DEFENCE CONSTRUCTION CANADA

COLLECTION OF LANDFILL MONITORING DATA YEAR 2008

FOX-4 CAPE HOOPER, NU

DCC PROJECT NO. KN28434 DLCMON FOX4
NUNATTA PROJECT NO. 06715

DECEMBER 2008

FINAL REPORT

Nunatta Environmental Services Inc.

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1.0 INTRODUCTION

1.1 Context and Mandate

Defence Construction Canada (DCC) is managing the cleanup and monitoring programs at Distant Early Warning (DEW) Line sites in Canada, on behalf of Department of National Defence (DND). Nunatta Environmental Services Inc. (Nunatta) was mandated by DCC to carry out the collection of monitoring data from landfill sites located on the former DEW Line site of FOX-4, Cape Hooper, Nunavut for the years 2005 to 2008. For this purpose, Nunatta has teamed up with Franz Environmental Inc. (FRANZ), who provided expert technical support for the fieldwork, collection of monitoring data and reporting for the year 2008. The present report documents the findings of the field program for the 2008 monitoring year.

1.2 Location and Site Features

Cape Hooper is located on the east coast of Baffin Island, at 68^{o}26' north latitude and 66^{o}44' west longitude, approximately midway between the communities of Qikiqtarjuaq and Clyde River. The FOX-4 Cape Hooper Site was a former auxiliary site on the DEW Line. A North Warning System Short Range Radar (SRR) has been constructed in the vicinity of the former DEW Line facilities. As part of the contract for the construction of the SRR, some demolition and landfilling of waste materials was carried out due to the limited area available for the new development.

The former DEW Line site was comprised of communications, accommodations and maintenance facilities located at the summit, with an airstrip, fuel storage and maintenance facilities located near the coast. These areas are referred to as the Upper and Lower Sites, respectively. The environmental cleanup and demolition of other facilities not required for the operation of the SRR site was initiated in 1996 and was completed in mid-1999. The cleanup included the excavation of one dump site, closure and remediation of six existing landfills, the construction of two new landfills for the disposal of non-hazardous wastes generated from demolition and collection of site debris, and construction of a DCC Tier II soil disposal facility. These landfills, as shown on the overall site plan, Figure 1 FOX-4 Cape Hooper – Overall Site Plan, include:

- Upper Site Dump (excavated during the cleanup, no monitoring required);
- Station Area Landfill (new landfill);
- Helipad Landfills - East and West;
- Barrel Dump Landfill;
- Lower Site Landfill (new landfill);
- DCC Tier II Soil Disposal Facility (new landfill);
- Airstrip Landfill; and
- Tanner Bay Landfill.

1.3 Objectives and Scope of Work

The objective of the DCC Landfill Monitoring Program is to collect sufficient information to assess the landfills' performance, from a geotechnical and environmental perspective.

DCC has specified the requirements for the Landfill Monitoring Program in the document *Terms of Reference – Consulting Services for the Collection of Landfill Monitoring Data – FOX-4 Cape Hooper*, DEW Line Site Nunavut Settlement Region, Qikiqtaaluk Region, DCC Project # DLCUMONFOX-4, 21 April 2005 (ToR, reference B).

The scope of work for the Landfill Monitoring Program is defined in the ToR (reference B) and in Nunatta's accepted proposal dated 2005 (reference C) that was submitted to DCC. The scope of work generally includes the following activities:

- Landfill Monitoring for each of the FOX-4 Landfills:
    - Visual inspection;
    - Soil sampling;
    - Groundwater sampling (selected landfill areas);
    - Thermal monitoring (DCC tier II Soil Disposal Facility only);
    - Creation of photographic records; and
- Draft and Final reports.

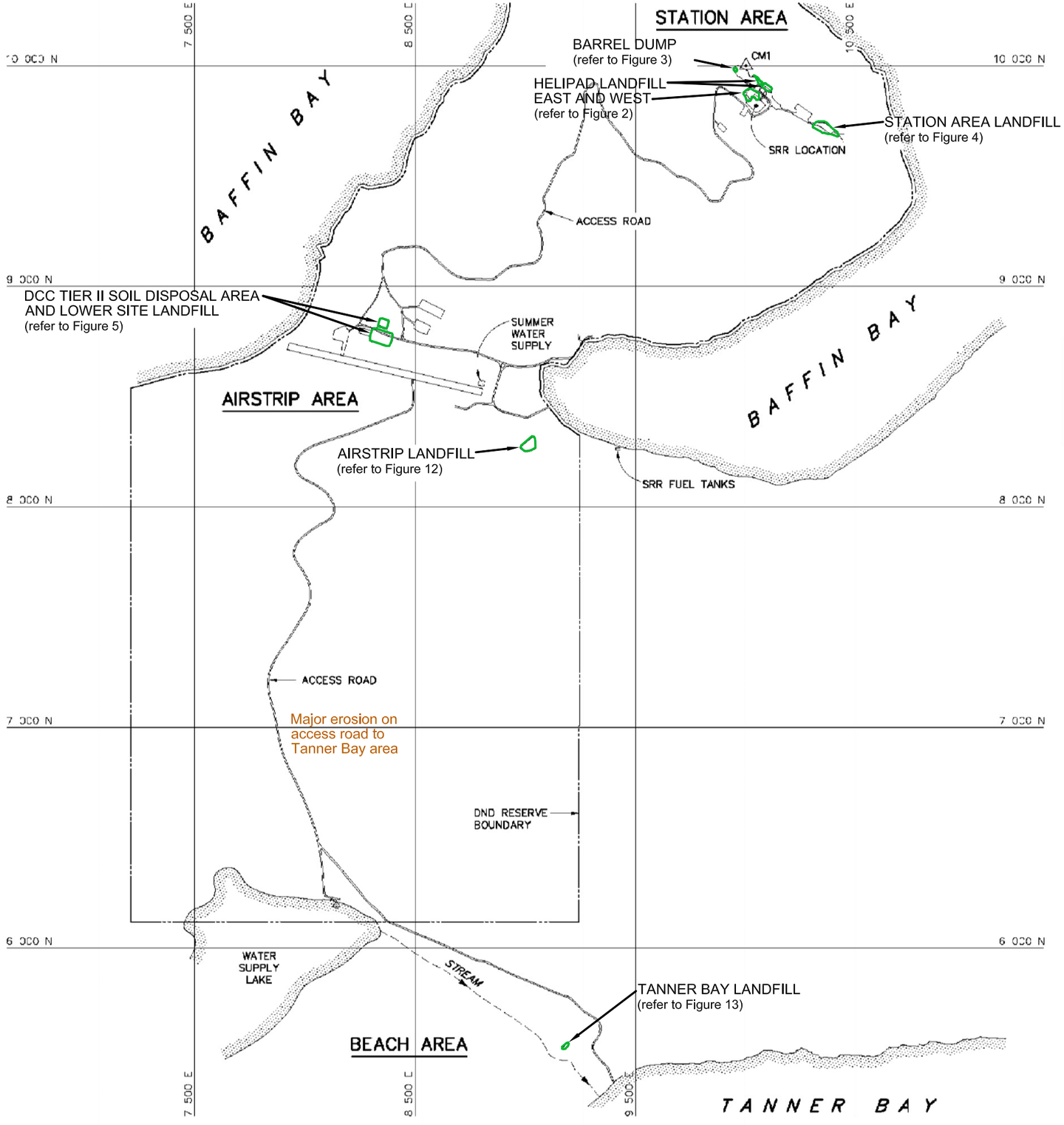
1.4 Report Format

This report describes the work carried out in August 2008 at eight landfill sites at FOX-4 Cape Hooper. Results from soil and groundwater sampling, thermal monitoring, and visual inspection of the sites are also presented in the formats described in the ToR (reference B).

An electronic version of the report and its component tables, figures and data files is included in an Addendum CD-ROM, which is appended to the report.

The report is organized with a separate chapter for each of the landfill areas. Each chapter contains all relevant information for that landfill area, for the 2008 Landfill Monitoring Program. For the photographic record, the printed copy of the report only includes an index of photos for each of the landfill areas. The original photos are included in electronic format (jpg) in the Addendum CD-ROM of the report.

Certificates of Analysis, QA/QC analytical results and field notes are attached in annexes.



LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

CM1 SURVEY CONTROL MONUMENT

LANDFILL BOUNDARIES (APPROXIMATE)

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	397.575	FOX-4 BASELINE STA. 0+00
				(LEAD PLUG IN ROCK)

Title: FOX-4 CAPE HOOPER - OVERALL SITE PLAN

Project: FOX-4 CAPE HOOPER
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:20,000

500 400 300 200 100 0 500
metres

FIGURE 1

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

2.0 OUTLINE AND METHODOLOGY

2.1 Field Program

The 2008 field program at FOX-4 Cape Hooper took place from August 19th to the 24th 2008. The Nunatta field program was executed by Mr. Richard Wells, P. Eng (B.C), Ryan Fletcher, Dipl. Tech, CEPIT, and two (2) Inuit wildlife monitors. Weather during the monitoring event ranged from sunny with light wind and 5 degrees celcius (Aug 19 and 20, 2008) to high winds (130 km/h gusts) and -5 degrees celcius, with flurries and rain (August 21 and 22, 2008). An additional day was added to the duration of the monitoring program due to the above mentioned adverse weather conditions encountered.

The Royal Military College of Canada, Environmental Services Group requested via e-mail (August 8, 2008) that a total of twelve additional samples be collected from the areas of the Tier II Facility, Lower Site Landfill, and the Tanner Bay Landfill. This request was completed during the 2008 sampling event.

2.2 Visual Inspection

The sites were inspected as per the ToR (reference B) for evidence of settlement, erosion, or frost action. All sites were visually inspected for potential seepage, water pooling and resurgence, staining, vegetation stress, odour and presence of hydrocarbon sheen. Photos with a measure of scale were taken to show the actual general state of the landfills as well as features of interest. Annotated sketches/diagrams are included in the present report for each landfill (Figures 2, 3, 4, 5, 12, and 13).

For the photographic record, the printed copy of the report only includes an index of photos for each of the landfill areas. The actual photos are included in electronic format (jpg) in the Addendum CD-ROM to the report.

2.3 Soil Sampling

The soil sampling methodology conformed to guidance provided in the following Canadian Council of Ministers of the Environment (CCME) documents:

- CCME Guidance Document on the Management of Contaminated Sites in Canada, April 1997, CCME PN 1279. (CCME catalogue - http://www.ccme.ca/pdfs/cat_eng.pdf);
- 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/pdfs/cat_eng.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/pdfs/cat_eng.pdf);

- Reference method for the Determination of Petroleum Hydrocarbons in Soil – Tier I Method, 2001; and
- CCME Subsurface Assessment Handbook for Contaminated Sites, March 1994, EPC-NCSRP-48E (CCME catalogue - http://www.ccme.ca/pdfs/cat_eng.pdf).

For the 2008 monitoring event, for each soil-sampling station one surface sample (0-15 cm depth below surface) and one subsurface sample (40-50 cm depth below surface) was collected.

The soil samples consisted mainly of fine to coarse sand, with traces of gravel and silt coloured brown to beige. The soils were generally well sorted.

As specified in the ToR (reference B, the soil sampling procedures were adhered to:

- Where required, the soil samples were collected from locations between two to four meter radius of the monitoring wells;
- Blind field duplicates (10 %) were collected for Quality Assurance and Quality Control purposes;
- Duplicate samples (10 %) were also obtained and sent to a second laboratory for quality control purposes; and
- An additional ten percent of soil samples taken were sent to the owner's representative (ESG OPS CENTRE) in Kingston for archiving as specified by DCC.

The soil samples were analyzed for the requested parameters (Total Petroleum Hydrocarbons (TPH), Total metals and Polychlorinated biphenyls (PCBs)) as specified by DCC. Table 2-1 below summarizes the soil sampling at FOX-4 during the August 2008 field program.

Table 2-1: Summary of Soil Sampling at FOX-4, August 2008

Landfill Site	Soil Sampling Stations						
Helipad Landfill West	F4-17	F4-18	F4-19	F4-20	MW-1	MW-2	MW-6
Helipad Landfill East	F4-1	MW-3	MW-4	MW-5			
Barrel Dump Landfill	F4-2	F4-3	F4-4	F4-5	F4-21	F4-22	F4-24
Station Area Landfill	MW-7	MW-8	MW-9				
DCC Tier II Landfill	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	
Lower Site Landfill	MW-16						
Airstrip Landfill	F4-8	F4-9	F4-10	F4-25			
Tanner Bay Landfill	F4-11	F4-12	F4-13				

Notes:

1 Soil samples collected between 2-4 metres from monitoring wells.
2 Samples annotated as “F” were collected in the designated locations.
3 All samples collected from two depths (0-15 cm and 40-50 cm).
4 For 2008 sampling, total no. of soil samples = 70 samples (35 samples X 2 depths) + 7 QA/QC + 7 (Inter-laboratory comparison) + 7 for Owner’s Representative (ESG OPS Archives) = **91 samples (total)**

2.4 Groundwater Sampling

The soil sampling methodology conformed to guidance provided in the following Canadian Council of Ministers of the Environment (CCME) 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/pdfs/cat_eng.pdf); and
- 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/pdfs/cat_eng.pdf).

Wells were purged as specified in the TOR and measurements of *in situ* temperature, conductivity and pH were taken. Sampling took place when these parameters stabilized. The samples were not acidified and were not filtered (as directed in the ToR).

A summary of the status of the monitoring wells and the attempts made to clear obstructions are summarized in Tables 2-2 and 2-3.

Table 2-2: Summary of Groundwater Sampling at FOX-4, August 2008

Landfill Site	Monitoring Well Stations				
Helipad Landfill West	**MW-1**	**MW-2**	MW-3	MW-5	MW-6
Helipad Landfill East	MW-4				
Barrel Dump	None				
Station Area Landfill	**MW-7**	MW-8	MW-9		
DCC Tier II Landfill	**MW-10**	MW-11	**MW-12**	**MW-13**	**MW-15**
Lower Site Landfill	**MW-14**	**MW-16**			
Airstrip Landfill	None				
Tanner Bay Landfill	None				

Notes:

1 **BOLD**: Monitoring wells sampled during the August 2008 sampling event. Other wells could not be sampled due to blockage and/or dry wells.

2 Total number of groundwater samples = 9 samples + 1 QAQC (blind field duplicates) + 1 inter laboratory analysis + 1 field/trip blank = 12.

In the majority of wells, bentonite covered the top of the well pipe to varying degrees. The bentonite well-seals had expanded to partially or completely fill the in-ground cavity surrounding the well top (flush mount of “road box”). It is suspected that due to temperature fluctuations and soil conditions in this northern environment, the bentonite has expanded, risen, and then swelled to the top of the protective casing. In several cases, sampling bailers were also observed to be obstructing the monitoring wells. Partially successful attempts were made to retrieve the stuck bailers. The results of this attempted recovery action are described in Table 2-3. The attempts made by the field personnel to retrieve the stuck bailers were documented during the field program.

In the sampled wells, free phase hydrocarbon product was not observed. Monitoring Well Development and Sampling Record forms are included in sections 3, 5, and 6 of this report.

Table 2-3: Summary of Monitoring Well Conditions at FOX-4, August 2008

Monitoring Well No.	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
	Status of the Well							
Franz, 2006	Good	Good (Bailer stuck in the well and it was removed)	Bailer stuck in the well. Could not be removed. However, the well had enough water for monitoring and sampling	Bailer stuck in the well at 1.44 m. Could not remove.	Bailer obstructing well. Could not remove. However, there was enough water to monitor and sample	Bailer stuck at 0.37 m. Succeeded in clearing the bailer to 0.6 m. Clearance to at least 0.75 m is required for sampling.	Well casing filled with bentonite. Cleared bentonite. Condition now good.	Good
Franz, 2007	Good Bentonite swelled to cap - removed	Good Bentonite swelled to cap - removed	Bailer stuck in the well. Could not be removed. Attempts were made to remove obstruction for 45 mins - no water. Ice found in bottom of well	Bailer stuck in the well. Could not be removed. Attempts were made to remove obstruction for 40 mins. 4 cm of water in bottom after forcing obstruction deeper, purged and allowed to re-charge for 3 hours - no water	Bentonite swelled to cap - removed. Bailer obstructing well. Could not remove. However, there was enough water to monitor and sample	Bentonite swelled to cap - removed. Bailer at 0.6 m. Ice found in bottom of well - no water. Could not sample	Good Bentonite swelled to cap - removed.	Good
Franz, 2008	Good Bentonite swelled to cap - removed	Good Bentonite swelled to cap - removed	Bailer stuck in well. Could not be removed. Probe inserted beside bailer. Well dry.	Bailer stuck in very bottom of well. Unable to remove. Probe inserted and found sludge on bottom of well. No water – well dry	Bentonite swelled to cap – removed. Bailer obstructing well. Probe inserted beside bailer. No water – well dry.	Bentonite swelled to cap – removed. Bailer at 0.6m. Probe inserted down beside bailer. No water – well dry.	Bentonite swelled to cap – removed. No water – well dry.	Good Bentonite swelled to cap - removed

Monitoring Well No.	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16
				Status of the Well				
Franz, 2006	Bailer stuck at 0.8 m. No water on top of bailer to sample. Could not remove bailer. Not possible to sample. Top of well plugged with bentonite. Cleared bentonite	Good (Top of well plugged with bentonite; it was cleared)	Top of well plugged with bentonite, which was cleared. Bailer stuck at 0.48 m. Could not remove bailer. No water on top of bailer to sample. Not possible to sample	Top of well plugged with bentonite, which was cleared. Bailer stuck at 0.60 m. Cleared through the top of bailer up to 1.36 m and sampled	Top of well plugged with bentonite, which was cleared. Some bentonite still in the bottom. Bailer stuck at 1.315 m. Could not remove bailer. However, there was enough water to monitor and sample	Good (Top of well plugged with bentonite; it was cleared)	Top of well plugged with bentonite, which was cleared. Bailer broken and stuck in the well. Cleared through the top of bailer up to 1.83 m and sampled	Top of well plugged with bentonite, which was cleared. Ice at 0.59 m; which was broken. Bailer stuck in the well at 1.35 m. Managed to pull out the cap and string of the bailer. Could not remove the rest. However, there was enough water to monitor and sample
Franz, 2007	Bailer stuck at 0.8 m. No water on top of bailer to sample. Could not remove bailer. Not possible to sample. Top of well plugged with bentonite. Cleared bentonite	Good (Top of well plugged with bentonite; it was cleared)	Bentonite swelled to cap – removed. Bailer stuck at 0.48 m. Could not remove bailer. No water on top of bailer to sample. Not possible to sample	Top of well plugged with bentonite, which was cleared. Bailer stuck at 0.60 m. Cleared through the top of bailer up to 1.36 m and sampled	Top of well plugged with bentonite, which was cleared. Some bentonite still in the bottom. Bailer stuck at 1.315 m. Could not remove bailer. However, there was enough water to monitor and sample	Good (Top of well plugged with bentonite; it was cleared)	Top of well plugged with bentonite, which was cleared. Bailer broken and stuck in the well. Cleared through the top of bailer up to 1.83 m and sampled	Top of well plugged with bentonite, which was cleared. Ice at 0.59 m. Bailer stuck in the well at 1.35 m. Managed to pull out the cap and string of the bailer. Could not remove the rest. However, there was enough water to monitor and sample
Franz, 2008	Bailer stuck at 0.8 m. Inserted probe beside bailer. No water – well dry	Good (Top of well plugged with bentonite; it was cleared)	Bentonite swelled to cap – removed. which was cleared. Bailer stuck at 0.48 m. Could not remove bailer. No water on top of bailer to sample. Not possible to sample	Good (Top of well plugged with bentonite; it was cleared)	Good (Top of well plugged with bentonite; it was cleared)	Good Bentonite swelled to cap - removed	Good Bentonite swelled to lid - removed	Good Bentonite swelled to lid - removed

2.5 Thermal monitoring

The summary of thermistor conditions at the Lower Site landfill and DCC Tier II landfill is presented below in Table 2-4.

Table 2-4: Summary of Thermistor Conditions at FOX-4, August 2008

Data Logger	Problem encountered	Attempt Made to solve the problem	Outcome of the attempt
T-1	1. Strings 2 and 3 not working 2. Multiplexor disabled 3. Cap missing	1. Old connector cable was re-attached. 2. Changed multiplexor to on setting 3. Created temporary duct tape cap to keep out elements	1. Likely need a new connector cable (2m length) and should conduct electrical continuity testing to confirm that repair was adequate. 2. Mulitplexor now on 3. Requires new cap to be installed.
T-2	1. Casing not attached at bottom 2. Cable connector is broken (see photolog) 3. Multiplexor disabled	1. Re-attached casing using duct tape 2. Taped connector on to ensure connection 3. Changed Multiplexor to on setting	1. New housing recommended 2. Cable connector requires replacement. 3. Multiplexor now on
T-3	1. Warm-up time was at 0.035 2. Multiplexor disabled 3. Cable connector is broken (see photolog)	1. Changed to 0.210 2. Changed Multiplexor to on setting 3. Taped connector to ensure connection	1. Now at 0.210 2. Multiplexor now on 3. Cable connector requires replacement
T-4	1. Connection failed after 31/5/08, no data collected past this point. 2. Multiplexor disabled	1. Re-connected cable with tape to ensure connection is not dislodged. 2. Changed Multiplexor to on setting	1. Outcome successful. Cable attachment requires replacement 2. Multiplexor now on
T-5	1. Connection failed after 27/12/07, no data collected past this point. (faulty battery connection) 2. Multiplexor disabled	1. Re-connected cable with tape and replaced battery 2. Changed Multiplexor to on setting	1. Outcome successful 2. Multiplexor now on
T-6	1. Multiplexor disabled 2. Warm-up time 0.160 3. Cable connector damaged	1. Changed Multiplexor to on setting 2. Changed warm-up time to 0.210 3. Attached cable connector with tape to ensure connection	1. Multiplexor now on 2. Warm-up time now 0.210 3. Cable connection requires replacement

2.6 Project References

The following references are specifically relevant to the 2008 Landfill Monitoring activities:

A. *Request for Abbreviated Proposal- Consultant Services – Collection of Landfill Monitoring Data – FOX-4 Cape Hooper, DEW Line Site Nunavut Settlement Region, Qikiqtaaluk Region, DCC Project # DLCUMONFOX-4*, 21 April 2005.

B. *Terms of Reference – Consulting Services for the Collection of Landfill Monitoring Data – FOX-4 Cape Hooper, DEW Line Site Nunavut Settlement Region, Qikiqtaaluk Region,*

DCC Project # DLCUMONFOX-4, 2 May 2005.

C. Nunatta Proposal, 2005.

D. *Collection of landfill Monitoring data – Year 2005, FOX-4 Cape Hooper, DCC Project #KN28434, Nunatta Project # M103208*, Nunatta Environmental Services, January 2006

3.0 HELIPAD LANDFILLS – EAST AND WEST

3.1 Summary

The Helipad Landfills are located at the Upper Site, west of the current Short Range Radar (SRR) facilities. These landfills were built during the construction of the SRR site, prior to the clean up of the DEW Line FOX-4 site. The waste material disposed in those landfills include the building module train, garage, communication dishes and other miscellaneous waste. The east and west landfills have an approximate surface area of 1600 m^2 and 2800 m^2, respectively.

The monitoring of these landfills included visual inspection to monitor evidence of settlement or erosion, and collection of soil and groundwater samples to monitor for the presence of leachate. Groundwater monitoring well locations, as well as soil sample locations, are identified in Figure 2 FOX-4 Cape Hooper – Helipad Landfills – East and West.

Four new sampling locations were established in 2005 order to monitor existing seepage and hydrocarbons impacts noted in 2003. The new stations were identified F4-17 to F4-20.

The soil and groundwater analytical data are presented in Tables 3-6 and 3-7 respectively. Soil at all stations was sampled as specified in the Terms of Reference.

The visual inspection report, including supporting photos and drawing, is presented in the following pages.

3.2 Visual Inspection Report

3.2.1 Helipad- West Landfill

The visual inspection of the Helipad West Landfill was conducted on August 20 and 21, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material containing boulders and cobbles. The boulder and cobble material is generally angular, and the gravel and sand particles are generally well rounded. The Visual Inspection Checklist/Report has been completed as per the Terms of Reference and is included as Table 3-1 of this report.

Settlement

Indications of differential settlement were not noted.

Erosion

Three areas of active erosion were noted, these areas are designated E1-1, E1-2 and E1-3; and, are presented on Figure 2 FOX-4 Cape Hooper – Helipad Landfills – East and West. Areas E1-1 and E1-2 are located on the southwest slope of the landfill and E1-3 is located in close proximity to the northwest slope. The erosion observed in 2008 has not increased

significantly since the 2007 landfill inspection. The maximum thickness of eroded material was observed at the area designated E1-1. The observed thickness of eroded material was approximately 0.5 m at the top of the slope and decreased to 0.3 m near the bottom of the slope. The erosion at E1-3 is an active erosion process that was observed within close proximity of the landfill and E1-3 was documented as a conservative measure. Photos 1G8, 1H8, and 1I8 record the erosion at E1-1, photos 1E8 and 1F8 record the erosion at E1-2 and photos 1A8 and 1B8 provide a record of the observed erosion at E1-3.

Frost Action

No frost action was observed at the surface (0-15 cm depth) or subsurface (40-50 cm depth) near the wells MW-1 to MW-6 of this area (see Figure 2 FOX-4 Cape Hooper – Helipad Landfills – East and West). It was noted that the soil present was generally low in silt and clay fractions. It is generally considered that materials less than 7% silt or clay are not frost susceptible. Based on a visual assessment of the soil type the capping material does not appear to have more than 7% silt or clay and therefore should not be susceptible to frost action.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed.

Re-establishment of Vegetation

Based on the regional setting of this landfill reestablishment of vegetation is not likely.

Staining

The labeling from 2007 to 2008 was kept consistent for comparison purposes. Area staining observed in 2008 remained unchanged from the 2007 monitoring event. The stained areas, designated ST1-1 to ST1-4 and ST1-8 to ST1-10, are presented in Figure 2 FOX-4 Cape Hooper – Helipad Landfills – East and West. ST1-5 through ST1-8 is no longer present due to the amalgamation of staining areas within the past three years. The staining appears reddish and is sometimes associated with a noticeable iridescent sheen, in addition there may be areas of dark grey and black staining. While difficult to quantify, the discoloration appeared to be slightly more than what was observed in 2007 and the associated seepage flows appeared to be equal.

Seepage Points

Seepage is occurring on the west side of the landfill in three areas. One approximately 25 m SE of MW-2, one at MW-1, and one at soil sample locations F4-18. Pooling was limited (occurring only in a small area defined as ST1-8/9 on Figure 2) during the 2008 site visit and most seepage is expected to occur during the spring melt. The actual seepage flows appeared to be equal with what was observed in 2007.

Debris

Exposed debris was not observed.

Discussion

Based on the active erosion observed at E1-1 and E1-2, the performance of the landfill with respect to containment was rated as marginal. The visual inspection report, including supporting photos and drawing, is presented in the following pages. With respect to the Helipad West Landfill the area of staining and erosion has remained consistent with the previous 2007 visual inspection. It was noted that surface runoff or overland drainage is directed overtop of the landfill and either continues flowing over the capping material or infiltrates the landfill. The surface water run off is causing erosion along the southwest and northwest slopes. The infiltrated water may be a contributor to the increase in seepage and staining evident on the southwest and northwest perimeter of the landfill. No frost action was observed at the surface (0-15 cm depth) or subsurface (40-50 cm depth) near the wells MW-1 to MW-6 of this area (see Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West).

3.2.2 Helipad- East Landfill

The visual inspection of the Helipad East Landfill was conducted on August 20 and 21, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material containing boulders and cobbles. The boulder and cobble material is generally angular, and the gravel and sand particles are generally well rounded. The Visual Inspection Checklist/Report has been completed as per the Terms of Reference and is included as Table 3-2 of this report.

Settlement

Indications of consolidation or differential settlement were not observed.

Erosion

An area of active erosion is occurring on the slope just above the landfill and material is being deposited on top of the landfill. This is marked as E2-1 on Figure 2 FOX-4 Cape Hooper – Helipad Landfills – East and West and shown by photographs 2C8, 2D8, HP-P7, and HP-P8.

Frost Action

No frost action was observed at the surface (0-15 cm depth) or subsurface (40-50 cm depth) near the wells MW-1 to MW-6 of this area (see Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West). The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted

Re-establishment of Vegetation

Based on the regional setting of this landfill re-establishment of vegetation is not likely.

Staining

The stained areas, designated ST2-1, ST2-2 and ST2-3 are presented on Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West. The areas of staining remained consistent with that observed in 2007. The photos documenting ST2-1 are 2C8, 2D8, and HP-P8 for ST2-2 the associated photos are 2E8, and 2F8; and for ST2-3 photos 2A8, and 2B8.

Seepage Points

The seepage areas are coincident with the areas of staining ST2-1, ST2-2 and ST2-3 and are presented in Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West. No new seepage points were observed during the 2008 inspection.

Debris

Exposed debris was not observed.

Discussion

Other than the appearance of the three areas of staining and seepage at the landfill, there appeared to be no active process that is reducing cover or containment of the material present in the landfill. The performance of the landfill containment was rated as acceptable.

Table 3-1: Visual Inspection Checklist – Inspection Report – Helipad West Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **HELIPAD WEST LANDFILL**
LANDFILL DESIGNATION: Landfill, Upper Site, West of SRR
DATE OF INSPECTION: August 20 and 21, 2008
DATE OF PREVIOUS INSPECTION: Aug 23, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	YES	The south west portion of the landfill. For locations, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	40 m	16 m		23 %	Based on anecdotal observations general settlement appears to have occurred along the south west portion of the landfill. This is consistent with consolidation of the landfill material. Indicators of differential settlement were not noted. No discernible difference from the 2007 observations		Consolidation settlement was observed over large portions of the landfill; it is generally not practicable to use hand-held photographs to document consolidation settlement.
Erosion	YES	Erosion appears to be active along the south west and north west slopes. For locations, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West. E1-1 E1-2 E1-3	 15 m 15 m 12 m	 5 m 3 m 8 m	 0.4 to 0.5 m 0.2 m 0.2 m	 3% 2% 3%	Surface run off is directed from behind the landfill across the capping layer to southwest slopes of the landfill.	Photographs: 1A8, 1B8, 1C8, 1D8, 1E8, 1F8, 1G8, 1H8, 1I8 and HP-P1. For locations and directions of photographs, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	
Frost Action	NO	Frost action was not noted. The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.							
Sloughing and Cracking	NO								
Animal Burrows	NO								
Vegetation	NO	No vegetation was observed at the upper site. It was noted that the lack of vegetation is consistent with the natural setting.							
Staining	YES	ST1-1A ST1-1B/3/4 ST1-2 ST1-8/9 ST1-10 For locations, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	50 m 84 m 24 m 60 m 12m	3 m 3.5 m 4m 10 m 3 m	5% 11% 4% 2% 1%		Staining from seepage was noted. However the staining was color was appeared darker than observed in 2007. Presumably due to a warmer and wetter than average summer season in comparison to 2007.	Photographs: 1J8, 1K8, 1L8, 1M8, 1N8, 1O8, 1P8, 1Q8, 1R8, 1S8, 1T8, 1U8, 1V8, HP-P3, HP-P4, and HP-P6. For locations and directions of photographs, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	
Vegetation Stress	NO	No vegetation was observed at the upper site.							
Seepage Points	YES	Seepage points coincide with staining locations.	See staining observations.	See staining observations.			Where there was staining there was an associated seepage point. The flows appeared to be equal to that observed in 2007	See staining observations.	
Debris Exposed	NO								
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.						Refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West and associated photographic log.	
Features of Note.	YES	South West Slope					The south western slope appears to have been constructed by end dumping and pushing material over the edge the slope therefore the material is at its angle of repose, making the material more susceptible to erosion.		

Table 3-2: Visual Inspection Checklist – Inspection Report – Helipad East Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST

INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **HELIPAD EAST LANDFILL**
LANDFILL DESIGNATION: Landfill, Upper Site, East of SRR
DATE OF INSPECTION: August 20 and 21, 2008
DATE OF PREVIOUS INSPECTION: August 23, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	NO								
Erosion	YES	Erosion appears to be active on the slope located southwest and upgradient of the landfill with deposition of the material occurring on the top of the landfill. E2-1	5 m	5 m	0.3 to 0.4 m	2%		Photographs: HP-P7 and HP-P8. For locations and directions of photographs, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	
Frost Action	NO	Frost action was not noted. The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.							
Sloughing and Cracking	NO								
Animal Burrows	NO								
Vegetation	NO	No vegetation was observed at the upper site. It was noted that the lack of vegetation is consistent with the natural setting.							
Staining	YES	ST2-1 ST2-2 ST2-3 For locations, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	1 m 1 m 3 m	0.5 m 0.5 m 1 m		1% 1% 3%	Staining noted during the 2008 monitoring event remained unchanged from previous monitoring events.	Photographs: 2A8, 2B8, 2C8, 2D8, 2E8, 2F8, HP-P7 and HP-P8. For locations and directions of photographs, refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.	
Vegetation Stress	NO	No vegetation was observed at the upper site.							
Seepage Points	YES	Seepage points coincide with staining locations. Seepage appeared to equal to the rate observed in 2007.	See staining observations.	See staining observations.			Where there was staining there was an associated seepage point.	See staining observations	
Debris Exposed	NO								
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.						Refer to Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West and associated photographic log.	
Features of Note.	NO								

3.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for Helipad Landfills West and East have been completed as per the Terms of Reference and are included as Tables 3-3 and 3-4 respectively of this report.

Table 3-3: Preliminary Stability Assessment – Helipad West Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	None (No Differential Settlement)
Erosion	Marginal	Occasional
Frost Action	Not Observed	None
Staining	Acceptable	Numerous
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Numerous
Debris Exposure	Not Observed	
Overall Landfill Performance	**Marginal**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

Table 3-4: Preliminary Stability Assessment – Helipad East Landfill

Feature	Severity Rating	Extent
Settlement	Not Observed	None
Erosion	Acceptable	Occasional
Frost Action	Not Observed	None
Staining	Acceptable	Occasional
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Occasional
Debris Exposure	Not Observed	None
Overall Landfill Performance	**Acceptable**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

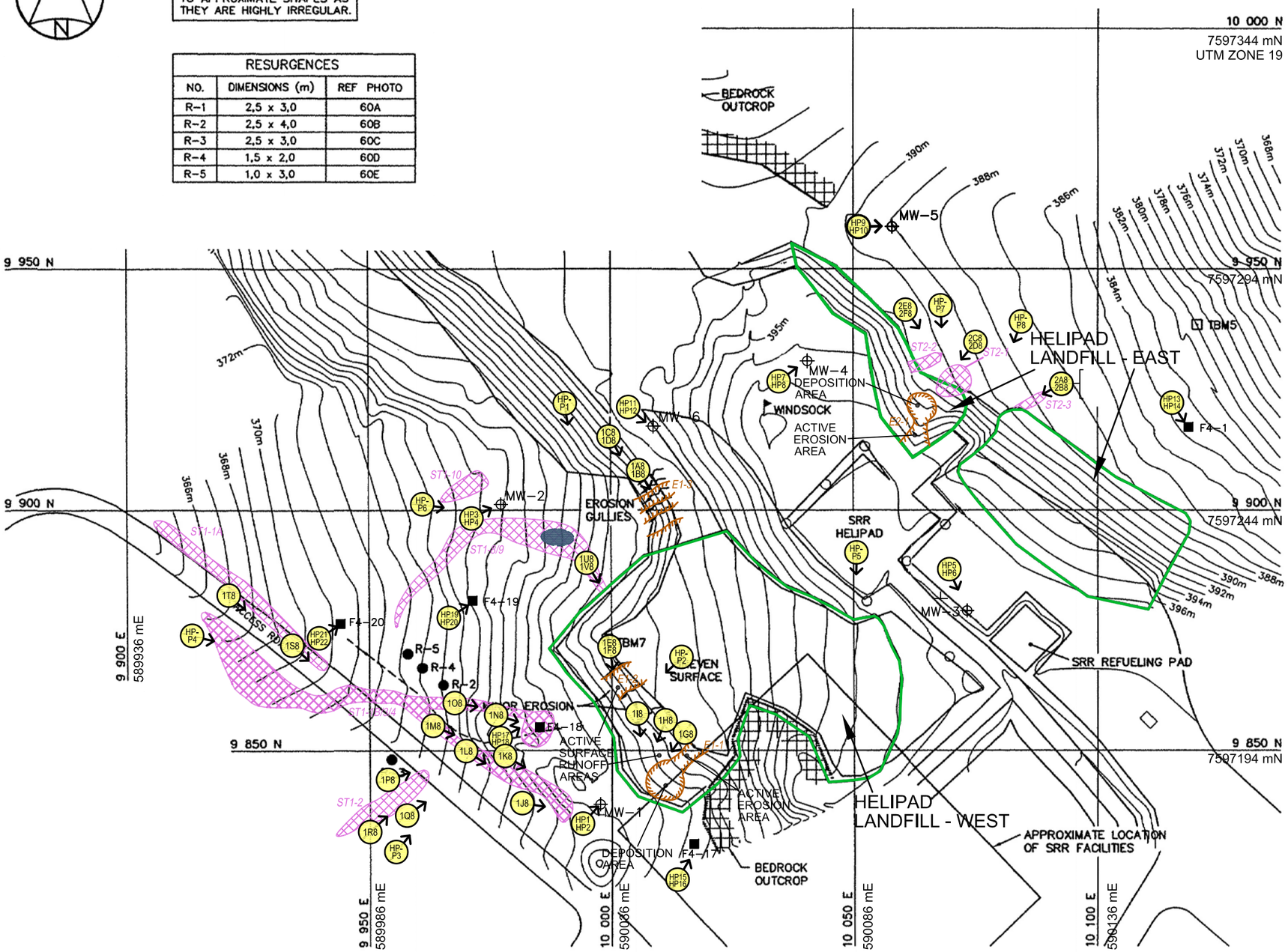
Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

3.4 Location Plan

The Location Plan for Helipad Landfills West and East has been completed as per the Terms of Reference and are included in the following page as Figure 2 FOX-4 Cape Hooper – Helipad landfills – East and West.

NOTE:
THE RESURGENCES ARE DRAWN TO APPROXIMATE SHAPES AS THEY ARE HIGHLY IRREGULAR.

