears in the lower right; and exposed riprap can be seen along the southern edge of the landfill toe. Direction photo taken: NE (picture # IMG_2499).

Photo 4. Top of the SSDF; picture viewpoint number 62 (Figure A-1, Appendix A). No significant change since previous inspection. Direction photo taken: SSW (picture # P9090620).

Photo 5. Minor erosion of fines and slight depression on the top of the SSDF; picture viewpoint number 56 (Figure A-1, Appendix A). No significant change since previous inspection. Direction photo taken: SE (picture # P9090677).

Photo 6. MW0605 on the wouth side of the SSDF (picture # P9080462).

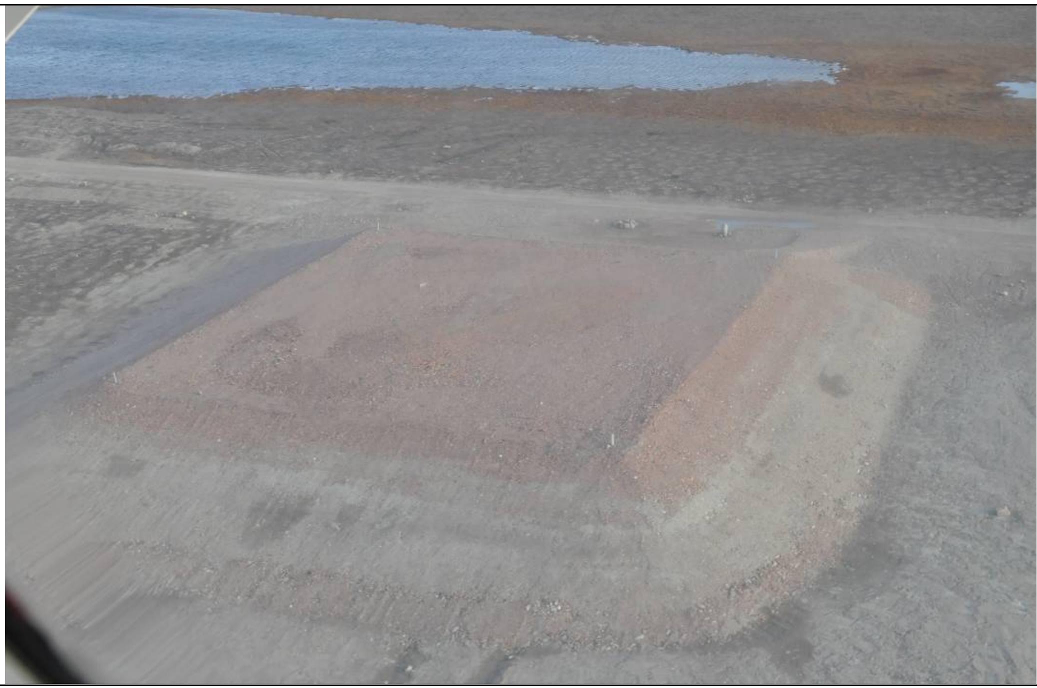


Photo 7. Seepage points on the eastern and southern sides of the SSDF. Direction photo taken: N (picture # DSC_0259).

Photo 8. Active seepage point E on south side of SSDF (refer to Figure A-1, Appendix A). Picture # P9090681.

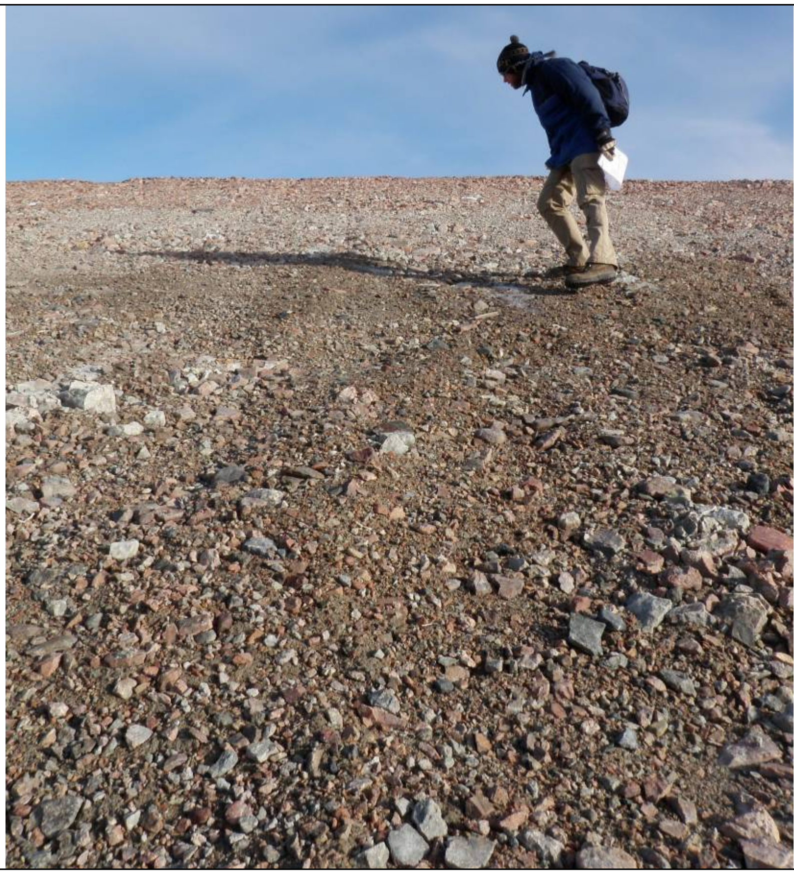


Photo 9. Close-up of active seepage point E showing frozen surface water (refer to Figure A-1, Appendix A). Picture # P9090682.