RESURGENCES		
NO.	DIMENSIONS (m)	REF PHOTO
R-1	2,5 x 3,0	60A
R-2	2,5 x 4,0	60B
R-3	2,5 x 3,0	60C
R-4	1,5 x 2,0	60D
R-5	1,0 x 3,0	60E



LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- CM1 SURVEY CONTROL MONUMENT
- TBM5 TEMPORARY BENCHMARK
- MONITORING WELL LOCATION
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2008 OBSERVATIONS:

- STAINS
- DEBRIS
- EROSION
- POOLING
- SINKHOLE
- PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
5	9 938.442	10 120.491	388.170	CROSS CUT IN ROCK
7	9 873.107	9 999.103	388.170	NAIL

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	397.575	FOX-4 BASELINE STA. 0+00

MONITORING WELLS		
NO.	COORDINATES	
	NORTHING	EASTING
MW-1	9 839.1	9 997.6
MW-2	9 901.6	9 977.5
MW-3	9 878..9	10 074.0
MW-4	9 930.8	10 040.0
MW-5	9 958.9	10 058.0
MW-6	9 917.3	10 008.5

Title: FOX-4 CAPE HOOPER - HELIPAD LANDFILLS - EAST AND WEST

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:935

25 20 15 9 3 0 25 metres

FIGURE 2

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

3.5 Photographic Records

The Photographic Record for Helipad Landfills West and East has been completed as per the Terms of Reference and are included in the following page as Table 3-5. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Figure 3-5 Photographic Record - Helipad East and West

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
1A8	1A8.jpg 21/08/2008	Slope erosion observed at 590049E/7597244N. Close up view, camera facing the erosion E1-3.		Figure 2
1B8	1B8.jpg 21/08/2008	Slope erosion observed at 590049E/7597244N. Close up view, camera facing the erosion E1-3.		Figure 2
1C8	1C7.jpg 21/08/2008	Slope erosion (E1-3) observed at 590049E/7597244N. Wide angle view, facing South-East.		Figure 2
1D8	1D7.jpg 21/08/2008	Slope erosion (E1-3) observed at 590049E/7597244N. Wide angle view, facing South-East.		Figure 2
1E8	1E8.jpg 21/08/2008	Slope erosion observed at 590040E/7597213N. Camera facing the erosion E1-2.		Figure 2
1F8	1F8.jpg 21/08/2008	Slope erosion (E1-2) observed at 590040E/7597213N. Close view, facing South.		Figure 2
1G8	1G7.jpg 21/08/2008	Slope erosion (E1-1) observed at 590049E/7597198N. Wide angle view, facing South-East.		Figure 2
1H8	1H7.jpg 21/08/2008	Slope erosion (E1-1) observed at 590049E/7597198N. Top of slope erosion is inferred based on comparison to potentially undisturbed slope. Camera facing South-West.		Figure 2

Figure 3-5 Photographic Record - Helipad East and West

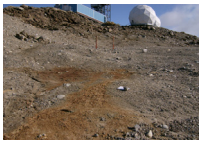
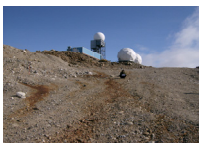
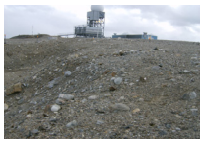
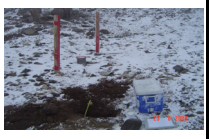
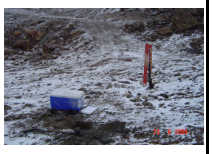
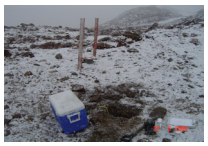
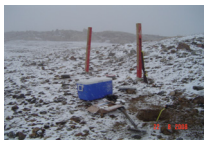
1I8	1I8.jpg 21/08/2008	Slope erosion (E1-1) observed at 590049E/7597198N. Camera facing South.		Figure 2
1J8	1J8.jpg 21/08/2008	Reddish soil staining and seepage observed at 590026E/7597188N, nearby well MW 1.		Figure 2
1K8	1K8.jpg 21/08/2008	Wide angle view of soil staining and seepage observed starting upgradient at 590026E/7597188N. Camera facing South-East.		Figure 2
1L8	1L8.jpg 21/08/2008	Reddish soil staining from seepage observed at 590001E/7597194N. White card is 20cm by 28cm. Camera facing South-East.		Figure 2
1M8	1M8.jpg 21/08/2008	Wide angle view of soil staining and seepage observed starting upgradient at 590001E/7597194N. Camera facing South-East.		Figure 2
1N8	1N8.jpg 21/08/2008	Close up view of seepage emerging from slope at 589996E/7597202N. Camera facing East.		Figure 2
1O8	1O8.jpg 21/08/2008	Reddish soil staining from seepage emerging at 589996E/7597202N. White card is 20cm by 28cm. Camera facing East.		Figure 2
1P8	1P8.jpg 21/08/2008	Close up view of seepage observed at 589995E/7597191N. Camera is facing North-East.		Figure 2
1Q8	1Q8.jpg 21/08/2008	Soil staining and seepage observed at 589995E/7597191N. White card is 20cm by 28cm.		Figure 2

Figure 3-5 Photographic Record - Helipad East and West

1R8	1R8.jpg 21/08/2008	Wide angle view of soil staining and seepage observed starting upgradient at 589995E/7597191N. Camera facing North-East.		Figure 2
1S8	1S7.jpg 21/08/2008	Close up view of seepage observed at 589976E/7597212N. Camera is facing South-East.		Figure 2
1T8	1T7.jpg 21/08/2008	Reddish soil staining and seepage observed at 589976E/7597212N. White card is 20cm by 28cm. Camera facing South-East.		Figure 2
1U8	1U7.jpg 21/08/2008	Wide angle view of reddish soil staining and seepage observed starting upgradient at 589976E/7597212N. Camera facing South-East.		Figure 2
1V8	1V8.jpg 21/08/2008	Close up view of seepage emerging from slope at 590015E/7597240N. Camera facing South-East.		Figure 2
2A8	2A8.jpg 20/08/2008	Close up view of seepage emerging from slope at 590120E/7597266N.		Figure 2
2B8	2B8.jpg 20/08/2008	Reddish soil staining and seepage observed at 590120E/7597266N. White card is 20cm by 28cm. Camera facing West.		Figure 2
2C8	2C8.jpg 20/08/2008	Wide angle view of area where seepage was observed in 2007 at 590120E/7597266N. Camera facing West.		Figure 2
2D8	2D8.jpg 20/08/2008	Close up view of area where seepage was observed in 2007 at 590107E/7597273N. Camera facing West.		Figure 2

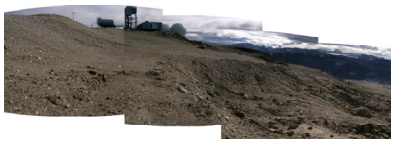
Figure 3-5 Photographic Record - Helipad East and West

2E8	2E8.jpg 20/08/2008	Wide angle view of slope erosion and areas of soil staining observed in 2007 at 590107E/7597273N. Camera facing West.		Figure 2
2F8	2F8.jpg 20/08/2008	Reddish soil staining observed at 590102E/7597276N. Camera facing South-West.		Figure 2
HP1	HP1.jpg 22/08/2008	Soil sampling at MW1, facing north.		Figure 2
HP2	HP2.jpg 22/08/2008	MW1, showing test pit to 50 cm.		Figure 2
HP3	HP3.jpg 23/08/2008	Soil sampling at MW2, facing northeast.		Figure 2
HP4	HP4.jpg 22/08/2008	MW2, showing test pit to 50 cm.		Figure 2
HP5	HP5.jpg 22/08/2008	Soil sampling at MW3, facing southeast.		Figure 2
HP6	HP6.jpg 22/08/2008	MW3, showing test pit to 50 cm.		Figure 2
HP7	HP7.jpg 22/08/2008	Soil sampling at MW4, facing northeast.		Figure 2

HP8	HP8.jpg 22/08/2008	MW4, showing test pit to 50 cm		Figure 2
HP9	HP9.jpg 22/08/2008	Soil sampling at MW5, facing east.		Figure 2
HP10	HP10.jpg 22/08/2008	MW5, showing test pit to 50 cm.		Figure 2
HP11	HP11.jpg 22/08/2008	Soil sampling at MW6, facing southeast.		Figure 2
HP12	HP12.jpg 22/08/2008	MW6, showing test pit to 50 cm.		Figure 2
HP13	HP13.jpg 22/08/2008	Soil sampling at station F4-1, facing southeast.		Figure 2
HP14	HP14.jpg 22/08/2008	F4-1, showing test pit to 50 cm.		Figure 2
HP15	HP15.jpg 22/08/2008	Soil sampling at station F4-17, facing northeast.		Figure 2
HP16	HP16.jpg 22/08/2008	F4-17, showing test pit to 50 cm.		Figure 2

HP17	HP17.jpg 22/08/2008	Soil sampling at station F4-18, facing northeast.		Figure 2
HP18	HP18.jpg 22/08/2008	F4-18, showing test pit to 50 cm.		Figure 2
HP19	HP19.jpg 22/08/2008	Soil sampling at station F4-19, facing northeast.		Figure 2
HP20	HP20.jpg 22/08/2008	F4-19, showing test pit to 50 cm.		Figure 2
HP21	HP21.jpg 22/08/2008	Soil sampling at station F4-20, facing northeast.		Figure 2
HP22	HP22.jpg 22/08/2008	F4-20, showing test pit to 50 cm.		Figure 2

Figure 3-5 Photographic Record - Helipad East and West

Photo	Electronic File Name/ Date	Thumbnail	Photo Description	Reference Figure Number
HP-P1	HP-P1.jpg 20/08/2008		Panorama showing erosional feature E1-3, facing southwest	Figure 2
HP-P2	HP-P2.jpg 21/08/2008		Panorama showing erosional feature E1-2, facing southwest	Figure 2
HP-P3	HP-P3.jpg		Showing staining ST1/2/3, facing northeast	Figure 2
HP-P4	HP-P4.jpg 21/08/2008		Showing staining ST1/2/3, facing southeast	Figure 2
HP-P5	HP-P5.jpg 21/08/2008		Panorama showing top of helipad, facing southwest	Figure 2
HP-P6	HP-P6.jpg 21/08/2008		Panorama showing ST-8/9/10, facing west	Figure 2
HP-P7	HP-P7.jpg 20/08/2008		Panorama showing erosional features and staining E2-1, ST2-2, ST2-1. Facing southeast.	Figure 2
HP-P8	HP-P8.jpg 20/08/2008		Panorama showing erosional features and staining E2-1, ST2-2, ST2-1. Facing south.	Figure 2

3.6 Thermal Monitoring Data

Not applicable to this landfill area.

3.7 Soil Sample Analytical Data

The surface (0-15cm) soil sample collected near MW-5 (downgradient) contains concentrations of Copper (Cu) (56 mg/kg) that are higher in comparison to the other soil samples. These samples ranged from 9 to 43 mg/kg. Concentrations of Nickel (Ni) are in the elevated range for soil samples collected near MW-2 and MW-5 for both shallow and deep soil samples and ranged in concentration from 25 to 37 mg/kg. Concentrations of Chromium (Cr) are generally low (from 18 to 31 mg/kg) for half the soil samples and ranged from 46 to 50 mg/kg at stations MW-3 (shallow), MW-5 (deep and shallow), and MW-2 (deep and shallow). Higher concentrations of arsenic in comparison to the other soil samples were found at MW-3 0-15 cm (49 mg/kg) and F4-1 40-50 cm (39 mg/kg). The concentrations of Mercury (Hg) are below detection limit in all soil samples. The concentrations of the other metals are either low or below the detection limit in soil samples collected from the Helipad East and West landfills.

The chemical analyses for the soil samples from downgradient locations at Helipad Landfill East and West (MW-5, F4-1, MW-1, MW-2, F4-18, F4-19, and F4-20) show fairly high TPH concentrations, more specifically for the F2 fraction (>1000 to 12200 mg/kg). The TPH concentrations in the subsurface soil samples are observed to be generally higher than the surface soil. Concentrations of TPH in soil samples collected from MW-3, MW-4, MW-6 and F4-17 are either relatively low or below detection limit. These findings are consistent with the 2007 findings.

PCB concentrations are below the detection limit in all soil samples with the exception of the F4-1 (0.12 mg/kg – 0-15 cm).

The soil sample analytical data is included on the following page as Table 3-6.

Table 3-6: Summary of 2008 Soil Analytical Data - Helipad Landfills East and West

Sample #	Location	Depth	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	TPH C_6-C_{34} [mg/kg]
	Sampling		*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
HELIPAD LANDFILL - EAST UPGRADIENT																
MW-3(Soil)0-15cm	MW-3	0-15	21	19	6	<0.5	7	23	48	49	<0.1	<0.05	<10	<10	18	18
MW-3(Soil)40-50cm	MW-3	40-50	17	14	<5	<0.5	7	<20	25	17	<0.1	<0.05	<10	<10	<10	<10
MW-4(Soil)0-15cm	MW-4	0-15	9	8	<5	<0.5	3	<20	20	5	<0.1	<0.05	<10	<10	<10	<10
MW-4(Soil)40-50cm	MW-4	40-50	9	8	<5	<0.5	3	<20	18	4	<0.1	<0.05	<10	<10	<10	<10
HELIPAD LANDFILL - EAST DOWNGRADIENT																
MW-5 (Soil) 0-15cm	MW-5	0-15	56	25	7	<0.5	17	58	50	23	<0.1	0.07	<10	258	669	927
MW-5 (soil) 40-50cm	MW-5	40-50	43	37	10	<0.5	10	40	47	19	<0.1	<0.05	<10	51	156	207
F4-1 (Soil) 0-15cm	F4-1	0-15	14	10	<5	<0.5	18	<20	21	10	<0.1	0.12	103	1840	632	2575
F4-1 (Soil) 40-50cm	F4-1	40-50	15	12	<5	<0.5	8	<20	23	39	<0.1	<0.05	306	12200	1950	14456
HELIPAD LANDFILL - WEST DOWNGRADIENT																
MW-1(Soil)0-15cm	MW-1	0-15	20	16	5	<0.5	20	<20	31	16	<0.1	<0.05	<10	138	85	223
MW-1(Soil) 40-50cm	MW-1	40-50	13	13	<5	<0.5	6	<20	22	14	<0.1	<0.05	<10	1800	142	1942
MW-2(Soil)0-15cm	MW-2	0-15	31	31	10	<0.5	9	33	46	18	<0.1	<0.05	16	862	305	1183
MW-2(Soil)40-50cm	MW-2	40-50	34	35	10	<0.5	10	33	49	12	<0.1	<0.05	62	6800	764	7626
F4-17(Soil) 0-15cm	F4-17	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	11	44	55
F4-17(Soil) 40-45cm	F4-17	40-45	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	420	115	535
F4-18(Soil) 0-15cm	F4-18	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	25	63	88
F4-18(Soil) 40-50cm	F4-18	40-50	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	416	614	1030
F4-19(Soil)0-15cm	F4-19	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	6820	645	7465
F4- 19(Soil)40-45cm	F4-19	40-45	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	40	7320	340	7700
F4-20(Soil) 0-15cm	F4-20	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	74	71	145
F4-20(Soil) 40-50cm	F4-20	30-40	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	995	97	1092
HELIPAD LANDFILL - WEST UPGRADIENT																
MW-6(Soil)0-15 cm	MW-6	0-15	24	14	<5	<0.5	43	<20	30	11	<0.1	<0.05	<10	99	345	444
MW-6(Soil)40-50cm	MW-6	40-50	23	19	5	<0.5	8	<20	37	13	<0.1	<0.05	<10	48	335	383

Notes

NV = No Value

ND = Non Detectable

3.8 Groundwater Sample Analytical Data

Groundwater was only collected in MW-1 and MW-2 for the 2008 groundwater monitoring event. Results show that metals concentrations in both wells are below detection limits for all parameters with the exception of Zinc (Zn) in MW-2, which was only 0.001 mg/L above the detection limit.

The concentrations of PCBs are below detection limit in all the groundwater samples analyzed.

The TPH concentrations were non-detectable in the groundwater samples collected at MW-1 and MW-2 had a concentrations of 0.869 mg/L.

The groundwater sample analytical data is included on the following page as Table 3-7.

Table 3-7: Summary of 2008 Groundwater Analytical - Helipad Lanfills East and West

Sample #	Location	Groundwater Elevation (masl)	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	TPH C_6-C_{34} [mg/L]
	Sampling Date		Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08	Aug-08
HELIPAD LANDFILL - EAST UPGRADIENT																
MW-3	MW-3	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
MW-4	MW-4	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
HELIPAD LANDFILL - EAST DOWNGRADIENT																
MW-5	MW-5	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
HELIPAD LANDFILL - WEST DOWNGRADIENT																
MW-1	MW-1	-	<0.005	NV	NV	<0.001	<0.001	<0.02	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.2
MW-2	MW-2	-	<0.005	NV	NV	<0.001	<0.001	0.0214	<0.05	<0.01	<0.0001	<0.00005	0.664	0.205	<0.1	0.869
HELIPAD LANDFILL - WEST UPGRADIENT																
MW-6	MW-6	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV

Notes

NV = No Value

ND = Non - Detectable

3.9 Monitoring Well Sampling Logs

The groundwater monitoring well sampling logs are included in the following pages as Tables 3-8 to 3-13.

Table 3-8: Monitoring Well Sampling Log MW 1 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-1		
Well Sampling Event:	2008	Sample Number:	MW-1
Condition of Well:	Good	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	8		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	96		
Static water level (cm):	96	from ground surface	88
Depth to bottom (cm):	165	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.8		
Conductivity (mS/cm) :	195		
Temperature (^{O}C):	0.1		
Depth of water (cm):	69		
Well volume of water (mL):	1400		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 3-9: Monitoring Well Sampling Log MW 2 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-2		
Well Sampling Event:	2008	Sample Number:	MW-2
Condition of Well:	Good	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	6		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	127.5		
Static water level (cm):	127.5	from ground surface	121.5
Depth to bottom (cm):	190	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.8		
Conductivity (mS/cm) :	429		
Temperature (^{O}C):	0.04		
Depth of water (cm):	62.5		
Well volume of water (mL):	1200		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 3-10: Monitoring Well Sampling Log MW 3 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-3		
Well Sampling Event:	2008	Sample Number:	MW-3
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	6		
Diameter of well (cm):	5		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	#VALUE!
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	NA		
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Note:

* The well height above ground is higher than that provided in the TOR. This is due to the reason that the well casing was possibly lifted up to remove bentonite and make room for the casing by the field personnel during the previous monitoring in 2005.

Table 3-11: Monitoring Well Sampling Log MW 4 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill East		
Monitoring Well ID:	MW-4		
Well Sampling Event:	2008	Sample Number:	MW-4
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	NA
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-		
Diameter of well (cm):	-		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing, sludge in bottom
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		

Table 3-12: Monitoring Well Sampling Log MW 5 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill East		
Monitoring Well ID:	MW-5		
Well Sampling Event:	2008	Sample Number:	MW-5
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-		
Diameter of well (cm):	-		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing, sludge in bottom
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		

Table 3-13: Monitoring Well Sampling Log MW 6 - Helipad Landfills East and West

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-6		
Well Sampling Event:	2008	Sample Number:	MW-6
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-		
Diameter of well (cm):	-		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing, sludge in bottom
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		

Note:

* The well height above ground is higher than that provided in the TOR. This is due to the reason that the well casing was possibly lifted up to remove bentonite and make room for the casing by the field personnel during the previous monitoring in 2005.

4.0 BARREL DUMP LANDFILL

4.1 Summary

The Barrel Dump Landfill is a small landfill located at the Upper Site, northwest of SRR facilities and Helipad Landfills East and West. It covers an area of approximately 200 m^2.

The monitoring of the Barrel Dump Landfill included visual inspection to monitor evidence of settlement or erosion, and collection of soil samples to monitor for the presence of leachate. Surface and subsurface samples were analyzed for all parameters (total metals, PCBs and TPH) or TPH only as specified by DCC. Soil sample locations are identified in Figure 3 FOX-4 Cape Hooper – Barrel Dump Landfill. There are no monitoring wells in this area.

The soil analytical data is presented in Tables 4-4. Due to unsafe slope and weather (snow and wind) conditions soil sample location F4-23 was not sampled in the 2008 monitoring round. Soil at all other stations was sampled as specified in the Terms of Reference.

The visual inspection report, including supporting photos and drawing, is presented in the following pages.

4.2 Visual Inspection Report

The visual inspection of the Barrel Dump landfill was conducted on August 22, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material containing boulders and cobbles. The boulder and cobble material is generally angular, and the gravel and sand particles are generally well rounded.

Settlement

Indications of consolidation or differential settlement were not observed.

Erosion

Erosion along the slope of the west edge of the landfill appears to be active. The material present at the surface of the west slope is intermixed colluvium and gravel. The slope may be more susceptible to erosion as these materials appear to be at their maximum angle of repose. The erosion has exposed debris along the west slope. Erosion appears unchanged from previous monitoring events.

Frost Action

No frost action was observed in the surface or subsurface soil at the Barrel Dump Landfill during the 2008 sampling program.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed.

Re-establishment of Vegetation

Based on the regional setting of this landfill, re-establishment of vegetation is not likely.

Staining

The stained areas, designated ST3-1 and ST3-2 are presented in Figure 3 FOX-4 Cape Hooper – Barrel Dump Landfill. There is staining occurring at the top of the landfill, ST3-1 and on the west slope of the landfill (ST3-2). The staining is associated with seepage and minor ponding of water. Staining appears darker and more evident than was observed in 2007.

Seepage Points

Ponding of water is occurring at the top of the landfill and seepage from the landfill is occurring on the west slope. The seepage and ponding coincide with the observed staining.

Debris

Metal debris is visible on the top of the landfill and on the west slope of the landfill. Exposed debris includes scrap metal and remains from crushed barrels/drums. No new exposed debris was observed that has not been recorded by previous monitoring events.

Discussion

The west slope of the landfill appears to be at its maximum angle of repose and erosion of these materials appears to be occurring. Debris is visible on the west slope and at the top of the landfill. Re-contouring or retaining the slope is one method that can be used to help reduce erosion and debris exposure. Based on the erosion of the west slope and the fact that the west slope is at its maximum angle of repose, the performance of the landfill with respect to containment was rated as marginal. The visual inspection report, including supporting photos and drawing, is presented on the following pages.

Table 4-1: Visual Inspection Checklist – Inspection Report – Barrel Dump Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **BARREL DUMP LANDFILL**
LANDFILL DESIGNATION: Landfill, Upper Site, North of SRR
DATE OF INSPECTION: August 23, 2008
DATE OF PREVIOUS INSPECTION: August 23, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	NO								
Erosion	YES	Erosion appears to be active on the slope located west side of the landfill. E3-1 For locations, refer to Figure 3 FOX-4 Cape Hooper-Barrel Dump.	15 m	15 m	0.2 m		The slope is likely at the maximum angle of repose for a colluvium like material present on the slope.	Photograph: 3G8, 3H8. For location and direction of photograph refer to Figure 3 Fox -4 Cape Hooper-Barrel Dump.	Much of erosion is outside the boundaries of the landfill, but the erosion directly impacts the integrity of the landfill as this down-gradient debris acts to counter weight and support the landfill slope.
Frost Action	NO	Frost action was not noted. The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.							
Sloughing and Cracking									
Animal Burrows	NO								
Vegetation	NO	No vegetation was observed at the upper site. It was noted that the lack of vegetation is consistent with the natural setting.							
Staining	YES	ST3-1 ST3-2 For locations, refer to Figure 3 FOX-4 Cape Hooper-Barrel Dump.	5 m 10 m	4 m 0.5 m		20% 30%	Staining was noted to be more visible than observed in 2007, but covering the same area.	Photographs:3A8, 3B8, 3E8, 3F8 For locations and directions of photograph refer to Figure 3 Fox -4 Cape Hooper-Barrel Dump.	
Vegetation Stress	NO	No vegetation was observed at the upper site.							
Seepage Points	YES	Seepage points coincide with staining locations.					Where there was staining there was an associated seepage point.	Photographs: 3A8, 3B8, 3C8 For locations and directions of photograph refer to Figure 3 Fox -4 Cape Hooper-Barrel Dump.	
Debris Exposed	YES	Metal debris is visible at the top of the landfill and on the west slope of the landfill						Photographs: 3A8, 3C8, 3D8, 3E8, 3F8 For locations and directions of photograph refer to Figure 3 Fox -4 Cape Hooper-Barrel Dump Landfill.	
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 3 FOX-4 Cape Hooper-Barrel Dump						For locations and directions of photograph refer to Figure 3 Fox -4 Cape Hooper-Barrel Dump.	
Features of Note.	NO								

4.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for the Barrel Dump Landfill has been completed as per the Terms of Reference and is included as Table 4-2 of this report.

Table 4-2: Preliminary Stability Assessment – Barrel Dump Landfill

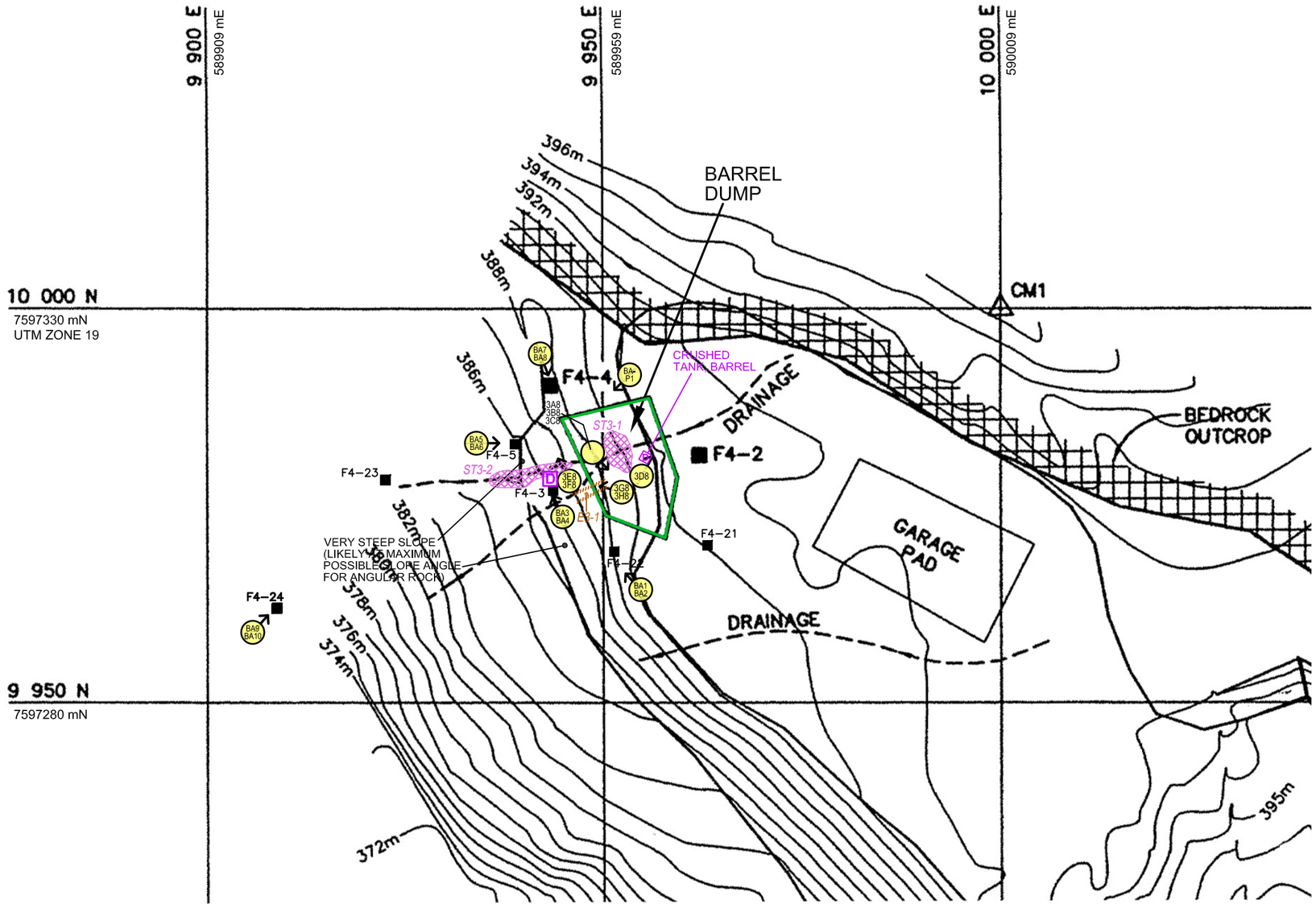
Feature	Severity Rating	Extent
Settlement	Not Observed	None
Erosion	Acceptable	Occasional
Frost Action	Not Observed	None
Staining	Acceptable	Occasional
Vegetation Stress	Acceptable	Occasional
Seepage / Ponded Water	Acceptable	Occasional
Debris Exposure	Marginal	Numerous
Overall Landfill Performance	**Marginal**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

4.4 Location Plan

The Location Plan for the Barrel Dump Landfill has been completed as per the Terms of Reference and is included on the following page as Figure 3 FOX-4 Cape Hooper – Barrel Dump Landfill.



LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- CM1 SURVEY CONTROL MONUMENT
- TBM5 TEMPORARY BENCHMARK
- MONITORING WELL LOCATION
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2008 OBSERVATIONS:

- ST3-1 STAINS
- D DEBRIS
- E3-1 EROSION
- POOLING
- SINKHOLE
- 3A7 3B7 PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
5	9 938.442	10 120.491	388:170	CROSS CUT IN ROCK
7	9 873.107	9 999.103	388.170	NAIL

SURVEY CONTROL MONUMENTS

NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	397.575	FOX-4 BASELINE STA. 0+00

MONITORING WELLS

NO.	COORDINATES	
	NORTHING	EASTING
MW-1	9 839.1	9 997.6
MW-2	9 901.6	9 977.5
MW-3	9 878..9	10 074.0
MW-4	9 930.8	10 040.0
MW-5	9 958.9	10 058.0
MW-6	9 917.3	10 008.5

NOTE:
THE RESURGENCES ARE DRAWN TO APPROXIMATE SHAPES AS THEY ARE HIGHLY IRREGULAR.

RESURGENCES

NO.	DIMENSIONS (m)	REF PHOTO
R-1	2,5 x 3,0	60A
R-2	2,5 x 4,0	60B
R-3	2,5 x 3,0	60C
R-4	1,5 x 2,0	60D
R-5	1,0 x 3,0	60E

Title: FOX-4 CAPE HOOPER - BARREL DUMP LANDFILL

Project: FOX-4 CAPE HOOPER
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:600
10 5 0 10 20 30
metres

FIGURE 3

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

4.5 Photographic Records

The Photographic Record for the Barrel Dump Landfill has been completed as per the Terms of Reference and is included on the following page as Table 4-3. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Figure 4-3 Photographic Record - Barrel Dump Landfill

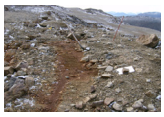
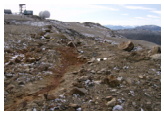
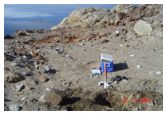
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
3A8	3A8.jpg 22/08/2008	Close up view of reddish soil staining observed at 589958E/7597312N. Camera facing southeast.		Figure 3
3B8	3B8.jpg 22/08/2008	View of reddish soil staining observed at 589958E/7597312N. Camera facing southeast.		Figure 3
3C8	3C8.jpg 22/08/2008	Wide angle view of reddish soil staining observed at 589958E/7597312N. Camera facing southeast.		Figure 3
3D8	3D8.jpg 22/08/2008	Close up of crushed barrels. Note the adjacent rock staining. The white card is located at 589965E/7597311N. Camera facing North-East.		Figure 3
3E8	3E8.jpg 22/08/2008	View of reddish staining observed at 589953E/7597307N. Camera facing south.		Figure 3
3F8	3F8.jpg 22/08/2008	View of reddish staining observed at 589953E/7597307N. Camera facing south.		Figure 3
3G8	3G8.jpg 22/08/2008	View of erosional feature E3-1. Camera facing west.		Figure 3
3H8	3G8.jpg 22/08/2008	View of erosional feature E3-1. Camera facing west.		Figure 3
BA1	BA1.jpg 22/08/2008	Soil sampling station F4-22, facing northwest.		Figure 3
BA2	BA2.jpg 22/08/2008	F4-22, showing test pit to 50 cm.		Figure 3

Figure 4-3 Photographic Record - Barrel Dump Landfill

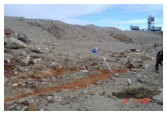
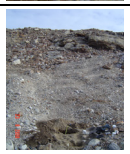
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
BA3	BA3.jpg 22/08/2008	Soil sampling station F4-3, facing northwest.		Figure 3
BA4	BA4.jpg 22/08/2008	F4-3, showing test pit to 50 cm.		Figure 3
BA5	BA5.jpg 22/08/2008	Soil sampling station F4-5, facing east.		Figure 3
BA6	BA6.jpg 22/08/2008	F4-5, showing test pit to 50 cm.		Figure 3
BA7	BA7.jpg 22/08/2008	Soil sampling station F4-4, facing northeast.		Figure 3
BA8	BA8.jpg 22/08/2008	F4-4, showing test pit to 50 cm.		Figure 3
BA9	BA9.jpg 22/08/2008	Soil sampling station F4-24, facing northeast.		Figure 3
BA10	BA10.jpg 22/08/2008	F4-24, showing test pit to 50 cm.		Figure 3

Photo	Electronic File Name/ Date	Thumbnail	Photo Description	Reference Figure Number
BA-P1	BA-P1.jpg 22/08/2008		Showing barrel dump staining. Facing southwest.	Figure 3

4.6 Thermal Monitoring Data

Not applicable to this landfill area.

4.7 Soil Sample Analytical Data

The concentrations of Cadmium (Cd) and Hg are in general non-detect in the soil samples analyzed for total metals. Slightly elevated concentrations of Lead (Pb) (in comparison to other soil samples in the area) were found in F4-3 (surface) at 27 mg/kg and for Nickel (Ni) station F4-5 (surface) at 46 mg/kg. The concentrations of the other metals analyzed are considered to be low in the soil samples.

PCB concentrations are generally lower than the detection limit in the soil samples except for the surface (0.21 mg/kg) and subsurface (0.19 mg/kg) samples from F4-3. Sample taken from F4-5 surface exhibited concentrations of 0.24 mg/kg.

TPH concentrations in soil samples from both upgradient and downgradient locations are considerably high, ranging from 1613 mg/kg to 11,318 mg/kg (F4-5). One soil sample F4-2 0-15 cm was the exception showing TPH concentrations of 561 mg/kg. Among the three hydrocarbon fractions, F2 shows the highest concentration in the soil samples, followed by F3 and F1. In the downgradient soil samples, the subsurface layer contains consistently higher TPH concentrations than the surface layer.

The soil sample analytical data is included in Table 4-4.

Table 4-4: Summary of 2008 Soil Analytical Data - Barrel Dump Landfill

Sample #	Location	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C6-C10 [mg/kg]	F2 C10-C16 [mg/kg]	F3 C16-C34 [mg/kg]	TPH C6-C34 [mg/kg]
Sampling Date			*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
BARREL DUMP UPGRADIENT																
F4-2 (Soil)0-15cm	F4-2	0-15	21	21	6	<0.5	12	<20	40	33	<0.1	<0.05	<10	467	94	561
F4-2 (Soil)40-50cm	F4-2	40-50	19	18	5	<0.5	7	<20	33	17	<0.1	<0.05	23	1470	120	1613
F4-21(Soil)0-15cm	F4-21	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	5830	4010	9840
F4-21(Soil)40-50cm	F4-21	40-45	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	85	8230	2360	10675
BARREL DUMP DOWNGRADIENT																
F4-3 (Soil)0-15cm	F4-3	0-15	34	30	7	<0.5	27	31	50	24	<0.1	0.21	58	5790	2370	8218
F4-3 (Soil)40-45cm	F4-3	40-45	37	31	7	<0.5	18	34	49	18	<0.1	0.19	41	7080	1570	8691
F4-4 (Soil)0-15cm	F4-4	0-15	35	34	8	<0.5	11	25	43	16	<0.1	<0.05	<10	2530	964	3494
F4-4 (Soil)40-45cm	F4-4	40-45	35	34	8	<0.5	9	25	45	16	<0.1	<0.05	27	6160	1030	7217
F4-5 (Soil)0-15cm	F4-5	0-15	31	46	7	<0.5	13	30	47	21	<0.1	0.24	11	3530	3540	7081
F4-5 (Soil)40-45cm	F4-5	40-45	40	38	8	<0.5	9	28	47	17	<0.1	<0.05	58	10100	1160	11318
F4-22(Soil)0-15cm	F4-22	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	2240	787	3027
F4-22(Soil)40-45cm	F4-22	40-45	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	39	7010	1640	8689
F4-23(Soil)0-15cm	F4-23	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
F4-23(Soil)40-50cm	F4-23	40-50	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
F4-24(Soil)0-15cm	F4-24	0-15	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	<10	681	280	961
F4-24(Soil) 40-50cm	F4-24	30-40	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	10	2830	431	3271

Notes

NV = No Value
ND = Non Detectable

4.8 Groundwater Sample Analytical Data

There are no monitoring wells in the Barrel Dump Landfill area.

4.9 Monitoring Well Sampling Logs

There are no monitoring wells in the Barrel Dump Landfill area.

5.0 STATION AREA LANDFILL

5.1 Summary

The Station Area Landfill is a new landfill constructed for the disposal of demolition and site waste generated during the site clean-up. It is located at the Upper Site, east of the SRR facilities. Its surface area is approximately 1400 m^2.

The monitoring of this landfill includes a visual inspection to verify for evidence of settlement or erosion and collection of soil and groundwater samples to monitor for the presence of leachate. Groundwater monitoring well locations, as well as soil sample locations, are identified on Figure 4 FOX-4 Cape Hooper – Station Area Landfill.

The soil and groundwater analytical data are presented in Tables 5-4 and 5-5 respectively.

The visual inspection report, including supporting photos and drawings, is presented in the following pages.

Four additional samples were collected during the 2008 sampling event at the request of the Royal Military College of Canada, Environmental Sciences Group.

5.2 Visual Inspection Report

The visual inspection of the Station Area landfill was conducted on August 22, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material with trace cobbles.

Settlement

Sinkholes were observed on the top of the landfill and to the west of the landfill. It is believed that these sinkholes are a combination of settlement and piping. The material at the surface is being washed into voids beneath the surface. The location of these sinkholes is presented in Figure 4 FOX-4 Cape Hooper – Station Area Landfill.

Erosion

Erosion of the capping material was not observed.

Frost Action

The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low. No evidence of frost action was observed during the 2008 monitoring program.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed.

Re-establishment of Vegetation

Based on the regional setting of this landfill re-establishment of vegetation is not likely.

Staining

The stained areas are presented on Figure 4, FOX-4 Cape Hooper – Station Area Landfill. Staining is concentrated in the low lying area to the southwest of the landfill where seepage and run-off gather before draining through a weakness in the bedrock outcrops to the southeast. The staining appears reddish in colour. Stained areas correlate directly with areas of pooled water. Areas of staining appeared to have remained consistent with the findings of the 2007 landfill visual inspection. The labeling of the stained areas was kept the same as the 2007 inspection for ease of reference.

Seepage Points

Seepage points are located in several locations at the Station Area Landfill. Two main seepages are located northeast of sampling locations ST08-1 and one northeast of ST08-2. These two seepages converge to create the remaining stained areas. The number of seepage points is unchanged from the previous 2007 visual inspection.

Debris

Exposed debris was not observed.

Discussion

The Station Area Landfill performance with respect to containment of the debris within the landfill is rated as acceptable. The visual inspection report, including supporting photos and drawing, is presented on the following pages.

Table 5-1: Visual Inspection Checklist – Inspection Report – Station Area Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **STATION AREA LANDFILL**
LANDFILL DESIGNATION: Landfill, Upper Site, South of SRR
DATE OF INSPECTION: August 23, 2008
DATE OF PREVIOUS INSPECTION: August 23, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of the their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	YES	Sinkholes and settlement were noted in fill material and material down gradient of the landfill on the west portion of the landfill. For locations refer to Figure 4 Fox -4 Cape Hooper-Station Area.	2m .75m	0.5 m .5m	1% <1%			Photographs: 4O8, 4P8, 4R8, 4S8. For locations and directions of photographs refer to Figure 4 Fox -4 Cape Hooper-Station Area.	
Erosion	NO								
Frost Action	NO	Frost action was not noted. The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.							
Sloughing and Cracking	NO								
Animal Burrows	NO								
Vegetation	NO	No vegetation was observed at the upper site. It was noted that the lack of vegetation is consistent with the natural setting.							
Staining	YES	ST4-1/5 ST4-4 For locations refer to Figure 4 Fox -4 Cape Hooper-Station Area.	110 m 25 m	8 m 8 m	63% 14%		Staining from seepage was noted and the affected area appears to have remained consistent with the findings from 2007.	Photographs: 4A8, 4B8, 4C8, 4D8, 4E8, 4F8, 4G8, 4H8, 4I8, 4J8, 4K8, 4L8, 4M8, 4N8, 4O8, 4P8, 4Q8, ST-P1, ST-P3, ST-P4, ST-P5, ST-P6 For locations and directions of photographs refer to Figure 4 Fox -4 Cape Hooper-Station Area.	
Vegetation Stress	NO	No vegetation was observed at the upper site.							
Seepage Points	YES	Seepage points coincide with staining locations.					Where there was staining there was an associated seepage point.	Photographs: 4A8, 4B8, 4C8, 4D8, 4E8, 4F8, 4G8, 4H8, 4I8, 4J8, 4K8, 4L8, 4M8, 4N8, 4O8, 4P8, 4Q8, ST-P1, ST-P3, ST-P4, ST-P5, ST-P6 For locations and directions of photographs refer to Figure 4 Fox -4 Cape Hooper-Station Area.	
Debris Exposed	NO								
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 4 Fox-4Cape Hooper – Station Area							
Features of Note.	NO								

5.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for the Station Area Landfill has been completed as per the Terms of Reference and is included as Table 5-2 of this report.

Table 5-2: Preliminary Stability Assessment – Station Area Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Acceptable	Isolated
Frost Action	Not Observed	None
Staining	Acceptable	Numerous
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Numerous
Debris Exposure	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

5.4 Location Plan

The Location Plan for the Station Area Landfill has been completed as per the Terms of Reference and is included in the following page as Figure 4 FOX-4 Cape Hooper – Station Area Landfill.