Photo 10. Active seepage point F on south side of SSDF (refer to Figure A-1, Appendix A) where small vegetation regrowing. Picture # P9090684.

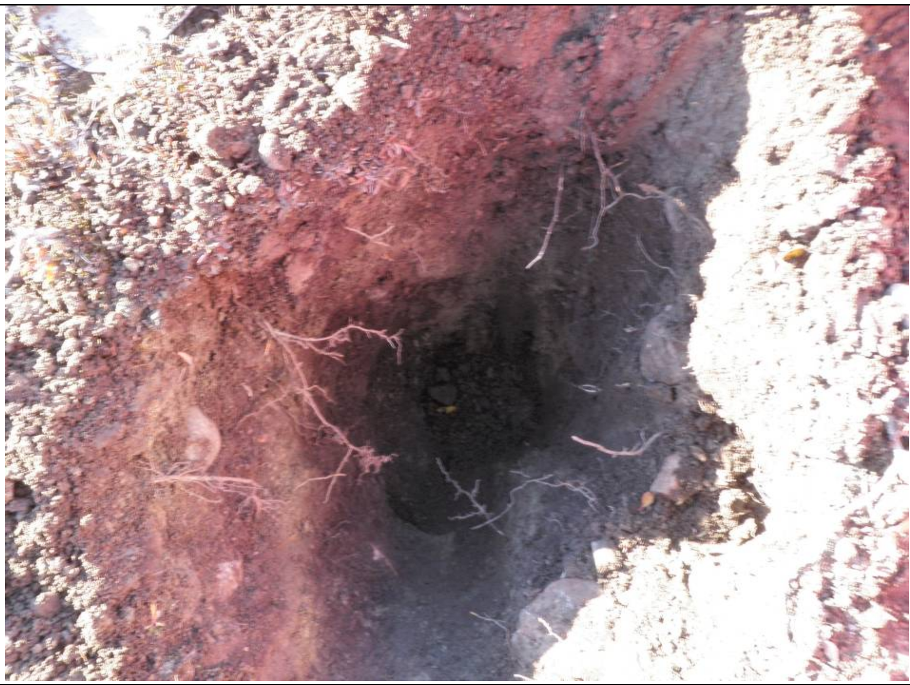


Photo 11. Test pit TP10-3 next to monitoring well MW0606 (picture # P9080456).

Photo 12. Cabin located between the SSDF and the NHWL showing some of surrounding debris. Direction photo taken: NE (picture # P9080469).

Photo 13. The south-eastern and south-western sides of the Non-Hazardous Waste Landfill (NHWL) shown from picture viewpoint number 23 (Figure A-2, Appendix A). Typical of all sides of the lanfill, the NHWL shows little sign of erosion, seepage or settlement. Direction photo taken: N ( picture # P9080513).

Photo 14. Top of NHWL showing minor depression and erosion of fines revealing gravel and cobbles; picture viewpoint number 35 (Figure A-2, Appendix A). Direction photo taken: NW (picture # P9080503).

Photo 15. MW06-01 near the NHWL showing conditions similar to those observed during the previous year's monitoring event. Picture viewpoint number 15 (Figure A-2, Appendix A); picture # P9080483.

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

| Viewpoint # | Picture # | Viewpoint # | Picture # | Viewpoint # | Picture # |
|---|---|---|---|---|---|
| 1 | P9090649 | 23 | P9090561 | 43 | P9090593 |
| 2 | P9090651 | 24 | P9090559 | 44 | N/A |
| 3 | P9090637 | 24a | P9090571 | 45 | P9090669 |
| 4 | P9090647 | 24b | P9090573 | 46 | P9090591 |
| 5 | P9090639 | 25 | N/A | 47 | N/A |
| 6 | P9090645 | 26 | P9090575 | 48 | N/A |
| 7 | P9090641 | 27 | P9090579 | 49 | P9090632 |
| 8 | P9090643 | 28 | P9090581 | 50 | P9090630 |
| 9 | P9090653 | 29 | P9090583 | 51 | P9090628 |
| 10 | P9090655 | 30 | P9090589 | 52 | P9090626 |
| 11 | IMG_2499 | 31 | P9090587 | 53 | P9090624 |
| 12 | IMG_2507 | 32 | P9090585 | 54 | P9090622 |
| 13 | IMG_2505 | 33 | P9090577 | 55 | P9090634 |
| 14 | IMG_2503 | 34 | P9090601 | 56 | P9090677 |
| 15 | IMG_2501 | 35 | P9090603 | 57 | P9090675 |
| 16 | P9090553 | 36 | P9090605 | 58 | P9090673 |
| 17 | P9090555 | 37 | P9090615 | 59 | P9090671 |
| 18 | P9090556 | 38 | P9090613 | 60 | P9090667 |
| 19 | P9090567 | 39 | P9090611 | 61 | P9090665 |
| 20 | P9090565 | 40 | P9090595 | 62 | P9090620 |
| 21 | P9090563 | 41 | P9090597 | 63 | P9090617 |
| 22 | P9090569 | 42 | P9090599 | 64 | P9090618 |

Table F-2. Picture viewpoint numbers of the NHWL (as depicted in Figure A-2, Appendix A) cross-referenced with picture numbers on Attached CD-ROM.

| Viewpoint # | Picture # | Viewpoint # | Picture # | Viewpoint # | Picture # |
|---|---|---|---|---|---|
| 1 | N/A | 23 | P9080513 | 45 | P90980487 |
| 2 | IMG_2472 | 24 | P9080515 | 46a | IMG_2488 |
| 3 | IMG_2482 | 25 | P9080517 | 46b | IMG_2490 |
| 4 | IMG_2474 | 26 | P9080519 | 48 | IMG_2484 |
| 5 | P9080543 | 27 | P9050521 | 49 | IMG_2486 |
| 6 | P9080545 | 28 | P9080523 | 50 | N/A |
| 7 | P9080547 | 29 | P9080525 | 51 | N/A |
| 8 | P9080549 | 30 | P9080533 | 52 | P9080527 |
| 9 | P9080471 | 31 | P9080535 | 53 | P9080529 |
| 10 | P9080473 | 32 | P9080537 | 54 | P9080531 |
| 11 | P9080475 | 33 | P9080539 | | |
| 12 | P9080477 | 34 | P9080541 | | |
| 13 | P9080479 | 35 | P9080503 | | |
| 14 | P9080481 | 36 | P9080501 | | |
| 5 | P9080483 | 37 | P9080505 | | |
| 16 | P9080485 | 38 | P9080507 | | |
| 17 | P9080489 | 39 | P9080511 | | |
| 18 | P9080491 | 40 | P9080509 | | |
| 19 | P9080493 | 41 | N/A | | |
| 20 | P9080495 | 42 | IMG_2476 | | |
| 21 | P9080496 | 43 | IMG_2478 | | |
| 22 | P9080499 | 44 | IMG_2480 | | |

# APPENDIX G

# Field Notes

# APPENDIX H

# Thermistor Details

From monitoring experience at INAC DEW Line and abandoned mine sites, Franz Environmental Inc. suggests the following steps be considered to collect better-quality temperature data with increased efficiency from the thermistor data loggers installed to monitor landfill freezeback.

1. Before the long-term monitoring field program commences, the following information should be confirmed if not recorded in the thermistor installation report: bead type, bead depths, bead offset or calibration data, appropriate temperature conversion file (e.g. 16temp.sff for bead type 44007 if using Lakewood Systems hardware and Prolog software). Without this baseline data, field temperature readings will not be interpretable.

2. A list of provisions and checks for thermistor maintenance should be provided, particularly given that most sites are visited only once per year. The list will increase the chances of rectifying or preventing problems with thermistors in the field, minimizing the chances of leaving malfunctioning loggers in the field to collect a year of bad data – or to collect no data at all. The list of provisions and checks should include (but not be limited to) the following items:
   a. A spare data logger. Consultants should be prepared to change data loggers on site if field observations indicate that the logger in place is not functioning. The logger replaced at 02VT (at the CAM-F SSDF in 2010) and sent to Lakewood Systems for repair should now be available to INAC.
   b. A spare set of data logger batteries. Consultants should be prepared to change data logger batteries (a 9V and a 12V lithium) if voltages are low or data logger not functioning (see also note 5 below). One set of batteries, left over from the 2010 CAM-F monitoring program, should be available to INAC.
   c. Consideration for shipment of dangerous goods. Lithium batteries are considered a dangerous good and therefore require special packaging and additional time to be transported to sites.
   d. Desiccant cartridges. Bring spare desiccant cartridges to all sites with thermistors, and open all data logger units to verify if cartridges require replacement (based on colour). Also look for evidence of moisture within the thermistor housing unit and on cable pins, as moisture can cause serious logger malfunction.
   e. Manual data verification. Temperature data should be verified manually in the field each year, for each thermistor string, which means bringing data logger software (with appropriate resistance-temperature conversion file obtained from the manufacturer) and a manual temperature conversion file (.xls), also obtained from the manufacturer. If there is a significant difference (i.e., > 0.2 C, perhaps giving small leeway to top bead and possible rapid temperature change over short time periods), the spare logger should be swapped in and again values compared. An

effort should be made, however, to attempt to minimize the time between manual and logged temperature readings. If issues persist, the beads themselves may not be in good condition (though there is no immediate field option to fix this problem).

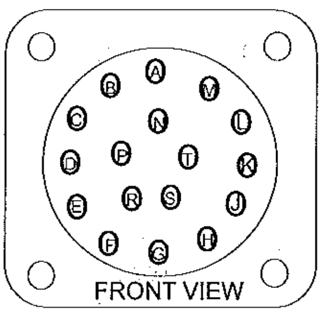
f. Manual verification equipment. A switchbox (to isolate and probe individual analog data channels on data loggers) and accurate ohmmeter is required to perform a manual verification of thermistor data loggers and temperature sensing beads. In the event that these are unavailable, manual verification is still possible, if slightly more difficult and less precise. Small alligator clips and a diagram of the data logger cable pin-out (attached later in this appendix) will be required to replace the switchbox (note pin “M” is common). In the absence of a Lakewood-provided, or other sensitive ohmmeter, a low quality multimeter can be used if calibrated, either before or immediately after field measurements. The internal resistors of the Lakewood Systems data loggers may be used for this purpose (contact Lakewood or see attached sheet later in this appendix for some common resistances found in the RX-16 data logger).
g. Adjust data logger clocks. If consistent termperature comparisons are to be made year to year, time should be verified and corrected to the appropriate local time as some data logger clocks appear to drift significantly over the period of a single year.