MONITORING WELLS		
NO.	COORDINATES	
	NORTHING	EASTING
MW-7	9 692.0	10 422.9
MW-8	9 726.2	10 297.7
MW-9	9 736.8	10 338.0

COORDINATE POINTS			
NO.	NORTHING	EASTING	ELEV.
101	9 721.3	10 358.1	386.3
102	9 704.3	10 390.6	386.0
103	9 691.0	10 385.5	386.8
104	9 696.5	10 347.8	386.3

LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- TBM3 ⊡ TEMPORARY BENCHMARK
- ⌖ MONITORING WELL LOCATION
- 101 • COORDINATE POINT
- ■ SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
3	9 695.382	10 473.854	398.519	CROSS CUT IN ROCK
4	9 833.172	10 278.429	394.655	CROSS CUT IN ROCK

2008 OBSERVATIONS:

- ST4-1 STAINS
- EROSION
- POOLING
- SINKHOLE
- 4A8 PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

Title: FOX-4 CAPE HOOPER - STATION AREA LANDFILL

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:1000

20 15 10 5 0 metres 25 50

FIGURE 4

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

5.5 Photographic Records

The Photographic Record for the Station Area Landfill has been completed as per the Terms of Reference and is included in the following page as Table 5-3. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Figure 5-3 Photographic Record - Station Area Landfill

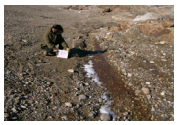
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
4A8	4A8.jpg 22/08/2008	Close up view of reddish soil staining, water runoff and overland drainage feature at 590436E/7597074N. Camera facing South-East.		Figure 4
4B8	4B8.jpg 22/08/2008	Wide angle view of soil staining, water runoff and overland drainage. Standing water is located on the downgradient portion of the landfill. Camera facing South-East.		Figure 4
4C8	4C8.jpg 22/08/2008	Close up view of standing water and water runoff observed at 590407E/7597099N. Camera facing South.		Figure 4
4D8	4D7.jpg 22/08/2008	Wide angle view of standing water and water runoff. White card in the center of the picture is 21cm by 28cm and is located at 10590407E/7597099N, facing South.		Figure 4
4E8	4E8.jpg 22/08/2008	Close up view of staining water and reddish soil staining at 590370E/7597109N. Camera facing East.		Figure 4
4F8	4F8.jpg 22/08/2008	Wide angle view of standing water course. White card is located at 590370E/7597109N. The water is staining soil red. Camera facing East.		Figure 4
4G8	4G8.jpg 22/08/2008	View of same standing water but further downstream, white card is located at 590370E/7597109N. The water is staining soil red. Camera facing South-East.		Figure 4
4H8	4H8.jpg 22/08/2008	Standing water observed at 590348E/7597107N. The water is staining soil red. Monitoring Well 9 is visible at the right of photo. Camera facing South-East		Figure 4

Figure 5-3 Photographic Record - Station Area Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
4I8	4I8.jpg 22/08/2008	Wide angle view of standing water and reddish soil staining located at 590348E/7597107N. Camera facing northeast		Figure 4
4J8	4J8.jpg 22/08/2008	Wide angle view of standing water and reddish soil staining located at 590348E/7597107N. Camera facing northeast		Figure 4
4K8	4K8.jpg 22/08/2008	View of standing water and reddish soil staining. White card is located at 590330E/7597102N. Camera facing North-East.		Figure 4
4L8	4L8.jpg 22/08/2008	View of same standing water but further downstream, white card is located at 590330E/7597102N. The water is staining soil red. Camera facing North-East.		Figure 4
4M8	4M8.jpg 22/08/2008	Close up view of standing water and reddish soil staining observed at 590325E/7597115N. White card in the left of the picture is 21cm by 28cm. Camera facing North-East.		Figure 4
4N8	4N8.jpg 22/08/2008	Wide view of standing water and reddish soil staining observed at 590325E/7597115N. White card in the left of the picture is 21cm by 28cm. Camera facing North-East.		Figure 4
4O8	4O8.jpg 22/08/2008	Panoramic view of Station Area Landfill. View of standing water and reddish soil staining. Camera facing east.		Figure 4
4P8	4P8.jpg 22/08/2008	Panoramic view of Station Area Landfill. Wide angle view of reddish soil staining and seepage observed starting upgradient. Monitoring Wells 8 (right) and 9 (left) are visible in background. Camera facing southwest.		Figure 4
4Q8	4Q8.jpg 22/08/2008	Wide angle view of reddish soil staining. Located at 590351E/7597087N. Camera facing North-East.		Figure 4

Figure 5-3 Photographic Record - Station Area Landfill

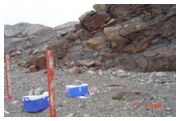
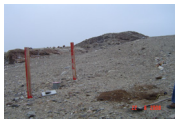
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
4R8	4R8.jpg 22/08/2008	Close up view of sinkhole observed at 590430E/7597057N.Camera facing South-East.		Figure 4
4S8	4S8.jpg 22/08/2008	Wide angle view of sinkhole. White card is 21cm by 28cm and located at 590430E/7597057N. Monitoring Well 7 is visible in background. Camera facing East.		Figure 4
ST1	ST1.jpg 22/08/2008	Soil sampling station MW7, facing east.		Figure 4
ST2	ST2.jpg 22/08/2008	MW7, showing test pit to 50 cm.		Figure 4
ST3	ST3.jpg 22/08/2008	Soil sampling station MW8, facing southeast.		Figure 4
ST4	ST4.jpg 22/08/2008	MW8, showing test pit to 50 cm.		Figure 4
ST5	ST5.jpg 22/08/2008	Soil sampling station MW9, facing east.		Figure 4
ST6	ST6.jpg 22/08/2008	MW9, showing test pit to 50 cm.		Figure 4
ST7	ST7.jpg 22/08/2008	NEW-2008. Soil sampling station ST08-1, facing west.		Figure 4

Figure 5-3 Photographic Record - Station Area Landfill

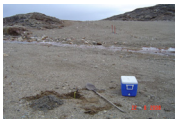
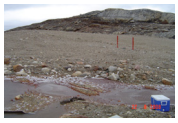
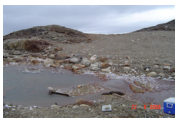
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
ST8	ST8.jpg 22/08/2008	NEW-2008. ST08-1, showing test pit to 15 cm (surface sample).		Figure 4
ST9	ST9.jpg 22/08/2008	NEW-2008. Soil sampling station ST08-2, facing south.		Figure 4
ST10	ST10.jpg 22/08/2008	NEW-2008. ST08-2, showing test pit to 15 cm (surface sample).		Figure 4
ST11	ST11.jpg 22/08/2008	NEW-2008. Soil sampling station ST08-3, facing northeast.		Figure 4
ST12	ST12.jpg 22/08/2008	NEW-2008. ST08-3, showing test pit to 50 cm (surface and depth).		Figure 4
ST13	ST13.jpg 22/08/2008	NEW-2008. Soil sampling station ST08-4, facing south		Figure 4
ST14	ST14.jpg 22/08/2008	NEW-2008. ST08-4, showing test pit to 15 cm (surface sample).		Figure 4

Figure 5-3 Photographic Record - Station Area Landfill

Photo	Electronic File Name/ Date	Thumbnail	Photo Description	Reference Figure Number
ST-P1	ST-P1.jpg 22/08/2008		Panorama, showing station area. Facing southeast.	Figure 4
ST-P2	ST-P2.jpg 22/08/2008		Panorama, showing station area, MW 8 and 9 are visible. Facing east.	Figure 4
ST-P3	ST-P3.jpg 22/08/2008		Panorama, showing extent of soil staining. Facing northeast.	Figure 4
ST-P4	ST-P4.jpg 22/08/2008		Panorama, showing pooled water and stained soil. Facing east.	Figure 4
ST-P5	ST-P5.jpg 22/08/2008		Panorama, showing station area staining extents. Facing southeast.	Figure 4
ST-P6	ST-P6.jpg 22/08/2008		Panorama, showing station area. Facing south.	Figure 4
ST-P7	ST-P7.jpg 22/08/2008		Panorama, showing station area. Facing west.	Figure 4

5.6 Thermal Monitoring Data

Not applicable for this landfill area.

5.7 Soil Sample Analytical Data

The concentrations of Cd and Hg in the soil samples collected in the vicinity of the existing monitoring wells are at or under the detection limit. Concentrations of Cu (53 mg/kg), Ni (32 mg/kg), Pb (40 mg/kg), Zn (48 mg/kg) and Cr (60 mg/kg) from the soil samples MW-7 are high in comparison to the other soil samples. The sub surface sample collected at MW-9 also showed slightly elevated levels of Cu (30 mg/kg), Zn (37 mg/kg) and Cr (65 mg/kg). The arsenic concentration was found to be highest in the sub surface soil collected near MW-7 at 24 mg/kg. The concentrations of the remaining metals were low in the upgradient and downgradient soil samples.

The concentrations of PCBs are at or below the detection limit in all soil samples, with the exception of MW-9 (surface) that is slightly higher (0.17 mg/kg).

The TPH concentrations in the soil samples range from non-detect to 178 mg/kg (MW-7 sub surface). The F1 and F2 concentrations are below the detection limit with exception to MW-9 (surface) at 36 mg/kg. F3 concentrations ranged from 29 mg/kg to 178 mg/kg and are considered low.

The soil sample analytical data is included in the following page as Table 5-4.

Table 5-4: Summary of 2008 Soil Analytical Data - Station Area Landfill

Sample #	Location	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	TPH C_6-C_{34} [mg/kg]
Sampling Date			*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
UPGRADIENT																
MW-7 (Soil) 0-15 cm	MW-7	0-15	47	21	6	0.6	40	48	41	20	<0.1	0.05	<10	<10	174	174
MW- 7 (Soil) 40-50 cm	MW-7	40-50	53	32	8	<0.5	24	46	61	24	<0.1	<0.05	<10	<10	178	178
DOWNGRADIENT																
MW-8 (Soil) 0-15 cm	MW-8	0-15	19	15	<5	<0.5	8	21	29	17	<0.1	<0.05	<10	<10	37	37
MW-8 (Soil) 40-50 cm	MW-8	40-50	17	14	<5	<0.5	7	<20	26	11	<0.1	<0.05	<10	<10	42	42
MW-9 (Soil) 0-15 cm	MW-9	0-15	17	13	<5	<0.5	7	<20	30	18	<0.1	0.17	<10	36	56	92
MW-9 (Soil) 40-45 cm	MW-9	40-45	30	23	7	<0.5	6	37	65	15	<0.1	0.05	<10	<10	29	29

Notes

NV = No value

ND = Non - Detectable

5.8 Groundwater Sample Analytical Data

Groundwater could only be collected from MW-8 during the 2008 sampling event. All metals parameters were below detection limits with the exception of Zn at 1.83 mg/kg.

The concentrations of PCBs are below detection limits in the groundwater sample analyzed.

THP concentrations are considered low at 0.215 mg/L. F2 and F3 concentrations were below detection limits and F1 showed the concentration of 0.215 mg/L.

The groundwater sample analytical data is included in the following page as Table 5-5.

Table 5-5: Summary of 2008 Groundwater Analytical - Station Area Landfill

Sample #	Location	Groundwater Elevation (masl)	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	TPH C_6-C_{34} [mg/L]
	Sampling Date		*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
STATION AREA LANDFILL UPGRADIENT																
MW-7	MW-7	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
STATION AREA LANDFILL DOWNGRADIENT																
MW-8	MW-8	-	<0.005	NV	<0.005	<0.001	<0.001	1.83	<0.05	<0.01	<0.0001	<0.00005	0.215	<0.1	<0.1	0.215
MW-9	MW-9	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV

Notes

NV = No Value

ND = Non - Detectable

5.9 Monitoring Well Sampling Logs

The groundwater monitoring well sampling logs are included in the following pages as Tables 5-6 to 5-8.

Table 5-6: Monitoring Well Sampling Log MW 7 - Station Area Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Sation Area Landfill		
Monitoring Well ID:	MW-7		
Well Sampling Event:	2008	Sample Number:	MW-7
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-		
Diameter of well (cm):	-		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing, sludge in bottom
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		

Table 5-7: Monitoring Well Sampling Log MW 8 - Station Area Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Sation Area Landfill		
Monitoring Well ID:	MW-8		
Well Sampling Event:	2008	Sample Number:	MW-8
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	3		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	110.4		
Static water level (cm):	110.4	from ground surface	107.4
Depth to bottom (cm):	146	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.39		
Conductivity (mS/cm) :	235		
Temperature (^{O}C):	0.02		
Depth of water (cm):	35.6		
Well volume of water (mL):	700		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 5-8: Monitoring Well Sampling Log MW 9 - Station Area Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Sation Area Landfill		
Monitoring Well ID:	MW-9		
Well Sampling Event:	2008	Sample Number:	MW-9
Condition of Well:	Good - well dry, no water	Procedure/Equipment:	Bailer
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-		
Diameter of well (cm):	-		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing, sludge in bottom
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		
Length screen collecting water:	-		
Shape factor:	-		

Note:

* The well height above ground is lower than that provided in the TOR. This is possibly due to the re-adjustment of the well-casing by the field personnel during the previous monitoring in 2005.

6.0 LOWER SITE LANDFILL AND DCC TIER II SOIL DISPOSAL AREA

6.1 Summary

The Lower Site Landfill and DCC Tier II Soil Disposal Area are located near the west end of Cape Hooper and north of the airstrip, in relatively close proximity to one another.

The Lower Site Landfill was constructed for the disposal of non-hazardous demolition and site waste and Tier I soil. It covers an area of approximately 1200 m^2.

The monitoring of this landfill site includes a visual inspection to verify for evidence of settlement or erosion and collection of soil and groundwater samples to monitor for the presence of leachate. Groundwater monitoring well and soil sampling locations are identified in Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill.

The DCC Tier II Soil Disposal facility was constructed for the disposal of DCC Tier II soil excavated from the FOX-4 site. The disposal facility has a surface area of approximately 3600 m^2.

Five additional soil samples were collected during the 2008 sampling event. Two samples from the stained areas south of the Tier II Facility, one south of the stained areas of the Tier II Facility, one sample in the large stained area west of the Lower Site Landfill and one sample north and outside of the stained area. Sampling locations are identified on Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill.

The monitoring of this disposal area includes a visual inspection to verify for evidence of settlement or erosion, collection of soil and groundwater samples to monitor for the presence of leachate. Monitoring of sub-surface ground temperatures in the disposal facility's main body (thermal monitoring) was also included in the 2008 field program. Groundwater monitoring well locations, as well as soil sample locations and thermistor locations are identified on Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill.

The visual inspection report, including supporting photos and drawings, is presented in the following pages.

6.2 Visual Inspection Report

6.2.1 Lower Site Landfill

The visual inspection of the Lower Site Landfill was conducted on August 20, 2008. The landfill surface is at the same elevation as the surrounding ground elevation. The groundwater levels in this area were noted to be 0.3 m to 0.4 m below ground surface. It was inferred that the debris contained within the Lower Site Landfill may be saturated during the period of maximum ground thaw. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material with trace cobbles.

Settlement

Sinkholes and surface ground cracks were observed on the north portion of the landfill. It is believed that these sinkholes are a combination of settlement and piping. The material at the surface is being washed into voids beneath the surface. The location of these sinkholes is presented in Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill.

Erosion

Erosion of the capping material was not observed.

Frost Action

The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low, however the presence of near surface groundwater may indicate that there is sufficient containment of the water due to a lower confining layer and that free draining materials may be frost susceptible.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed in the landfill however arctic hares and fox were observed in the area.

Re-establishment of Vegetation

Re-establishment of vegetation was not observed.

Staining

The stained areas, designated ST5-1 and ST5-2/3, are presented on Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill. Areas ST5-2 and ST5-3 have remained amalgamated and the area is designated ST5-2/3. Areas of staining appeared to have remained equal to that observed in the 2007 landfill visual inspection. The staining appears reddish in color and is sometimes associated with a noticeable iridescent sheen.

Seepage Points

The number of seepage points remains consistent with the previous landfill visual inspection and are coincident with the areas of staining.

Debris

Exposed debris was not observed.

Discussion

The Lower Site Landfill performance with respect to containment of the debris within the landfill is rated as acceptable.

6.2.2 DCC Tier II Landfill

The visual inspection of the DCC Tier II landfill was conducted on August 20, 2008. The landfill surface is elevated above the surrounding ground elevation. The groundwater levels in this area were observed to be 0.3 m to 0.4 m below ground surface. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material with trace cobbles.

Settlement

Consolidation settlement of the landfill is somewhat variable and a record of the magnitude of the settlement is visible based on the elevations of the thermistor monitoring stations. It was assumed that the thermistor bases were originally installed flush with the ground surface. The consolidation settlement does not appear to indicate a lose debris from within the landfill.

Erosion

Erosion of the capping material was not observed.

Frost Action

The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low, however the presence of near surface groundwater may indicate that there is sufficient containment of the water due to a lower confining layer and that free draining materials may be frost susceptible.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed in the landfill however arctic hares and fox were observed in the area.

Re-establishment of Vegetation

Re-establishment of vegetation was not observed.

Staining

The stained areas, designated ST6-1 to ST6-6, are presented in Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill. Areas of staining appeared to have increased slightly since the 2007 landfill visual inspection. The area of ST6-4 seems to have amalgamated with ST6-5. The staining appears reddish in color and is sometimes associated with a noticeable iridescent sheen.

Seepage Points

The seepage points are coincident with the areas of staining. The flow from the seepage points appeared to be greater than what was observed in the 2007 visual inspection. However, pooling water in the area of ST6-4 had decreased from the 2007 visual inspection.

Debris

Exposed debris was not observed.

Discussion

The Tier II Landfill performance with respect to containment of the debris within the landfill is rated as acceptable.

Table 6-1: Visual Inspection Checklist – Inspection Report – Lower Site Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **LOWER SITE LANDFILL**
LANDFILL DESIGNATION: Landfill, Lower Site North of Airstrip
DATE OF INSPECTION: August 20, 2008
DATE OF PREVIOUS INSPECTION: August 22, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	YES	North Portion of the landfill For location refer to Figure 5 Fox -4 Cape Hooper-Lower Site	1 m	0.5 m	0.2m	<1%		Photographs: 5A8, 5B8, 5C8, 5N8 For locations and directions of photographs refer to Figure 5 Fox -4 Cape Hooper-Lower Site	
Erosion	NO								
Frost Action	NO	Frost action was not noted.							
Sloughing and Cracking	YES	North mid portion of the landfill. For location refer to Figure 5 Fox -4 Cape Hooper-Lower Site	8m	0.1m		<1%	Settlement Cracks		
Animal Burrows	NO								
Vegetation	NO								
Staining	YES	ST5-1 ST5-2/3 For location refer to Figure 5 Fox -4 Cape Hooper-Lower Site	65 m 25 m	2 m 5 m		11% 10%	Staining from seepage was noted and the affected area appears to have increased slightly from the previous year.	Photographs: 5A8, 5B8, 5C8, 5D8, 5E8, 5F8, 5G8, 5H8, 5I8, 5J8, 5K8, 5L8, 5M8, 5N8, T2-P5, T2-P6, T2-P7 For locations and directions of photographs refer to Figure 5 Fox -4 Cape Hooper-Lower Site	
Vegetation Stress	NO	No vegetation was observed							
Seepage Points	YES	Seepage points coincide with staining locations					Where there was staining there was an associated seepage point.	Photographs: 5A8, 5B8, 5C8, 5D8, 5E8, 5F8, 5G8, 5H8, 5I8, 5J8, 5K8, 5L8, 5M8, 5N8, T2-P5, T2-P6, T2-P7 For locations and directions of photographs refer to Figure 5 Fox -4 Cape Hooper-Lower Site	
Debris Exposed	NO								
Presence/Condition – Monitoring Instruments	YES	For location refer to Figure 5 Fox -4 Cape Hooper-Lower Site							
Features of Note.	NO								

Table 6-2: Visual Inspection Checklist – Inspection Report – DCC Tier II Soil Disposal Area

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **DCC TIER II LANDFILL**
LANDFILL DESIGNATION: Landfill, Lower Site, North of Airstrip
DATE OF INSPECTION: August 20, 2008
DATE OF PREVIOUS INSPECTION: August 21-22, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	YES	Consolidation settlement was noted throughout the landfill. For locations, refer to Figure 5 FOX-4 Cape Hooper – DCC Tier II and Lower Site Landfills.				100 %	This was based on observations of settlement in comparison to the thermistor stations.		
Erosion	NO								
Frost Action	NO	Frost action was not noted.							
Sloughing and Cracking	NO								
Animal Burrows	NO								
Vegetation	NO							No vegetation was observed on the capping cover.	
Staining	YES	ST6-1 ST6-2 ST6-3A ST6-3B ST6-4 ST6-5 ST6-6 For locations, refer to Figure 5 FOX-4 Cape Hooper – Helipad landfills – East and West.	45 m 60 m 50 m 45 m 35 m 70 m 18 m	11 m 4 m 0.5 m 0.5 m 4 m 5 m 12 m		40% 20% 2% 2% 11% 28% 18%	Staining from seepage was noted and the affected area appears to have increased slightly from the previous year (2006).	Photographs: 6A8, 6B8, 6C8, 6D8, 6E8, 6F8, 6G8, 6H8, 6I8, 6J8, 6K8, 6L8, 6M8, 6N8, 6O8, 6P7, 6Q8, 6R8, 6S8, 6T8, 6U8, 6V8, 6W8, 6X8, 6Y8, T2-P1, T2-P2, T2-P3, T2-P4, T2-P8 For locations and directions of photographs, refer to Figure 5 FOX-4 Cape Hooper –DCC Tier II and Lower Site landfills.	
Vegetation Stress	NO							No vegetation was observed on the capping cover.	
Seepage Points	YES	Seepage points coincide with staining locations.	See staining observations.	See staining observations.			Staining	See staining observations.	
Debris Exposed	NO								
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 5 FOX-4 Cape Hooper –DCC Tier II and Lower Site landfills.						Refer to Figure 5 FOX-4 Cape Hooper –DCC Tier II and Lower Site landfills.	
Features of Note.	YES	The slopes of the landfill.						Photographs: 6L8	The slopes of the landfill were covered with round rock for erosion protection. This round rock is sliding down the slope. If long term erosion protection is required the nearby colluvium (angular rock) should be used to minimize erosion and prevent debris exposure or loss of the insulative soil layer.

6.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for the Lower Site Landfill and DCC Tier II Soil Disposal Area have been completed as per the Terms of Reference and are included as Tables 6-3 and 6-4 respectively of this report.

Table 6-3: Preliminary Stability Assessment – Lower Site Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Acceptable	Isolated
Frost Action	Not Observed	None
Staining	Acceptable	Numerous
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Numerous
Debris Exposure	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

Table 6-4: Preliminary Stability Assessment – DCC Tier II Soil Disposal Area

Feature	Severity Rating	Extent
Settlement	Acceptable	None (No Differential Settlement)
Erosion	Acceptable	None
Frost Action	Not Observed	None
Staining	Acceptable	Numerous
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Numerous
Debris Exposure	Not Observed	
Overall Landfill Performance	**Acceptable**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

6.4 Location Plan

The Location Plan for the Lower Site Landfill and DCC Tier II Soil Disposal Area has been completed as per the Terms of Reference and is included in the following page as Figure 5 FOX-4 Cape Hooper – DCC Tier II Soil Disposal and Lower Site Landfill.

LEGEND:

NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- TBM202 — TEMPORARY BENCHMARK
- MONITORING WELL LOCATION
- 105 — COORDINATE POINT
- VERTICAL THERMISTOR
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2008 OBSERVATIONS:

- ST5-1 — STAINS
- D — DEBRIS
- EROSION
- POOLING
- SINKHOLE
- 6A7 6B7 — PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
202	20 079.007	20 509.423	24.110	19mm DIA. PIPE

MONITORING WELLS

NO.	COORDINATES	
	NORTHING	EASTING
MW-10	20 071.0	20 374.8
MW-11	20 027.3	20 396.2
MW-12	20 011.5	20 444.4
MW-13	20 030.8	20 483.1
MW-14	20 096.0	20 503.0
MW-15	20 098.0	20 396.0
MW-16	20 159.4	20 449.0

VERTICAL THERMISTORS

NO.	COORDINATES	
	NORTHING	EASTING
T-1	20 050.0	20 388.0
T-2	20 062.0	20 410.0
T-3	20 043.0	20 417.0
T-4	20 071.0	20 442.0
T-5	20 031.0	20 453.0
T-6	20 048.0	20 448.0

COORDINATE POINTS

NO.	NORTHING	EASTING	ELEV.	NO.	NORTHING	EASTING	ELEV.
108	20 088.0	20 394.0	22.10	115	20 030.0	20 432.0	22.04
109	20 068.0	20 387.0	22.65	116	20 068.0	20 454.0	22.34
110	20 046.0	20 380.0	21.89	117	20 026.0	20 445.0	22.34
111	20 081.0	20 420.0	22.30	118	20 064.0	20 472.0	22.31
112	20 038.0	20 407.0	22.00	119	20 042.0	20 465.0	22.60
113	20 071.0	20 442.0	22.28	120	20 022.0	20 458.0	22.01
114	20 054.0	20 440.0	22.75				

COORDINATE POINTS

NO.	NORTHING	EASTING	ELEV.
105	20 107	20 415	21.0
106	20 097	20 447	21.3
107	20 139	20 425	21.1
107A	20 129	20 457	21.6

Title: FOX-4 CAPE HOOPER - DCC TIER II SOIL DISPOSAL AND LOWER SITE LANDFILL

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:1000

20 15 10 5 0 metres 25 50

FIGURE 5

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

6.5 Photographic Records

The Photographic Records for the Lower Site Landfill and DCC Tier II Soil Disposal Area have been completed as per the Terms of Reference and are included in the following page as Table 6-5. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
5A8	5A8.jpg 20/08/2008	Sinkhole observed at 588472E/7596102N. Wide angle view facing West. White card is 20cm by 28cm.		Figure 5
5B8	5B8.jpg 20/08/2008	Close up view of sinkhole observed at 588472E/7596092N. Camera facing North-West.		Figure 5
5C8	5C8.jpg 20/08/2008	Wide angle view of sinkhole observed at 588472E/7596092N. Camera facing North-West.		Figure 5
5D8	5D8.jpg 20/08/2008	Wide angle view of pooling observed at 588428E/7596104N. Camera facing South-West.		Figure 5
5E8	5E8.jpg 20/08/2008	Wide angle view of pooling observed at 588428E/7596104N. Camera facing South-West.		Figure 5
5F8	5F8.jpg 20/08/2008	Wide angle view of pooling and soil staining. Camera facing West.		Figure 5
5G8	5G8.jpg 20/08/2008	Wide angle showing soil staining from seepage. Camera facing northeast.		Figure 5
5H8	5H8.jpg 20/08/2008	Wide angle view of area immediately down gradient (south) of pooled water and staining ST6-6 and ST6-5. Camera facing south.		Figure 5
5I8	5I8.jpg 20/08/2008	Wide angle showing pooled water and soil staining ST6-6, ST5-2/3, and ST6-5. Camera facing east.		Figure 5
5J8	5J8.jpg 20/08/2008	Wide angle showing pooled water and some soil staining. Camera facing northeast.		Figure 5

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
5K8	5K8.jpg 20/08/2008	Panoramic view of pooling and water channels. Camera facing South-West.		Figure 5
5L8	5L8.jpg 20/08/2008	Panoramic view of reddish soil staining and pooling. View of the Tier II soil disposal area on the background. Camera facing South.		Figure 5
5M8	5M8.jpg 20/08/2008	Panoramic view of reddish soil staining. Camera facing South-East.		Figure 5
5N8	5N8.jpg 20/08/2008	Showing close up of sinkhole observed at 588460E/756098N. Camera facing west.		Figure 5
6A8	6A8.jpg 20/08/2008	Wide angle view of pooling observed at 588423E/7595968N. Camera facing West.		Figure 5
6B8	6B8.jpg 20/08/2008	Close up view of pooling observed at 588423E/7595968N. No noticeable sheen on the water this year. White card is 20cm by 28cm.		Figure 5
6C8	6C8.jpg 20/08/2008	View of pooling border at 588423E/7595968N and Monitoring Well 11 at the left of the photo. Camera facing North-West		Figure 5
6D8	6D8.jpg 20/08/2008	Close up view of standing water observed at 588449E/7595957N. Water is staining the soil red. Camera facing South-West.		Figure 5
6E8	6E8.jpg 20/08/2008	Wide angle view of standing water and channels observed at 588449E/7595957N. Camera facing South-West.		Figure 5
	6F8.jpg 21/08/2008	Wide angle view of standing water and channels observed at 588449E/7595957N. Camera facing South-West.		Figure 5

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
6G8	6G8.jpg 20/08/2008	Wide angle view of standing water and channels observed at 588521E/7595963N. Camera facing South-West.		Figure 5
6H8	6H8.jpg 20/08/2008	View of standing water observed at 588521E/7595963N. Water is staining the soil red. Camera facing South.		Figure 5
6I8	6I8.jpg 20/08/2008	View of soil staining, no water this year. 5885170E/7596015N. Camera facing North-West.		Figure 5
6J8	6J8.jpg 20/08/2008	Reddish soil staining observed at 5885170E/7596015N. Water is staining the soil red. No water present this year. Camera facing South-West. Monitoring Well 13 visible in the background.		Figure 5
6K8	6K8.jpg 20/08/2008	View of standing water, channels, and reddish soil staining observed at 5885170E/7596015N. Camera facing South.		Figure 5
6L8	6L8.jpg 20/08/2008	Reddish soil staining observed at 5885170E/7596015N. Water is staining the soil red. Camera facing south. Monitoring Well 13 visible in the background.		Figure 5
6M8	6M8.jpg 20/08/2008	Wide angle view of standing water and reddish soil staining observed at 588508E/7596040N. Monitoring Well 15 visible on the background. Camera facing West.		Figure 5
6N8	6N8.jpg 20/08/2008	Reddish soil staining and pooled water observed at 588488E/7596047N. Wide angle view, facing North-West.		Figure 5

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
6O8	6O8.jpg 20/08/2008	Wide angle view of pooling and soil staining at 588482E/7596039N. Camera facing west.		Figure 5
6P8	6P8.jpg 20/08/2008	Pooling observed at 588482E/7596039N. Tier II Soil Disposal Area in background. Camera facing South-West.		Figure 5
6Q7	6Q8.jpg 20/08/2008	Wide angle view of reddish soil staining and standing water at 588463E/7596049N. Camera facing east.		Figure 5
6R7	6R8.jpg 20/08/2008	General View of pooling, channels, and soil staining at 588463E/7596047N. Monitoring Well 15 in background. Camera facing southwest.		Figure 5
6S7	6S8.jpg 20/08/2008	View of standing water at 588421E/7596058N. Monitoring Well 15 is visible at the left of photo. Camera facing North-West.		Figure 5
6T8	6T8.jpg 20/08/2008	Reddish soil staining visible at 588421E/7596058N. Monitoring Well 15 is visible at the right of photo. Camera facing South-East.		Figure 5
6U8	6U8.jpg 20/08/2008	Wide angle view of reddish soil staining (ST6-5) and standing water. Camera facing South-East.		Figure 5
6V8	6V8.jpg 20/08/2008	Panoramic view. Wide angle view of soil staining and pooling. Camera facing North.		Figure 5
6W8	6W8.jpg 20/08/2008	Panoramic view. Wide angle view of western slope of disposal area. Monitoring Wells 10 and 15 visible at the left of photo. Camera facing North-East.		Figure 5
6X8	6X8.jpg 20/08/2008	Panoramic view. Wide angle view of disposal area. Monitoring Wells 11 visible at the right of photo. Camera facing South-East.		Figure 5
6Y8	6Y8.jpg 20/08/2008	Panoramic view. Wide angle view of soil staining ST6-1. Camera facing South.		Figure 5

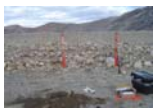
Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
T2-1	T2-1.jpg 20/08/2008	Showing Thermistor 1, facing southwest.		Figure 5
T2-2	T2-2.jpg 20/08/2008	Showing Thermistor 1, facing northeast.		Figure 5
T2-3	T2-3.jpg 20/08/2008	Showing inside Thermistor 1, station requires proper cap.		Figure 5
T2-4	T2-4.jpg 20/08/2008	Showing Thermistor 2, facing east.		Figure 5
T2-5	T2-5.jpg 20/08/2008	Showing connector on Thermistor 2, requires replacement.		Figure 5
T2-6	T2-6.jpg 21/08/2008	Showing Thermistor 3, facing east.		Figure 5
T2-7	T2-7.jpg 21/08/2008	Showing connector on Thermistor 3, requires replacement.		Figure 5
T2-8	T2-8.jpg 21/08/2008	Showing Thermistor 4, facing north.		Figure 5
T2-9	T2-9.jpg 21/08/2008	Showing connector on Thermistor 4, requires replacement.		Figure 5
T2-10	T2-10.jpg 21/08/2008	Showing Thermistor 5, facing east.		Figure 5
T2-11	T2-11.jpg 21/08/2008	Showing Thermistor 6, facing east.		Figure 5
T2-12	T2-12.jpg 20/08/2008	Soil sampling station MW10, facing east.		Figure 5

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
T2-13	T2-13.jpg 20/08/2008	MW10, showing test pit to 50 cm.		Figure 5
T2-14	T2-14.jpg 20/08/2008	Soil sampling station MW11, facing north.		Figure 5
T2-15	T2-15.jpg 20/08/2008	MW11, showing test pit to 50 cm.		Figure 5
T2-16	T2-16.jpg 20/08/2008	Soil sampling station MW12, facing northwest.		Figure 5
T2-17	T2-17.jpg 20/08/2008	MW12, showing test pit to 50 cm.		Figure 5
T2-18	T2-18.jpg 19/08/2008	Soil sampling station MW13, facing west.		Figure 5
T2-19	T2-19.jpg 19/08/2008	MW13, showing test pit to 50 cm.		Figure 5
T2-20	T2-20.jpg 20/08/2008	Soil sampling station MW14, facing west.		Figure 5
T2-21	T2-21.jpg 20/08/2008	MW14, showing test pit to 50 cm.		Figure 5
T2-22	T2-22.jpg 20/08/2008	Soil sample station MW15, facing south.		Figure 5
T2-23	T2-23.jpg 20/08/2008	MW15, showing test pit to 50 cm.		Figure 5

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
T2-24	T2-24.jpg 20/08/2008	Soil sampling station MW16, facing southeast.		Figure 5
T2-25	T2-25.jpg 20/08/2008	MW16, showing test pit to 50 cm.		Figure 5
T2-26	T2-26.jpg 20/08/2008	NEW-2008. Soil sampling station LS08-1, facing west.		Figure 5
T2-27	T2-27.jpg 20/08/2008	NEW-2008. Soil sampling station LS08-2, facing southwest.		Figure 5
T2-28	T2-28.jpg 20/08/2008	NEW-2008. Soil sampling station T208-1, facing northeast.		Figure 5
T2-29	T2-29.jpg 20/08/2008	NEW-2008. T208-1, showing test pit to 15 cm (surface sample)		Figure 5
T2-30	T2-30.jpg 20/08/2008	NEW-2008. Soil sampling station T208-2, facing northwest.		Figure 5
T2-31	T2-31.jpg 20/08/2008	NEW-2008. T208-2, showing test pit to 15 cm (surface sample)		Figure 5
T2-32	T2-32.jpg 20/08/2008	NEW-2008. Soil sampling station T208-3, facing northwest.		Figure 5
T2-33	T2-33.jpg 20/08/2008	NEW-2008. T208-3, showing test pit to 40 cm. (surface and depth)		Figure 5
T2-34	T2-34.jpg 20/08/2008	Showing attempts to clear obstructions from MW11.		Figure 5
T2-35	T2-35.jpg 20/08/2008	Showing attempts to clear obstructions from MW11. Facing northwest.		Figure 5

Photo	Electronic File Name/ Date	Thumbnail	Photo Description	Reference Figure Number
T2-P1	T2-P1.jpg 20/08/2008		Showing staining ST6-3A/3B and ST6-4. Camera facing south.	Figure 5
T2-P2	T2-P2.jpg 20/08/2008		Showing staining ST6-4, Tier II facility in background. Facing southwest.	Figure 5
T2-P3	T2-P3.jpg 20/08/2008		Wide angle view showing staining ST6-4, Tier II facility in background. Facing southwest.	Figure 5
T2-P4	T2-P4.jpg 20/08/2008		View showing Tier II facility. Camera facing northeast.	Figure 5
T2-P5	T2-P5.jpg 20/08/2008		View showing staining ST5-1 and pooled water. Facing northwest.	Figure 5
T2-P6	T2-P6.jpg 20/08/2008		Genral overview of Lower Site Landfill, MW16 visible center right. Camera facing south.	Figure 5
T2-P7	T2-P7.jpg 20/08/2008		General shot showing Lower Site and Tier II facility, MW14 visible center left. Facing south.	Figure 5
T2-P8	T2-P8.jpg 20/08/2008		View of Tier II facility and staining at ST6-4/5. Facing south.	Figure 5

6.6 Thermal Monitoring Data

Specific detailed information regarding temperature data is contained in the report section on the Lower Site landfill and DCC Tier II Soil Disposal Area.

The datalogger batteries were all replaced during the 2008 monitoring event.

6.6.1 Landfill Temperature Data from Dataloggers

The tables and corresponding figures (See Figures 6 – 11) in the following pages summarize temperature data obtained from the dataloggers. This data is a representative sampling of 2007-2008 data points downloaded from thermistor dataloggers. The dataloggers actually recorded data points (temperatures) every 12 hours, however for these tables and corresponding figures, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

Table 6- 6: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T1

DATA T1 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 5
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5 [2]	1 [2]	1.5	2
	08/31/07	12:00:00	3.3945	0	0	-0.8219	-1.4818
	09/30/07	12:00:00	-0.0882	0	0	-0.5943	-1.1742
	10/31/07	12:00:00	-4.4986	0	0	-0.5846	-1.0248
	11/30/07	12:00:00	-10.0085	0	0	-3.8123	-3.3383
	12/31/07	12:00:00	-16.7665	0	0	-7.6419	-6.5604
	01/31/08	12:00:00	-17.1251	0	0	-10.614	-9.4985
	02/29/08	12:00:00	-21.236	0	0	-14.141	-12.5985
	03/31/08	12:00:00	-17.6608	0	0	-14.5287	-13.552
	04/30/08	12:00:00	0	0	0	0	0
	05/31/08	12:00:00	0	0	0	0	0
	06/30/08	12:00:00	0	0	0	0	0
	07/31/08	12:00:00	5.0164	0	0	-1.2367	-2.1079
	08/19/08	12:00:00	5.16	0.6825	0	-0.9282	-1.6686

[1] This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T1. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

[2] Data obtained from these strings during the 2007-2008 sampling program does not reflect real life tempuratures in the sub-surface. A value of Zero was entered in the place of the downloaded valued in order to complete the graphs. Please refer to the raw data for actual downloaded values.