3. Whether future installations of thermistor strings include surface (air) temperature beads or not, weather data from the nearest weather stations should be considered in analyses. Although temperature data is likely to be the most reliable and useful, snowfall and wind speed data, landfill aggregate type and moisture content could also be shown to impact landfill freezeback.

4. Reports and data from other permafrost sites with landfill thermistors would be extremely useful in helping to analyse landfill temperature trends.

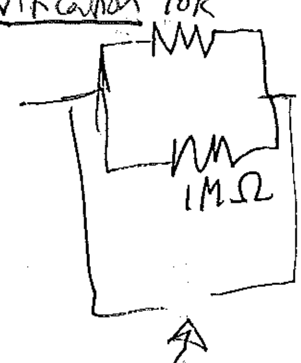
5. A note on battery voltages: The battery voltage levels are particularly meaningful when rechargeable batteries are used. With lithium batteries, as is the case at CAM-F, the discharge curve is extremely flat until total failure, when voltage levels drop off abruptly. Because voltage readings are not a good predictor of failure, lithium batteries should generally be replaced based on their date stickers.

# RX-16 CONNECTOR PINOUT AND WIRING




| PIN# | ALG# | COLOR |
|---|---|---|
| PIN A | ALG 1 | Black |
| PIN B | ALG 2 | Purple |
| PIN C | ALG 3 | White |
| PIN D | ALG 4 | Grey |
| PIN E | ALG 5 | Red |
| PIN F | ALG 6 | Brown |
| PIN G | ALG 7 | White/Green |
| PIN H | ALG 8 | Blue |
| PIN J | ALG 9 | Green |
| PIN K | ALG 10 | Yellow |
| PIN L | ALG 11 | White/Blue |
| PIN N | ALG 12 | Orange |
| PIN P | ALG 13 | White/Yellow |
| PIN R | ALG 14 | White/Black |
| PIN S | ALG 15 | White/Brown (Bat V) |
| PIN T | ALG 16 | P1 Green |
| PIN M | REF | Black (18 Guage) |

Data logger (thermistor) - verification




- open logger
- red module across top
- analog 1 (A1) + GND
  - ↳ meas Ω across : should be 9998Ω ± few ohms (record val)
  - ↳ calibrate V-meter afterwards (from ___ to ___)
- jumper A1 & A2 & should get ~5K ± few ohms (for that Ω range)

pin-out for thermistor string : maybe labelled inside box

④ leads : L

A-T : pins 1-16

A-H = 1-8
J = 9
K-L = 10-11
N = 12
P-T = 13-16

\# Pin "M" is common

\# no pin "I", "O",

# APPENDIX D: CAM-F Sarcpa Lake
# Long Term Monitoring Health and Safety Plan

# HEALTH AND SAFETY PLAN

# COLLECTION OF LANDFILL MONITORING DATA FOR DEW LINE SITE: CAM-F SARCPA LAKE

Prepared For

Contaminated Sites
Indian and Northern Affairs Canada (INAC)
Nunavut Regional Office
P.O. Box 2200
Iqaluit, Nunavut
X0A 0H0

Prepared by:

Franz Environmental Inc.
329 Churchill Avenue, Suite 200
Ottawa, Ontario
K1Z 5B8
(613) 721-0555

July 2, 2010

## TABLE OF CONTENTS

## 1.0 INTRODUCTION

Franz Environmental Inc. (FRANZ) has prepared this Health and Safety Plan (Plan) to encompass environmental monitoring work at the now dismantled CAM-F Distant Early Warning (DEW) Line site in Sarcpa Lake, Nunavut (the Project). All FRANZ employees and subcontractors involved in the field investigations, testing, and sampling programs will agree to, and abide by, the requirements of this Plan as a condition of working on this site for this Project. This Plan remains in effect until the site work on this Project is declared finished by Indian and Northern Affairs Canada (INAC) or by FRANZ employees with the authority to act on behalf of INAC.

Anticipated Project personnel are:

- 2 FRANZ staff members;
- 1 Bear Monitor;
- 2 Pilots.

As necessary, when new information regarding a potential hazard emerges during the project suggesting further safeguards that would be prudent, amendments to this Plan will be issued. Amendments will pertain to specific precautions to be taken for specific locations or operations, or regarding specific contaminants. Unless any of these Amendments specify otherwise, all provisions of this Plan will remain in effect as well, for the duration of project work at this site.

This Plan represents the minimum Health and Safety precautionary requirements and guidelines to be expected. FRANZ, however, reserves the option to make rapid improvements to such precautions, as deemed prudent by the Site Health and Safety Officer (SHSO), if the improved precautions must be instated more rapidly than a Plan Amendment can be put in place. As appropriate, such Amendments would then be generated as soon as practicable. The SHSO is expected to record all such rapidly implemented field decisions in his or her field notes and confirm, by memo, with the Project Manager of FRANZ.

## 2.0 AUTHORITY

Mr. Stephen Hooey of INAC is the main client contact. Prior to work at the site, he will be contacted by the Project Manager. Ms. Natalie Plato is the secondary client contact.

The Site Health and Safety Officer (SHSO) or his/her representative, designated FRANZ, will remain on site for the duration of work being conducted at the project site. The SHSO shall make decisions regarding Health and Safety based on the provisions of this Plan. If the SHSO has serious concerns or questions, the SHSO is advised to consult with the FRANZ Project Manager by the most expeditious communication means available. The Site Health and Safety Officer is Matthew Cyr and, in his absence, an alternate will be designated.

The SHSO will have the authority to stop work and to authorize resumption of work based on health and safety considerations, as specified in this Plan.