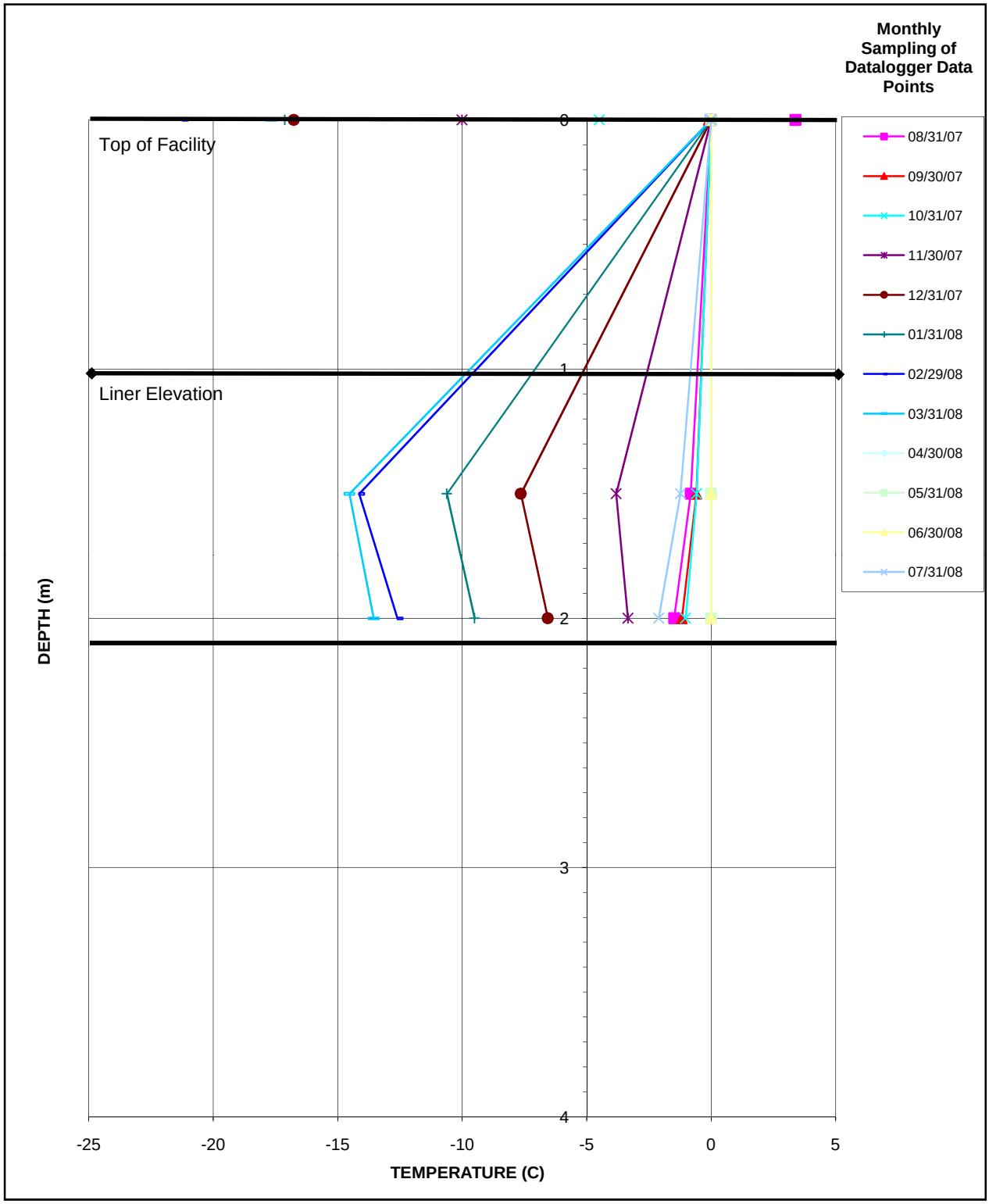


Figure 8 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T1

Table 6-7: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T2

DATA T2 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 4
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5	1	1.5	2
	08/31/07	12:00:00	3.6269	1.9583	0.1074	-1.2704	-0.6718
	09/30/07	12:00:00	-0.1028	0.0682	0.0536	-0.9137	-0.6331
	10/31/07	12:00:00	-4.6522	-0.4778	0.0095	-0.8413	-0.4584
	11/30/07	12:00:00	-11.2063	-5.7316	-3.9012	-2.7582	-3.183
	12/31/07	12:00:00	-15.7962	-10.6323	-8.1902	-6.105	-6.978
	01/31/08	12:00:00	-14.746	-12.5619	-11.0149	-9.1614	-10.0449
	02/29/08	12:00:00	-20.3859	-17.144	-15.1029	-12.3699	-13.6807
	03/31/08	12:00:00	-17.4423	-16.1655	-15.2004	-13.5428	-14.4271
	04/30/08	12:00:00	-9.3846	-11.0604	-12.0775	-15.605	-12.7541
	05/31/08	12:00:00	-2.4122	-4.8892	-6.689	-8.5552	-7.8385
	06/30/08	12:00:00	2.9067	0.1662	-1.6016	-3.9012	-5.7316
	07/31/08	12:00:00	5.5236	2.2812	-0.1028	-2.0174	-1.0826
	08/20/08	12:00:00	-2.265	3.1321	0.6974	-1.2175	-0.7397

Notes:

1 This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T2. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

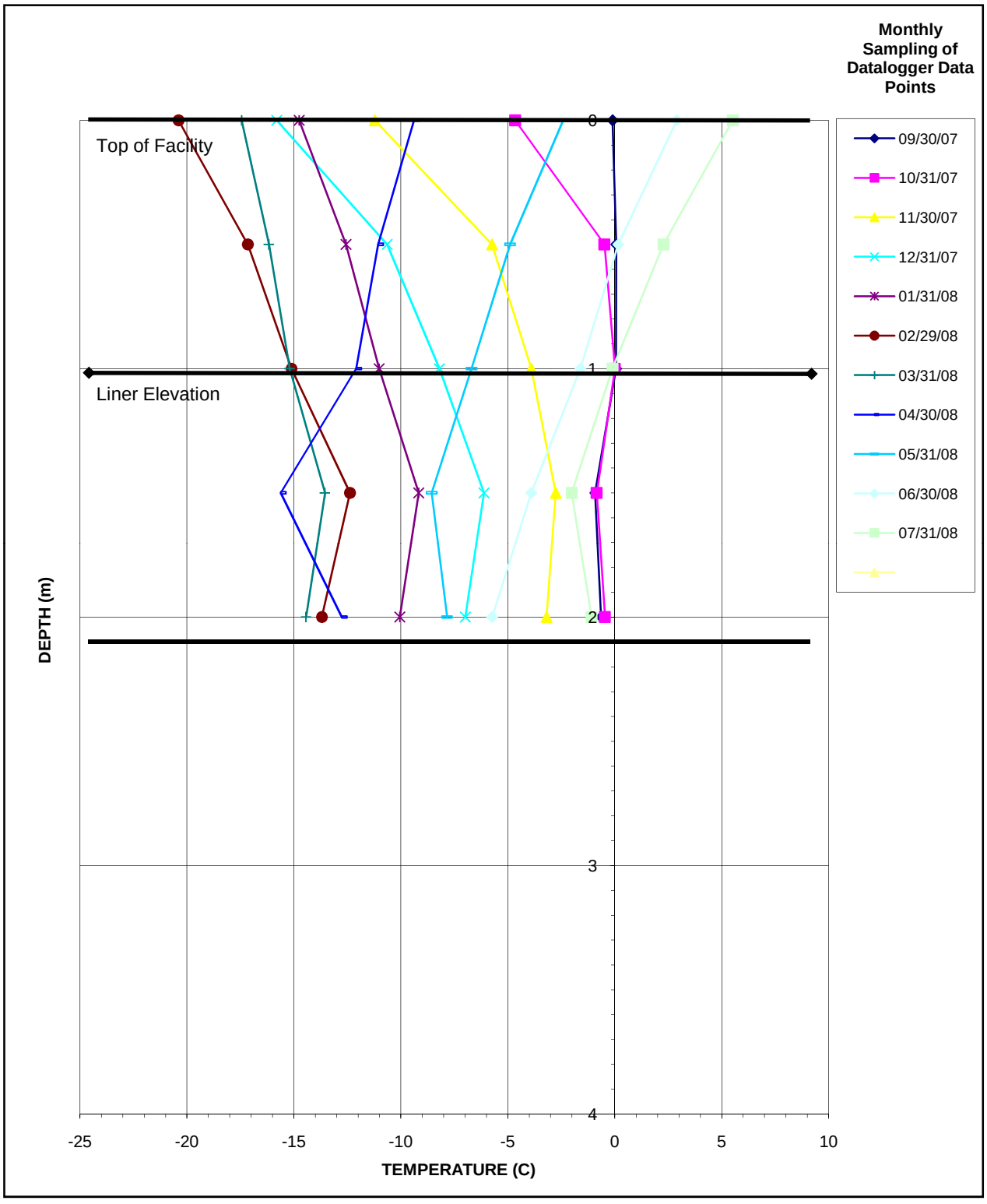


Figure 7 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T2

Table 6-8: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T3

DATA T3 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 5
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5	1	1.5	2
	08/31/07	12:00:00	4.7145	2.3369	0.3674	-0.5312	-1.256
	09/30/07	12:00:00	-0.0882	0.034	-0.01	-0.2881	-0.9041
	10/31/07	12:00:00	-3.4746	-0.9669	-0.0296	-0.3222	-0.8606
	11/30/07	12:00:00	-10.3682	-5.2832	-3.3383	-2.36	-2.1079
	12/31/07	12:00:00	-11.8721	-8.391	-6.7395	-5.6623	-5.0933
	01/31/08	12:00:00	-12.1049	-10.5958	-9.4666	-8.464	-7.8385
	02/29/08	12:00:00	-15.4607	-13.4096	-12.0684	-10.8418	-9.9902
	03/31/08	12:00:00	-14.5842	-13.4969	-12.745	-11.8721	-11.2655
	04/30/08	12:00:00	-9.4302	-10.9374	-11.3384	-11.106	-10.8691
	05/31/08	12:00:00	-2.796	-4.9866	-6.3995	-7.2575	-7.9664
	06/30/08	12:00:00	3.2554	0.6529	-1.2079	-2.4739	-3.6201
	07/31/08	12:00:00	7.3828	3.1732	0.034	-0.8751	-1.7308
	08/20/08	12:00:00	6.636	4.0374	1.472	-0.2881	-1.0826

1 This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T3. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

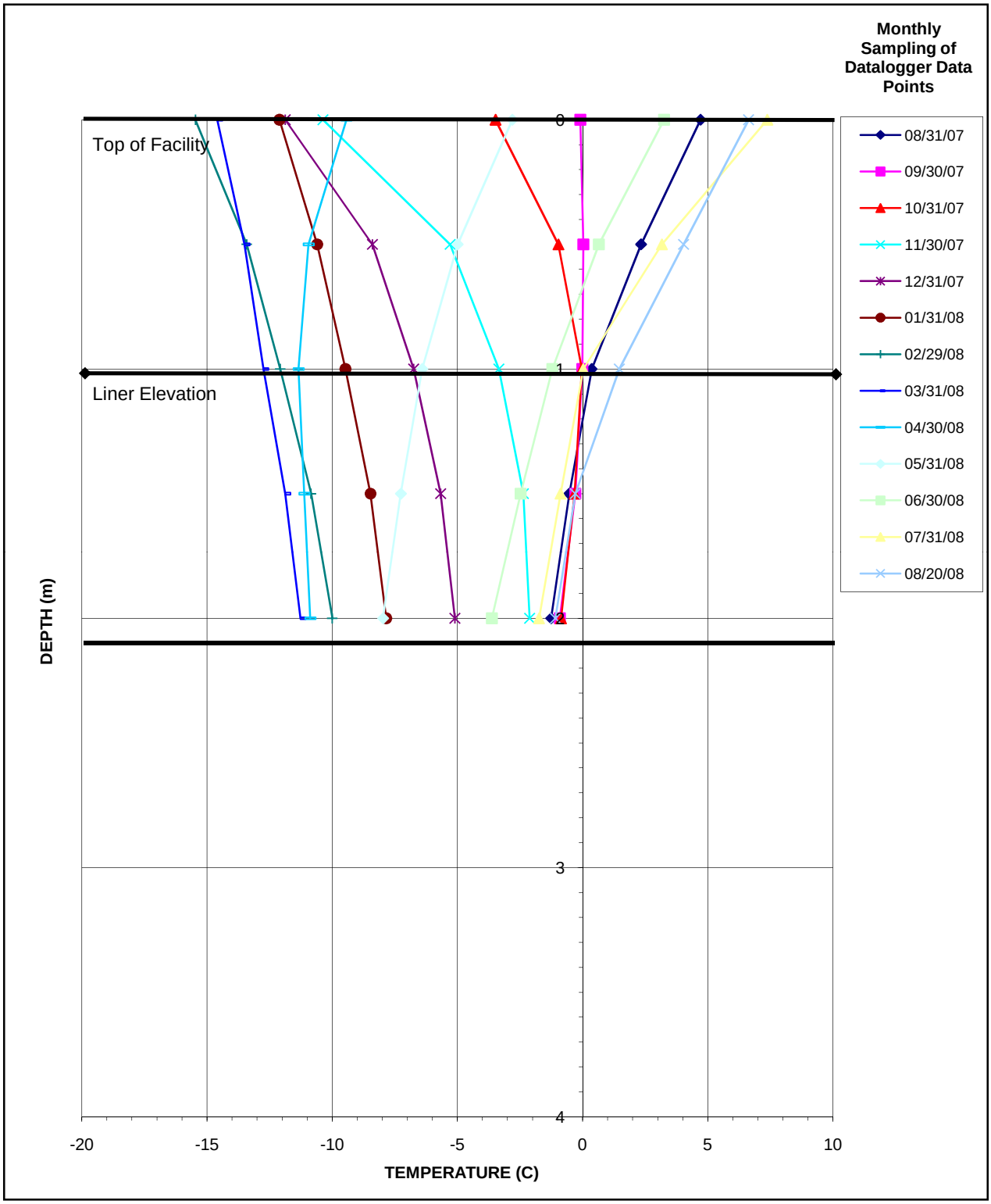


Figure 8 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T3

Table 6-9: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T4

DATA T4 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 5
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5	1	1.5	2
	08/31/07	12:00:00	3.1886	1.2974	-0.2784	-0.9669	-1.616
	09/30/07	12:00:00	0.0536	0.034	-0.1467	-0.7058	-1.1934
	10/31/07	12:00:00	-1.9792	0.034	-0.1809	-0.7058	-1.0537
	11/30/07	12:00:00	-2.744	-0.6864	-0.2784	-0.7397	-5.6623
	12/31/07	12:00:00	-6.9643	-4.5452	-3.3665	-2.8527	-2.4312
	01/31/08	12:00:00	-8.6601	-7.3857	-6.4731	-5.8838	-5.5376
	02/29/08	12:00:00	-10.1223	-8.8607	-7.9253	-7.2072	-19.9089
	03/31/08	12:00:00	-10.4091	-9.5304	-8.8105	-8.2313	-25.2358
	04/30/08	12:00:00	-9.3026	-9.1341	-8.7193	-8.3682	-22.1037
	05/31/08	12:00:00	-4.233	-5.2971	-5.9207	-6.4501	-7.0514
	06/30/08	12:00:00	0	0	0	0	0
	07/31/08	12:00:00	0	0	0	0	0
	08/20/08	12:00:00	0	0	0	0	0

[1] This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T4. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

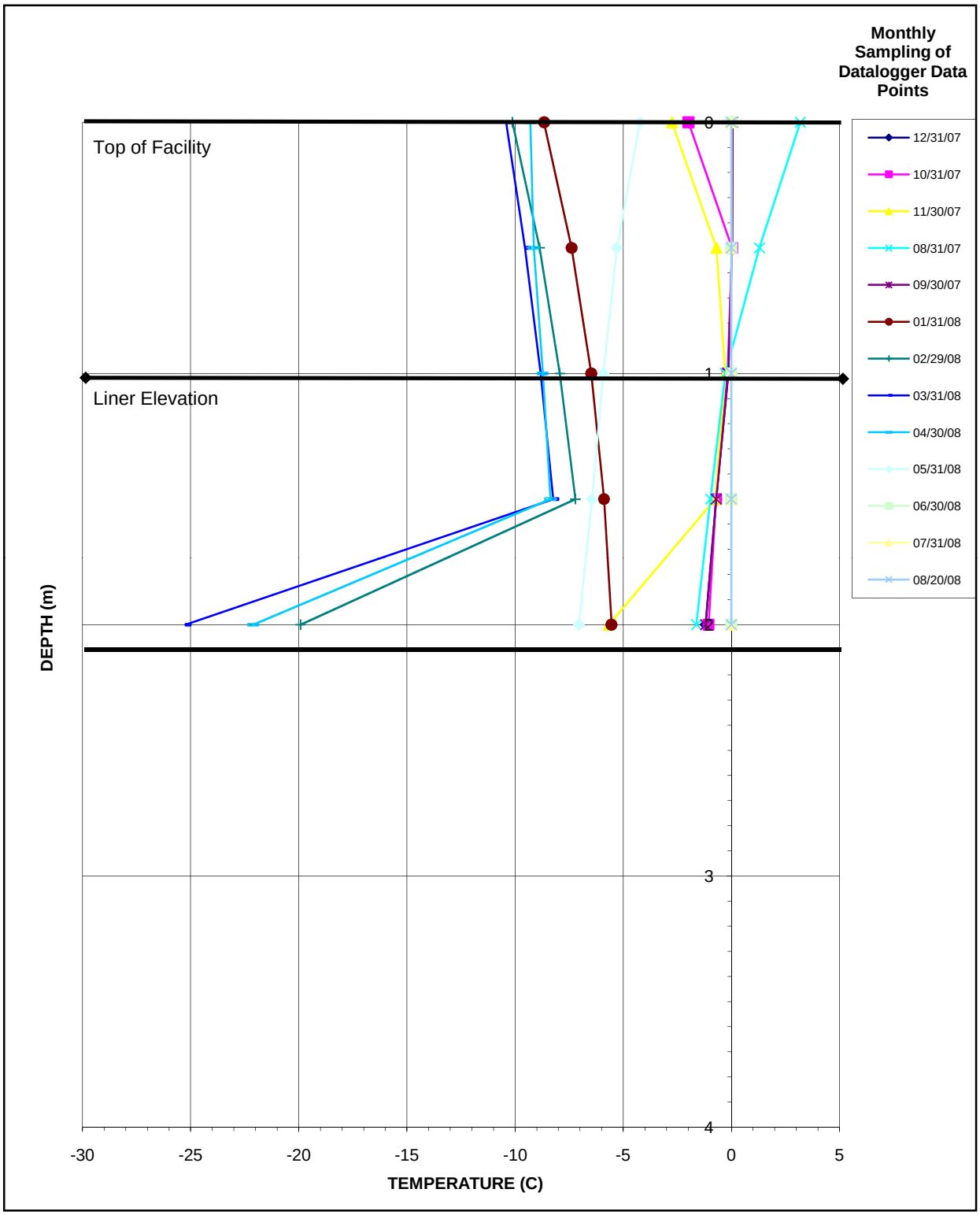


Figure 9 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T4

Table 6- 10: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T5

DATA T5 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 5
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5	1	1.5	2
	08/31/07	12:00:00	9.8715	3.6425	1.612	-0.1175	-0.8751
	09/30/07	12:00:00	0.225	-0.1663	0.127	-0.0296	-0.6137
	10/31/07	12:00:00	-5.9023	-3.8685	-0.7493	-0.1028	-0.5846
	11/30/07	12:00:00	-21.0211	-10.0267	-5.1535	-3.4558	-2.7345
	12/31/07	12:00:00	0	0	0	0	0
	01/31/08	12:00:00	0	0	0	0	0
	02/29/08	12:00:00	0	0	0	0	0
	03/31/08	12:00:00	0	0	0	0	0
	04/30/08	12:00:00	0	0	0	0	0
	05/31/08	12:00:00	0	0	0	0	0
	06/30/08	12:00:00	0	0	0	0	0
	07/31/08	12:00:00	0	0	0	0	0
	08/20/08	12:00:00	0	0	0	0	0

1 This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T5. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

2 No data was collected by the datalogger after 20 December, 2007 at 12:00:00. The reason for this is disconnected wire on battery end of system. All other cables and connectors were found intact.

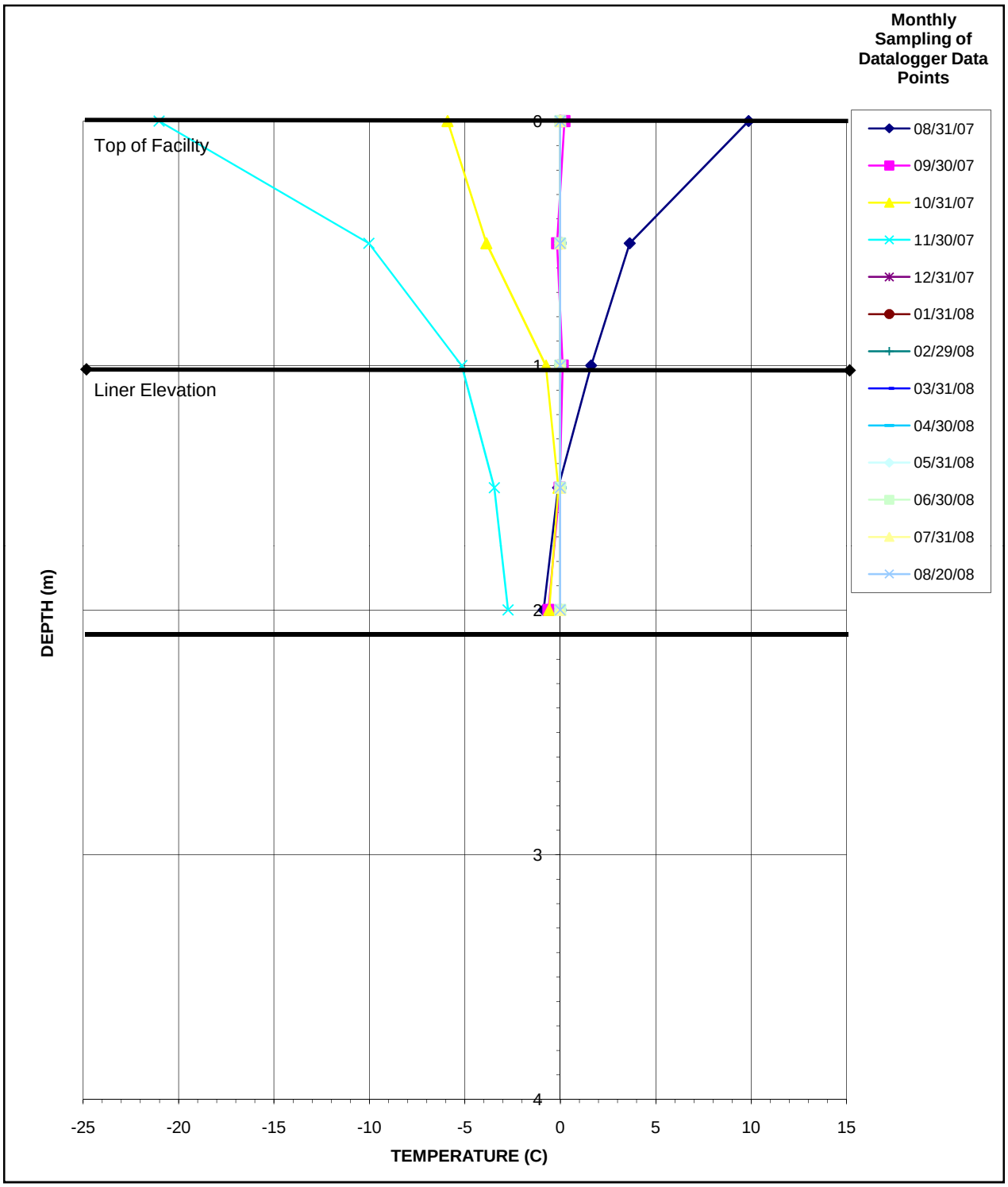


Figure 10 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T5

Table 6- 11: 2007-2008 Thermal Data - FOX-4 Cape Hooper - Thermistor Station T6

DATA T6 2007-2008

	DATE	TIME	ANALOG 1	ANALOG 2	ANALOG 3	ANALOG 4	ANALOG 5
	MM/DD/YY	HH:MM:SS					
DEPTH (m)			0	0.5	1	1.5	2
	08/31/07	12:00:00	5.9276	3.312	1.0537	-0.2784	-1.0248
	09/30/07	12:00:00	-0.5312	0.0095	0.0536	-0.1663	-0.7493
	10/31/07	12:00:00	-6.9322	-4.7405	-0.8026	-0.2199	-0.6476
	11/30/07	12:00:00	-19.1147	-10.4091	-6.3259	-4.8752	-4.0368
	12/31/07	12:00:00	-23.0528	-15.9409	-10.564	-8.3499	-7.001
	01/31/08	12:00:00	-17.1062	-16.2966	-13.0014	-11.2883	-10.1132
	02/29/08	12:00:00	-23.7779	-18.2622	-14.9684	-13.3545	-12.0501
	03/31/08	12:00:00	-15.6796	-16.2029	-14.5056	-13.5887	-12.745
	04/30/08	12:00:00	-6.0313	-10.4091	-11.7762	-12.0181	-11.831
	05/31/08	12:00:00	1.5269	-3.3853	-6.0221	-7.3125	-8.1902
	06/30/08	12:00:00	3.4977	2.1145	-0.7397	-2.0698	-3.3665
	07/31/08	12:00:00	9.3377	4.7145	1.1382	-0.4584	-1.4626
	08/20/08	12:00:00	7.4945	5.1814	1.9281	-0.1028	-0.9137

1 This data is a representative sampling of 2007-2008 data points downloaded from thermistor datalogger at station T6. The datalogger actually recorded data points (temperatures) every 12 hours. In this table, one data point per month (end of month) is tabulated and graphically depicted in this report (as per DCC Terms of Reference). A complete datalogger data set for 2007-2008 is available in the Addendum CD-ROM to this report (3 formats as per the DCC Terms of Reference: CSV, MS Excel, RAW data).

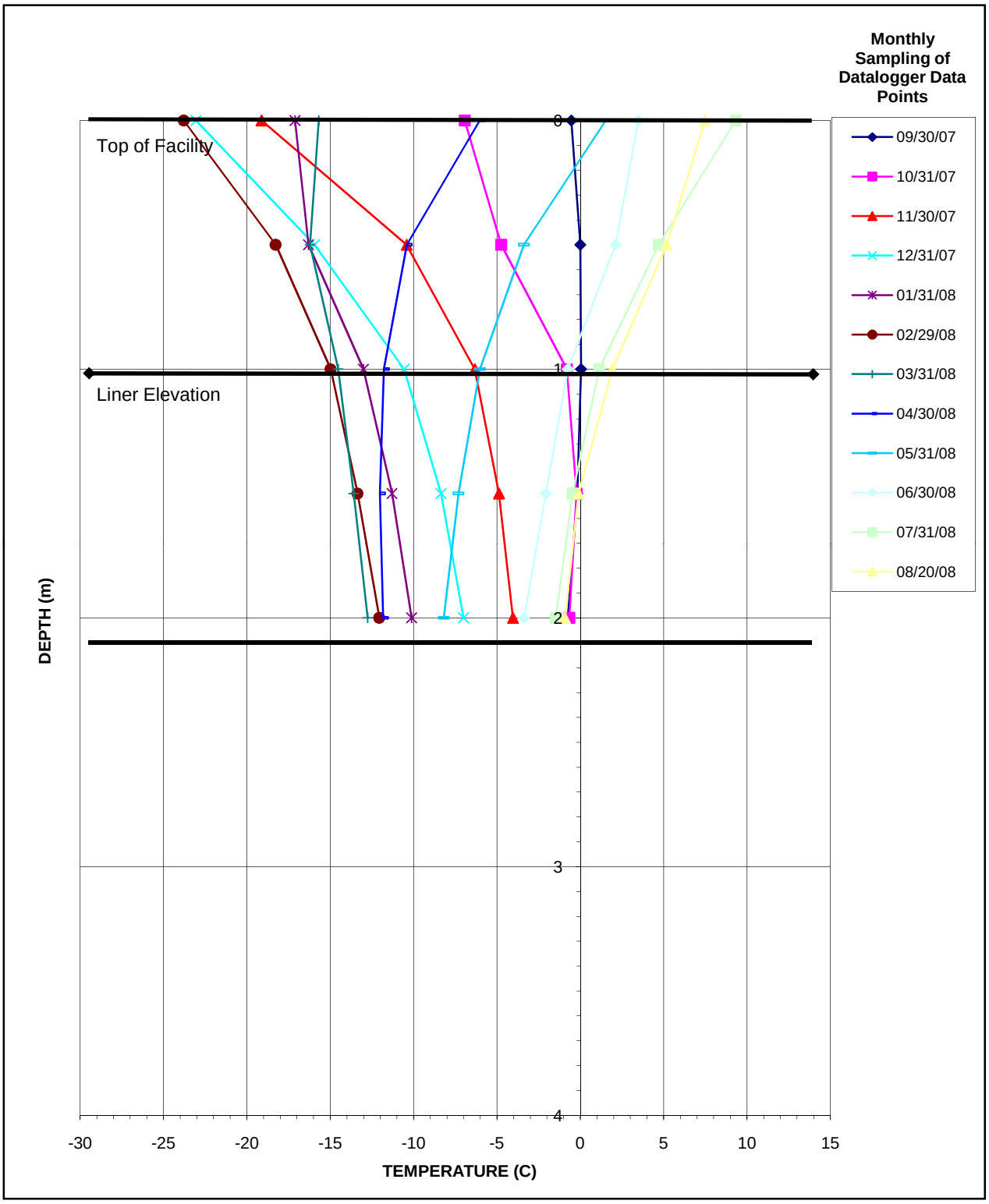


Figure 11 FOX-4 Cape Hooper – Thermal Data Graphs – Thermistor Station T6

6.6.2 Thermistor Maintenance Report Templates

The 2008 Thermistor Maintenance Report Templates are included in the following tables.

Table 6-12: 2008 Thermistor Maintenance Report - Thermistor Station T1

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**	Thermistor Location:	**Tier II Disposal Facility**		
Thermistor Number:	**T1**	Inclination:	**Vertical**		
Install Date:	**15-Aug-98**	First Date Event	**05-Jul-99**	Last Date Event	**15-Aug-05**
Coordinates and Elevation	**N20050**	**E20388**		Elevation:	**?**
Length of Cable	**4.27**	Cable Lead Above Ground	**1.9**	Nodal Points	**5**
Datalogger Serial #	**705043**	Cable Serial # 1	**String#4**		

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☐	☑	**Secured at base with gravel and at top with wire**
Cover	☐	☑	**Requires new cover (lid)**
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	**Check Connectors**

Battery Installation Date: Installed new battery 2008

Battery Levels: Main **11.34V (BEST)** Aux **12.71V (GOOD)**

Observations

Memory used: 21%
Analog 2 and 3 not working
Multiplexor disabled
Appears to be a new connection cable compared to 2007 sampling event

Proposed Maintenance

Analog Strings 2 & 3 are not in working condition. Should be replaced (possible down hole issue).
Required new cap (lid)

Table 6-13: 2008 Thermistor Maintenance Report - Thermistor Station T2

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**		Thermistor Location:	**Tier II Disposal Facility**	
Thermistor Number:	**T2**		Inclination:	**Vertical**	
Install Date:			First Date Event	Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	**1.59**	Cable Lead Above Ground		Nodal Points	**5**
Datalogger Serial #	**67755**	Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☐	☑	**Bent (Repaired onsite)**
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☑	**Connetion cable damaged**
Beads	☐	☐	

Battery Installation Date: **Installed new battery 2008**

Battery Levels: Main **11.34V** (100% Best) Aux **13.38V** (100% Best)

Observations

Memory used is 21%
Multiplexor disabled
Casing bent
Connection cable damaged - requires replacement

Proposed Maintenance

Replace - permanent repair of casing

Replace connection cable

Table 6-14: 2008 Thermistor Maintenance Report - Thermistor Station T3

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**	Thermistor Location:	**Tier II Disposal Facility**		
Thermistor Number:	**T3**	Inclination:	**Vertical**		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	**1.56**	Cable Lead Above Ground		Nodal Points	**5**
Datalogger Serial #	**67725**	Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☐	☑	**Cable connection damaged**
Beads	☑	☐	

Battery Installation Date: **New battery installed 2008**

Battery Levels: Main **11.34V** (Best 100%) Aux **13.38V** (Full 90%)

Observations

Memory used - 20%
Warm-up time 0.035 sec - changed to 0.210 sec
Multiplexor disbled - changed to on
Cable coinnection broken

Proposed Maintenance

Replace cable connection

Table 6-15: 2008 Thermistor Maintenance Report - Thermistor Station T4

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**	Thermistor Location:	**Tier II Disposal Facility**		
Thermistor Number:	**T4**	Inclination:	**Vertical**		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	**1.67**	Cable Lead Above Ground		Nodal Points	**5**
Datalogger Serial #		Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☐	☑	**Connection cable damaged**
Beads	☑	☐	

Battery Installation Date: **New battery installed 2008**

Battery Levels: Main **11.34V** (100% Best) Aux **13.02V** (90% Best)

Observations

Used memory: 21%
Multiplexor disabled - changed to on
No data collected past 31/5/08 - data cable came dislodged

Proposed Maintenance

Replace cable conneciton

Table 6-16: 2008 Thermistor Maintenance Report - Thermistor Station T5

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**	Thermistor Location:	**Tier II Disposal Facility**		
Thermistor Number:	**T5**	Inclination:	**Vertical**		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	**1.39**	Cable Lead Above Ground		Nodal Points	**5**
Datalogger Serial #		Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☐	☑	**Battery connection failed**
Cable	☑	☐	
Beads	☑	☐	

Battery Installation Date: **Label indicates: Lithium Battery (datalogger expiration 09/2001, however this battery was reported as changed in 2005.**

Battery Levels	Main	**11.34V** (100% Best)	Aux	**13.8 V** (90% Best)

Observations

Used memory: 13%.
Battery connection failed - bacame dislodged (not data collected after 17/12/07)
- Replaced battery - connection good
Warm-up time 0.160 - changed to 0.210
Multiplexor disabled -
turned on

Proposed Maintenance

Table 6-17: 2008 Thermistor Maintenance Report - Thermistor Station T6

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	**FRANZ - Nunatta**	Inspection Date:	**20-Aug-08**
Prepared By:	**Ryan Fletcher**		

Thermistor Information

Site Name:	**FOX-4**		Thermistor Location:	**Tier II Disposal Facility**	
Thermistor Number:	**T6**		Inclination:	**Vertical**	
Install Date:			First Date Event	Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	**1.49**	Cable Lead Above Ground		Nodal Points	**5**
Datalogger Serial #	**806104**	Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☐	☑	**Cable connector damaged**
Beads	☑	☐	

Battery Installation Date: **New battery installed 2008**

Battery Levels: Main **11.34V** (100% Best) Aux **12.65 V** (90% green)

Observations

Used memory: 13% and fulll.
Warm-up time 0.160 - changed to 0.210
Multiplexor disabled - turned on

Proposed Maintenance

Replace cable connection.

6.7 Soil Sample Analytical Data

The concentrations of Cobalt (Co), Cd, and Hg are at or below the detection limit. Elevated levels of Zn were found in MW-15 (subsurface) at 72 mg/kg and MW-14 (surface and subsurface) at 23 and 33 mg/kg respectively. As concentrations were elevated in samples MW-16 (subsurface) at 44 mg/kg and MW-12 (subsurface) at 42 mg/kg. The concentrations of the other metals analyzed are low in the remainder of the soil samples (surface and subsurface). In the case of the Lower Site landfill, the metal concentrations are generally higher in the downgradient soil samples as compared to the upgradient soil samples. In the case of the Tier II landfill, the metal concentrations in the upgradient versus the downgradient soil samples are also elevated.

The concentrations of PCBs are below the detection limit in the surface and subsurface samples from both the Lower Site Landfill and Tier II Facility.

The results for TPH analysis in soil samples show that the concentrations are either non-detect or fairly low, ranging from 10 to 43 mg/kg in the upgradient and downgradient samples. The exception is soil samples MW-14 (surface and subsurface) where concentrations were detected at 1,219 and 2,160 mg/kg respectively.

The soil sample analytical data is included in the following page as Table 6-18.

Table 6-18: Summary of 2008 Soil Analytical Data - DCC Tier II Soil Disposal and Lower Site Landfill

Sample #	Location	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C16-C34 [mg/L]	TPH C_6-C_{34} [mg/kg]
	Sampling Date		*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
LOWER SITE LANDFILL - UPGRADIENT																
MW-16 (Soil) 0-15 cm	MW-16	0-15	9	9	<5	<0.5	3	<20	19	15	<0.1	<0.05	<10	<10	<10	<10
MW-16 (Soil) 40-50 cm	MW-16	40-50	9	9	<5	<0.5	3	<20	18	44	<0.1	<0.05	<10	<10	<10	<10
TIER II FACILITY - UPGRADIENT / LOWER SITE LANDFILL - DOWNGRADIENT																
MW-14 (Soil) 0-15 cm	MW-14	0-15	21	17	5	<0.5	16	23	38	19	<0.1	<0.05	<10	355	864	1219
MW-14 (Soil) 40-50 cm	MW-14	40-50	22	22	6	<0.5	10	33	56	15	<0.1	<0.05	<10	1640	520	2160
MW-15 (Soil) 0-15 cm	MW-15	0-15	12	12	<5	<0.5	3	<20	24	11	<0.1	<0.05	<10	<10	<10	<10
MW-15 (Soil) 40-50 cm	MW-15	40-50	16	12	<5	<0.5	4	72	28	8	<0.1	<0.05	<10	31	<10	31
TIER II FACILITY - DOWNGRADIENT																
MW-10 (Soil) 0-15cm	MW-10	0-15	15	14	<5	<0.5	4	<20	26	14	<0.1	<0.05	<10	<10	<10	<10
MW-10 (Soil) 40-50 cm	MW-10	40-50	15	17	5	<0.5	5	<20	31	8	<0.1	<0.05	<10	<10	10	10
MW-11 (Soil) 0-15 cm	MW-11	0-15	17	16	5	<0.5	6	<20	33	10	<0.1	<0.05	<10	<10	15	15
MW-11 (Soil) 40-50 cm	MW-11	40-50	8	10	<5	<0.5	3	<20	22	6	<0.1	<0.05	<10	<10	34	34
MW-12 (Soil) 0-15 cm	MW-12	0-15	17	16	<5	<0.5	5	<20	33	12	<0.1	<0.05	<10	<10	10	10
MW-12 (Soil)40-50 cm	MW-12	40-50	21	17	5	<0.5	5	<20	33	42	<0.1	<0.05	<10	10	33	43
MW-13 (Soil) 0-15 cm	MW-13	0-15	14	13	<5	<0.5	6	<20	26	10	<0.1	<0.05	<10	<10	20	20
MW-13 (Soil) 40-50 cm	MW-13	40-50	16	15	<5	<0.5	5	<20	30	9	<0.1	<0.05	<10	<10	<10	<10

Notes

NV = No Value

ND = Non - Detectable

6.8 Groundwater Sample Analytical Data

The concentrations for all parameters are at or below the laboratory detection limit, with the exception of Zn which ranges from 0.055 mg/L (MW-15) to 1.01 mg/L (MW-12) across the site.

The concentrations of PCBs and TPH are non-detect for all groundwater samples with the exception of MW-14, which has a TPH concentration of 0.139 mg/L.

The groundwater sample analytical data is included in the following page as Table 6-19.

Table 6-19: Summary of 2008 Groundwater Analytical - DCC Tier II Soil Disposal and Lower SiteLandfill

Sample #	Location	Groundwater Elevation (masl)	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	F1 C6-C10 [mg/L]	F2 C10-C16 [mg/L]	F3 C16-C34 [mg/L]	TPH C6-C34 [mg/L]
	Sampling Date		*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
LOWER SITE LANDFILL - UPGRADIENT WELL																
MW-16	MW-16	-	<0.005	NV	NV	<0.001	<0.001	0.403	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1
TIER II FACILITY - UPGRADIENT																
MW-14	MW-14	-	<0.005	NV	NV	<0.001	<0.001	0.204	<0.05	<0.01	<0.0001	<0.00005	<0.2	0.139	<0.1	0.139
MW-15	MW-15	-	0.005	NV	NV	<0.001	<0.001	0.055	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1
TIER II FACILITY - DOWNGRADIENT WELLS																
MW-10	MW-10	-	<0.005	NV	NV	<0.001	<0.001	0.499	<0.05	<0.01	<0.0001	<0.00005				
MW-11	MW-11	-	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
MW-12	MW-12	-	<0.005	NV	NV	<0.001	<0.001	1.010	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1
MW-13	MW-13	-	<0.005	NV	NV	<0.001	<0.001	0.802	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1

Notes

NV = No Value

6.9 Monitoring Well Sampling Logs

The monitoring well sampling logs for MW-10 to MW-16 are included in the following pages as Tables 6-20 to 6-26.

Table 6-20: Monitoring Well Sampling Log MW 10 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Teir II Landfill		
Monitoring Well ID:	MW-10		
Well Sampling Event:	2008	Sample Number:	MW-10
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	7		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	70		
Static water level (cm):	70	from ground surface	63
Depth to bottom (cm):	150	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.65		
Conductivity (mS/cm) :	398		
Temperature (^{O}C):	1.43		
Depth of water (cm):	80		
Well volume of water (mL):	1600		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 6-21: Monitoring Well Sampling Log MW 11 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-11		
Well Sampling Event:	2008	Sample Number:	MW-11
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	7		
Diameter of well (cm):	5		
Depth of installation (cm):	-	from ground surface	
Length screened section (cm):	-		
Depth to top of screen (cm):	-	from ground surface	
Depth to water surface (cm):	-	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	-		
Static water level (cm):	-	from ground surface	
Depth to bottom (cm):	-	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	-	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	-		
Conductivity (mS/cm) :	-		
Temperature (^{O}C):	-		
Depth of water (cm):	-		
Well volume of water (mL):	-		
Length screen collecting water:	-		
Shape factor:	-		

Table 6-22: Monitoring Well Sampling Log MW 12 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-12		
Well Sampling Event:	2008	Sample Number:	MW-12
Condition of Well:	Good - bailer stuck at 0.6m	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	2		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	37		
Static water level (cm):	37	from ground surface	35
Depth to bottom (cm):	60	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.43		
Conductivity (mS/cm) :	323		
Temperature (^{O}C):	3.69		
Depth of water (cm):	23		
Well volume of water (mL):	500		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 6-23: Monitoring Well Sampling Log MW 13 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-13		
Well Sampling Event:	2008	Sample Number:	MW-13
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	-2		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	16		
Static water level (cm):	16	from ground surface	18
Depth to bottom (cm):	115	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	7.29		
Conductivity (mS/cm) :	182		
Temperature (^{O}C):	3.66		
Depth of water (cm):	99		
Well volume of water (mL):	1900		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 6-24: Monitoring Well Sampling Log MW 14 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Lower Site Landfill		
Monitoring Well ID:	MW-14		
Well Sampling Event:	2008	Sample Number:	MW-14
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	22		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	93		
Static water level (cm):	93	from ground surface	71
Depth to bottom (cm):	174	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.21		
Conductivity (mS/cm) :	103		
Temperature (^{O}C):	1.66		
Depth of water (cm):	81		
Well volume of water (mL):	1600		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 6-25: Monitoring Well Sampling Log MW 15 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Helipad Landfill West		
Monitoring Well ID:	MW-15		
Well Sampling Event:	2008	Sample Number:	MW-15
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	7		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	14		
Static water level (cm):	14	from ground surface	7
Depth to bottom (cm):	174	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.71		
Conductivity (mS/cm) :	220		
Temperature (^{O}C):	3.34		
Depth of water (cm):	160		
Well volume of water (mL):	3100		
Length screen collecting water:	All of well		
Shape factor:	NA		

Table 6-26: Monitoring Well Sampling Log MW 16 - DCC Tier II Soil Disposal and Lower Site Landfill

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	20/08/2008	Time:	PM
Names of Samplers:	R.F		
Landfill Name:	Lower Site Landfill		
Monitoring Well ID:	MW-16		
Well Sampling Event:	2008	Sample Number:	MW-16
Condition of Well:	Good	Procedure/Equipment:	Waterra tube and foot valve
Decontamination required (Y/N):	N	Number washes and rinses:	NA

Measured Data

Well height above ground (cm):	12		
Diameter of well (cm):	5		
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	74		
Static water level (cm):	74	from ground surface	62
Depth to bottom (cm):	150	Evidence of sludge etc:	no
		Evidence of freezing/siltation:	no freezing
		(compare to installation record)	
Free product thickness (mm):	none	Method (electric meter, steel tape, etc):	interface probe/paste
pH:	6.71		
Conductivity (mS/cm) :	97		
Temperature (^{O}C):	1.23		
Depth of water (cm):	76		
Well volume of water (mL):	1500		
Length screen collecting water:	All of well		
Shape factor:	NA		

7.0 AIRSTRIP LANDFILL

7.1 Summary

The Airstrip Landfill is located at the lower site on high ground, south of the east end of the airstrip. Its surface area is approximately 2600 m^2.

The monitoring of this landfill includes a visual inspection to verify for evidence of settlement or erosion and collection of soil samples to monitor for the presence of leachate. Soil sample locations are identified in Figure 12 FOX-4 Cape Hooper – Airstrip Landfill. The soil analytical data is presented in Table 7-6. Soils at all stations were sampled from the surface and subsurface as specified. There are no monitoring wells in this area.

The visual inspection report, including supporting photos and drawing, is presented in the following pages.

7.2 Visual Inspection Report

The visual inspection of the Airstrip Landfill was conducted on August 20, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material with trace cobbles. There are some areas that are comprised of cobbles and boulders.

Settlement

Indications of settlement were not observed.

Erosion

Based on the supplied topographical map it appears that the landfill was placed over a former natural drainage feature or gully. Erosion channels coincident with the former gullies are present and appeared larger than the original surveyed dimensions. In general, both channels may have migrated upland by 5 m to 6 m, these measurements were taken using a hand held GPS and compared to the original topographic survey contours. At the time of the measurements, the GPS reported accuracy was approximately +/- 4 m. Round rock was noted in the erosion channels and may have been placed in the channels to reduce erosion. However, the water flow velocity and slope of the top of the landfill is causing loss or displacement of the round rock.

As noted in the 2007 visual inspection report, active erosion is being observed. The cause of the erosion is evidenced by a seepage occurring just above the landfill area and seepage emerging from a point down gradient of the landfill indicating that both surface and sub surface flows of water are active in this area. This can cause erosion of the surface and piping in the subsurface both of which result in material loss of the capping layer.

Frost Action

No frost action was observed in this area.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed in the landfill however arctic hares and fox were observed in the area.

Re-establishment of Vegetation

Re-establishment of vegetation was not oberved.

Staining

Two of the stained areas originally noted in the 2005 inspection report were not noted in the 2008 visual inspection. Area ST7-1 was noted and has decreased since the 2007 inspection.

Seepage Points

Seepage is emerging just above the southern portion of the landfill and is emerging from the northern down-slope portion of the landfill. The seepage was noted to be limited at the time of the inspection but is likely to be quite high during the spring melt.

Debris

Exposed debris was not observed.

Discussion

Based on the presence of significant and active erosion occurring on the capping layer the landfill performance is rated as marginal.

The erosion channels have been in-filled with round rock for erosion protection. This round rock is being displaced down the slope and is likely to be ineffective as means to control erosion in the long term. Nearby colluvium (angular rock) is available on site, which would be more effective at minimizing erosion and preventing debris exposure or loss of the insulative soil layer.

Table 7-1: Visual Inspection Checklist – Inspection Report – Airstrip Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **AIRSTRIP LANDFILL**
LANDFILL DESIGNATION: Landfill, Lower Site, South of East end of Airstrip
DATE OF INSPECTION: August 20, 2008
DATE OF PREVIOUS INSPECTION: August 22, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	NO								
Erosion	YES	For locations, refer to Figure 12 FOX-4 Cape Hooper – Airstrip Landfill. E7-1 E7-2	 50 m 25 m	 7 m 5 m	 0.5 m -1 m 0.5 m	14%* 5% *Only erosion channel length in landfill area was measured. In 2006 entire channel length was used. Actual length of erosion channel similar to 2006 and 2007 observations	Erosion is occurring along channels within the capping cover material. The erosion channels likely were filled in with round rock in some areas to reduce erosion however the slope and flow gradient are too high and movement of the round rock is occurring. GPS measurements were taken (+/- 4m) and the erosion increased 5 or 6 m in the uphill directions since the original site survey was conducted.	Photographs: 7B8, 7C8, 7D8, 7E8, 7H8, 7L8 For locations and directions of photographs, refer to Figure 12 FOX-4 Cape Hooper – Airstrip landfills.	The landfill may have been sited in a natural watercourse or drainage feature. The water flow is occurring along these infilled drainage features causing excessive erosion. If future work is conducted to reduce the erosion of the capping material the nearby colluvium (angular rock) should be used to minimize erosion. The colluvium (rocks) of the correct size should be used based on the water flow rate to minimize displacement of the armouring angular rock.
Frost Action	NO	Frost action was not noted.							
Sloughing and Cracking	NO								
Animal Burrows	NO								
Vegetation	NO							No vegetation was observed on the capping cover.	
Staining	YES	ST7-1	13 m	5m	3%			Staining noted as ST7-2 and 3 in 2005 not noted during the 2008 landfill inspection. Photographs: 7F8, 7G8 For locations and directions of photographs, refer to Figure 12 FOX-4 Cape Hooper – Airstrip landfills.	Staining at ST7-1 appears to be less than was observed in the previous investigation (2007).
Vegetation Stress	NO							No vegetation was observed on the capping cover.	
Seepage Points	YES	One seepage point is present on the south landfill boundary. Refer to Figure 12 FOX-4 Cape Hooper –Airstrip landfills.							
Debris Exposed	NO (but debris is visible outside of Landfill area)	Steel cable, drum, and metal debris visible outside of landfill area. Not likely related directly to the landfill activities.						Photographs: 7A8, 7I8, 7J8, 7K8 For locations and directions of photographs, refer to Figure 12 FOX-4 Cape Hooper – Airstrip landfills.	
Presence/Condition – Monitoring Instruments	YES	Refer to Figure 12 FOX-4 Cape Hooper –Airstrip landfills.						Refer to Figure 12 FOX-4 Cape Hooper – Airstrip landfills.	
Features of Note.	NO								

7.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for the Airstrip Landfill has been completed as per the Terms of Reference and is included as Tables 7-2 of this report.

Table 7-2: Preliminary Stability Assessment – Airstrip Landfill

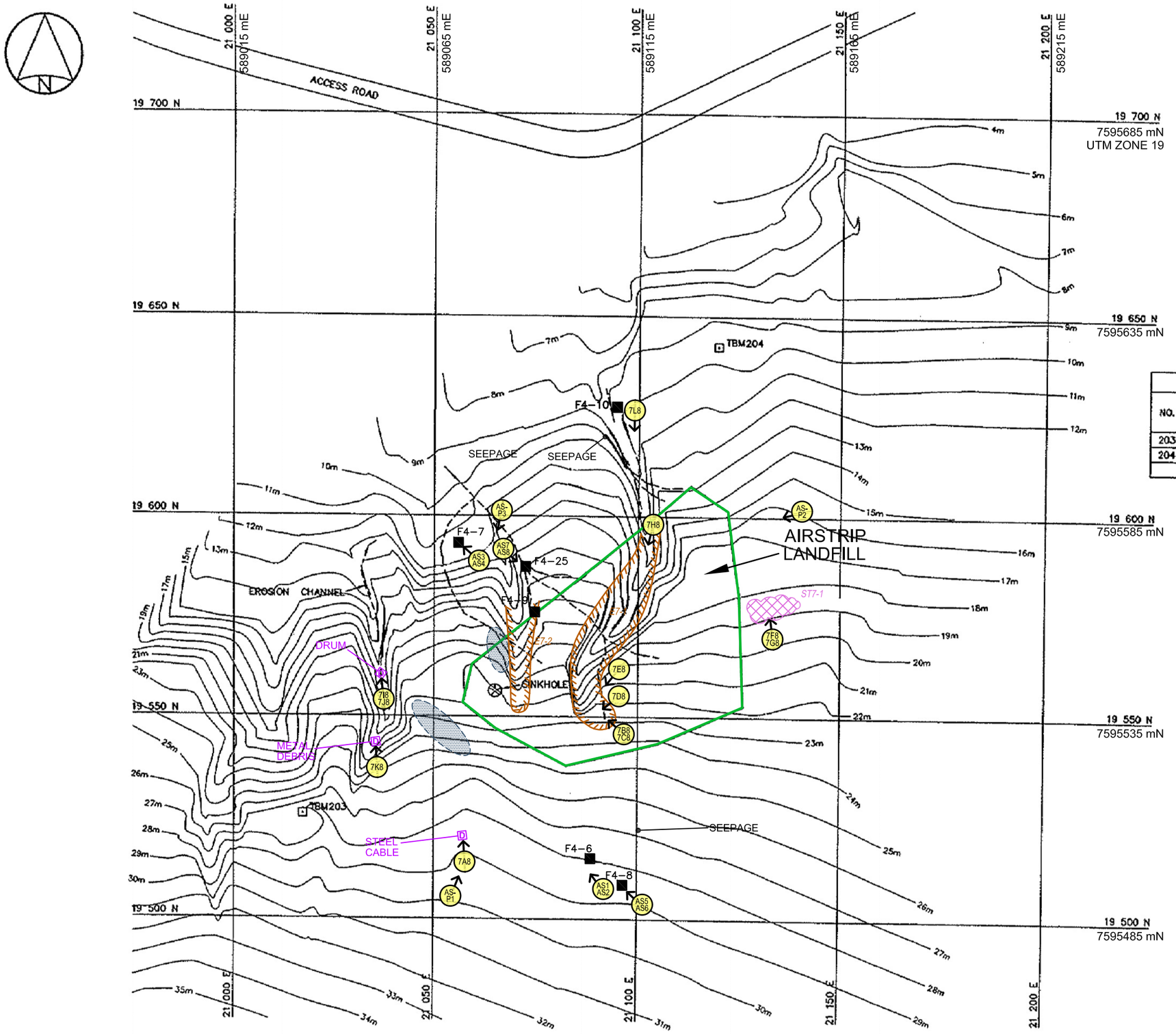
Feature	Severity Rating	Extent
Settlement	Acceptable	None
Erosion	Significant	Occasional
Frost Action	Not Observed	None
Staining	Not Observed	None
Vegetation Stress	Not Observed	None
Seepage / Ponded Water	Acceptable	Occasional
Debris Exposure	Not Observed	None
Overall Landfill Performance	**Marginal**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

7.4 Location Plan

The Location Plan for the Airstrip Landfill has been completed as per the Terms of Reference and is included in the following page as Figure 12 FOX-4 Cape Hooper – Airstrip Landfill.



LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- TBM203 TEMPORARY BENCHMARK
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2008 OBSERVATIONS:

- ST7-1 STAINS
- D DEBRIS
- E7-1 EROSION
- POOLING
- SINKHOLE
- PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV. (m)	DESCRIPTION
	NORTHING	EASTING		
203	19 525.545	21 017.155	28.241	19mm DIA. PIPE/STONE CAIRN
204	19 642.453	21 119.708	10.019	19mm DIA. PIPE/STONE CAIRN

Title: FOX-4 CAPE HOOPER - AIRSTRIP LANDFILL

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:1000

20 15 10 5 0 metres 25 50

FIGURE 12

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

7.5 Photographic Records

The Photographic Record for the Airstrip Landfill has been completed as per the Terms of Reference and is included in the following page as Table 7-3. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Figure 7-3 Photographic Record - Airstrip Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
7A8	7A8.jpg 20/08/2008	view of metal debris observed at 589072E/75975500N. Camera facing North.		Figure 12
7B8	7B8.jpg 20/08/2008	Close up view of erosion area observed at 589112E/7595533N. White card is 21cm by 28cm. Camera facing North-East.		Figure 12
7C8	7C8.jpg 20/08/2008	Close up view of erosion area observed at 589112E/7595533N. White card is 21cm by 28cm. Camera facing South.		Figure 12
7D8	7D8.jpg 20/08/2008	South-West view of erosion area observed at 589112E/7595533N.		Figure 12
7E8	7E8.jpg 20/08/2008	Wide angle view of the same erosion area. White card is 21cm by 28cm and located at 589112E/7595533N. Camera facing South-West.		Figure 12
7F8	7F8.jpg 20/08/2008	Wide angle view of reddish soil staining. White card is 21cm by 28cm and located at 589149E/7595557N. Camera facing North.		Figure 12
7G8	7G8.jpg 20/08/2008	Close up view of reddish soil staining observed at 589149E/7595557N.Camera facing North.		Figure 12
7H8	7H8.jpg 20/08/2008	Facing upgradient at slope erosion at 589119E/7595583N. White card is 21cm by 28cm. Depth greater than 2.0 meters. Seepage visible at bottom.		Figure 12

Figure 7-3 Photographic Record - Airstrip Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
7I8	7I8.jpg 20/08/2008	Wide angle view of drum and small stream. White card is 21cm by 28cm and located at 589047E/7595541N. Camera facing South.		Figure 12
7J8	7J8.jpg 20/08/2008	Close up view of drum observed at 589047E/7595541N. Camera facing South-West.		Figure 12
7K8	7K8.jpg 20/08/2008	View of metal debris observed at 589047E/75975528N. Camera facing South.		Figure 12
7L8	7L8.jpg 20/08/2008	Facing upgradient at slope erosion E71. Seepage visible at bottom. Facing south.		Figure 12
AS1	AS1.jpg 20/08/2008	Soil sampling station F4-6, facing northwest.		Figure 12
AS2	AS2.jpg 20/08/2008	F4-6, showing test pit to 50 cm.		Figure 12
AS3	AS3.jpg 20/08/2008	Soil sampling station F4-7, facing southwest.		Figure 12
AS4	AS4.jpg 20/08/2008	F4-7, showing test pit to 50 cm.		Figure 12
AS5	AS5.jpg 20/08/2008	Soil sampling station F4-8, facing northwest.		Figure 12

Figure 7-3 Photographic Record - Airstrip Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
AS6	AS6.jpg 20/08/2008	F4-8, showing test pit to 45 cm.		Figure 12
AS7	AS7.jpg 20/08/2008	Soil sampling station F4-25, facing southeast.		Figure 12
AS8	AS8.jpg 20/08/2008	F4-25, showing test pit to 50 cm.		Figure 12
Photo	**Electronic File Name/ Date**	**Thumbnail**	**Photo Description**	**Reference Figure Number**
AS-P1	AS-P1-jpg 20/08/2008		Panorama showing top section of landfill. Facing northeast.	Figure 12
AS-P2	AS-P2.jpg 20/08/2008		Panorama showing top section of landfill. Facing northwest.	Figure 12
AS-P3	AS-P3.jpg 20/08/2008		Panorama showing erosional feature E7-2 facing up gradient. Facing south.	Figure 12

7.6 Thermal Monitoring Data

Not applicable to this landfill area.

7.7 Soil Sample Analytical Data

The concentrations of total Cd and Hg are below detection limits. Elevated concentrations of Arsenic (As) were found in soil samples F4-6 (shallow and deep) at 187 and 230 mg/kg respectively. The concentrations of Cu, Ni, Co, Pb, Zn, and Cr are generally low, however concentrations located upgradient tend to be slightly elevated in comparison to the downgradient soil sample locations.

The concentrations of PCBs were below detection limits in the soil samples collected.

The TPH chemical analyses results for the soil samples are non-detect or at low concentrations ranging from 14 mg/kg to 22 mg/kg. The results for hydrocarbon fractions F1 and F2 were below detection limits for all samples, while F3 was detected in the surface soil sample F4-6 and both surface and subsurface at sample F4-8.

The soil sample analytical data is included in the following page as Table 7-4.

Table 7-4: Summary of 2008 Soil Analytical Data - Airstrip Landfill

Sample #	Location	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	TPH C_6-C_{34} [mg/kg]
	Sampling Date		*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
AIRSTRIP LANDFILL UPGRADIENT																
F4-8(Soil)0-15cm	F4-8	0-15	17	17	<5	<0.5	5	<20	34	23	<0.1	<0.05	<10	<10	14	14
F4-8(Soil)40-50cm	F4-8	40-50	21	17	<5	<0.5	6	<20	34	23	<0.1	<0.05	<10	<10	17	17
F4-6(Soil) 0-15cm	F4-6	0-15	47	37	11	<0.5	8	40	66	187	<0.1	<0.05	<10	<10	22	22
F4-6(Soil)40-50cm	F4-6	40-50	34	29	7	<0.5	8	53	53	230	<0.1	<0.05	<10	<10	<10	<10
AIRSTRIP LANDFILL DOWNGRADIENT																
F4-7(Soil)0-15cm	F4-7	0-15	10	12	<5	<0.5	5	<20	26	14	<0.1	<0.05	<10	<10	<10	<10
F4-7(Soil)40-50cm	F4-7	40-50	5	7	<5	<0.5	4	<20	25	33	<0.1	<0.05	<10	<10	<10	<10
F4-25(Soil)0-15cm	F4-25	0-15	8	8	<5	<0.5	2	<20	14	8	<0.1	<0.05	<10	<10	<10	<10
F4-25(Soil)40-50cm	F4-25	40-50	6	7	<5	<0.5	3	<20	15	16	<0.1	<0.05	<10	<10	<10	<10

7.8 Groundwater Sample Analytical Data

There are no monitoring wells in the Airstrip Landfill Area.

7.9 Monitoring Well Sampling Logs

There are no monitoring wells in the Airstrip Landfill Area.

8.0 TANNER BAY LANDFILL

8.1 Summary

The Tanner Bay Landfill is located at the original beach landing area for the site, along Tanner Bay. It has a surface area of approximately 400 m^2.

Three additional soil samples were collected at the request of the Royal Military College of Canada, Environmental Sciences Group. Sample locations are identified in Figure 13 FOX-4 Cape Hooper – Tanner Bay Landfill

The monitoring of this landfill includes a visual inspection to verify for evidence of settlement or erosion and collection of soil samples to monitor for the presence of leachate. Soil sample locations are identified in Figure 13 FOX-4 Cape Hooper – Tanner Bay Landfill. The soil analytical data is presented in Table 8-6. Soil samples were collected from surface and subsurface at all stations. There are no monitoring wells in this area.

The visual inspection report is presented in the following pages.

8.2 Visual Inspection Report

The visual inspection of the Tanner Bay Landfill was conducted on August 24, 2008. The observed capping material over the landfill grades from a sandy gravel to a gravelly sand material with trace cobbles.

Settlement

Indications of settlement were not observed.

Erosion

Minor erosion of the capping layer surface was observed. The erosion was located on the landfill side slope and not on the top of the landfill capping layer.

Frost Action

No frost action was observed in this area.

Evidence of Burrowing Animals

Indications of burrowing animals were not observed in the landfill however arctic hares and fox were observed in the area.

Re-establishment of Vegetation

Re-establishment of vegetation was not observed.

Staining

The stained areas are visible adjacent to the northwest of the landfill and appear to have increased in area slightly since the 2007 visual inspection. The staining is reddish and grey with an occasional associated sheen (See Figure 13 FOX-4 Cape Hooper – Tanner Bay Landfill).

Seepage Points

Seepage is emerging from the northwest portion of the landfill and is discharging to an area of mature vegetation. Discoloration of the vegetation is occurring. Seepage is associated with reddish and grey brown staining observed on the ground surface.

Debris

Exposed debris was noted at one location within the landfill. Two areas of debris outside of the landfill area were photographed and are presented on the drawing to illustrate it likely that the debris is related to the landfill activities.

Discussion

The Tanner Bay Landfill performance with respect to containment of the debris within the landfill is rated as acceptable.

Table 8-1: Visual Inspection Checklist – Inspection Report – Tanner Bay Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING

VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 OF 2

SITE NAME: **TANNER BAY LANDFILL**
LANDFILL DESIGNATION:
DATE OF INSPECTION: August 24, 2008
DATE OF PREVIOUS INSPECTION: August 24, 2007
INSPECTED BY: Richard Wells
REPORT PREPARED BY: Ryan Fletcher and Stephen Livingstone
The inspector/reporter represents to the best of their knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

VISUAL INSPECTION CHECKLIST - INSPECTION REPORT – PAGE 2 OF 2

Checklist Item	Present Yes/No	Location (Describe relative to existing monuments/features and relative to landfill design i.e. surface, berms, toe)	Length	Width	Depth	Extent relative to Area of Landfill (%)	Description	Photographic Records Focal length, location, view point & direction (relative to magnetic north) Feature of note Scale	Additional Comments
Settlement	NO								
Erosion	YES	Minor Surface erosion is starting to expose the top of a barrel. This is a singular case of minor debris exposure. UTM coordinates indicate the drum may be outside of landfill area but landfill outline is assumed to represent top of slope and the drum may is located on the landfill side slope. For locations refer to Figure Fox -13 Cape Hooper-Tanner Bay	0.1 m	0.1 m	0.1 m	<1%		Photographs: 8L8, 8M8 For locations and directions of photographs refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	
Frost Action	NO	Frost action was not noted. The visible materials appeared to be coarse grained or granular materials and frost susceptibility was assumed to be low.							
Sloughing and Cracking									
Animal Burrows	NO								
Vegetation	NO	No vegetation was observed on top of the landfill however vegetation in close proximity to landfill appears to be well developed.					Lichen and Moss		
Staining	YES	ST8-1/2 For locations refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	36 m	4 m		12%	Staining was noted	Photographs: 8C8, 8D8, 8E8, 8F8, 8G8, 8H8, 8I8, 8J8, 8K8, TB-P2 For locations and directions of photographs refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	
Vegetation Stress	NO	No vegetation stress was observed in the vegetation adjacent to the landfill.					Slight Discoloration	Photographs: 8C8, 8D8, 8E8, 8F8, 8G8, 8H8, 8I8, 8J8, 8K8, TB-P2 For locations and directions of photographs refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	
Seepage Points	YES	Seepage points coincide with stain location ST8-1/2					Where there was staining there was an associated seepage point.	Photographs: 8C8, 8D8, 8E8, 8F8, 8G8, 8H8, 8I8, 8J8, 8K8, TB-P2 For locations and directions of photographs refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	
Debris Exposed	YES (but might be located outside of landfill area)						Miscellaneous debris, cans, top of drum, glass from light bulbs small pieces of wire	Photographs: 8A8, 8B8, 8L8, 8M8 For locations and directions of photographs refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay	
Presence/Condition – Monitoring Instruments	YES	For locations refer to Figure 13 Fox -4 Cape Hooper-Tanner Bay							
Features of Note.	NO	Access road to the Tanner Bay landfill					Cross ditching has not been installed at locations where natural watercourses intersect the access road.		Progressive wash out of the road is occurring and may limit access to foot traffic only.

8.3 Preliminary Stability Assessment

The Preliminary Stability Assessment for the Tanner Bay Landfill has been completed as per the Terms of Reference and is included as Tables 8-2 of this report.

Table 8-2: Preliminary Stability Assessment – Tanner Bay Landfill

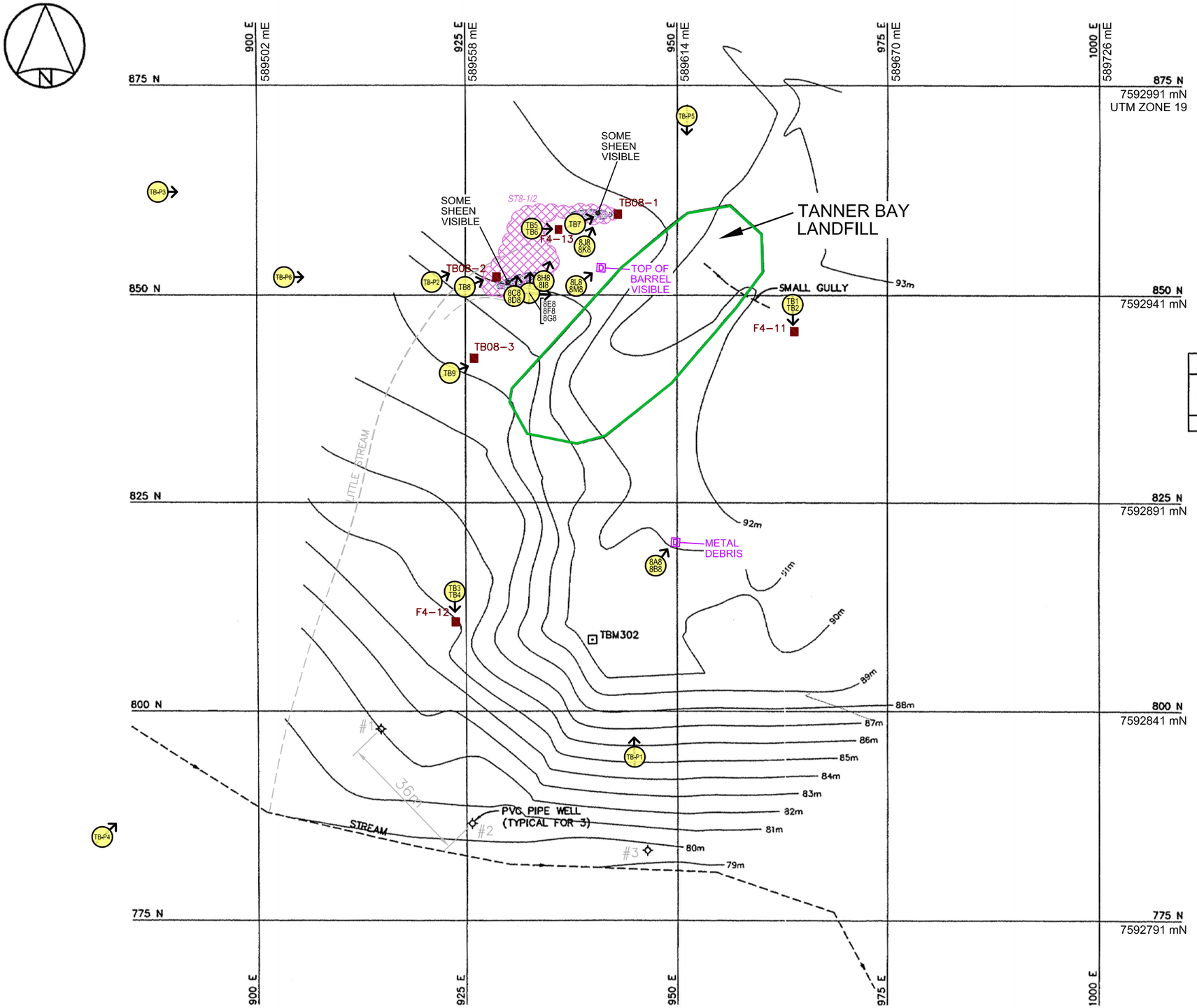
Feature	Severity Rating	Extent
Settlement	Not Observed	None
Erosion	Acceptable	Occasional
Frost Action	Not Observed	None
Staining	Acceptable	Occasional
Vegetation Stress	Acceptable	Occasional
Seepage / Ponded Water	Acceptable	Occasional
Debris Exposure	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

Performance / Severity Rating	Description
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacted less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

8.4 Location Plan

The Location Plan for the Tanner Bay Landfill has been completed as per the Terms of Reference and is included in the following page as Figure 13 FOX-4 Cape Hooper – Tanner Bay Landfill.



LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- TBM302 — TEMPORARY BENCHMARK
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2008 OBSERVATIONS:

- ST8-1 — STAINS
- D — DEBRIS
- EROSION
- POOLING
- SINKHOLE
- 8A8 8B8 — PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
302	808.603	939.857	90.944	19mm DIA. PIPE/STONE CAIRN

Title: FOX-4 CAPE HOOPER - TANNER BAY LANDFILL

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2008

Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:1000

20 15 10 5 0 25 50 metres

FIGURE 13

Z:\Projects\2008\1213-0801 Fox-4 Cape Hooper\Figures

8.5 Photographic Records

The Photographic Record for the Tanner Bay Landfill has been completed as per the Terms of Reference and is included in the following page as Table 8-3. The Photographic Record only contains an index and “thumbnail” photographs; full sized photographs are contained in the Addendum CD-ROM. The addition of panoramic photographs was added to the photographic records during the 2008 sampling event and can be found in the bottom section of the photologs.

Figure 8-3 Photographic Record - Tanner Bay Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
8A8	8A8.jpg 24/08/2008	Wide angle view of metal debris. The white card is 21cm by 28cm and located at 589608E/7592873N. Camera facing North-East.		Figure 13
8B8	8A8.jpg 24/08/2008	Close up view of metal debris observed at 589608E/7592873N. Camera facing North-East.		Figure 13
8C7	8C7.jpg 24/08/2008	Pooling, soil staining, and seepage observed at 589572E/7592941N. Some sheen on water visible Camera facing North.		Figure 13
8D8	8D8.jpg 24/08/2008	Close up view of pooling, soil staining and sheen on water observed at 589572E/7592941N. Camera facing North.		Figure 13
8E8	8E8.jpg 24/08/2008	Some sheen on standing water and reddish soil staining observed at 589576E/7592943N. Camera facing North.		Figure 13
8F8	8F8.jpg 23/08/2007	Close view of seepage and pooling. Some sheen on water is visible at 589576E/7592943N. Camera facing North		Figure 13
8G8	8G8.jpg 24/08/2008	Looking towards landfill from seepage area. Facing northeast.		Figure 13
8H8	8H8.jpg 24/08/2008	Wide angle view of standing water and reddish soil staining. The white card is 21cm by 28cm and located at 589581E/7592950N. North West slope of Tanner Bay Landfill in background. Camera facing North-East.		Figure 13
8I8	8I8.jpg 24/08/2008	Close up view of standing water and reddish soil staining observed at 589581E/7592950N. Camera facing North-East.		Figure 13
8J8	8J8.jpg 24/08/2008	Standing water and reddish soil staining observed at 589590E/7592955N. Some sheen is visible on water. Camera facing North-East.		Figure 13

Figure 8-3 Photographic Record - Tanner Bay Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
8K8	8K8.jpg 24/08/2008	Wide angle view of standing water and soil staining. White card is located at 589590E/7592955N. Camera facing North-East.		Figure 13
8L8	8L8.jpg 24/08/2008	North West corner of Tanner Bay Landfill. Wide angle view of top of barrel located at 589589E/7592943N. White card is 21cm by 28cm. Camera facing North-East.		Figure 13
8M8	8M8.jpg 24/08/2008	Close up view showing top of barrel at 589589E/7592943N. Camera facing North-East.		Figure 13
TB1	TB1.jpg 24/08/2008	Soil sampling station F4-11, facing northwest.		Figure 13
TB2	TB2.jpg 24/08/2008	F4-11, showing test pit to 50 cm.		Figure 13
TB3	TB3.jpg 24/08/2008	Soil sampling station F4-12, facing north.		Figure 13
TB4	TB4.jpg 24/08/2008	F4-12, showing test pit to 50 cm.		Figure 13
TB5	TB5.jpg 24/08/2008	Soil sampling station F4-13, facing northeast.		Figure 13
TB6	TB6.jpg 24/08/2008	F4-13, showing test pit to 50 cm.		Figure 13
TB7	TB7.jpg 24/08/2008	NEW-2008. Soil sampling station TB08-1, facing northeast.		Figure 13

Figure 8-3 Photographic Record - Tanner Bay Landfill

Photo	Electronic File Name/ Date	Photo Description	Thumbnail	Reference Figure Number
TB8	TB8.jpg 24/08/2008	NEW-2008. Soil sampling station TB08-2, facing northeast.		Figure 13
TB9	TB9.jpg 24/08/2008	NEW-2008. Soil sampling station TB08-3, facing northeast.		Figure 13

Photo	Electronic File Name/ Date	Thumbnail	Photo Description	Reference Figure Number
TB-P1	TB-P1.jpg 24/08/2008		View of toe of landfill (south side). Facing north.	Figure 13
TB-P2	TB-P2.jpg 24/08/2008		Showing soil staining at ST8-1. Facing northeast.	Figure 13
TB-P3	TB-P3.jpg 24/08/2008		Wide view of landfill from the west. Facing east.	Figure 13
TB-P4	TB-P4.jpg 24/08/2008		Wide view of landfill from the southwest. Facing northeast.	Figure 13
TB-P5	TB-P1.jpg 24/08/2008		View of staining at ST8-1 and landfill. Facing south.,	Figure 13
TB-P6	TB-P1.jpg 24/08/2008		View of landfill and staingin at ST8-1 from the west. Facing east.	Figure 13

8.6 Thermal Monitoring Data

Not applicable to this landfill area.

8.7 Soil Sample Analytical Data

The concentrations of Cu, Co, Cd, Zn, As, and Hg are below detection limits, while the concentrations of the other metals are generally low. In general, the concentrations Ni, Pb, and Cr from downgradient soil samples are comparable to the upgradient soil samples for both depths.

The concentrations of PCBs are below detection limits in the soil samples (both depths) collected from each of the locations.

The surface soil at F4-11 contains a fairly elevated concentration of TPH (1,707 mg/kg) and subsurface soil at F4-11 also contains slightly elevated TPH levels at 379 mg/Kg. The TPH concentration is attributed to higher concentrations of F2 and F3 fractions, while F1 was non-detect in both the surface and subsurface samples. The TPH concentrations in the remaining soil samples are at or below detection limit or at low concentrations.

The soil sample analytical data is included in the following page as Table 8-4.

Table 8-4: Summary of 2008 Soil Analytical Data - Tanner Bay Landfill

Sample #	Location	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	TPH C_6-C_{34} [mg/kg]
Sampling Date			*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*	*Aug-08*
UPGRADIENT																
F4-12(Soil)0-15cm	F4-12	0-15	<5	8	<5	<0.5	5	<20	17	<1	<0.1	<0.05	<10	<10	11	11
F4-12(Soil)40-50cm	F4-12	40-50	<5	8	<5	<0.5	6	<20	19	<1	<0.1	<20	<10	<10	<10	<10
DOWNGRADIENT																
F4-11(Soil)0-15cm	F4-11	0-15	<5	7	<5	<0.5	4	<20	14	<1	<0.1	<0.05	<10	1120	587	1707
F4-11(Soil)40-50cm	F4-11	40-50	<5	7	<5	<0.5	3	<20	12	<1	<0.1	<0.05	<10	272	107	379
F4-13(Soil)0-15cm	F4-13	0-15	<5	10	<5	<0.5	5	<20	17	<1	<0.1	<0.05	<10	<10	<10	<10
F4-13(Soil)40-50cm	F4-13	40-50	<5	8	<5	<0.5	5	<20	15	<1	<0.1	<0.05	<10	<10	<10	<10

Notes

NV = No Value

8.8 Groundwater Sample Analytical Data

There are no monitoring wells in the Tanner Bay Landfill area.

8.9 Monitoring Well Sampling Logs

There are no monitoring wells in the Tanner Bay Landfill area.

ANNEX 1

CERTIFICATES OF ANALYSIS

ANNEX 1-A

SOIL AND GROUNDWATER RESULTS - PARACEL

PARACEL LABORATORIES LTD.

TRUSTED. RESPONSIVE. RELIABLE.

300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8

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e: paracel@paracellabs.com

www.paracellabs.com

OTTAWA ◉ NIAGARA FALLS ◉ MISSISSAUGA ◉ SARNIA

Certificate of Analysis

Nunatta Environmental Services Inc.

P.O. Box 267
Iqaluit, NUNAVUT X0A 0H0
Attn: Alain Carrier

Phone: (867) 979-1488
Fax: (867) 979-1478

Client PO:
Project: FOX-4

Report Date: 2-Sep-2008
Order Date: 27-Aug-2008

Custody: 42874, 42875, 42868, 42873, 42876, 42872, 42871, 4

Order #: 0835084

This Certificate of Analysis contains analytical data applicable to the following samples submitted:

Paracel ID	Client ID
0835084-01	MW-1 (soil) 0-15cm
0835084-02	MW-1 (soil) 40-50cm
0835084-03	MW-2 (soil) 0-15cm
0835084-04	MW-2 (soil) 40-50cm
0835084-05	MW-3 (soil) 0-15cm
0835084-06	MW-3 (soil) 40-50cm
0835084-07	MW-4 (soil) 0-15cm
0835084-08	MW-4 (soil) 40-50cm
0835084-09	MW-5 (soil) 0-15cm
0835084-10	MW-5 (soil) 40-50cm
0835084-11	MW-6 (soil) 0-15cm
0835084-12	MW-6 (soil) 40-50cm
0835084-13	MW-7 (soil) 0-15cm
0835084-14	MW-7 (soil) 40-50cm
0835084-15	MW-8 (soil) 0-15cm
0835084-16	MW-8 (soil) 40-50cm
0835084-17	MW-9 (soil) 0-15cm
0835084-18	MW-9 (soil) 40-50cm
0835084-19	MW-10 (soil) 0-15cm
0835084-20	MW-10 (soil) 40-50cm
0835084-21	MW-11 (soil) 0-15cm
0835084-22	MW-11 (soil) 40-50cm
0835084-23	MW-12 (soil) 0-15cm
0835084-24	MW-12 (soil) 40-50cm
0835084-25	MW-13 (soil) 0-15cm
0835084-26	MW-13 (soil) 40-50cm
0835084-27	MW-14 (soil) 0-15cm
0835084-28	MW-14 (soil) 40-50cm
0835084-29	MW-15 (soil) 0-15cm
0835084-30	MW-15 (soil) 40-50cm
0835084-31	MW-16 (soil) 0-15cm
0835084-32	MW-16 (soil) 40-50cm
0835084-33	F4-1 (soil) 0-15cm
0835084-34	F4-1 (soil) 40-50cm
0835084-35	F4-2 (soil) 0-15cm
0835084-36	F4-2 (soil) 40-50cm
0835084-37	F4-3 (soil) 0-15cm
0835084-38	F4-3 (soil) 40-50cm
0835084-39	F4-4 (soil) 0-15cm
0835084-40	F4-4 (soil) 40-50cm
0835084-41	F4-5 (soil) 0-15cm
0835084-42	F4-5 (soil) 40-50cm
0835084-43	F4-6 (soil) 0-15cm
0835084-44	F4-6 (soil) 40-50cm
0835084-45	F4-7 (soil) 0-15cm
0835084-46	F4-7 (soil) 40-50cm
0835084-47	F4-8 (soil) 0-15cm
0835084-48	F4-8 (soil) 40-50cm
0835084-49	F4-11 (soil) 0-15cm
0835084-50	F4-11 (soil) 40-50cm
0835084-51	F4-12 (soil) 0-15cm
0835084-52	F4-12 (soil) 40-50cm
0835084-53	F4-13 (soil) 0-15cm
0835084-54	F4-13 (soil) 40-50cm

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

0835084-55	F4-17 (soil) 0-15cm
0835084-56	F4-17 (soil) 40-50cm
0835084-57	F4-18 (soil) 0-15cm
0835084-58	F4-18 (soil) 40-50cm
0835084-59	F4-19 (soil) 0-15cm
0835084-60	F4-19 (soil) 40-50cm
0835084-61	F4-20 (soil) 0-15cm
0835084-62	F4-20 (soil) 40-50cm
0835084-63	F4-21 (soil) 0-15cm
0835084-64	F4-21 (soil) 40-50cm
0835084-65	F4-22 (soil) 0-15cm
0835084-66	F4-22 (soil) 40-50cm
0835084-67	F4-24 (soil) 0-15cm
0835084-68	F4-24 (soil) 40-50cm
0835084-69	F4-25 (soil) 0-15cm
0835084-70	F4-25 (soil) 40-50cm
0835084-71	QA/QC 1
0835084-72	QA/QC 2
0835084-73	QA/QC 3
0835084-74	QA/QC 4
0835084-75	QA/QC 5
0835084-76	QA/QC 6
0835084-77	QA/QC 7

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	28-Aug-08	28-Aug-08
CCME PHC F1	CWS Tier 1 - P&T GC-FID	27-Aug-08	30-Aug-08
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	28-Aug-08	31-Aug-08
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	29-Aug-08	29-Aug-08
Mercury	EPA 7471A - CVAA, digestion	28-Aug-08	28-Aug-08
Metals	EPA 6020 - Digestion - ICP-MS	28-Aug-08	28-Aug-08
PCBs, total	SW846 8080 - GC-ECD	28-Aug-08	28-Aug-08
Solids, %	Gravimetric, calculation	28-Aug-08	29-Aug-08

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-1 (soil) 0-15cm	MW-1 (soil) 40-50cm	MW-2 (soil) 0-15cm	MW-2 (soil) 40-50cm
	Sample Date:	22-Aug-08	22-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-01	0835084-02	0835084-03	0835084-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.2	91.6	93.7	91.4
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	16	14	18	12
Barium	10 ug/g dry	41	26	66	71
Beryllium	0.5 ug/g dry	<0.5	<0.5	0.8	1.0
Boron, available	0.5 ug/g dry	<0.5	<0.5	1.1	0.8
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	31	22	46	49
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	5	<5	10	10
Copper	5 ug/g dry	20	13	31	34
Iron	200 ug/g dry	10800	8760	15300	16800
Lead	1 ug/g dry	20	6	9	10
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	16	13	31	35
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	35	27	49	53
Zinc	20 ug/g dry	<20	<20	33	33
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	16	62
F2 PHCs (C10-C16)	10 ug/g dry	138	1800	862	6800
F3 PHCs (C16-C34)	10 ug/g dry	85	142	305	764
F4 PHCs (C34-C50)	10 ug/g dry	11	<10	<10	33
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	81.5%	83.4%	82.6%	85.1%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-3 (soil) 0-15cm	MW-3 (soil) 40-50cm	MW-4 (soil) 0-15cm	MW-4 (soil) 40-50cm
	Sample Date:	22-Aug-08	22-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-05	0835084-06	0835084-07	0835084-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.9	97.2	97.8	97.3
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	49	17	5	4
Barium	10 ug/g dry	74	46	28	26
Beryllium	0.5 ug/g dry	<0.5	0.6	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	48	25	20	18
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	6	<5	<5	<5
Copper	5 ug/g dry	21	17	9	9
Iron	200 ug/g dry	13800	9490	7530	7380
Lead	1 ug/g dry	7	7	3	3
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	1
Nickel	5 ug/g dry	19	14	8	8
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	50	27	24	23
Zinc	20 ug/g dry	23	<20	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	18	<10	<10	<10
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	88.8%	84.0%	85.5%	85.2%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-5 (soil) 0-15cm	MW-5 (soil) 40-50cm	MW-6 (soil) 0-15cm	MW-6 (soil) 40-50cm
	Sample Date:	22-Aug-08	22-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-09	0835084-10	0835084-11	0835084-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.1	93.2	96.2	95.5
Metals					
Antimony	1 ug/g dry	2	1	<1	<1
Arsenic	1 ug/g dry	23	19	11	13
Barium	10 ug/g dry	61	72	40	43
Beryllium	0.5 ug/g dry	0.7	0.8	<0.5	0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	50	47	30	37
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	7	10	<5	5
Copper	5 ug/g dry	56	43	24	23
Iron	200 ug/g dry	17100	17600	10300	13200
Lead	1 ug/g dry	17	10	43	8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	2	1	<1	1
Nickel	5 ug/g dry	25	37	14	19
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	51	55	33	39
Zinc	20 ug/g dry	58	40	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	258	51	99	48
F3 PHCs (C16-C34)	10 ug/g dry	669	156	345	335
F4 PHCs (C34-C50)	10 ug/g dry	133	24	69	67
PCBs					
PCBs, total	0.05 ug/g dry	0.07	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	88.3%	81.8%	84.9%	83.7%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-7 (soil) 0-15cm	MW-7 (soil) 40-50cm	MW-8 (soil) 0-15cm	MW-8 (soil) 40-50cm
	Sample Date:	23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
	Sample ID:	0835084-13	0835084-14	0835084-15	0835084-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.5	95.2	94.8	93.6
Metals					
Antimony	1 ug/g dry	3	<1	<1	<1
Arsenic	1 ug/g dry	20	24	17	11
Barium	10 ug/g dry	62	89	41	38
Beryllium	0.5 ug/g dry	0.5	0.7	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	0.6	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	41	61	29	26
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	6	8	<5	<5
Copper	5 ug/g dry	47	53	19	17
Iron	200 ug/g dry	13600	19500	10400	10100
Lead	1 ug/g dry	40	24	8	7
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	2	<1	<1
Nickel	5 ug/g dry	21	32	15	14
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	42	61	33	31
Zinc	20 ug/g dry	48	46	21	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	174	178	37	42
F4 PHCs (C34-C50)	10 ug/g dry	53	42	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	84.8%	86.0%	80.0%	83.7%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-9 (soil) 0-15cm	MW-9 (soil) 40-50cm	MW-10 (soil) 0-15cm	MW-10 (soil) 40-50cm
	Sample Date:	23-Aug-08	23-Aug-08	23-Aug-08	19-Aug-08
	Sample ID:	0835084-17	0835084-18	0835084-19	0835084-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.7	96.1	93.3	92.8
Metals					
Antimony	1 ug/g dry	1	<1	<1	<1
Arsenic	1 ug/g dry	18	15	14	8
Barium	10 ug/g dry	38	100	33	45
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	30	65	26	31
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	7	<5	5
Copper	5 ug/g dry	17	30	15	15
Iron	200 ug/g dry	10500	18000	10200	12200
Lead	1 ug/g dry	7	6	4	5
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	13	23	14	17
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	34	61	32	33
Zinc	20 ug/g dry	<20	37	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10 [1]
F2 PHCs (C10-C16)	10 ug/g dry	36	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	56	29	<10	10
F4 PHCs (C34-C50)	10 ug/g dry	39	<10	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	0.17	0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	84.7%	82.7%	92.6%	84.9%

PARACEL LABORATORIES LTD.