## 3.0 HAZARD ASSESSMENT

### 3.1 Petroleum Hydrocarbons

Potential contaminants of concern, as of the writing of this Plan, are primarily hydrocarbons, specifically gasoline and diesel. Other potential contaminants include polychlorinated biphenyls (PCBs) and metals. Likely locations of such contaminants are only partially known, as of the previous investigations. However, low to high concentrations may be present in soil and groundwater at the various landfill sites.

Hygienic precautions are provided by this Plan to prevent or minimize exposure (within acceptable limits) to hazardous agents found on site. These exposure controls consist of appropriate personal protective clothing, work practices, personal hygiene practices and facilities, and training, as detailed below.

### 3.2 Accident Hazards

We expect this operation to be very safe. Unfortunately, in the presence of machinery, there is potential for personal injury from such events as:

- Catching loose clothing or hair in shaking, in-running nip, or rotating equipment, including ATVs and aircraft;
- Injury from impact due to a loose piece of equipment, soil, or debris;
- Manual handling of debris recovered from the earth that may result in accidental cuts, skin scrapes or punctures;
- Long term exposure to loud noises generated by equipment, including aircraft;
- Ingestion / exposure / contact with contaminants derived from the soil and/or water; and,

- Slips, trips, and falls.

Therefore, the following safety precautions must be followed during *on site* activities:

- Daily activities must be cleaned up every day. Every step should be taken to avoid the creation of potential safety hazards, and prevent injury due to slips, trips, and falls;
- Watch out for equipment at all times; get out of the way. Assume that, in certain positions, the operator or pilot may have a blind spot and be unable to see a worker;
- Wear appropriate personal protective equipment (PPE);
- Wear hearing protection when necessary;
- Avoid wearing loose clothing, such as a tie, or long, free-hanging hair on site. If you unexpectedly find yourself on the site with loose clothing or long free-hanging hair, secure the clothing or hair by tucking it in close fitting clothing;
- Stand clear of mechanical equipment during operation, as much as possible, especially when it is being relocated or repositioned; and,
- Avoid ingestion of soil and water. Wash hands thoroughly with soap before eating.

### 3.3 Wildlife

Polar bears, which are found in Nunavut, are among the largest carnivores in the world. They are strong, fast and agile on ice, land, as well as in water. The best way to be safe is to avoid them. Further details on wildlife safety are described in Section 4.6 of this document.

## 4.0 HEALTH AND SAFETY MEASURES

### 4.1 Training

Before any fieldwork begins on this project, all FRANZ staff and subcontractor staff are to have reviewed this document. A contractor safety briefing will be conducted, regarding the hazards represented by the contaminants being sampled and other general safety issues, by the SHSO for all staff and contractors working on this project.

Contractors will also be briefed by the SHSO in the provisions of this Plan including:

- The nature and sequence of soil sampling and soil storage operations;
- Contaminants of concern, historic operations of concern and safety hazards addressed in this Plan;
- Health hazards possible from over-exposure to identified contaminants, as given in this Plan;
- Precautions required to control exposures, including:
    - Use of protective gear (respirators and clothing);
    - Work practices;

- Personal hygiene practices and facilities; and
- Emergency procedures, in case of accidents, including liaison with local emergency facilities, and provision of first aid supplies and a person on site certified within the last year to provide first aid for an injury.

## 4.2 Protective Equipment

Each site worker covered by this Plan shall be provided by his/her respective employer with the following personal protective clothing and equipment, and shall use them at all times during field work:

- Construction hard hat;
- Safety-toed boots;
- Fluorescent orange work wear with reflective striping; and
- Hearing protection.

Additional personal protective equipment (PPE) that should be used as appropriate includes the following:

- Nitrile gloves

These requirements may apply to personnel working adjacent to the boreholes, and during sampling of the soil and water. These requirements will be mandated by the SHSO or designate. Equipment operators and visitors do not need to meet these requirements. Whenever gloves (inside or outside layers) show signs of wear, tearing or leakage, they should be replaced.

Personal protective equipment that will protect employees from the hazards and potential hazards likely to be encountered during site activities will be selected and used. Personal protective equipment selection will be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site. The level of protection provided will be increased when site conditions deem it necessary to reduce employee exposures to below permissible exposure limits and published exposure levels for hazardous substances

## 4.3 Decontamination of Protective Gear and Skin

No facilities are available on site and therefore extra care must be taken to avoid dermal contact and ingestion of contaminated particles.

## 4.4 Work and Personal Hygiene Practices

Routine investigative operations are expected to require protection only against prevention of skin contact and ingestion of site contaminants. Respiratory protection is presently anticipated to be needed only in certain circumstances, as identified by the SHSO, whose decisions on respirator use shall be final.

To prevent skin contact and ingestion, workers must:

- Avoid skin contact with or accidental ingestion of soil or water;
- After removing protective clothing, thoroughly wash hands and face;
  - Before eating, drinking, smoking, gum chewing, or other hand-to-face behaviour; or,
  - Before leaving a project site; and,
- Not eat, drink or chew in the monitoring/sampling site areas.

SMOKING IS NOT PERMITTED in the monitoring/sampling site areas during the work program. This is necessary because combustible petroleum products are likely to be encountered.