Order #: 0835084

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Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-11 (soil) 0-15cm	MW-11 (soil) 40-50cm	MW-12 (soil) 0-15cm	MW-12 (soil) 40-50cm
	Sample Date:	19-Aug-08	19-Aug-08	19-Aug-08	19-Aug-08
	Sample ID:	0835084-21	0835084-22	0835084-23	0835084-24
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.4	91.6	90.8	91.5
Metals					
Antimony	1 ug/g dry	2	<1	<1	<1
Arsenic	1 ug/g dry	10	6	12	42
Barium	10 ug/g dry	48	30	48	46
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	33	22	33	33
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	5	<5	<5	5
Copper	5 ug/g dry	17	8	17	21
Iron	200 ug/g dry	11500	7350	11200	11400
Lead	1 ug/g dry	6	3	5	5
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	16	10	16	17
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	36	23	35	36
Zinc	20 ug/g dry	<20	<20	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10 [1]	<10 [1]	<10 [1]	<10 [1]
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	10
F3 PHCs (C16-C34)	10 ug/g dry	15	34	10	33
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	15
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	87.4%	92.3%	91.4%	93.5%

PARACEL LABORATORIES LTD.

Order #: 0835084

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Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-13 (soil) 0-15cm	MW-13 (soil) 40-50cm	MW-14 (soil) 0-15cm	MW-14 (soil) 40-50cm
	Sample Date:	19-Aug-08	19-Aug-08	19-Aug-08	19-Aug-08
	Sample ID:	0835084-25	0835084-26	0835084-27	0835084-28
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.4	87.0	93.4	93.0
Metals					
Antimony	1 ug/g dry	<1	<1	2	<1
Arsenic	1 ug/g dry	10	9	19	15
Barium	10 ug/g dry	36	43	57	65
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	26	30	38	56
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	5	6
Copper	5 ug/g dry	14	16	21	22
Iron	200 ug/g dry	9370	10300	12500	17900
Lead	1 ug/g dry	6	5	16	10
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	1
Nickel	5 ug/g dry	13	15	17	22
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	29	32	37	55
Zinc	20 ug/g dry	<20	<20	23	33
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10 [1]	<10 [1]	<10 [1]	<10 [1]
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	355	1640
F3 PHCs (C16-C34)	10 ug/g dry	20	<10	864	520
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	58	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	91.7%	73.7%	62.1%	84.2%

PARACEL LABORATORIES LTD.

Order #: 0835084

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Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	MW-15 (soil) 0-15cm	MW-15 (soil) 40-50cm	MW-16 (soil) 0-15cm	MW-16 (soil) 40-50cm
	Sample Date:	19-Aug-08	19-Aug-08	19-Aug-08	19-Aug-08
	Sample ID:	0835084-29	0835084-30	0835084-31	0835084-32
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.0	88.6	94.2	87.2
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	11	8	15	44
Barium	10 ug/g dry	32	38	24	23
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	24	28	19	18
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	<5	<5
Copper	5 ug/g dry	12	16	9	9
Iron	200 ug/g dry	8530	9480	8120	7980
Lead	1 ug/g dry	3	4	3	3
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	2	<1	<1
Nickel	5 ug/g dry	12	12	9	9
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	28	31	26	26
Zinc	20 ug/g dry	<20	72	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10 [1]	<10 [1]	<10 [1]	<10 [1]
F2 PHCs (C10-C16)	10 ug/g dry	<10	31	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	<10	<10
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	70.6%	83.6%	74.5%	72.6%

PARACEL LABORATORIES LTD.

Order #: 0835084

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Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	F4-1 (soil) 0-15cm	F4-1 (soil) 40-50cm	F4-2 (soil) 0-15cm	F4-2 (soil) 40-50cm
	Sample Date:	23-Aug-08	23-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-33	0835084-34	0835084-35	0835084-36
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.9	89.5	95.1	95.0
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	10	39	33	17
Barium	10 ug/g dry	28	25	54	42
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	21	23	40	33
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	6	5
Copper	5 ug/g dry	14	15	21	19
Iron	200 ug/g dry	7340	9270	14000	12100
Lead	1 ug/g dry	18	8	12	7
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	2	<1	<1	<1
Nickel	5 ug/g dry	10	12	21	18
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	21	27	45	39
Zinc	20 ug/g dry	<20	<20	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	103	306	<10	23
F2 PHCs (C10-C16)	10 ug/g dry	1840	12200	467	1470
F3 PHCs (C16-C34)	10 ug/g dry	632	1950	94	120
F4 PHCs (C34-C50)	10 ug/g dry	129	387	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	0.12	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	72.9%	64.4%	66.2%	81.8%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	F4-3 (soil) 0-15cm	F4-3 (soil) 40-50cm	F4-4 (soil) 0-15cm	F4-4 (soil) 40-50cm
	Sample Date:	22-Aug-08	22-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-37	0835084-38	0835084-39	0835084-40
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.0	91.8	95.4	92.6
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	24	18	16	16
Barium	10 ug/g dry	66	66	62	59
Beryllium	0.5 ug/g dry	0.7	0.7	0.9	0.9
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	50	49	43	45
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	7	7	8	8
Copper	5 ug/g dry	34	37	35	35
Iron	200 ug/g dry	17400	16600	18100	18400
Lead	1 ug/g dry	27	18	11	9
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	1	1	1
Nickel	5 ug/g dry	30	31	34	34
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	52	50	49	51
Zinc	20 ug/g dry	31	34	25	25
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	58	41	<10	27
F2 PHCs (C10-C16)	10 ug/g dry	5790	7080	2530	6160
F3 PHCs (C16-C34)	10 ug/g dry	2370	1570	964	1030
F4 PHCs (C34-C50)	10 ug/g dry	424	261	84	73
PCBs					
PCBs, total	0.05 ug/g dry	0.21	0.19	<0.05	<0.05
Decachlorobiphenyl	Surrogate	86.3%	99.1%	82.6%	97.8%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008

Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	F4-5 (soil) 0-15cm	F4-5 (soil) 40-50cm	F4-6 (soil) 0-15cm	F4-6 (soil) 40-50cm
	Sample Date:	22-Aug-08	22-Aug-08	20-Aug-08	20-Aug-08
	Sample ID:	0835084-41	0835084-42	0835084-43	0835084-44
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.9	91.6	95.6	97.4
Metals					
Antimony	1 ug/g dry	2	<1	<1	<1
Arsenic	1 ug/g dry	21	17	187	230
Barium	10 ug/g dry	66	59	82	74
Beryllium	0.5 ug/g dry	0.5	0.9	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	47	47	66	53
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	7	8	11	7
Copper	5 ug/g dry	31	40	47	34
Iron	200 ug/g dry	16600	19600	22700	18900
Lead	1 ug/g dry	13	9	8	8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	1	2	1
Nickel	5 ug/g dry	46	38	37	29
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	50	51	78	65
Zinc	20 ug/g dry	30	28	40	53
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	11	58	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	3530	10100	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	3540	1160	22	<10
F4 PHCs (C34-C50)	10 ug/g dry	507	111	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	0.24	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	100%	90.0%	74.3%	87.3%

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	F4-7 (soil) 0-15cm	F4-7 (soil) 40-50cm	F4-8 (soil) 0-15cm	F4-8 (soil) 40-50cm
	Sample Date:	20-Aug-08	20-Aug-08	20-Aug-08	20-Aug-08
	Sample ID:	0835084-45	0835084-46	0835084-47	0835084-48
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.4	96.6	94.5	94.4
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	14	33	23	23
Barium	10 ug/g dry	32	14	48	46
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	26	15	34	34
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	<5	<5
Copper	5 ug/g dry	10	5	17	21
Iron	200 ug/g dry	9430	6960	11000	11800
Lead	1 ug/g dry	5	4	5	6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	<1	<1	1
Nickel	5 ug/g dry	12	7	17	17
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	31	22	34	36
Zinc	20 ug/g dry	<20	<20	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	14	17
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	0.05
Decachlorobiphenyl	Surrogate	86.4%	89.2%	85.9%	80.4%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Client ID:		F4-11 (soil) 0-15cm	F4-11 (soil) 40-50cm	F4-12 (soil) 0-15cm	F4-12 (soil) 40-50cm
Sample Date:		23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
Sample ID:		0835084-49	0835084-50	0835084-51	0835084-52
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	84.6	87.3	95.7	96.6
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	<1	<1	<1	<1
Barium	10 ug/g dry	12	10	14	13
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	14	12	17	19
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	<5	<5
Copper	5 ug/g dry	<5	<5	6	6
Iron	200 ug/g dry	8160	7980	9260	10900
Lead	1 ug/g dry	4	3	5	6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	7	7	8	8
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	25	22	28	36
Zinc	20 ug/g dry	<20	<20	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	1120	272	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	587	107	11	<10
F4 PHCs (C34-C50)	10 ug/g dry	62	32	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	76.4%	81.3%	94.8%	71.3%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Client ID:		F4-13 (soil) 0-15cm	F4-13 (soil) 40-50cm	F4-17 (soil) 0-15cm	F4-17 (soil) 40-50cm
Sample Date:		23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
Sample ID:		0835084-53	0835084-54	0835084-55	0835084-56
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	79.6	82.1	93.8	93.3
Metals					
Antimony	1 ug/g dry	<1	<1	-	-
Arsenic	1 ug/g dry	<1	<1	-	-
Barium	10 ug/g dry	16	<10	-	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	-
Boron, available	0.5 ug/g dry	<0.5	<0.5	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5 ug/g dry	17	15	-	-
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	-	-
Cobalt	5 ug/g dry	<5	<5	-	-
Copper	5 ug/g dry	9	5	-	-
Iron	200 ug/g dry	9550	8820	-	-
Lead	1 ug/g dry	5	5	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1 ug/g dry	<1	<1	-	-
Nickel	5 ug/g dry	10	8	-	-
Selenium	1 ug/g dry	<1	<1	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1 ug/g dry	<1	<1	-	-
Vanadium	10 ug/g dry	28	29	-	-
Zinc	20 ug/g dry	<20	<20	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	11	420
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	44	115
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	-	-
Decachlorobiphenyl	Surrogate	75.9%	63.2%	-	-

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Client ID:		F4-18 (soil) 0-15cm	F4-18 (soil) 40-50cm	F4-19 (soil) 0-15cm	F4-19 (soil) 40-50cm
Sample Date:		23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
Sample ID:		0835084-57	0835084-58	0835084-59	0835084-60
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	90.6	94.5	93.3	91.7
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	40
F2 PHCs (C10-C16)	10 ug/g dry	25	416	6820	7320
F3 PHCs (C16-C34)	10 ug/g dry	63	614	645	340
F4 PHCs (C34-C50)	10 ug/g dry	<10	70	41	12

Client ID:		F4-20 (soil) 0-15cm	F4-20 (soil) 40-50cm	F4-21 (soil) 0-15cm	F4-21 (soil) 40-50cm
Sample Date:		23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
Sample ID:		0835084-61	0835084-62	0835084-63	0835084-64
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.5	91.1	97.2	92.9
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	85
F2 PHCs (C10-C16)	10 ug/g dry	74	995	5830	8230
F3 PHCs (C16-C34)	10 ug/g dry	71	97	4010	2360
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	1110	625

Client ID:		F4-22 (soil) 0-15cm	F4-22 (soil) 40-50cm	F4-24 (soil) 0-15cm	F4-24 (soil) 40-50cm
Sample Date:		23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
Sample ID:		0835084-65	0835084-66	0835084-67	0835084-68
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.6	94.9	94.4	93.3
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	39	<10	10
F2 PHCs (C10-C16)	10 ug/g dry	2240	7010	681	2830
F3 PHCs (C16-C34)	10 ug/g dry	787	1640	280	431
F4 PHCs (C34-C50)	10 ug/g dry	123	333	55	54

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	F4-25 (soil) 0-15cm	F4-25 (soil) 40-50cm	QA/QC 1	QA/QC 2
	Sample Date:	20-Aug-08	20-Aug-08	22-Aug-08	22-Aug-08
	Sample ID:	0835084-69	0835084-70	0835084-71	0835084-72
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	97.9	96.3	97.1	97.2
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	8	16	30	27
Barium	10 ug/g dry	17	15	64	53
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	14	15	44	42
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	6	6
Copper	5 ug/g dry	8	6	18	22
Iron	200 ug/g dry	6180	6640	13300	14800
Lead	1 ug/g dry	2	3	5	10
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	8	7	19	23
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	18	20	45	48
Zinc	20 ug/g dry	<20	<20	24	24
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	524
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	43	133
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	<10	14
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	90.3%	95.8%	89.8%	93.0%

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	QA/QC 3	QA/QC 4	QA/QC 5	QA/QC 6
	Sample Date:	21-Aug-08	19-Aug-08	19-Aug-08	20-Aug-08
	Sample ID:	0835084-73	0835084-74	0835084-75	0835084-76
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.6	94.0	86.5	95.0
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	11	16	9	19
Barium	10 ug/g dry	38	50	41	31
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	28	34	29	27
Chromium (VI)	0.4 ug/g dry	<0.4	<0.4	<0.4	<0.4
Cobalt	5 ug/g dry	<5	<5	<5	<5
Copper	5 ug/g dry	18	18	15	10
Iron	200 ug/g dry	10100	11400	10300	9990
Lead	1 ug/g dry	6	14	7	6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	<1	<1	<1
Nickel	5 ug/g dry	17	17	17	12
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	31	35	32	34
Zinc	20 ug/g dry	20	21	<20	<20
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10 [1]	<10 [1]	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	627	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	37	910	15	21
F4 PHCs (C34-C50)	10 ug/g dry	<10	275	<10	<10
PCBs					
PCBs, total	0.05 ug/g dry	0.14	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	92.1%	89.1%	71.1%	93.3%

PARACEL LABORATORIES LTD.

Order #: 0835084

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

	Client ID:	QA/QC 7	-	-	-
	Sample Date:	23-Aug-08	-	-	-
	Sample ID:	0835084-77	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	96.1	-	-	-
Metals					
Antimony	1 ug/g dry	<1	-	-	-
Arsenic	1 ug/g dry	<1	-	-	-
Barium	10 ug/g dry	14	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron, available	0.5 ug/g dry	<0.5	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5 ug/g dry	17	-	-	-
Chromium (VI)	0.4 ug/g dry	<0.4	-	-	-
Cobalt	5 ug/g dry	<5	-	-	-
Copper	5 ug/g dry	8	-	-	-
Iron	200 ug/g dry	8700	-	-	-
Lead	1 ug/g dry	4	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1 ug/g dry	<1	-	-	-
Nickel	5 ug/g dry	8	-	-	-
Selenium	1 ug/g dry	<1	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1 ug/g dry	<1	-	-	-
Vanadium	10 ug/g dry	28	-	-	-
Zinc	20 ug/g dry	<20	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	-	-	-
F2 PHCs (C10-C16)	10 ug/g dry	<10	-	-	-
F3 PHCs (C16-C34)	10 ug/g dry	<10	-	-	-
F4 PHCs (C34-C50)	10 ug/g dry	<10	-	-	-
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	-	-	-
Decachlorobiphenyl	Surrogate	84.2%	-	-	-

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g						
F2 PHCs (C10-C16)	ND	10	ug/g						
F3 PHCs (C16-C34)	ND	10	ug/g						
F4 PHCs (C34-C50)	ND	10	ug/g						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	10	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.4	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	5	ug/g						
Copper	ND	5	ug/g						
Iron	ND	200	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.0787*		*ug/g*		*78.7*	*40-147*			

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g dry	ND				32	
F2 PHCs (C10-C16)	ND	10	ug/g dry	ND				50	
F3 PHCs (C16-C34)	21	10	ug/g dry	18			12.3	50	
F4 PHCs (C34-C50)	ND	10	ug/g dry	ND				50	
Metals									
Antimony	2.0	1	ug/g dry	ND				26	QR-01
Arsenic	15.1	1	ug/g dry	15.7			4.2	35	
Barium	41.7	10	ug/g dry	41.3			1.0	34	
Beryllium	ND	0.5	ug/g dry	ND				25	
Boron, available	ND	0.5	ug/g dry	ND				35	
Cadmium	ND	0.5	ug/g dry	ND				33	
Chromium (VI)	ND	0.4	ug/g dry	ND				35	
Chromium	31.2	5	ug/g dry	31.3			0.6	32	
Cobalt	ND	5	ug/g dry	ND				32	
Copper	20.6	5	ug/g dry	20.4			1.3	32	
Iron	10700	200	ug/g dry	10800			0.7	32	
Lead	19.8	1	ug/g dry	20.4			2.9	44	
Mercury	ND	0.1	ug/g dry	ND				35	
Molybdenum	ND	1	ug/g dry	ND				29	
Nickel	16.6	5	ug/g dry	16.4			1.5	29	
Selenium	ND	1	ug/g dry	ND				28	
Silver	ND	0.3	ug/g dry	ND				28	
Thallium	ND	1	ug/g dry	ND				27	
Vanadium	34.8	10	ug/g dry	35.1			0.9	27	
Zinc	28.0	20	ug/g dry	ND				27	QR-01
PCBs									
PCBs, total	0.058	0.05	ug/g dry	0.072			21.2	30	
Surrogate: Decachlorobiphenyl	*0.0881*		*ug/g dry*	*ND*	*83.7*	*40-147*			
Physical Characteristics									
% Solids	81.8	0.1	% by Wt.	81.8			0.0	25	

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	98	10	ug/g	ND	98.3	80-120			
F2 PHCs (C10-C16)	76	10	ug/g	ND	95.0	61-129			
F3 PHCs (C16-C34)	202	10	ug/g	ND	101	61-129			
F4 PHCs (C34-C50)	128	10	ug/g	ND	107	61-129			
Metals									
Antimony	45.9		ug/L	0.4	91.0	78-126			
Arsenic	53.1		ug/L	6.3	93.7	80-120			
Barium	69.6		ug/L	16.5	106	83-116			
Beryllium	46.2		ug/L	0.14	92.2	72-123			
Boron, available	4.83	0.5	ug/g	ND	96.5	70-122			
Cadmium	47.4		ug/L	0.04	94.7	78-118			
Chromium (VI)	5.0	0.4	ug/g	ND	99.5	89-123			
Chromium	60.7		ug/L	12.5	96.4	80-124			
Cobalt	50.3		ug/L	1.9	96.7	78-125			
Copper	56.1		ug/L	8.1	95.9	75-123			
Iron	5440		ug/L	4310	113	66-119			
Lead	56.5		ug/L	8.1	96.7	80-120			
Mercury	1.64	0.1	ug/g	ND	109	72-128			
Molybdenum	49.4		ug/L	0.2	98.4	82-119			
Nickel	54.6		ug/L	6.5	96.1	78-119			
Selenium	47.8		ug/L	0.02	95.5	81-125			
Silver	44.8		ug/L	ND	89.7	80-120			
Thallium	51.0		ug/L	0.06	102	82-127			
Vanadium	62.8		ug/L	14.0	97.6	82-123			
Zinc	56.1		ug/L	6.2	99.7	78-130			
PCBs									
PCBs, total	0.353	0.05	ug/g	ND	88.3	58-147			
Surrogate: Decachlorobiphenyl	*0.0836*		*ug/g*		*83.6*	*40-147*			

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: Project Description: FOX-4

Sample and QC Qualifiers Notes

1- H-01 : Holding time had been exceeded upon sample receipt.
2- QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody Record
№ 42874
Pg. 1 of 10

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Project Ref: Fox-4
PO #: 1213-0801
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # 0835084 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	MW-1-(soil) 0-15 cm ✓	S	3	22/8/08	X	X	X	X	X									
2	MW-1 (soil) 40-50 cm ✓				X	X	X	X	X									
3	MW-2 (soil) 0-15 cm ✓				X	X	X	X	X									
4	MW-2 (soil) 40-50 cm				X	X	X	X	X									
5	MW-3 (soil) 0-15 cm				X	X	X	X	X									
6	MW-3 (soil) 40-50 cm				X	X	X	X	X									
7	MW-4 (soil) 0-15 cm				X	X	X	X	X									
8	MW-4 (soil) 40-50 cm				X	X	X	X	X									
9	MW-5 (soil) 0-15 cm				X	X	X	X	X									
10	MW-5 (soil) 40-50 cm				X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions & F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: Ryan Fletcher
Date: 25/8/08 Time:

Received by: Jessica
Date: Aug 27 Time: 12:30

Verified by: NCorry
Date: Aug 27 Time: 1:42

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Chain of Custody Record

№ 42875

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 339 Churchill, Ottawa / Iqaluit, NU
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 213-0001
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: ☑ signed PDF [☑ spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [☑] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # 0835084 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	MW-6 (soil) 0-15 cm	S	3	22/8/08	X	X	X	X	X									
2	MW-6 (soil) 40-50 cm				X	X	X	X	X									
3	MW-7 (soil) 0-15 cm			23/8/08	X	X	X	X	X									
4	MW-7 (soil) 40-50 cm				X	X	X	X	X									
5	MW-8 (soil) 0-15 cm				X	X	X	X	X									
6	MW-8 (soil) 40-50 cm				X	X	X	X	X									
7	MW-9 (soil) 0-15 cm				X	X	X	X	X									
8	MW-9 (soil) 40-50 cm				X	X	X	X	X									
9	MW-10 (soil) 0-15 cm				X	X	X	X	X									
10	MW-10 (soil) 40-50 cm	↓	↓	19/8/08	X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by: Jessica
Date: Time:

Verified by: NC
Date: Aug 27 Time: 1442

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Chain of Custody Record

№ 42868

Pg. 3 of 10

Contact: R. Fletcher / A. Carrier
Company: Franz / Numatec
Address: 329 Churchill Ave, Ottawa / Iqaluit, NU
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # 0835084 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	MW-11 (soil) 0-15 cm	S	3	19/8/08	X	X	X	X	X									
2	MW-11 (soil) 40-50 cm				X	X	X	X	X									
3	MW-12 (soil) 0-15 cm				X	X	X	X	X									
4	MW-12 (soil) 40-50 cm				X	X	X	X	X									
5	MW-13 (soil) 0-15 cm				X	X	X	X	X									
6	MW-13 (soil) 40-50 cm				X	X	X	X	X									
7	MW-14 (soil) 0-15 cm				X	X	X	X	X									
8	MW-14 (soil) 40-50 cm				X	X	X	X	X									
9	MW-15 (soil) 0-15 cm				X	X	X	X	X									
10	MW-15 (soil) 40-50 cm	↓	↓	↓	X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PAC Fraction 5: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: JC
Date: Aug 27 Time: 1:42

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Chain of Custody Record

№ 42873

Contact: R. Fletcher / A. Carrier
Company: Franc / Nunatta
Address: 329 Churchill Ave, Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1313-0801
Quote #: ☒ Not Quoted
Email: rfletcher@francenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #: 0835084

	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury
1	MW-16 (soil) 0-15 cm	S	3	19/8/08	X	X	X	X	X
2	MW-16 (soil) 40-50 cm			"	X	X	X	X	X
3	F4-1 (soil) 0-15 cm			23/8/08	X	X	X	X	X
4	F4-1 (soil) 40-50 cm		4	"	X	X	X	X	X
5	F4-2 (soil) 0-15 cm		3	22/8/08	X	X	X	X	X
6	F4-2 (soil) 40-50 cm				X	X	X	X	X
7	F4-3 (soil) 0-15 cm				X	X	X	X	X
8	F4-3 (soil) 40-50 cm				X	X	X	X	X
9	F4-4 (soil) 0-15 cm				X	X	X	X	X
10	F4-4 (soil) 40-50 cm				X	X	X	X	X

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NC
Date: Aug 27 Time: 142

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Chain of Custody Record

№ 42876

Contact: R. Fletcher / A. Corrier
Company: Franz / Nunatta
Address: 329 Churchill Ave, Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: ☒ signed PDF ☒ spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [☒] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # 0835084 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	F4-5 (soil) 0-15 cm	S	3	22/8/08	X	X	X	X	X									
2	F4-5 (soil) 40-50 cm			"	X	X	X	X	X									
3	F4-6 (soil) 0-15 cm			20/8/08	X	X	X	X	X									
4	F4-6 (soil) 40-50 cm				X	X	X	X	X									
5	F4-7 (soil) 0-15 cm				X	X	X	X	X									
6	F4-7 (soil) 40-50 cm				X	X	X	X	X									
7	F4-8 (soil) 0-15 cm				X	X	X	X	X									
8	F4-8 (soil) 40-50 cm				X	X	X	X	X									
9	F4-11 (soil) 0-15 cm			23/8/08	X	X	X	X	X									
10	F4-11 (soil) 40-50 cm			"	X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NC
Date: Aug 27 Time: 1:42

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Chain of Custody Record
№ 42872

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: ☒ signed PDF ☒ spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #: 0835084

	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury	
1	F4-12 (soil) 0-15 cm	S	3	23/8/08	X	X	X	X	X	
2	F4-12 (soil) 40-50 cm				X	X	X	X	X	
3	F4-13 (soil) 0-15 cm				X	X	X	X	X	
4	F4-13 (soil) 40-50 cm				X	X	X	X	X	
5	F4-17 (soil) 0-15 cm		2		X	X				F1 and F2-F4 ONLY
6	F4-17 (soil) 40-50 cm		2		X	X				
7	F4-18 (soil) 0-15 cm		2		X	X				
8	F4-18 (soil) 40-50cm		2		X	X				
9	F4-19 (soil) 0-15 cm		2		X	X				
10	F4-19 (soil) 40-50 cm		2		X	X				

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NC
Date: Aug 27 Time: 1:42

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Chain of Custody Record

№ 42871

Pg. 7 of 10

Contact: rFletcher / A. Cavrier
Company: Franz / Nuvatta
Address: 339 Churchill Ave, Ottawa / Iqaluit, NU
Tel: 613-721-0555 Fax: 613-721-0079

Project Ref: FCX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required														
	Paracel Order # 0835084 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4													
1	F4-20 (soil) 0-15 cm	S	2		X	X													
2	F4-20 (soil) 40-50 cm		2		X	X													
3	F4-21 (soil) 0-15 cm		2		X	X													
4	F4-21 (soil) 40-50 cm		2		X	X													
5	F4-22 (soil) 0-15 cm		2		X	X													
6	F4-22 (soil) 40-50 cm		3		X	X													
7	[illegible]																		
8	[illegible]																		
9	F4-24 (soil) 0-15 cm		3		X	X													
10	F4-24 (soil) 40-50 cm		3		X	X													

F1 and F2-F4 ONLY

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NC
Date: Aug 27 Time: 1:42

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Chain of Custody Record

№ 42870

Contact: Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave., Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: fletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: ☒ signed PDF ☒ spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day ☒ Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #: 0835084

	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2 - F4	PCBs	Metals	Mercury
1	F4-25 (soil) 0-15cm	S	3	20/8/08	X	X	X	X	X
2	F4-25 (soil) 40-50cm			"	X	X	X	X	X
3	QA/QC 1			22/8/08	X	X	X	X	X
4	QA/QC 2			22/8/08	X	X	X	X	X
5	QA/QC 3			21/8/08	X	X	X	X	X
6	QA/QC 4			19/8/08	X	X	X	X	X
7	QA/QC 5			19/8/08	X	X	X	X	X
8	QA/QC 6			20/8/08	X	X	X	X	X
9	QA/QC 7			23/8/08	X	X	X	X	X
10	Trip Blank	↓	↓	N/A	X	X	X	X	X

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NCorn
Date: Aug 27 Time: 1:42

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OTTAWA ◉ NIAGARA FALLS ◉ MISSISSAUGA ◉ SARNIA

Certificate of Analysis

Nunatta Environmental Services Inc.

P.O. Box 267
Iqaluit, NUNAVUT X0A 0H0
Attn: Alain Carrier

Phone: (867) 979-1488
Fax: (867) 979-1478

Client PO: 1213-0801
Project: FOX-4
Custody: 42870, 42879, 42880,

Report Date: 2-Sep-2008
Order Date: 27-Aug-2008
Order #: 0835085

This Certificate of Analysis contains analytical data applicable to the following samples submitted:

Paracel ID	Client ID
0835085-01	Trip Blank
0835085-02	MW-1
0835085-03	MW-2
0835085-04	MW-8
0835085-05	MW-10
0835085-06	MW-12
0835085-07	MW-13
0835085-08	MW-14
0835085-09	MW-16
0835085-10	MW-15
0835085-11	QA/QC 2

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

PARACEL LABORATORIES LTD.

Order #: 0835085

Certificate of Analysis

Report Date: 02-Sep-2008

Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	27-Aug-08	29-Aug-08
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	28-Aug-08	28-Aug-08
Mercury	EPA 245.1 - Cold Vapour AA	29-Aug-08	29-Aug-08
Metals	EPA 200.8 - ICP-MS	27-Aug-08	27-Aug-08
PCBs, total	EPA 608 - GC-ECD	28-Aug-08	29-Aug-08

PARACEL LABORATORIES LTD.

Order #: 0835085

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

	Client ID:	Trip Blank	MW-1	MW-2	MW-8
	Sample Date:	06-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
	Sample ID:	0835085-01	0835085-02	0835085-03	0835085-04
	MDL/Units	Water	Water	Water	Water
Metals					
Aluminum	10 ug/L	<10	<10	<10	<10
Antimony	1 ug/L	<1	<1	7	3
Arsenic	10 ug/L	<10	<10	<10	<10
Barium	10 ug/L	<10	10	12	17
Boron	50 ug/L	<50	543	167	53
Cadmium	1 ug/L	<1	<1	<1	<1
Calcium	200 ug/L	<200	13700	46800	15900
Chromium	50 ug/L	<50	<50	<50	<50
Copper	5 ug/L	<5	<5	<5	<5
Iron	200 ug/L	<200	<200	1590	<200
Lead	1 ug/L	<1	<1	<1	<1
Manganese	50 ug/L	<50	115	597	735
Mercury	0.1 ug/L	<0.1 [1]	<0.1	<0.1	<0.1
Selenium	5 ug/L	<5	<5	<5	<5
Sodium	200 ug/L	698	6370	9520	5550
Uranium	5 ug/L	<5	<5	<5	<5
Zinc	20 ug/L	<20	214	53	1830
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200 [1]	<200	664	215
F2 PHCs (C10-C16)	100 ug/L	<100 [1]	<100	205	<100
F3 PHCs (C16-C34)	100 ug/L	<100 [1]	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100 [1]	<100	<100	<100
PCBs					
PCBs, total	0.05 ug/L	<0.05 [1]	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	55.3% [1]	80.1%	70.2%	68.8%

PARACEL LABORATORIES LTD.

Order #: 0835085

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

	Client ID:	MW-10	MW-12	MW-13	MW-14
	Sample Date:	23-Aug-08	23-Aug-08	23-Aug-08	23-Aug-08
	Sample ID:	0835085-05	0835085-06	0835085-07	0835085-08
	MDL/Units	Water	Water	Water	Water
Metals					
Aluminum	10 ug/L	14	303	212	109
Antimony	1 ug/L	<1	<1	1	1
Arsenic	10 ug/L	<10	<10	<10	<10
Barium	10 ug/L	16	18	13	<10
Boron	50 ug/L	<50	<50	<50	<50
Cadmium	1 ug/L	<1	<1	<1	<1
Calcium	200 ug/L	31700	22000	14400	3380
Chromium	50 ug/L	<50	<50	<50	<50
Copper	5 ug/L	<5	<5	<5	<5
Iron	200 ug/L	<200	<200	<200	<200
Lead	1 ug/L	<1	<1	<1	<1
Manganese	50 ug/L	135	546	276	119
Mercury	0.1 ug/L	<0.1	<0.1	<0.1	<0.1
Selenium	5 ug/L	<5	<5	<5	<5
Sodium	200 ug/L	21200	14500	7190	5640
Uranium	5 ug/L	<5	<5	<5	<5
Zinc	20 ug/L	499	1010	802	204
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	<200	<200	<200
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	139
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
PCBs					
PCBs, total	0.05 ug/L	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	57.6%	65.8%	56.2%	63.6%

PARACEL LABORATORIES LTD.

Order #: 0835085

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

	Client ID:	MW-16	MW-15	QA/QC 2	-
	Sample Date:	23-Aug-08	23-Aug-08	23-Aug-08	-
	Sample ID:	0835085-09	0835085-10	0835085-11	-
	MDL/Units	Water	Water	Water	-
Metals					
Aluminum	10 ug/L	315	27	38	-
Antimony	1 ug/L	<1	<1	<1	-
Arsenic	10 ug/L	<10	<10	<10	-
Barium	10 ug/L	<10	<10	14	-
Boron	50 ug/L	<50	<50	<50	-
Cadmium	1 ug/L	<1	<1	<1	-
Calcium	200 ug/L	2140	17000	32400	-
Chromium	50 ug/L	<50	<50	<50	-
Copper	5 ug/L	<5	5	<5	-
Iron	200 ug/L	<200	<200	<200	-
Lead	1 ug/L	<1	<1	<1	-
Manganese	50 ug/L	<50	144	122	-
Mercury	0.1 ug/L	<0.1	<0.1	<0.1	-
Selenium	5 ug/L	<5	<5	<5	-
Sodium	200 ug/L	5300	14200	21800	-
Uranium	5 ug/L	<5	<5	<5	-
Zinc	20 ug/L	403	55	423	-
Hydrocarbons					
F1 PHCs (C6-C10)	200 ug/L	<200	<200	<200	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
PCBs					
PCBs, total	0.05 ug/L	<0.05	<0.05	<0.05	-
Decachlorobiphenyl	Surrogate	60.8%	75.1%	60.6%	-

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Aluminum	ND	10	ug/L						
Antimony	ND	1	ug/L						
Arsenic	ND	10	ug/L						
Barium	ND	10	ug/L						
Boron	ND	50	ug/L						
Cadmium	ND	1	ug/L						
Calcium	ND	200	ug/L						
Chromium	ND	50	ug/L						
Copper	ND	5	ug/L						
Iron	ND	200	ug/L						
Lead	ND	1	ug/L						
Mercury	ND	0.1	ug/L						
Manganese	ND	50	ug/L						
Selenium	ND	5	ug/L						
Sodium	ND	200	ug/L						
Uranium	ND	5	ug/L						
Zinc	ND	20	ug/L						
PCBs									
PCBs, total	ND	0.05	ug/L						
Surrogate: Decachlorobiphenyl	*0.405*		*ug/L*		*81.1*	*37-130*			

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	200	ug/L	ND				32	
Metals									
Aluminum	57.3	10	ug/L	62.9			9.4	27	
Antimony	8.2	1	ug/L	2.0			121.0	26	QR-01
Arsenic	ND	10	ug/L	ND				29	
Barium	78.2	10	ug/L	76.7			1.9	34	
Boron	92.4	50	ug/L	90.9			1.6	33	
Cadmium	ND	1	ug/L	ND				33	
Calcium	74000	200	ug/L	73600			0.5	30	
Chromium	ND	50	ug/L	ND				32	
Copper	ND	5	ug/L	ND				32	
Iron	269	200	ug/L	261			3.3	32	
Lead	ND	1	ug/L	ND				32	
Mercury	ND	0.1	ug/L	ND				20	
Manganese	185	50	ug/L	200			7.8	29	
Selenium	ND	5	ug/L	ND				28	
Sodium	66800	200	ug/L	65800			1.6	27	
Uranium	5.0	5	ug/L	ND				27	QR-01
Zinc	ND	20	ug/L	ND				27	

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2060	200	ug/L	ND	103	68-117			
F2 PHCs (C10-C16)	1000	100	ug/L	ND	62.5	61-129			
F3 PHCs (C16-C34)	3620	100	ug/L	ND	90.5	61-129			
F4 PHCs (C34-C50)	2300	100	ug/L	ND	95.7	61-129			
Metals									
Aluminum	52.4		ug/L	6.3	92.2	74-130			
Antimony	44.3		ug/L	0.2	88.2	78-126			
Arsenic	51.3		ug/L	0.1	102	83-119			
Barium	56.4		ug/L	7.7	97.5	83-116			
Boron	53.6		ug/L	9.1	89.1	71-128			
Cadmium	49.4		ug/L	0.02	98.7	78-119			
Calcium	8310		ug/L	7360	95.0	64-127			
Chromium	48.3		ug/L	0.4	95.7	80-124			
Copper	48.3		ug/L	0.2	96.2	75-123			
Iron	1090		ug/L	26	107	66-119			
Lead	46.1		ug/L	0.03	92.2	77-126			
Mercury	3.55	0.1	ug/L	ND	118	78-137			
Manganese	68.2		ug/L	20.0	96.5	79-123			
Selenium	55.0		ug/L	0.09	110	81-125			
Sodium	7660		ug/L	6580	108	68-132			
Uranium	47.7		ug/L	0.5	94.4	70-131			
Zinc	50.3		ug/L	ND	101	78-130			
PCBs									
PCBs, total	0.831	0.05	ug/L	ND	83.1	54-137			
Surrogate: Decachlorobiphenyl	*0.368*		*ug/L*		*73.6*	*37-130*			

Certificate of Analysis

Report Date: 02-Sep-2008
Order Date:27-Aug-2008

Client: **Nunatta Environmental Services Inc.**

Client PO: 1213-0801 Project Description: FOX-4

Sample and QC Qualifiers Notes

1- H-01 : Holding time had been exceeded upon sample receipt.
2- QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

PARACEL LABORATORIES LTD.

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e: paracel@paracellabs.com
www.paracellabs.com

Chain of Custody Record

№ 42870

Pg. 9 of 10

Contact: Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave., Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: fletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: ☒ signed PDF ☒ spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day ☒ Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
Paracel Order #	0835084 - soil 0835085 - H2O																	
	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2 - F4	PCBs	Metals	Mercury									
1	F4-25 (soil) 0-15cm	S	3	20/8/08	X	X	X	X	X									
2	F4-25 (soil) 40-50cm	↓	↓	"	X	X	X	X	X									
3	QA/QC 1			22/8/08	X	X	X	X	X									
4	QA/QC 2			22/8/08	X	X	X	X	X									
5	QA/QC 3			21/8/08	X	X	X	X	X									
6	QA/QC 4			19/8/08	X	X	X	X	X									
7	QA/QC 5			19/8/08	X	X	X	X	X									
8	QA/QC 6			20/8/08	X	X	X	X	X									
9	QA/QC 7			23/8/08	X	X	X	X	X									
10	Trip Blank	↓	↓	N/A	X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by: NCorn
Date: Aug 29 Time: 1:42

PARACEL LABORATORIES LTD.

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www.paracellabs.com

Chain of Custody Record

№ 42879

Pg. 9 of 10

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave., Ottawa / Iqaluit, NU
Tel: 6137210555 Fax: 6137210029

Project Ref: FOX-4
PO #: 1213-0601
Quote #: ☐ Not Quoted
Email: rfletcher@grancenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☒ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # 0835085 / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	MW-1	GW	5		x	x	x	x	x									
2	MW-2		5		x	x	x	x	x									
3	MW-8		5		x	x	x	x	x									
4	MW-10		5		x	x	x	x	x									
5	MW-12		3		x	x	x	x	x	NO	VOC	Vials						
6	MW-13		5		x	x	x	x	x									
7	MW-14		5		x	x	x	x	x									
8	~~MW-15~~																	
9	MW-16		5		x	x	x	x	x									
10	MW-15	↓	5		x	x	x	x	x									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 8/08 Time:

Received by:
Date: Time:

Verified by: NCary
Date: Aug 27 Time: 2:04

PARACEL LABORATORIES LTD.

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Chain of Custody Record

№ 42880

Contact: R. Fletcher / A. Corriveau
Company: Franz / Nunatta
Address: 329 Churchill, Ottawa / Iqaluit/NU
Tel: 6137210555 Fax: 6137210029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☒ No

Reporting Options
Electronic: [X] signed PDF [✓] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [✓] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order # 0835085

	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	~~[illegible]~~	~~GW~~	~~5~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~									
2	QA/QC 2	GW	5		x	x	x	x	x									
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher / [signature]
Date: 8/09 Time:

Received by:
Date: Time:

Verified by: NCorry
Date: Aug 27 Time: 2:00

ANNEX 1-B

INDEPENDENT LAB ANALYSIS - MAXXAM

Your Project #: 1213-0801
Site: FOX-4 DEW LINE
Your C.O.C. #: 92262-01

Attention: Ryan Fletcher
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

Report Date: 2008/09/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A895880
Received: 2008/08/27, 07:10

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Petroleum Hydro. CCME F1 & BTEX in Soil (1)	7	2008/08/27	2008/08/29	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (1)	6	2008/08/27	2008/08/29	CAM SOP-00316	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (1)	1	2008/08/27	2008/08/30	CAM SOP-00316	CCME CWS
Mercury in Soil by CVAA	7	2008/09/02	2008/09/02	CAM SOP-00453	EPA 7470
Acid Extr. Metals (aqua regia) by ICPMS	7	2008/09/02	2008/09/02	CAM SOP-00447	EPA 6020
MOISTURE (1)	7	N/A	2008/08/31	CAM SOP-00445	MOE HANDBOOK(1983)
MOISTURE	7	N/A	2008/08/30	CAM SOP-00445	McKeague 2nd ed 1978
Polychlorinated Biphenyl in Soil	3	2008/08/28	2008/08/31	CAM SOP-00307	EPA 8082
Polychlorinated Biphenyl in Soil	1	2008/08/28	2008/09/03	CAM SOP-00307	EPA 8082
Polychlorinated Biphenyl in Soil	3	2008/08/30	2008/08/31	CAM SOP-00307	EPA 8082

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Petroleum Hydro. CCME F1 & BTEX in Water (1)	1	N/A	2008/08/28	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water (1)	1	2008/08/28	2008/08/28	CAM SOP-00316	CCME Hydrocarbons
Mercury in Water by CVAA	1	2008/09/02	2008/09/02	CAM SOP-00453	EPA 7470
Lab Filtered Metals by ICPMS	1	2008/09/03	2008/09/04	CAM SOP-00447	EPA 6020
Polychlorinated Biphenyl in Water	1	2008/09/02	2008/09/03	CAM SOP-00307	EPA 8081 modified

* 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

6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel: 905-817-5700 Toll free:800-563-6266 Fax: 905-817-5777

Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

Encryption Key

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

CHRISTINE MCLEAN, Project Manager
Email: christine.mclean@maxxamanalytics.com
Phone# (905) 817-5700

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 2

Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

RESULTS OF ANALYSES OF SOIL

Maxxam ID		AH7097	AH7098	AH7099	AH7100	AH7101	AH7102	AH7103		
Sampling Date		2008/08/22	2008/08/21	2008/08/19	2008/08/19	2008/08/22	2008/08/20	2008/08/23		
	Units	MW-3 (SOIL) 0-15CM	MW-8 (SOIL) 0-15CM	MW-14 (SOIL) 0-15CM	MW-13 (SOIL) 0-15CM	F4-2 (SOIL) 0-15CM	F4-7 (SOIL) 0-15CM	F4-12 (SOIL) 0-15CM	RDL	QC Batch
Inorganics										
Moisture	%	3.9	4.9	11	14	2.8	3.9	4.2	0.2	1597601

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		AH7097	AH7098	AH7099	AH7100	AH7101	AH7102	AH7103		
Sampling Date		2008/08/22	2008/08/21	2008/08/19	2008/08/19	2008/08/22	2008/08/20	2008/08/23		
	Units	MW-3 (SOIL) 0-15CM	MW-8 (SOIL) 0-15CM	MW-14 (SOIL) 0-15CM	MW-13 (SOIL) 0-15CM	F4-2 (SOIL) 0-15CM	F4-7 (SOIL) 0-15CM	F4-12 (SOIL) 0-15CM	RDL	QC Batch
Metals										
Acid Extractable Mercury (Hg)	ug/g	ND	ND	ND	ND	ND	ND	ND	0.05	1601807
Acid Extractable Arsenic (As)	ug/g	84	13	24	10	21	36	1	1	1601806
Acid Extractable Cadmium (Cd)	ug/g	ND	ND	0.3	ND	ND	ND	ND	0.1	1601806
Acid Extractable Chromium (Cr)	ug/g	44	24	59	30	35	27	13	1	1601806
Acid Extractable Cobalt (Co)	ug/g	5.6	3.7	7.2	4.2	5.4	3.1	1.6	0.1	1601806
Acid Extractable Copper (Cu)	ug/g	17	15	31	16	21	12	5.6	0.5	1601806
Acid Extractable Lead (Pb)	ug/g	5	6	25	6	14	3	2	1	1601806
Acid Extractable Nickel (Ni)	ug/g	17	13	26	15	19	9.3	4.7	0.5	1601806
Acid Extractable Zinc (Zn)	ug/g	37	31	60	31	34	21	12	5	1601806

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel: 905-817-5700 Toll free:800-563-6266 Fax: 905-817-5777

Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		AH7097	AH7098	AH7099	AH7100	AH7101	AH7102	AH7103		
Sampling Date		2008/08/22	2008/08/21	2008/08/19	2008/08/19	2008/08/22	2008/08/20	2008/08/23		
	Units	**MW-3 (SOIL) 0-15CM**	**MW-8 (SOIL) 0-15CM**	**MW-14 (SOIL) 0-15CM**	**MW-13 (SOIL) 0-15CM**	**F4-2 (SOIL) 0-15CM**	**F4-7 (SOIL) 0-15CM**	**F4-12 (SOIL) 0-15CM**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons										
F1 (C6-C10)	ug/g	ND	ND	ND	ND	ND	ND	ND	10	1597935
F1 (C6-C10) - BTEX	ug/g	ND	ND	ND	ND	ND	ND	ND	10	1597935
Gasoline	ug/g	ND	ND	ND	ND	ND	ND	ND	10	1597935
F2-F4 Hydrocarbons										
F2 (C10-C16 Hydrocarbons)	ug/g	ND	ND	370	ND	180	ND	ND	10	1597844
F3 (C16-C34 Hydrocarbons)	ug/g	37	21	630	24	72	ND	ND	10	1597844
Reached Baseline at C50	ug/g	YES	YES	YES	YES	YES	YES	YES		1597844
Diesel (C11-C32)	ug/g	37	21	990	24	250	ND	ND	10	1597844
Diesel (C10-C24)	ug/g	17	ND	820	ND	220	ND	ND	10	1597844
Surrogate Recovery (%)										
1,4-Difluorobenzene	%	99	104	106	100	107	102	108		1597935
4-Bromofluorobenzene	%	100	103	98	104	102	100	100		1597935
D10-Ethylbenzene	%	95	89	94	87	96	95	89		1597935
D4-1,2-Dichloroethane	%	120	140	124	113	129	133	134		1597935
o-Terphenyl	%	110	104	113	99	102	101	101		1597844

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel: 905-817-5700 Toll free:800-563-6266 Fax: 905-817-5777

Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		AH7097	AH7098		AH7099		AH7100	AH7101	AH7102	AH7103		
Sampling Date		2008/08/22	2008/08/21		2008/08/19		2008/08/19	2008/08/22	2008/08/20	2008/08/23		
	Units	**MW-3 (SOIL) 0-15CM**	**MW-8 (SOIL) 0-15CM**	**RDL**	**MW-14 (SOIL) 0-15CM**	**RDL**	**MW-13 (SOIL) 0-15CM**	**F4-2 (SOIL) 0-15CM**	**F4-7 (SOIL) 0-15CM**	**F4-12 (SOIL) 0-15CM**	**RDL**	**QC Batch**
PCBs												
Aroclor 1262	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1016	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1221	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1232	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1242	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1248	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1254	ug/g	ND	0.03	0.01	ND	0.03	ND	0.03	ND	ND	0.01	1601117
Aroclor 1260	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Aroclor 1268	ug/g	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	0.01	1601117
Total PCB	ug/g	ND	0.03	0.01	ND	0.03	ND	0.03	ND	ND	0.01	1601117
Surrogate Recovery (%)												
2,4,5,6-Tetrachloro-m-xylene	%	74	75		89		101	70	73	71		1601117
Decachlorobiphenyl	%	92	55		75		89	92	64	86		1601117

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		AH7104		
Sampling Date		2008/08/20		
	Units	**MW-10**	**RDL**	**QC Batch**
Metals				
Mercury (Hg)	mg/L	ND	0.0001	1602063
Dissolved Arsenic (As)	ug/L	1	1	1602934
Dissolved Cadmium (Cd)	ug/L	ND	0.1	1602934
Dissolved Chromium (Cr)	ug/L	ND	5	1602934
Dissolved Cobalt (Co)	ug/L	1.3	0.5	1602934
Dissolved Copper (Cu)	ug/L	1	1	1602934
Dissolved Lead (Pb)	ug/L	ND	0.5	1602934
Dissolved Nickel (Ni)	ug/L	8	1	1602934
Dissolved Zinc (Zn)	ug/L	330	5	1602934

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		AH7104		
Sampling Date		2008/08/20		
	Units	**MW-10**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons				
F1 (C6-C10)	ug/L	ND	100	1597826
F1 (C6-C10) - BTEX	ug/L	ND	100	1597826
Gasoline	ug/L	ND	100	1597826
F2-F4 Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	ug/L	ND	100	1598502
F3 (C16-C34 Hydrocarbons)	ug/L	ND	100	1598502
Reached Baseline at C50	ug/L	YES		1598502
Diesel (C10-C24)	ug/L	ND	100	1598502
Diesel (C11-C32)	ug/L	ND	100	1598502
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	102		1597826
4-Bromofluorobenzene	%	99		1597826
D10-Ethylbenzene	%	89		1597826
D4-1,2-Dichloroethane	%	121		1597826
o-Terphenyl	%	79		1598502

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		AH7104		
Sampling Date		2008/08/20		
	Units	**MW-10**	**RDL**	**QC Batch**
PCBs				
Aroclor 1016	ug/L	ND	0.05	1601429
Aroclor 1221	ug/L	ND	0.05	1601429
Aroclor 1232	ug/L	ND	0.05	1601429
Aroclor 1242	ug/L	ND	0.05	1601429
Aroclor 1248	ug/L	ND	0.05	1601429
Aroclor 1254	ug/L	ND	0.05	1601429
Aroclor 1260	ug/L	ND	0.05	1601429
Aroclor 1262	ug/L	ND	0.05	1601429
Aroclor 1268	ug/L	ND	0.05	1601429
Total PCB	ug/L	ND	0.05	1601429
Surrogate Recovery (%)				
2,4,5,6-Tetrachloro-m-xylene	%	69		1601429
Decachlorobiphenyl	%	84		1601429

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

GENERAL COMMENTS

Sample AH7099-01: PCB analysis: Detection Limit was raised due to matrix interferences.

PETROLEUM HYDROCARBONS (CCME)

Petroleum Hydrocarbons F2-F4 in Soil: Matrix Spiked recoveries were not calculated (NC) because of high concentration of target compounds in the parent sample.

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Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

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
1597601	Moisture	2008/08/31							0	50		
1597826	1,4-Difluorobenzene	2008/08/27	92	70 - 130	94	70 - 130	96	%				
1597826	4-Bromofluorobenzene	2008/08/27	99	70 - 130	99	70 - 130	104	%				
1597826	D10-Ethylbenzene	2008/08/27	81	70 - 130	92	70 - 130	92	%				
1597826	D4-1,2-Dichloroethane	2008/08/27	100	70 - 130	100	70 - 130	105	%				
1597826	F1 (C6-C10)	2008/08/27	87	70 - 130	99	70 - 130	ND, RDL=100	ug/L				
1597826	Gasoline	2008/08/27	87	70 - 130	99	70 - 130	ND, RDL=100	ug/L	NC	40		
1597826	F1 (C6-C10) - BTEX	2008/08/27					ND, RDL=100	ug/L				
1597844	o-Terphenyl	2008/08/29	110	30 - 130	101	30 - 130	112	%				
1597844	F2 (C10-C16 Hydrocarbons)	2008/08/30	NC	60 - 130	98	60 - 130	ND, RDL=10	ug/g	NC	50		
1597844	F3 (C16-C34 Hydrocarbons)	2008/08/30	NC	60 - 130	98	60 - 130	ND, RDL=10	ug/g	NC	50		
1597844	Diesel (C11-C32)	2008/08/29	NC	N/A	98	N/A	ND, RDL=10	ug/g				
1597844	Diesel (C10-C24)	2008/08/29	NC	60 - 130	98	60 - 130	ND, RDL=10	ug/g				
1597935	1,4-Difluorobenzene	2008/08/29	102	60 - 140	109	60 - 140	94	%				
1597935	4-Bromofluorobenzene	2008/08/29	108	60 - 140	98	60 - 140	102	%				
1597935	D10-Ethylbenzene	2008/08/29	90	30 - 130	101	30 - 130	109	%				
1597935	D4-1,2-Dichloroethane	2008/08/29	100	60 - 140	127	60 - 140	91	%				
1597935	F1 (C6-C10)	2008/08/30	103	60 - 140	84	60 - 140	ND, RDL=10	ug/g	NC	50		
1597935	Gasoline	2008/08/29	103	60 - 140	84	60 - 140	ND, RDL=10	ug/g				
1597935	F1 (C6-C10) - BTEX	2008/08/30					ND, RDL=10	ug/g	NC	50		
1598502	o-Terphenyl	2008/08/28	98	30 - 130	106	30 - 130	90	%				
1598502	F2 (C10-C16 Hydrocarbons)	2008/08/28	94	60 - 130	100	60 - 130	ND, RDL=100	ug/L	NC	50		
1598502	F3 (C16-C34 Hydrocarbons)	2008/08/28	94	60 - 130	100	60 - 130	ND, RDL=100	ug/L	NC	50		
1598502	Diesel (C10-C24)	2008/08/28	94	30 - 130	100	30 - 130	ND, RDL=100	ug/L				
1598502	Diesel (C11-C32)	2008/08/28	94	N/A	100	N/A	ND, RDL=100	ug/L				
1601117	2,4,5,6-Tetrachloro-m-xylene	2008/08/31	117	40 - 130	98	40 - 130	109	%				
1601117	Decachlorobiphenyl	2008/08/31	120	40 - 130	106	40 - 130	112	%	0	N/A		
1601117	Aroclor 1260	2008/08/31	101	30 - 130	88	30 - 130	ND, RDL=0.01	ug/g				
1601117	Total PCB	2008/08/31	101	30 - 130	88	30 - 130	ND, RDL=0.01	ug/g	NC	50		
1601117	Aroclor 1262	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1016	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1221	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1232	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1242	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1248	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1254	2008/08/31					ND, RDL=0.01	ug/g				
1601117	Aroclor 1268	2008/08/31					ND, RDL=0.01	ug/g				
1601247	Moisture	2008/08/30							2.0	50		
1601429	2,4,5,6-Tetrachloro-m-xylene	2008/09/02	71	30 - 150	74	30 - 150	90	%				
1601429	Decachlorobiphenyl	2008/09/02	82	29 - 139	84	29 - 139	108	%	4.8	N/A		

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Maxxam Job #: A895880
Report Date: 2008/09/04

Franz Environmental Inc
Client Project #: 1213-0801
Project name: FOX-4 DEW LINE
Sampler Initials: RF

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
1601429	Aroclor 1260	2008/09/02	89	30 - 130	96	30 - 130	ND, RDL=0.05	ug/L	NC	40		
1601429	Total PCB	2008/09/02	89	30 - 130	96	30 - 130	ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1016	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1221	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1232	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1242	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1248	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1254	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1262	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601429	Aroclor 1268	2008/09/02					ND, RDL=0.05	ug/L	NC	40		
1601806	Acid Extractable Arsenic (As)	2008/09/02	100	75 - 125			ND, RDL=1	ug/g	NC	35	96	75 - 125
1601806	Acid Extractable Cadmium (Cd)	2008/09/02	99	75 - 125			ND, RDL=0.1	ug/g	NC	35	91	75 - 125
1601806	Acid Extractable Chromium (Cr)	2008/09/02	96	75 - 125			ND, RDL=1	ug/g	1.3	35	94	75 - 125
1601806	Acid Extractable Cobalt (Co)	2008/09/02	97	75 - 125			ND, RDL=0.1	ug/g	1.4	35	92	75 - 125
1601806	Acid Extractable Copper (Cu)	2008/09/02	97	75 - 125			ND, RDL=0.5	ug/g	1.3	35	92	75 - 125
1601806	Acid Extractable Lead (Pb)	2008/09/02	102	75 - 125			ND, RDL=1	ug/g	NC	35	102	75 - 125
1601806	Acid Extractable Nickel (Ni)	2008/09/02	99	75 - 125			ND, RDL=0.5	ug/g	2.8	35	90	75 - 125
1601806	Acid Extractable Zinc (Zn)	2008/09/02	95	75 - 125			ND, RDL=5	ug/g	NC	35	95	75 - 125
1601807	Acid Extractable Mercury (Hg)	2008/09/02	89	75 - 125			ND, RDL=0.05	ug/g	NC	35	99	75 - 125
1602063	Mercury (Hg)	2008/09/02	96	75 - 125	102	84 - 113	ND, RDL=0.0001	mg/L	NC	25		
1602934	Dissolved Arsenic (As)	2008/09/04	104	80 - 120	99	85 - 115	ND, RDL=1	ug/L	NC	25		
1602934	Dissolved Cadmium (Cd)	2008/09/04	108	80 - 120	103	85 - 115	ND, RDL=0.1	ug/L	NC	25		
1602934	Dissolved Chromium (Cr)	2008/09/04	105	80 - 120	100	85 - 115	ND, RDL=5	ug/L	NC	25		
1602934	Dissolved Cobalt (Co)	2008/09/04	103	80 - 120	99	85 - 115	ND, RDL=0.5	ug/L	NC	25		
1602934	Dissolved Copper (Cu)	2008/09/04	101	80 - 120	98	85 - 115	ND, RDL=1	ug/L	NC	25		
1602934	Dissolved Lead (Pb)	2008/09/04	103	80 - 120	99	85 - 115	ND, RDL=0.5	ug/L	NC	25		
1602934	Dissolved Nickel (Ni)	2008/09/04	102	80 - 120	99	85 - 115	ND, RDL=1	ug/L	7.0	25		
1602934	Dissolved Zinc (Zn)	2008/09/04	NC(1)	80 - 120	100	85 - 115	ND, RDL=5	ug/L	0.8	25		

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
(1) - The recovery in the matrix spike was not calculated (NC). Because of the high concentration of this analyte in the parent sample, the relative difference between the spiked and unspiked concentrations is not sufficiently significant to permit a reliable recovery calculation.

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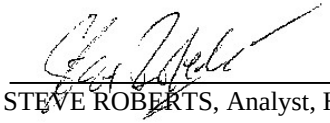
Validation Signature Page

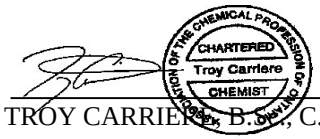
Maxxam Job #: A895880

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



STEVE ROBERTS, Analyst, Hydrocarbons



TROY CARRIERE, B.Sc., C.Chem, Scientific Specialist

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

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Chain of Custody Record

No: 42874

Pg: 1 of 10

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 29 Churchill Ave, Ottawa / Iqaluit
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: Fox-4
PO #: 1213-0801
Quote #: ☐ Not Quoted
Email: rfletcher@franceenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order # / Sample Identification		Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	MW-1 (soil) 0-15 cm	S	3	22/8/08	X	X	X	X	X									
2	MW-1 (soil) 40-50 cm				X	X	X	X	X									
3	MW-2 (soil) 0-15 cm				X	X	X	X	X									
4	MW-2 (soil) 40-50 cm				X	X	X	X	X									
5	MW-3 (soil) 0-15 cm				X	X	X	X	X									
6	MW-3 (soil) 40-50 cm				X	X	X	X	X									
7	MW-4 (soil) 0-15 cm				X	X	X	X	X									
8	MW-4 (soil) 40-50 cm				X	X	X	X	X									
9	MW-5 (soil) 0-15 cm				X	X	X	X	X									
10	MW-5 (soil) 40-50 cm				X	X	X	X	X									

Comments: Metals to include: As Cd, Cr, Co, Cu Pb Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by:	Received by:	Verified by:
Ryan Fletcher		
Date: 25/8/08 Time:	Date: Time:	Date: Time:

PARACEL LABORATORIES LTD.

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Chain of Custody Record

No. 42875

Pg. 2 of 10

Contact: R. Fletcher / A. Carrier
Company: Franz / Nautra
Address: 329 Churchill Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 213-0691
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [ ] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	Analysis Required: TL	F1-F4	PCBs	Metals	Mercury									
1	MW-6 (soil) 0-15 cm	S	3	22/8/08	X	X	X	X	X									
2	MW-6 (soil) 40-50 cm				X	X	X	X	X									
3	MW-7 (soil) 0-15 cm			23/8/08	X	X	X	X	X									
4	MW-7 (soil) 40-50 cm				X	X	X	X	X									
5	MW-8 (soil) 0-15 cm				X	X	X	X	X									
6	MW-8 (soil) 40-50 cm				X	X	X	X	X									
7	MW-9 (soil) 0-15 cm				X	X	X	X	X									
8	MW-9 (soil) 40-50 cm				X	X	X	X	X									
9	MW-10 (soil) 0-15 cm				X	X	X	X	X									
10	MW-10 (soil) 40-50 cm			19/8/08	X	X	X	X	X									

Comments: Metals to include: As Cd, Cr, Co, Cu Pb Ni Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by:	Received by:	Verified by:
R. Fletcher		
Date: 25/8/08 Time:	Date: Time:	Date: Time:

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Chain of Custody Record

No. 42868

Pg. 3 of 10

Contact: R. Fletcher / A. Carrier
Company: Franc / Nunatta
Address: 324 Churchill Ave Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: Fox-4
PO #: 1213-0901
Quote #: ☐ Not Quoted
Email: rfletcher@francenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required														
	Paracel Order # / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury										
1	MW-11 (soil) 0-15cm	S	3	19/8/08	X	X	X	X	X										
2	MW-11 (soil) 40-50cm				X	X	X	X	X										
3	MW-12 (soil) 0-15cm				X	X	X	X	X										
4	MW-12 (soil) 40-50cm				X	X	X	X	X										
5	MW-13 (soil) 0-15cm				X	X	X	X	X										
6	MW-13 (soil) 40-50cm				X	X	X	X	X										
7	MW-14 (soil) 0-15cm				X	X	X	X	X										
8	MW-14 (soil) 40-50cm				X	X	X	X	X										
9	MW-15 (soil) 0-15cm				X	X	X	X	X										
10	MW-15 (soil) 40-50cm				X	X	X	X	X										

Comments: Metals to include: As Cd Cr Co Cu Pb Ni Zn
PHC Fraction: F1 (C6-C10) F2 (C10-C16) F3 (C16-C34)

Relinquished by:	Received by:	Verified by:
R. Fletcher		
Date: 25/8/08 Time:	Date: Time:	Date: Time:

PARACEL LABORATORIES LTD.

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f: (613) 731-9064
e: paracel@paracellabs.com
www.paracellabs.com

Chain of Custody Record

No. 42873

Pg. 1 of 10

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave, Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PAHs	Metals	Mercury									
1	MW-16 (soil) 0-15 cm	S	3	19/8/08	X	X	X	X	X									
2	MW-16 (soil) 40-50 cm			"	X	X	X	X	X									
3	F4-1 (soil) 0-15 cm		↓	23/8/08	X	X	X	X	X									
4	F4-1 (soil) 40-50 cm		4	"	X	X	X	X	X									
5	F4-2 (soil) 0-15 cm		3	22/8/08	X	X	X	X	X									
6	F4-2 (soil) 40-50 cm				X	X	X	X	X									
7	F4-3 (soil) 0-15 cm				X	X	X	X	X									
8	F4-3 (soil) 40-50 cm				X	X	X	X	X									
9	F4-4 (soil) 0-15 cm				X	X	X	X	X									
10	F4-4 (soil) 40-50 cm	↓	↓	↓	X	X	X	X	X									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher	Received by:	Verified by:
Date: 25/8/08 Time:	Date: Time:	Date: Time:

PARACEL LABORATORIES LTD.

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Chain of Custody Record

No: 42876

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 339 Churchill Ave, Ottawa / Iqaluit, NU
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required														
Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury										
1	F4-5 (soil) 0-15 cm	S	3	22/8/08	X	X	X	X	X										
2	F4-5 (soil) 40-50 cm			"	X	X	X	X	X										
3	F4-6 (soil) 0-15 cm			20/8/08	X	X	X	X	X										
4	F4-6 (soil) 40-50 cm				X	X	X	X	X										
5	F4-7 (soil) 0-15 cm				X	X	X	X	X										
6	F4-7 (soil) 40-50 cm				X	X	X	X	X										
7	F4-8 (soil) 0-15 cm				X	X	X	X	X										
8	F4-8 (soil) 40-50 cm				X	X	X	X	X										
9	F4-11 (soil) 0-15 cm			23/8/08	X	X	X	X	X										
10	F4-11 (soil) 40-50 cm			"	X	X	X	X	X										

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by:
Date: Time:

PARACEL LABORATORIES LTD.

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Chain of Custody Record

No: 42872

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required													
	Paracel Order # / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
1	F4-12 (soil) 0-15 cm	S	3	23/8/08	X	X	X	X	X									
2	F4-12 (soil) 40-50 cm				X	X	X	X	X									
3	F4-13 (soil) 0-15 cm				X	X	X	X	X									
4	F4-13 (soil) 40-50 cm				X	X	X	X	X									
5	F4-17 (soil) 0-15 cm		2		X	X												
6	F4-17 (soil) 40-50 cm		2		X	X												
7	F4-18 (soil) 0-15 cm		2		X	X												
8	F4-18 (soil) 40-50cm		2		X	X												
9	F4-19 (soil) 0-15 cm		2		X	X												
10	F4-19 (soil) 40-50 cm		2		X	X												

F1 and F2-F4 ONLY

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher	Received by:	Verified by:
Date: 25/8/08 Time:	Date: Time:	Date: Time:

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Chain of Custody Record

No. 42871

Pg. 7 of 10

Contact: rFletcher / A. Cassiv
Company: Franz / Nunatta
Address: 329 Churchill Ave, Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franceenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Sample Information					Analysis Required														
Paracel Order # / Sample Identification		Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4													
1	F4-20 (soil) 0-15 cm	S	3		X	X													
2	F4-20 (soil) 40-50 cm		2		X	X													
3	F4-21 (soil) 0-15 cm		3		X	X													
4	F4-21 (soil) 40-50 cm		3		X	X													
5	F4-22 (soil) 0-15 cm		3		X	X													
6	F4-22 (soil) 40-50 cm		3		X	X													
7	[illegible]																		
8	[illegible]																		
9	F4-24 (soil) 0-15 cm		3		X	X													
10	F4-24 (soil) 40-50 cm		3		X	X													

F1 and F2-F4 ONLY

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher
Date: 25/8/08 Time:

Received by:
Date: Time:

Verified by:
Date: Time:

PARACEL LABORATORIES LTD.

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Chain of Custody Record

ID: 42870

Contact: rFletcher / A. Carrier
Company: Franz / Nuvatta
Address: 329 Churchill Ave., Ottawa / Iqaluit, Nu
Tel: 613-721-0555 Fax: 613-721-0029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☒ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☐ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements: CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order #	Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2 - F4	PCBs	Metals	Mercury									
	Sample Information				**Analysis Required**													
1	F4-25 (soil) 0-15cm	S	3	20/8/08	x	x	x	x	x									
2	F4-25 (soil) 40-50cm			"	x	x	x	x	x									
3	QA/QC 1			22/8/08	x	x	x	x	x									
4	QA/QC 2			22/8/08	x	x	x	x	x									
5	QA/QC 3			21/8/08	x	x	x	x	x									
6	QA/QC 4			19/8/08	x	x	x	x	x									
7	QA/QC 5			19/8/08	x	x	x	x	x									
8	QA/QC 6			20/8/08	x	x	x	x	x									
9	QA/QC 7			23/8/08	x	x	x	x	x									
10	Trip Blank			N/A	x	x	x	x	x									

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by: R. Fletcher	Received by:	Verified by:
Date: 23/8/08 Time:	Date: Time:	Date: Time:

PARACEL LABORATORIES LTD.

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www.paracellabs.com

Chain of Custody Record

ID: 42879

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 329 Churchill Ave, Ottawa / Iqaluit, NU
Tel: 6137210555 Fax: 6137210029

Project Ref: FOX-4
PO #: 1213-0801
Quote #: ☐ Not Quoted
Email: rfletcher@franceenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☒ No

Reporting Options
Electronic: [X] signed PDF [X] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [X] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

	Sample Information				Analysis Required														
	Paracel Order # / Sample Identification	Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury										
1	MW-1	GW	5		x	x	x	x	x										
2	MW-2		5		x	x	x	x	x										
3	MW-8		5		x	x	x	x	x										
4	MW-10		5		x	x	x	x	x										
5	MW-12		3		x	x	x	x	x	NO	VOC	Vials							
6	MW-13		5		x	x	x	x	x										
7	MW-14		5		x	x	x	x	x										
8	MW-15				x	x	x	x	x										
9	MW-16		5		x	x	x	x	x										
10	MW-15	↓	5		x	x	x	x	x										

Comments: Metals to include: As, Cd, Cr, Co, Cu, Pb, Ni, Zn
PHC Fractions: F1 (C6-C10), F2 (C10-C16), F3 (C16-C34)

Relinquished by:	Received by:	Verified by:
R. Fletcher		
Date: 8/08 Time:	Date: Time:	Date: Time:

PARACEL LABORATORIES LTD.

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www.paracellabs.com

Chain of Custody Record

No 42830

Contact: R. Fletcher / A. Carrier
Company: Franz / Nunatta
Address: 529 Churchill Ottawa / Iqaluit/NU
Tel: 6372 1055 Fax: 6372 1029

Project Ref: FOX-4
PO #: 215-0821
Quote #: ☐ Not Quoted
Email: rfletcher@franzenvironmental.com
Preservative to be added by Paracel? ☐ Yes ☒ No

Reporting Options
Electronic: [X] signed PDF [✓] spreadsheet
Other:
Turn Around Time: [ ] 1-day [ ] 2-day [✓] Regular
Regulatory/Guideline Requirements
CCME

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other RDW–Regulated Drinking Water

Paracel Order # / Sample Identification		Matrix	# Bottles	Date Sampled dd/mm/yy	F1	F2-F4	PCBs	Metals	Mercury									
		Sample Information			**Analysis Required**													
1	[illegible]																	
2	QA/QC 2	GW	5		X	X	X	X	X									
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: Metals to include; As Cd, Cr Co, Cu, Pb, Ni, Zn
PAC Fractions; F1 (C6-C10) F2 (C10-C16) F3 (C16-C34)

Relinquished by:	Received by:	Verified by:
R. Fletcher		
Date: 8/08 Time:	Date: Time:	Date: Time:

Chain of Custody Template for Owner's Representative

CHAIN OF CUSTODY REPORT

Environmental Sciences Group
Royal Military College of Canada
12 Verite Avenue, Bldg. #36
Kingston, ON K7K7B4
Tel: (613)541-6000 Ext: 6818/6819
Cell: (613)530-1350
Fax: (613)541-6820
Attn: ESG OPS Centre

Cooler ID: 2 coolers
Date Shipped: Aug. 25/08
Prepared By: Ryan Fletcher
Relinquished By:
Signature:
Date:
Received By:
Date Received:

Check	Sample number	Sample Matrix	Date Collected	Project/Site Name	Container Types: Jar 125ml Glass	Jar 500ml Glass	I-Chem	Qorpaks	Whirlpaks	Ziploc	Bottle 1L Teflon	Bottle 1L Plastic	Bottle 1L Glass	Bottle 250ml Plastic	Bottle 250ml Glass	Bottle Bacterial	Other (Unspecified)
	F4-7(soil) 0-15	Soil		FOX-4	2										1		
	F4-12(soil) 0-15				2										1		
	F4-2(soil) 0-15				2										1		
	MW-8(soil) 0-15				2										1		
	MW-14(soil) 0-15				2										1		
	MW-13(soil) 0-15				2										1		
	MW-3(soil) 0-15				2										1		
	LS08-1 0-15				2										1		
	LS08-2 0-15				2										1		
	T208-1 0-15				2										1		
	T208-3 0-15				2										1		
	T208-2 0-15				2										1		
	T208-3 40-50				2										1		
	TB08-1 0-15				2										1		
	TB08-2 0-15				2										1		
	TB08-3 0-15				2										1		
	ST08-1 0-15				2										1		
	ST08-2 0-15				2										1		
	ST08-3 0-15				2										1		
	ST08-3 40-50				2										1		
	ST08-4 0-15				2										1		

New samples for 2008

Maxxam Analytics Inc

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: #22520 Nunatta Environmental Services Inc
Contact Name: Alain Carriere
Address: Building 1575 Suite 1
Iqaluit NU X0A 0H0
Phone: (867)979-1488 Fax: (867)979-1478
Email: a.carriere@sympatico.ca

REPORT INFORMATION (if differs from invoice):

Company Name: #9348 Franz Environmental Inc
Contact Name: Ryan Fletcher
Address: 329 Churchill Ave N Suite 200
Ottawa ON K1Z 5B8
Phone: (613)721-0555 Fax: (613)721-0029
Email: rfletcher@franzenvironmental.com

PROJECT INFORMATION:

Quotation #: A85513
P.O. #:
Project #: 1213-0801
Project Name:
Site Location: Fox-4 DEW line
Sampled By: Ryan Fletcher

MAXX

CHAIN OF

C#922

REGULATORY CRITERIA:

☐ MISA Reg. 153/04 Sewer Use ☐ Sanitary ☐ Storm ☐ Combined
☐ PWQO ☐ Table 1 ☐ Table 2
☐ Reg. 558 ☐ Table 3 ☐ Table 6 Municipality
Other (specify) CCME

SPECIAL INSTRUCTIONS

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

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

ANALYSIS REQUESTED (Please be specific):

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Mercury in Soil by CVAA	Acid Extr. Metals (aqua regia) by ICPMS	Polychlorinated Biphenyl in Soil	Petroleum Hydro F1 & TPH gas in Soil	Petroleum Hyd F2-F3 & TPH diesel in Soil	Lab Filtered Metals by ICPMS	Mercury in Water by CVAA	Polychlorinated Biphenyl in Water	Petroleum Hydro F1 & TPH gas in Water	Petroleum Hyd F2-F3 &TPH diesel in Water	# of Bottles	
1		MW-3 (soil) 0-15cm	Aug 22/08	SOIL			X	X	X	X	X						3	Metals Co, C
2		MW-8 (soil) 0-15cm	Aug 21/08	SOIL			X	X	X	X	X						3	
3		MW-14 (soil) 0-15cm	Aug 19/08	SOIL			X	X	X	X	X						3	
4		MW-13 (soil) 0-15cm	Aug 19/08	SOIL			X	X	X	X	X						3	
5		F4-2 (soil) 0-15cm	Aug 22/08	SOIL			X	X	X	X	X						3	
6		F4-8 (soil) 0-15cm	Aug 20/08	SOIL			X	X	X	X	X						3	
7		F4-12 (soil) 0-15cm	Aug 23/08	SOIL			X	X	X	X	X						3	
8		MW-10	Aug 20/08	GW SOIL								X	X	X	X	X	9	
9		″	″	GW SOIL								X	X	X	X	X	9	Co
10				SOIL														

TURN

PLEASE PROV

Regular (Standard) TAT:
(will be applied if Rush TA
Standard TAT = 5-7 Work
Please note: Standard TA
days - contact your Projec

Job Specific Rush TAT (
Date Required:
Rush Confirmation Numbe

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:
Ryan Fletcher	2008/8/25				

Lab

Time Sensitive ☐

Temperature (°C) on Re

* 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.

ANNEX 2

QA/QC ANALYTICAL RESULTS

QUALITY ASSURANCE/QUALITY CONTROL

A Quality Assurance/Quality Control (QA/QC) program was implemented to monitor the quality of the analytical results. The main objective of this QA/QC program is to insure that sampling data and analysis results are complete, precise, exact, representative and comparable.

All samples were given sequential alphanumerical coding before submitting to the analytical laboratories; these coding masked any information concerning site location, sample type or possible concentrations in the samples.

All soil and groundwater samples were sent for analysis to Paracel, Ottawa, Canada. In order to insure the quality of analytical results, 10 % of duplicate samples were sent to a second laboratory (Maxxam Analytics Inc.) and analyzed for inter-laboratory comparison purposes. All results are presented in the table to this Annex (Annex 2 Table 1).

Soil Samples

In case of soil samples, some minor differences were noted within the Paracel metals results when duplicates were compared, although all differences are considered to be within acceptable limits.

Metals

For the soil sample MW3 (soil) 0-15cm the results for As presented significant discrepancies between the sample and the inter-laboratory results (i.e. 49 vs. 84 mg/Kg).

A likely explanation for these discrepancies could be explained due to the heterogeneous nature of the soil samples.

Hydrocarbons

For the soil sample F4-2, and MW14 (soil) 0-15cm the results for TPH presented slight discrepancies between the sample and its QA/QC inter-laboratory duplicate (i.e. 657 vs. 252 mg/Kg; 1537 vs. 1000 mg/Kg respectively).

A likely explanation for these discrepancies could be explained due to the heterogeneous nature of the soil samples.

Groundwater

Groundwater samples were subject to inter-laboratory comparison (as per Terms of Reference). In the case of groundwater, the TPH were identical between the samples and the duplicate. The results for the total metals in the samples and the duplicates were generally similar except for;

In case of some parameters, minor differences were noted within the Paracel metals results when duplicates were compared, although all differences are considered to be within acceptable limits.

Overall, the soil and groundwater sample results are broadly coherent and within the same range of results for both laboratories. In general, the reliability of the analytical results is considered as good.