### 4.5 Harsh Weather Conditions

Harsh weather conditions can arrive in Hall Beach and the site at CAM-F at any time, therefore each member of the team must abide by the following:

- To deal with low and sub zero temperature every staff member must bring warm clothes, backup clothes, waterproof breathable outerwear, waterproof boots, hats, gloves, rain vests; learn how to use of a kerosene heater; and learn how set up wall tents;
- To deal with strong winds have adequate clothing and shelter, avoid working near steep slopes or water bodies until winds have calmed down, and cancel return charter until landing conditions are improved;
- To deal with fog only work near camp where field workers can always be under direct sight of the bear monitor and stop work if fog is too dense; and,
- To deal with rain and freezing rain have adequate clothing and shelter and remember keeping dry remains the most important point.

Occasional delays may occur due to adverse weather conditions. It is of primary importance to work under safe conditions even if it causes delays. The Team Leader/SHSO decides when to stop work. Staff will stay in their tents during adverse weather conditions. Regular safety rounds are undertaken every hour around the camp installations by the Team Leader/SHSO.

### 4.6 Wildlife Safety

Wildlife safety and monitoring is continuous during the entire fieldwork period. One community member from Hall Beach with Two a strong knowledge of wildlife, and the use of rifles to scare or kill bears will be assigned as the Bear Monitor. The role of the Bear Monitor is as follows, but not limited to:

- Check for wildlife, such as bears, approaching the work site;

- Protect wildlife by preventing it from approaching the workers by using bear bangers (bears will be temporarily scared of a banger);
- Ensure that all garbage and food waste are picked up and properly packaged after meals (all workers at the site should assist with maintaining a clean camp);
- Have all field workers under direct view at all times;
- Walk around perimeter of the work place or hills to look for wildlife approaching the site, inform staff if wildlife are approaching, and inform field workers of the measures being taken to address the approaching wildlife; and
- Any other measures necessary to protect the health and safety of staff and contractors from wildlife, especially bears.

Before any fieldwork begins on this project, all FRANZ staff and subcontractor staff are to have reviewed documentation related to Polar Bear Safety. Listed below are resources where some documentation is located.

- Parks Canada Polar Bear Safety found at: http://www.pc.gc.ca/~/media/pn-np/nu/auyuittuq/pdf/PolarBearEnglish2007final.ashx
- Nunavut Parks Polar Bear Safety sheet http://www.nunavutparks.com/english/parks-special-places/katannilik-territorial-park/documents/PolarBearSafety.pdf

A couple of general comments regarding Polar Bear behaviour include:

- Do not try to run away from a polar bear. They can outrun a human. Seeing an animal fleeing from them arouses their instincts to chase. They think you are prey. Always back away slowly from a polar bear.
- Do not stare at them directly. Direct eye contact, to them, is a sign of aggression.

### 4.7 ATV Safety

ATV transportation is required on site. All ATV vehicles are to be operated in accordance with the manufacturer's requirements and specifications. Use of ATVs on site requires the authorization of the Site Health and Safety Officer (SHSO). Operators will be trained onsite by qualified or competent personnel.

*General operating procedures are as follows*:

1. Training will consist of these set of instructions, hands-on training, and demonstration of basic skills. Individuals are expected to meet all training requirements before ATV use.
2. ATVs shall remain on flat surfaces at all times and shall not be operated on slopes steeper that a 45% grade.
3. Daily inspections of the machines are required (i.e. fluid leaks/levels, tire pressure, tire

surfaces, lights, fuel levels, brakes, etc..).

*Operators and passengers shall wear:*

- Safety glasses, goggles, or face shield;
- Leather CSA approved boots; and
- A properly fitted (DOT/ANSI/SNELL) helmet.

*ATV Safety Summary*

- Speed limits shall be maintained at safe operating speeds at all times;
- Turn off engines before dismounting;
- Avoid driving over extreme obstacles (i.e. high logs, deep water, etc.);
- Remember to shift weight appropriately if turning or driving up hill;
- Watch for other workers on foot at all times;
- Do not exceed manufacturers recommended payload;
- Watch the turning radius when using trailers;
- No person shall ride in trailers;
- Slow down before coming to a stop;
- Turn off engine before refuelling;
- Each driver shall have a valid drivers licence; and
- Absolutely no horseplay or stunting will be tolerated.

Any improper use of ATVs is to be reported to the site SHSO immediately. The SHSO has the authority to suspend any worker or contractor from use of the ATV for the remainder of the project duration at his/her discretion.

### 4.8 Spills

If a spill of automotive fuel, aviation fuel, or other hazardous material occurs please take the following steps:

- Keep non-involved people away from the spill;
- Initiate alert of other workers on site;
- Avoid contact and inhalation of spilled material;
- Reduce, stop and contain discharge;
- Apply first aid if needed (see section 4.9);
- Notify authorities;
- Record all events relating to mishap;
- Be certain that personnel leaving site are completely decontaminated thus eliminating “tracking” off-site; and

- Apply corrective measures as dictated by the SHSO.

Ensure that monthly reports if required by regulatory authorities are submitted.

### 4.9 First Aid

The SHSO will ensure that all staff knows the location of the first aid kit(s) at the site and its content and proper usage are covered in the instruction manual. A minimum of 1 individual with certified First Aid training and Wilderness Training will be present on the site during the work period.

- Never forget to promptly remove contaminated clothing from an exposed individual. Dispose, in a defined area, the contaminated clothing in order that one can reclaim personal belongings. Move victim out of contaminated area to a place with fresh air.
- While assisting a worker, victim of an accident, adhere to the following five steps to first aid emergency response as per CSST's first aid manual.

**Step 1 - Assess the Situation**

- Is the area hazardous for me? Is air breathable? Is there a risk of explosion, fire, structural failure, intoxication, and electrocution?

**Step 2 - Examine the Victim**

*Primary Assessment*

- Check consciousness
- Check breathing
- Check severe bleeding
- Check state of chock

*Secondary Assessment*

- Check for possible spinal fracture
- Check for consciousness
- Check for other injuries

**Step 3 - Assist According to Priorities**

- Save Life First
    - Respiratory arrest → Initiate artificial respiration)
    - Cardiac arrest → Initiate CPR
    - Severe bleeding → Apply compression & elevate member
    - Shock position → Flat & elevate legs
- Prevent Injury Aggravation
    - Spinal column fracture → Do not move, stabilise victim)
    - Unconsciousness → Recovery position

- Other injuries :
  - Burns → Clean, protect
  - Fractures → Stabilise
  - Minor injuries → Clean, protect

**Step 4 - Communicate with Emergency Services**

- If possible, designate somebody to call for help (see Section 6.0 for Emergency Contacts). Stay with the victim to check on him/her and support him/her.
- The person contacting Emergency Services/Response Center should provide the following information:
  - Indicate the location (name & address) of the site – Give geographical reference;
  - Indicate the exact location of the victim;
  - The number of injured persons;
  - Brief description of the situation; and
  - Give the name & telephone number of the caller.

WAIT FOR THE EMERGENCY SERVICE RESPONSE CENTER OPERATOR'S SIGNAL BEFORE HANGING UP THE PHONE. MAKE SURE ALL QUESTIONS HAVE BEEN ANSWERED.

**Step 5 - Calmly wait for the Air Ambulance**

- Continue monitoring for breathing and pulse.
- Install comfortably the victim.
- Inform him/her of the upcoming transport.
- Keep on lookers away.

### 4.10 On-site Communications

Communications during the fieldwork is as follows:

- Satellite phone to contact the Inuvik or other places. This phone is activated 24/7. It will be used if emergencies arise.
- Verbal communications between workers
- Use of an ATV to cover the distance between two parties
- Use of a rifle or bear banger to get immediate attention of all staff
- Rally point in case of an emergency

# 5.0 ADMINISTRATION

## 5.1 Additional Medical Emergency Information

Accidents, medical emergencies, personnel injury and sickness will be handled by the first aid certified environmental technician(s). The procedures to follow in such events are as follows:

- Bring immediate attention to the injured person(s);
- Inform all workers of the situation;
- Use first aid kit if required;
- Bring the wounded person inside the tent if possible or necessary;
- Call the emergency number for medical consultancy;
- Give warm clothes, food and liquid to a sick or wounded person as required; and
- SHSO/Team leader decides if a call to the air ambulance is required, depending on the situation.

## 5.2 Review of Safety Plan

Prior to departure to CAM-F Sarcpa Lake, field coordinator Matthew Cyr, will call a safety meeting with all individuals involved in the fieldwork. The purpose of the meeting is to recall the general safety precautions specific to CAM-F Sarcpa Lake and all related issues found in the comprehensive Health & Safety Plan. The points to be covered will include:

- The Team Leader/SHOS is identified;
- Review of the first aid kit content and how to use it;
- All Terrain Vehicle (ATV) procedures and safety issues;
- Who to contact (with the satellite phone) in case of an emergency (24/7) (please see Emergency Contact List at end of document);
- General use of rifle;
- How to use a rifle to scare wildlife;
- General procedure in case of a fuel spill (see Section 4.8);
- Bear monitoring responsibilities;
- Safety near and around aircraft;
- Importance of working in pairs and telling second party where the work is happening and vice-versa;
- Safety procedures in case of strong winds, fog, low temperature and other adverse weather; and,
- Review / check all survival equipment prior to boarding aircraft (includes but not limited to fuel, heaters, 3 star sleeping bags, food, first aid kit, tents, riffle, ammunition, bear bangers, satellite phone, important phone numbers, backup and warm clothing, etc).

Every person involved with the fieldwork shall receive a copy of this Health and Safety Plan, review its contents, and sign the enclosed responsibility statement.

## 6.0 EMERGENCY PHONE NUMBERS AND CONTACT LIST

| **Contact** | **Person or Agency** | **Phone Number** |
|---|---|---|
| Hospital | Baffin Regional Hospital<br>Hall Beach Health Center | 867-979-7300<br>867-928-8827 |
| Police | RCMP, Hall Beach<br>RCMP Emergency Contact | 867-928-0123<br>867-928-1111 |
| Fire Department | Hall Beach Fire Division Emergency Contact-George | 867-928-8888 |
| Spill Report Line | Spill Action Centre | 867-669-4700 |
| Indian and Northern Affairs Canada | Stephen Hooey<br>Natalie Plato | 867-975-4731<br>867-975-4730 |
| Franz Environmental Coordinator (onsite) | Matthew Cyr | 450-674-2207 (O) |
| Franz Environmental Inc. | Steve Livingstone<br><br>Andrew Henderson | 613-721-0555 (O)<br>613-791-8515 (SL cell)<br>613-324-1742 (AH cell) |
| Aircraft Charter Company | Kenn Borek Air | 867-979-0040 |

## 7.0 ACKNOWLEDGEMENT

I, (_________________________________________),
(Please print name in full)

I, (_________________________________________),
(Please print name in full)

I, (_________________________________________),
(Please print name in full)

I, (_________________________________________),
(Please print name in full)

I, (_________________________________________),
(Please print name in full)

have read this document and agree to abide by the requirements of this Plan for staff and contractors as a condition of working at this site for this project.

___________________________________
FRANZ Project Manager Signature Date

___________________________________
FRANZ Project Principal Signature Date

___________________________________
Staff/Contractor's Signature Date

___________________________________
Staff/Contractor's Signature Date

___________________________________
Staff/Contractor's Signature Date

___________________________________
Staff/Contractor's Signature Date

___________________________________
Staff/Contractor's Signature Date

# ATTACHMENT A

# SITE HAZARDS CHECKLIST

Site Chemical Hazards and Mitigation

| TYPE OF HAZARD | DESCRIPTION OF HAZARD | MITIGATION | Expected Hazard | |
|---|---|---|---|---|
| | | | YES | NO |
| Petroleum Hydrocarbons, Metals, PCBs, VOCs | In site soils and groundwater, | Personnel to wear nitrile gloves while handling any site soil. | ☒ | ☐ |
| PCBs | PCBs are present within site landfills | Personnel to wear nitrile gloves while handling on-site material | ☒ | ☐ |

Site Physical Hazards and Mitigation

| TYPE OF HAZARD | DESCRIPTION OF HAZARD | MITIGATION | Expected Hazard | |
|---|---|---|---|---|
| | | | YES | NO |
| Overhead Hazards | No overhead power lines on or near the site. | | ☐ | ☒ |
| Underground Hazards | No expected active underground hazards | | ☐ | ☒ |
| Equipment Hazards | ATVs, Twin Otter aircraft | Stay out of operating equipment; expect that the equipment operator can not see you. Make eye contact with operator prior to moving around equipment. | ☒ | ☐ |
| Drilling Hazards | No drilling to be completed on site | | ☐ | ☒ |
| Excavation Hazards | Hollow pits may be present in various areas of the site. | Be aware of your surroundings. Proceed slowly through areas of the site Work with a buddy who can get help if you fall in. | ☒ | ☐ |
| Machinery Hazards | See equipment hazards above. | See equipment hazards above. | ☒ | ☐ |
| Heat Exposure | Warm temperatures may be present during the project duration. | If temperatures are warm use sunscreen and drink fluids to prevent dehydration. | ☒ | ☐ |
| Cold Exposure | Cold temperatures may be present during the project duration. | Dress appropriately bring change of clothing in case of falling in water. | ☒ | ☐ |

| TYPE OF HAZARD | DESCRIPTION OF HAZARD | MITIGATION | Expected Hazard | |
|---|---|---|---|---|
| | | | YES | NO |
| Electrical Hazards | No expected electrical hazards. | | ☐ | ☒ |
| Oxygen Deficiency | Oxygen deficiency is not expected in areas on site. | | ☐ | ☒ |
| Noise Hazards | Helicopters, airplanes | Wear ear plugs, while near helicopter and if required, while getting on/off airplanes. | ☒ | ☐ |
| Fire/Explosion Hazards | Refuelling ATVs with gasoline.<br><br>Site Bear Monitors carry live ammunition | Keep ignition sources away from any petroleum products.<br><br>No smoking on site.<br><br>Keep ammunition away from ignition sources. | ☒ | ☐ |
| Wildlife | Rare encounters with bear | Be alert, while onsite, especially while walking trails or wooded areas.<br><br>Keep in constant contact with site bear monitors. | ☒ | ☐ |
| Boating | Drowning hazards, equipment hazards. | | ☐ | ☒ |
| Holes/Ditches | See excavation hazards above. | See excavation hazards above. | ☒ | ☐ |
| Steep Grades | Steep shorelines | Maintain a buddy system and watch footing on steeper slopes. | ☒ | ☐ |
| Slippery Surfaces | Slippery slopes and shorelines | Maintain a buddy system and watch footing while sampling in shallow water and approaching waters edge | ☒ | ☐ |
| Uneven Terrain | Uneven terrain is encountered throughout the site | Maintain a buddy system and watch footing as well as wear ankle supporting foot ware | ☒ | ☐ |
| Unstable Surfaces | Loose rocks or boulders | Maintain a buddy system and watch footing as well as wear ankle supporting foot ware. | ☒ | ☐ |
| Elevated Work Surfaces | Not expected to work from an elevated surface | | ☐ | ☒ |

| TYPE OF HAZARD | DESCRIPTION OF HAZARD | MITIGATION | Expected Hazard | |
|---|---|---|---|---|
| | | | YES | NO |
| Shoring/Scaffolding | No expected shoring or scaffolding required for this project. | | ☐ | ☒ |
| Public Risk | Site not with in a populated area (200km to the closest permanent community). | | ☐ | ☒ |
| Vehicular | See equipment hazards above. | See equipment hazards above. | ☒ | ☐ |

# ATTACHMENT B

# HEALTH AND SAFTEY TRAINING INVENTORY

**HEALTH AND SAFETY TRAINING INVENTORY**

| Personnel | Trained In | Completed | | Certification Date # |
|---|---|---|---|---|
| Tina Ranger (FRANZ) | • WHIMIS | Yes ☑ | No ☐ | May 2009 |
| | • First Aid/CPR | Yes ☑ | No ☐ | May 2009 |
| | • Wilderness First Aid | Yes ☑ | No ☐ | May 2009 |
| SHSO – Mathew Cyr (FRANZ) | • WHIMIS | Yes ☑ | No ☐ | May 2009 |
| | • First Aid/CPR | Yes ☑ | No ☐ | May 2009 |
| | • Wilderness First Aid | Yes ☑ | No ☐ | May 2009 |