Annex 2 to QA/QC Discussion
Table 1 - SUMMARY OF 2008 SOIL AND GROUNDWATER DATA
QA/QC DATA

Sample #	Location	Laboratory	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	Hg	PCBs	F1 C_6-C_{10}	F2 C_{10}-C_{16}	F3 C_{16}-C_{34}	TPH C_6-C_{34}
Soil			[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]
MW3 (soil) 0-15cm	MW3	Paracel	21	19	6	<0.5	7	23	48	49	<0.1	<0.05	<10	<10	18	18
QA/QC-1	MW3	Paracel	18	19	6	<0.5	5	24	44	30	<0.1	<0.05	<10	>10	43	43
MW3 (soil) 0-15cm	MW3	Maxxam	17	17	5.6	<0.1	5	37	44	84	<0.05	<0.01	<10	<10	37	37
F4-2 (soil) 0-15cm	F4-2	Paracel	21	21	6	<0.5	12	<20	40	33	<0.1	<0.05	<10	467	94	561
QA/QC-2	F4-2	Paracel	22	23	6	<0.5	10	24	42	27	<0.1	<0.05	<10	524	133	657
F4-2 (soil) 0-15cm	F4-2	Maxxam	21	19	5.4	<0.1	14	34	35	21	<0.05	0.03	<10	180	72	252
MW8 (soil) 0-15cm	MW8	Paracel	19	15	<5	<0.5	8	21	29	17	<0.1	<0.05	<10	<10	37	37
QA/QC-3	MW8	Paracel	18	17	<5	<0.5	6	20	28	11	<0.1	0.14	<10	<10	37	37
MW8 (soil) 0-15cm	MW8	Maxxam	15	13	3.7	<0.1	6	31	24	13	<0.05	0.03	<10	<10	21	21
MW14 (soil) 0-15cm	MW-14	Paracel	21	17	5	<0.5	16	23	38	19	<0.1	<0.05	<10	355	864	1219
QA/QC-4	MW-14	Paracel	18	17	<5	<0.5	14	21	34	16	<0.1	<0.05	<10	627	910	1537
MW14 (soil) 0-15cm	MW-14	Maxxam	31	26	7.2	0.3	25	60	59	24	<0.05	<0.01	<10	370	630	1000
MW13 (soil) 0-15cm	MW-13	Paracel	14	13	<5	<0.5	6	<20	26	10	<0.1	<0.05	<10	<10	20	20
QA/QC-5	MW-13	Paracel	15	17	<5	<0.5	7	<20	29	9	<0.1	<0.05	<10	<10	15	15
MW13 (soil) 0-15cm	MW-13	Maxxam	16	15	4.2	<0.1	6	31	30	10	<0.05	<0.01	<10	<10	24	24
F4-7(soil) 0-15cm	F4-7	Paracel	10	12	<5	<0.5	5	<20	26	14	<0.1	<0.05	<10	<10	<10	<10
QA/QC-6	F4-7	Paracel	10	12	<5	<0.5	6	<20	27	19	<0.1	<0.05	<10	<10	21	21
F4-7(soil) 0-15cm	F4-7	Maxxam	12	9.3	3.1	<0.1	3	21	27	36	<0.05	<0.01	<10	<10	<10	<10
F4-12 (soil) 0-15cm	F4-12	Paracel	<5	8	<5	<0.5	5	<20	17	<1	<0.1	<0.05	<10	<10	11	11
QA/QC-7	F4-12	Paracel	8	8	<5	<0.5	4	<20	17	<1	<0.1	<0.05	<10	<10	<10	<10
F4-12 (soil) 0-15cm	F4-12	Maxxam	5.6	4.7	1.6	<0.1	2	12	13	1	<0.05	<0.01	<10	<10	<10	<10
Water			[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[ug/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]
MW-10	MW-10	Paracel	<0.005	NV	NV	<0.001	<0.001	0.499	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1
QA/QC-2	MW-10	Paracel	<0.005	NV	NV	<0.001	<0.001	0.423	<0.05	<0.01	<0.0001	<0.00005	<0.2	<0.1	<0.1	<0.1
MW-10	MW-10	Maxxam	0.001	0.008	0.001	<0.0001	<0.0005	0.33	<0.005	0.001	<0.0001	<0.00005	<0.1	<0.1	<0.1	<0.1

ANNEX 3

FIELD NOTES

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/8/06	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Heli-pad		
Monitoring Well ID:	MW-1		
Well Sampling Event:	2006	Sample Number:	MW-1
Condition of Well:	Good → Bentonite swelled to lid ↳ Removed	Procedure/Equipment:	Bailer
Volume Purged Water (mL):	3.5 L	Purging (Y/N):	~~N~~ Y
Sampling Equipment:	Bailer		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	Houston ↳ Alconox	Number washes and rinses:	~~1~~ 2

Measured Data

Well height above ground (cm):				
Diameter of well (cm):	2 inch			
Depth of installation (cm):	1.65 m		from ground surface	—
Length screened section (cm):	—			
Depth to top of screen (cm):	—		from ground surface	—
Depth to water surface (cm):	0.96 m		Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)				
Static water level (cm):			from ground surface	
Depth to bottom (cm):	1.65 m		Evidence of sludge etc:	None
			Evidence of freezing/siltation:	None
			(compare to installation record)	
Free product thickness (mm):	None		Method (electric meter, steel tape, etc):	
pH:	7.03 | 6.9		6.8	
Conductivity (µS/cm) :	.197 | .190		.195	
Temperature (°C):	0.51 | 0.12		0.10	
Depth of water (cm):				
Well volume of water (mL):				
Length screen collecting water:				
Shape factor:	—			

Development of Monitoring Wells

Site Name:	23/8/06		
Date of Sampling Event:	Fox-4	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Heliport		
Monitoring Well ID:	MW-2		
Well Sampling Event:	2008	Sample Number:	MW-2
Condition of Well:	Good →	Procedure/Equipment:	Bentonite swelled to lid is removed. Bailer,
Volume Purged Water (mL):	3 L	Purging (Y/N):	Y
Sampling Equipment:	Bailer		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	Hexan	Number washes and rinses:	—

Measured Data Lg/Al canned

Well height above ground (cm):					
Diameter of well (cm):	2 inch				
Depth of installation (cm):	1.9 m			from ground surface	
Length screened section (cm):	—				
Depth to top of screen (cm):	—			from ground surface	
Depth to water surface (cm):	1.275 m			Method (electric meter, steel tape, etc):	
(from top of pipe)					
Static water level (cm):				from ground surface	
Depth to bottom (cm):	1.9 m			Evidence of sludge etc:	No
				Evidence of freezing/siltation:	No
				(compare to installation record)	
Free product thickness (mm):	None			Method (electric meter, steel tape, etc):	electric meter
pH:	6.95	6.9	6.8		
Conductivity (µS/cm) :	.431	.534	.429		
Temperature (°C):	9.58	9.03	9.04		
Depth of water (cm):	✓				
Well volume of water (mL):					
Length screen collecting water:					
Shape factor:					

Development of Monitoring Wells

Site Name:	Fox-4 Helipad		
Date of Sampling Event:	23/8/08	Time:	
Names of Samplers:	RF		
Landfill Name:	Heli-pad		
Monitoring Well ID:	MW-3		
Well Sampling Event:	2008	Sample Number:	
Condition of Well:	Good	Procedure/Equipment:	
Volume Purged Water (mL):		Purging (Y/N):	
Sampling Equipment:			
Filtration (Y/N):	N	Acidification (Y/N):	
Decontamination required (Y/N):		Number washes and rinses:	

Measured Data

Well height above ground (cm):	0.16 m		
Diameter of well (cm):	2 inch		
Depth of installation (cm):		from ground surface	
Length screened section (cm):	Dry		
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):	NO	from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
		Evidence of freezing/siltation:	
	H20	(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:			
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	FOX-4		
Date of Sampling Event:	23/8/08	Time:	—
Names of Samplers:	RF		
Landfill Name:	Heli pad		
Monitoring Well ID:	MW-4		
Well Sampling Event:	2008	Sample Number:	—
Condition of Well:	Good	Procedure/Equipment:	—
Volume Purged Water (mL):	—	Purging (Y/N):	—
Sampling Equipment:	—		
Filtration (Y/N):	N	Acidification (Y/N):	—
Decontamination required (Y/N):	—	Number washes and rinses:	1

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):	Dry	Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
		Evidence of freezing/siltation:	
	N/O	(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:			
Conductivity (µS/cm) :			
Temperature (°C):	N/O		
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	23/8/08	Time:	~
Names of Samplers:	RF		
Landfill Name:	Heli-pad		
Monitoring Well ID:	MW-5		
Well Sampling Event:	2008	Sample Number:	~
Condition of Well:	Good Bentonite swelled to lid → H2O in casing	Procedure/Equipment:	→ sheen on H2O
Volume Purged Water (mL):	~	Purging (Y/N):	~
Sampling Equipment:	~		
Filtration (Y/N):	~	Acidification (Y/N):	~
Decontamination required (Y/N):	~	Number washes and rinses:	~

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):	NO	from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):	H2O	Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
	Dry well	Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:			
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	Fcx-4		
Date of Sampling Event:	23/8/98	Time:	~
Names of Samplers:	KF		
Landfill Name:	Helipad		
Monitoring Well ID:	MW-6		
Well Sampling Event:	2008	Sample Number:	
Condition of Well:	Good	Procedure/Equipment:	Bentonite de lid → cleared ~~float~~
Volume Purged Water (mL):	-	Purging (Y/N):	-
Sampling Equipment:	-		
Filtration (Y/N):	-	Acidification (Y/N):	-
Decontamination required (Y/N):	-	Number washes and rinses:	-

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):		from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):	Dry	from ground surface	
Depth to water surface (cm):		Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):	well	from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
		Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):	NO	Method (electric meter, steel tape, etc):	
pH:	H2O		
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	FOX-4		
Date of Sampling Event:	23/06/08	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Stanton Area		
Monitoring Well ID:	MW-7		
Well Sampling Event:	2008	Sample Number:	—
Condition of Well:	Good	Procedure/Equipment:	—
Volume Purged Water (mL):	—	Purging (Y/N):	—
Sampling Equipment:	—		
Filtration (Y/N):	—	Acidification (Y/N):	—
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):	NG	from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):	H20	Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
	WELL	Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:	DRY		
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	Fox Ln		
Date of Sampling Event:	23/8/08	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Station Area		
Monitoring Well ID:	MW-8		
Well Sampling Event:	2008	Sample Number:	MW-8
Condition of Well:	Good - Bentonite to	Procedure/Equipment:	1.0 L → Removed
Volume Purged Water (mL):	4L	Purging (Y/N):	Y
Sampling Equipment:	Waterra tube		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data Horiba → Alarm

Well height above ground (cm):			
Diameter of well (cm):	2 inch		
Depth of installation (cm):	—	from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	1,104 m	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):	1,46 m	Evidence of sludge etc:	No
		Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:	6,55 | 6,45 | 6,39		
Conductivity (µS/cm) :	.230 | .232 | .235		
Temperature (°C):	0,03 | 0,02 | 0,02		
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

MW-8

Development of Monitoring Wells

Site Name:	FOX-4		
Date of Sampling Event:	23/8/09	Time:	—
Names of Samplers:	RF		
Landfill Name:	Station Area		
Monitoring Well ID:	MW-9		
Well Sampling Event:	2009	Sample Number:	—
Condition of Well:	Good	Procedure/Equipment:	—
Volume Purged Water (mL):	—	Purging (Y/N):	—
Sampling Equipment:	—		—
Filtration (Y/N):	—	Acidification (Y/N):	—
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):	NO	from ground surface	
Length screened section (cm):			
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):	H2O	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)			
Static water level (cm):		from ground surface	—
Depth to bottom (cm):		Evidence of sludge etc:	None
	WELL	Evidence of freezing/siltation:	None
		(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	~~tape~~
pH:	DRY		
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug 20/08	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-10		
Well Sampling Event:	2008	Sample Number:	MW-10
Condition of Well:		Procedure/Equipment:	↳QA/QC 2 waterra / foot valve
Volume Purged Water (mL):	9 Litres	Purging (Y/N):	Y
Sampling Equipment:	waterra - Foot valve		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data

Well height above ground (cm):	0.06m		
Diameter of well (cm):	2 inch		
Depth of installation (cm):	1.5m	from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.70	Method (electric meter, steel tape, etc):	
(from top of pipe)	0.70		
Static water level (cm):	0.70	from ground surface	
Depth to bottom (cm):	1.50	Evidence of sludge etc:	
		Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	
pH:	6.54 | 6.58 | 6.62 | 6.65 | 6.65	6.65	
Conductivity (µS/cm) :	.513 | .480 | .435 | .418 | 0.399	.389	
Temperature (°C):	1.98 | 1.77 | 1.66 | 1.42 | 1.29	1.43	
Depth of water (cm):	0.8m		
Well volume of water (mL):			
Length screen collecting water:	—		
Shape factor:	—		

1.50
0.70
0.80

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug	Time:	
Names of Samplers:	RF		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-11		
Well Sampling Event:	2008	Sample Number:	
Condition of Well:	Bailer stuck	Procedure/Equipment:	
Volume Purged Water (mL):		Purging (Y/N):	
Sampling Equipment:			
Filtration (Y/N):		Acidification (Y/N):	
Decontamination required (Y/N):		Number washes and rinses:	

Measured Data

Well height above ground (cm):			
Diameter of well (cm):			
Depth of installation (cm):		from ground surface	
Length screened section (cm):	NO		
Depth to top of screen (cm):		from ground surface	
Depth to water surface (cm):	H2O	Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):		Evidence of sludge etc:	
	Well	Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):		Method (electric meter, steel tape, etc):	
pH:	Dry		
Conductivity (µS/cm) :			
Temperature (°C):			
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Bailer still stuck!

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug 20/08	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-12		
Well Sampling Event:	2008	Sample Number:	
Condition of Well:	Good → one stripped nut/bolt	Procedure/Equipment:	Bailer ~~Bailer~~
Volume Purged Water (mL):	5 Litres	Purging (Y/N):	Y
Sampling Equipment:	Same		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	~~Y~~	Number washes and rinses:	—

4 L – horiba

Measured Data

Well height above ground (cm):	= to ground		
Diameter of well (cm):	2 inch		
Depth of installation (cm):	0.6	from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.37	Method (electric meter, steel tape, etc):	
(from top of pipe)	0.37		
Static water level (cm):	0.37	from ground surface	
Depth to bottom (cm):	0.6	Evidence of sludge etc:	
	4 bailer lodged in	Evidence of freezing/siltation:	
	well	(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	
pH:	7.00 / 6.98 / 6.81 / 6.64 / 6.55	/ 6.43 /	
Conductivity (µS/cm) :	0.452 / 0.308 / 3.06 / 0.319 / 0.321	/ 0.322 /	
Temperature (°C):	3.54 / 4.17 / 4.36 / 3.81 / 3.64	/ 3.69 /	
Depth of water (cm):			
Well volume of water (mL):			
Length screen collecting water:			
Shape factor:			

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug 20/08	Time:	pm
Names of Samplers:	RF		
Landfill Name:	RF		
Monitoring Well ID:	MW-13		
Well Sampling Event:	2008	Sample Number:	—
Condition of Well:	Good	Procedure/Equipment:	waterra Foot valve
Volume Purged Water (mL):	7 Litres	Purging (Y/N):	Y
Sampling Equipment:	waterra		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	N	Number washes and rinses:	—

0.16
1.15
0.16
0.99

Measured Data

Well height above ground (cm):	- 0.05m		
Diameter of well (cm):	2 inch		
Depth of installation (cm):	1.15m	from ground surface	—
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.16 m	Method (electric meter, steel tape, etc):	electric meter
(from top of pipe)	0.16m		
Static water level (cm):	0.16m	from ground surface	
Depth to bottom (cm):	1.15	Evidence of sludge etc:	No
		Evidence of freezing/siltation:	No
		(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	electric meter
pH:	8,6 / 8,13 / 7,95 / 7,54 / 7,35 / 7,29		
Conductivity (µS/cm) :	0,332 / 0.306 / 0,248 / 0,169 / 0.184 / 0.184	horiba Probe	multi-meter
Temperature (°C):	3,57 / 3,21 / 3,29 / 3,49 / 3,53 / 3,66		
Depth of water (cm):	0.99 m		
Well volume of water (mL):			
Length screen collecting water:	1.15		
Shape factor:	—		

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-14		
Well Sampling Event:	2008	Sample Number:	MW-14
Condition of Well:	Good	Procedure/Equipment:	
Volume Purged Water (mL):		Purging (Y/N):	Y
Sampling Equipment:	Waterra		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data

Well height above ground (cm):	0.22m		
Diameter of well (cm):	2 inch		
Depth of installation (cm):		from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.93	Method (electric meter, steel tape, etc):	
(from top of pipe)			
Static water level (cm):		from ground surface	
Depth to bottom (cm):	1.74	Evidence of sludge etc:	
		Evidence of freezing/siltation:	
		(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	

pH:	6.76	6.65	6.44	6.29	6.21		
Conductivity (µS/cm) :	.118	.111	.100	.107	.105		
Temperature (°C):	1.65	1.65	1.57	1.55	1.66		

Depth of water (cm):	0.81
Well volume of water (mL):	
Length screen collecting water:	—
Shape factor:	—

1.74
0.93
0.81

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug	Time:	PM
Names of Samplers:	RF		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-15		
Well Sampling Event:	2008	Sample Number:	MW-15
Condition of Well:		Procedure/Equipment:	QA/QC 1
Volume Purged Water (mL):	6 litres	Purging (Y/N):	✓
Sampling Equipment:	Waterra → Geotube		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	—	Number washes and rinses:	—

Measured Data

Well height above ground (cm):	0.07		
Diameter of well (cm):	2 inch		
Depth of installation (cm):	1.74	from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.14 m	Method (electric meter, steel tape, etc):	electric metre
(from top of pipe)	0.14m		
Static water level (cm):	—	from ground surface	
Depth to bottom (cm):	1.74	Evidence of sludge etc:	None
		Evidence of freezing/siltation:	None
		(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	electric metre

pH:	6.95	6.93	6.88	6.83	6.76	6.73	6.71			
Conductivity (µS/cm) :	.223	.214	.211	.210	.216	.217	.220			
Temperature (°C):	3.94	3.79	3.63	3.47	3.18	3.43	3.34			

Depth of water (cm):	
Well volume of water (mL):	
Length screen collecting water:	
Shape factor:	—

Development of Monitoring Wells

Site Name:	Fox-4		
Date of Sampling Event:	Aug.	Time:	PM
Names of Samplers:	RFO		
Landfill Name:	Tier II		
Monitoring Well ID:	MW-16		
Well Sampling Event:	2008	Sample Number:	MW-16
Condition of Well:	Good	Procedure/Equipment:	Hebeva/ foot valve
Volume Purged Water (mL):	4.5 liters	Purging (Y/N):	
Sampling Equipment:	Hebeva		
Filtration (Y/N):	N	Acidification (Y/N):	N
Decontamination required (Y/N):	Horiba	Number washes and rinses:	

Measured Data

Well height above ground (cm):	0.14		
Diameter of well (cm):	2 inch		
Depth of installation (cm):	1.5m	from ground surface	
Length screened section (cm):	—		
Depth to top of screen (cm):	—	from ground surface	
Depth to water surface (cm):	0.74 m	Method (electric meter, steel tape, etc):	
(from top of pipe)	0.74m		
Static water level (cm):	0.74m	from ground surface	
Depth to bottom (cm):	1.5m	Evidence of sludge etc:	None
		Evidence of freezing/siltation:	No
		(compare to installation record)	
Free product thickness (mm):	None	Method (electric meter, steel tape, etc):	

pH:	6.99	6.98	6.79	6.71	6.69	6.61	6.54
Conductivity (µS/cm) :	.105	.100	.099	.097	.096	.096	.096
Temperature (°C):	1.78	1.33	1.03	1.17	1.28	1.44	1.23

Depth of water (cm):	0.76
Well volume of water (mL):	
Length screen collecting water:	—
Shape factor:	—

bailer shock @ 0.71m

Downloaded Aug 19

Table 6-12: 2007 Thermistor Maintenance Report - Thermistor Station T1

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	21-Aug-07
Prepared By:	Ryan Fletcher		

Fox-4 cable 1 Site 3

Thermistor Information

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility		
Thermistor Number:	T1	Inclination:	Vertical		
Install Date:	15-Aug-98	First Date Event	05-Jul-99	Last Date Event	15-Aug-05
Coordinates and Elevation	N20050	E20388		Elevation:	?
Length of Cable	4.27	Cable Lead Above Ground	1.9	Nodal Points	5
Datalogger Serial #	705043	Cable Serial # 1	String#4		

Thermistor Inspection

Need lid/lock

	Good	Needs Maintenance	
Casing	☑	☒	Secured with gravel at the base
Cover	☑	☒	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	Check Connectors

Battery Installation Date: 21-Aug-07

Battery Levels: Main 11.34V (BEST) 11.34 Best; Aux ~~12.77V~~ (GOOD) 12.71 Good

Observations

Memory used: 21%

Analog 2 and 3 not working → same

Memory 21%

Multiplexor Enabled off → turned on

Proposed Maintenance

Analog Strings 2 & 3 are not in working condition. Should be replaced.

Station #7

Table 6-14: 2007 Thermistor Maintenance Report - Thermistor Station T3

Aug 20, 2009

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	~~22-Aug-07~~
Prepared By:	Ryan Fletcher		

Fox-4 cable 3 Site #55

Thermistor Information

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility		
Thermistor Number:	~~T3~~ T2	Inclination:	Vertical		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	1.56	Cable Lead Above Ground		Nodal Points	5
Datalogger Serial #	67725	Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☐	☑	**Bent (Repaired onsite)** Bent → (repaired onsite)
Cover	☐	☑	**Missing (Found, had blown away)**
Data Logger	☑	☐	
Cable	☑	☒	connection cable damaged → needs replacing
Beads	☑	☐	

Battery Installation Date: ~~21-Aug-07~~ 20 - Aug - 09

Battery Levels: Main **11.34V** Best 100% Aux ~~**13.87V**~~ Best 100%

13,38V

Observations

Memory battery best before December 2006. Analog 1 - 5 is green. Warm up time is 0.035 and charged to 0.210. 0.210. Reset datalogger.

Memory 21% used
Multiplexer off → turned on

Proposed Maintenance

install new casing / housing

Station #2

Department of National Defence
Consulting Services for Collection
of Montoring Data

KN28434
December 2007

Table 6-13: 2007 Thermistor Maintenance Report - Thermistor Station ~~T2~~ T3

Aug 20/08

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	22-Aug-07
Prepared By:	Ryan Fletcher		

Fox-4 cable 2 site #25

Thermistor Information

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility		
Thermistor Number:	~~T2~~ T3	Inclination:	Vertical		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	1.59	Cable Lead Above Ground		Nodal Points	5
Datalogger Serial #	67755	Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	

Battery Installation Date: **Battery installed Aug 22/07**

Battery Levels: Main **11.34V** (100% Best) Aux ~~13.26V~~ (90% green/full)

13.38V

Observations

~~**Memory used is 21%**~~

Memory used - 20%
warm-up time 0.035 sec, changed to 0.210
multiplexor disabled → turned on

- Setting/Programming checked and reset. Clock Set to local Time

Proposed Maintenance

Station #3

Table 6-15: 2007 Thermistor Maintenance Report - Thermistor Station T4

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	22 August, 2007
Prepared By:	Ryan Fletcher		

FOX-4 Cable 4 Site 43

Thermistor Information

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility		
Thermistor Number:	T4	Inclination:	Vertical		
Install Date:		First Date Event		Last Date Event	
Coordinates and Elevation				Elevation:	
Length of Cable	1.67	Cable Lead Above Ground		Nodal Points	5
Datalogger Serial #		Cable Serial #			

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	

Battery Installation Date: **Not indicated on datalogger/battery label.** last year

Battery Levels: Main **11.34V** same (100% Best); Aux **13.02V** same (90% Best)

Observations

Used memory: 21% ✓ same

Multiplexer disabled – turned on

Proposed Maintenance

Station #4

Downloaded Aug 19/08

Table 6-16: 2007 Thermistor Maintenance Report - Thermistor Station T5

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	21-Aug-07
Prepared By:	Ryan Fletcher		

Site 009 cable 6

Thermistor Information

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility
Thermistor Number:	T5	Inclination:	Vertical
Install Date:		First Date Event	Last Date Event
Coordinates and Elevation			Elevation:
Length of Cable	1.39	Cable Lead Above Ground	Nodal Points 5
Datalogger Serial #		Cable Serial #	

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑ ✓	☐	
Cover	☑ ✓	☐	
Data Logger	☑	☑	Battery connection broken → replaced battery → OK now
Cable	☑	☐	
Beads	☑	☐	

Battery Installation Date: **Label indicates: Lithium Battery (datalogger expiration 09/2001, however this battery was reported as changed in 2005.**

Battery Levels: Main **11.34V** (Same) 100% Best; Aux **15.38 V** 90% Best

13.8 ✓

Observations

Used memory: 13%. Reset datalogger. Downloaded data. Changed battery.

Warm up time 0.16C, changed to 0.21C

Multiplexer off → changed to on

Dec. 17th → no more data

Proposed Maintenance

Station 5

Department of National Defence
Consulting Services for Collection
of Monitoring Data

KN28434
December 2007

Table 6-17: 2007 Thermistor Maintenance Report - Thermistor Station T6

Aug 20/08

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contractor Name:	FRANZ - Nunatta	Inspection Date:	22-Aug-07
Prepared By:	Ryan Fletcher		

Thermistor Information Site: 4 cable 5

Site Name:	FOX-4	Thermistor Location:	Tier II Disposal Facility
Thermistor Number:	T6	Inclination:	Vertical
Install Date:		First Date Event	Last Date Event
Coordinates and Elevation			Elevation:
Length of Cable	1.49	Cable Lead Above Ground	Nodal Points 5
Datalogger Serial #	806104	Cable Serial #	

Thermistor Inspection

	Good	Needs Maintenance	
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☒	connecter needs to be replaced
Beads	☑	☐	

Battery Installation Date: **Label indicates: Lithium Battery (datalogger expiration 09/2001, however this battery was reported as changed in 2005.**

Battery Levels: Main **11.34V** full green 100% Best; Aux 12.9 ~~12.65~~ V 90% green ~~85% Best~~

Observations / same

Used memory: 13% and fulll. Warm up time is 0.160 and changed to 0.210

warm up time 0.160 - changed to 0.210
multiplexer off - turned on

Proposed Maintenance

NUNATTA Environmental Services Inc.

Station #6

pijiit@gmail.com

Tier II Disposal Area + Lower Site Landfill

LS08-1 0-15 cm

light brown fine to coarse sand + gravel, moist to wet, faint HC odour, some orange staining

LS08-2 0-15 cm

light brown/ greyish fine to coars sand + gravel, wet (saturated), no odour, orange staining from 0-1 cm

T208-1 0-15 cm

Dark grey fine to med sand, some gravel, orange staining from 0-1cm, wet to saturated, faint odour

T208-2

Brown fine to coarse sand and gravel, trace silt, moist, no odour, no staining

T208-3 0-15 cm + 40-50 cm

Grey to dark grey fine to medium sand, some gravel, orange staining from 0-1 cm, wet to saturated, faint odour

Station Area

3 was deep

STOS-1 0-15

light brown fine to coarse sand and gravel, moist, no odour, no staining

STOS-2 0-15

Dark grey fine to coarse sand + gravel, saturated, faint odour, orange staining from 0-0.5cm

STOS-3 0-15 + 40-50

0-0.2m - light brown fine to coarse sand + gravel, moist, faint odour, no staining

0.2-0.5m - grey fine to coarse sand, some gravel, moist to wet, strong odour

STOS-4

Dark brown to grey fine to coarse sand + gravel, wet, faint odour, orange staining from 0-0.5 cm

Tanner Bay

589567 E
7592935 N

TB08-3 0-15

↑ fine to coarse sand + gravel, moist, no odour, no staining
Brown

~~589587 E~~
~~7592944 N~~

TB08-1 0-15

Dark brown to black organic peaty soil, moist to wet, strong organic odour, orange staining from 0-0.9cm

TB08-2 0-15

~~589576 E~~
~~7592943 N~~

589581 E
7592950 N
①

same descript.

→ 589572 E
7592941 N

N

900 E 589502 mE
925 E 589558 mE
950 E 589614 mE
975 E 589670 mE
1000 E 589726 mE

875 N 7592991 mN UTM ZONE 19
850 N 7592941 mN
825 N 7592891 mN
800 N 7592841 mN
775 N 7592791 mN

SOME SHEEN VISIBLE
SOME SHEEN VISIBLE
ST8-1
TANNER BAY LANDFILL
TB3 TB5
F4-13
8J7 8K7
TOP OF BARREL VISIBLE
8L7 8M7
8H7 8I7
8C7 8D7
8E7 8F7 8G7
SMALL GULLY
93m
TB1 TB2
F4-11
TB3 TB4
F4-12
LITTLE STREAM
92m
91m
90m
89m
88m
87m
86m
85m
84m
83m
82m
81m
80m
79m
8A7 8B7
TBM302
#1
36m
PVC PIPE WELL (TYPICAL FOR 3)
#2
#3
STREAM

LEGEND: NOTE: FEATURES IN GREY PREDATE THE 2005 FIELD SEASON

- TBM302 TEMPORARY BENCHMARK
- SOIL SAMPLE
- LANDFILL BOUNDARY (APPROXIMATE)

2007 OBSERVATIONS:

- ST8-1 STAINS
- D DEBRIS
- EROSION
- POOLING
- SINKHOLE
- 8A7 8B7 PHOTOGRAPH LOCATION (INDICATING PHOTO NUMBER, LOCATION, VIEWING DIRECTION)

TEMPORARY BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
302	308.603	939.857	90.944	19mm DIA. PIPE/STONE CAIRN

Title: FOX-4 CAPE HOOPER - TANNER BAY LANDFILL

Project: FOX-4 CAPE HOOPER DEW LINE CLEAN UP LANDFILL MONITORING PLAN

Date: DECEMBER 2007

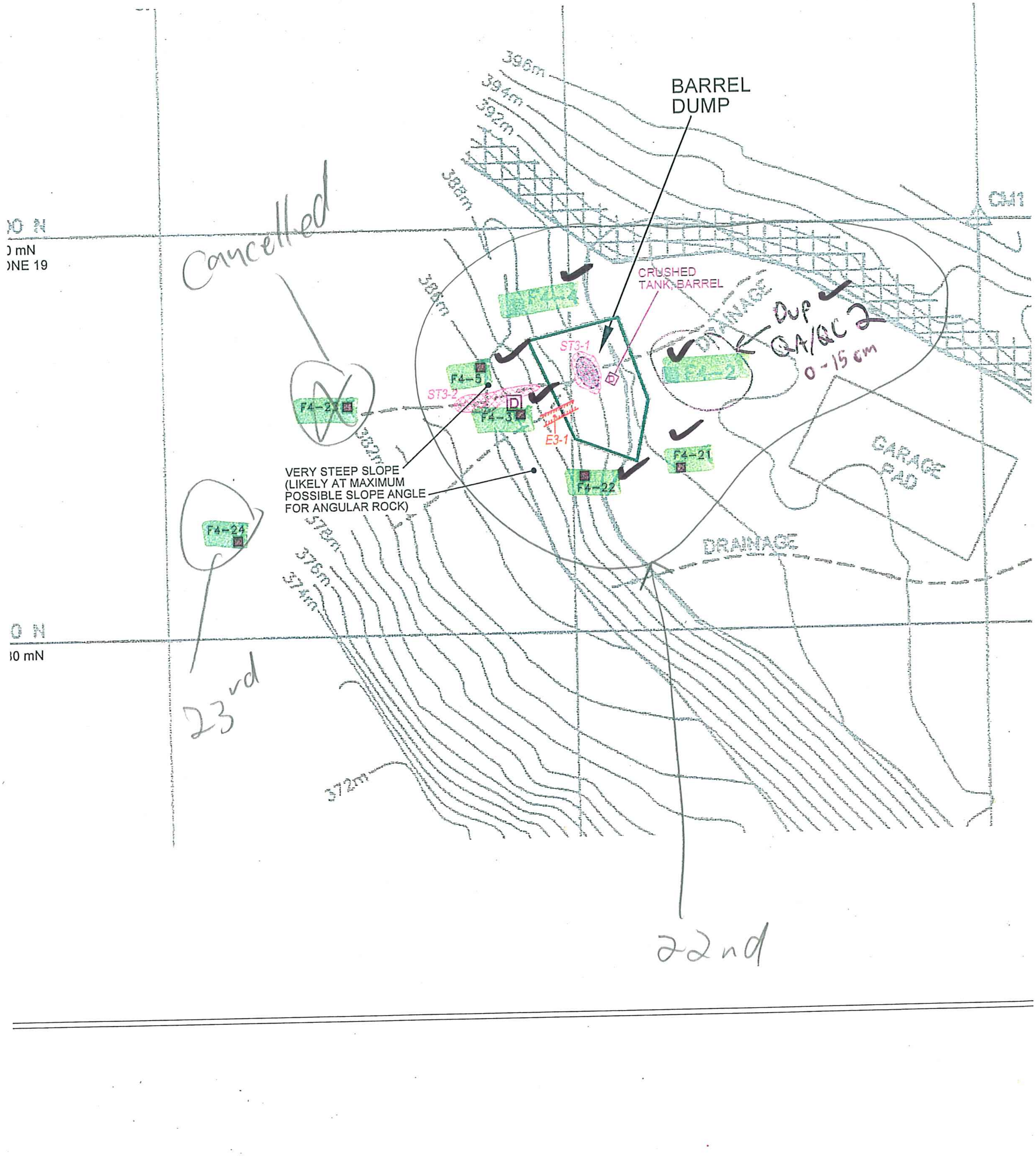
Client: DEFENCE CONSTRUCTION CANADA

SCALE 1:1000

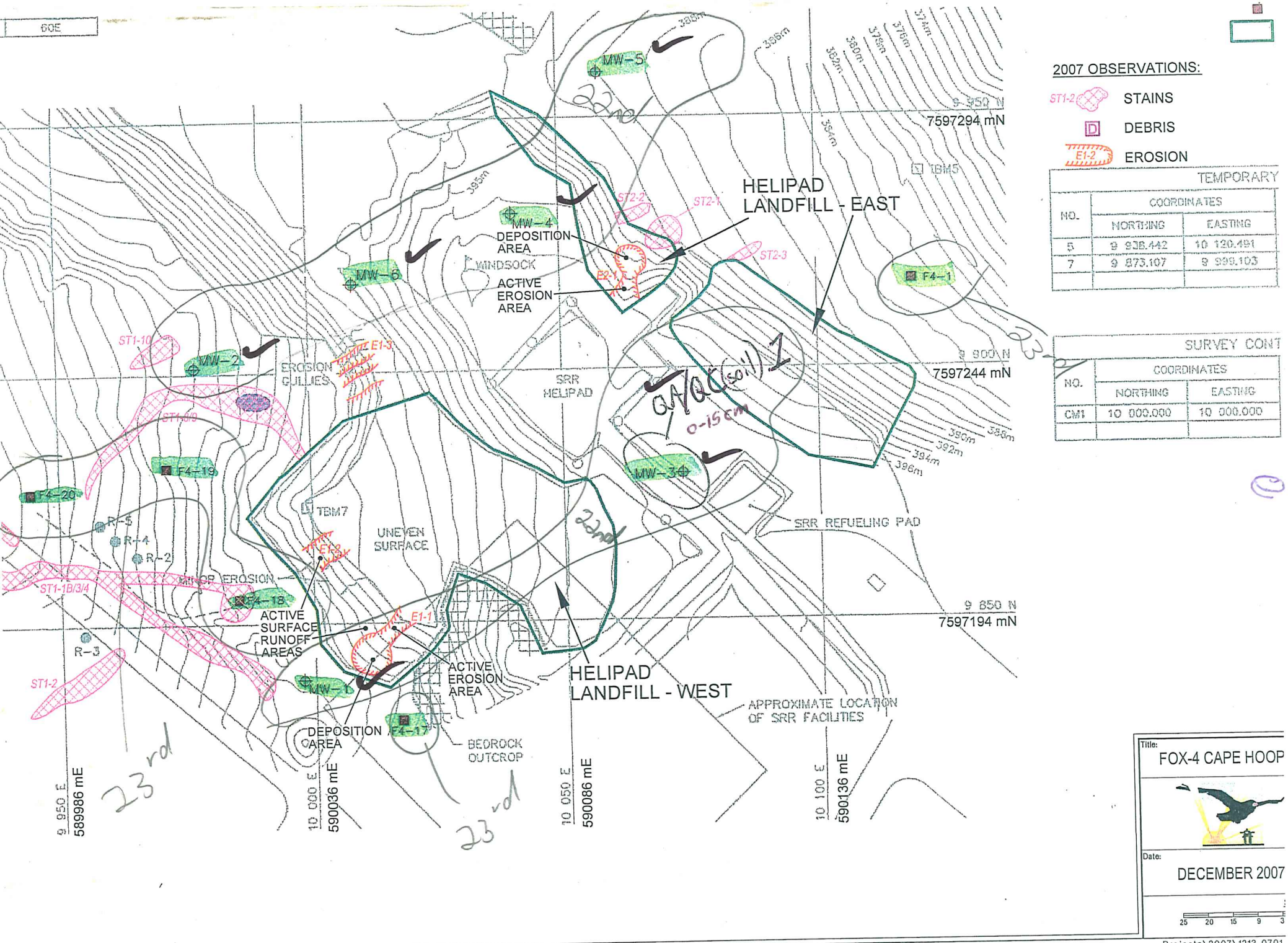
20 15 10 5 0 metres 25 50

FIGURE 13

Projects\2007\1213-0701 FOX-4 Cape Hooper 2007\Figures\Fox4-6-TannerBayLandfill.dwg



BARREL DUMP
CRUSHED TANK, BARREL
ST3-1
ST3-2
E3-1
F4-2
F4-3
F4-5
F4-21
F4-22
F4-23
F4-24
DRAINAGE
GARAGE PAD
VERY STEEP SLOPE (LIKELY AT MAXIMUM POSSIBLE SLOPE ANGLE FOR ANGULAR ROCK)
396m
394m
392m
388m
382m
378m
376m
374m
372m
CM11
0 mN
ONE 19
80 mN
Cancelled
Dup QA/QC 2
0-15 cm
23rd
22nd



2007 OBSERVATIONS:

ST1-2 STAINS

D DEBRIS

E1-2 EROSION

TEMPORARY

NO.	COORDINATES	
	NORTHING	EASTING
5	9 936.442	10 120.491
7	9 875.107	9 999.103

SURVEY CONT

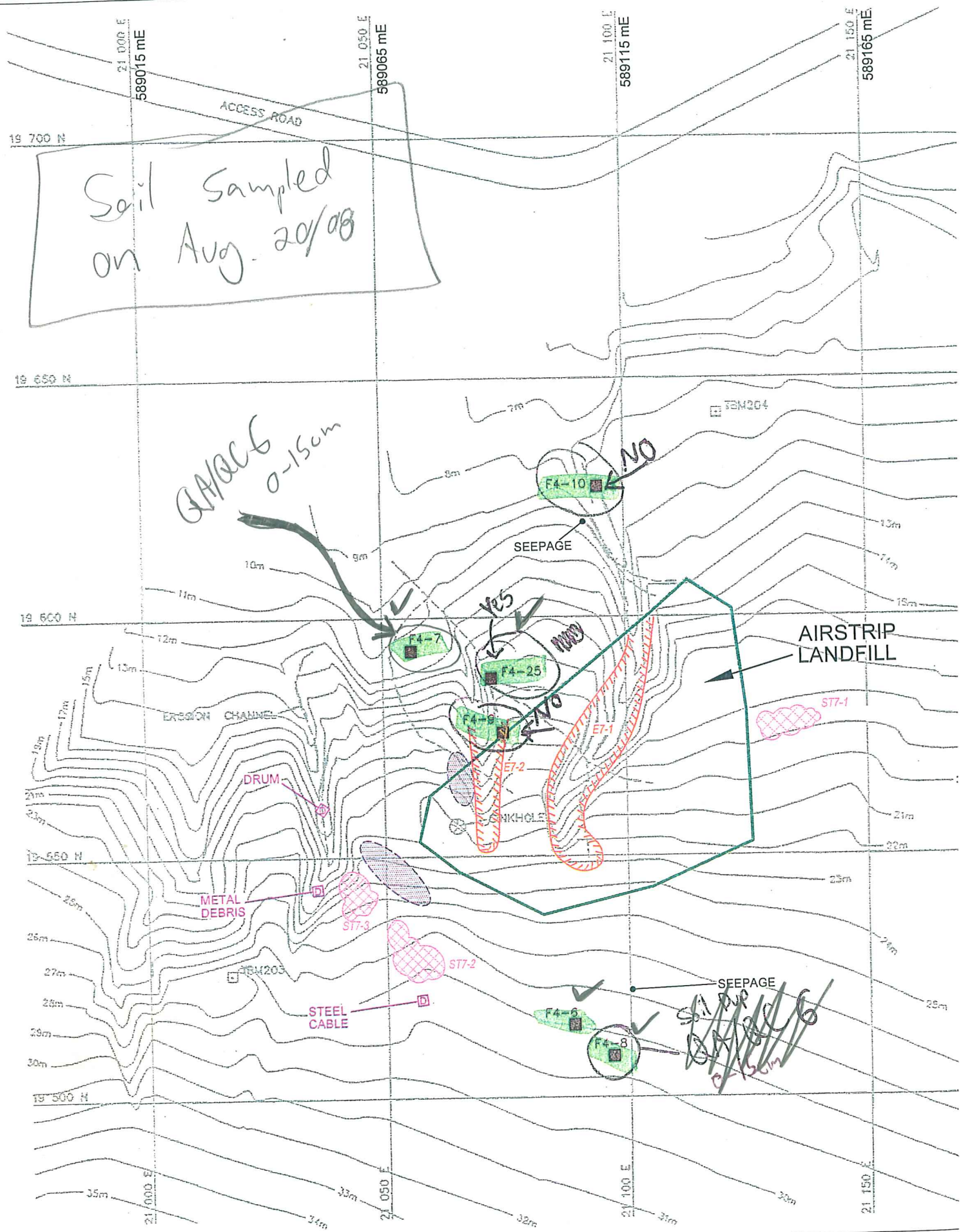
NO.	COORDINATES	
	NORTHING	EASTING
CM1	10 000.000	10 000.000

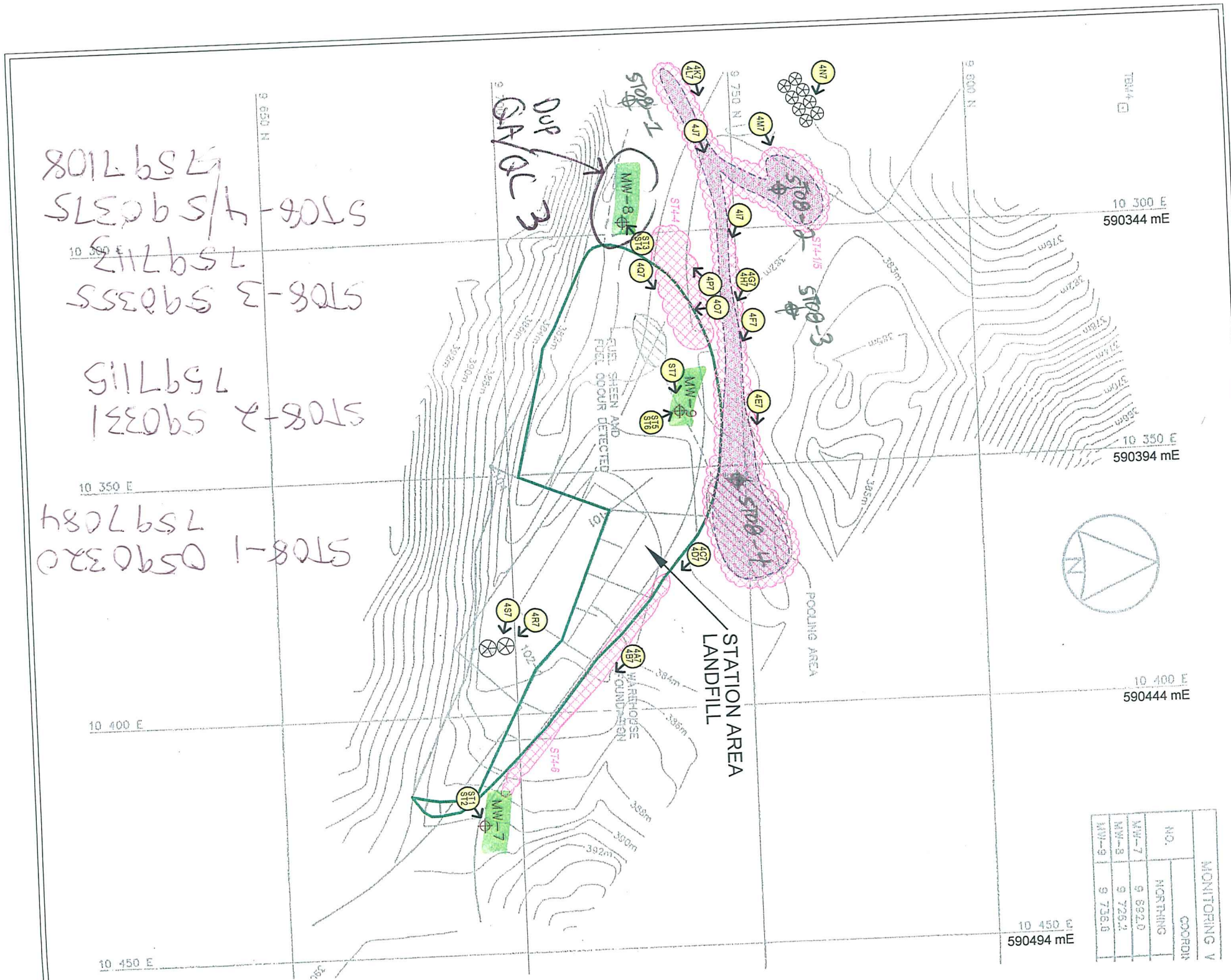
Title: FOX-4 CAPE HOOP

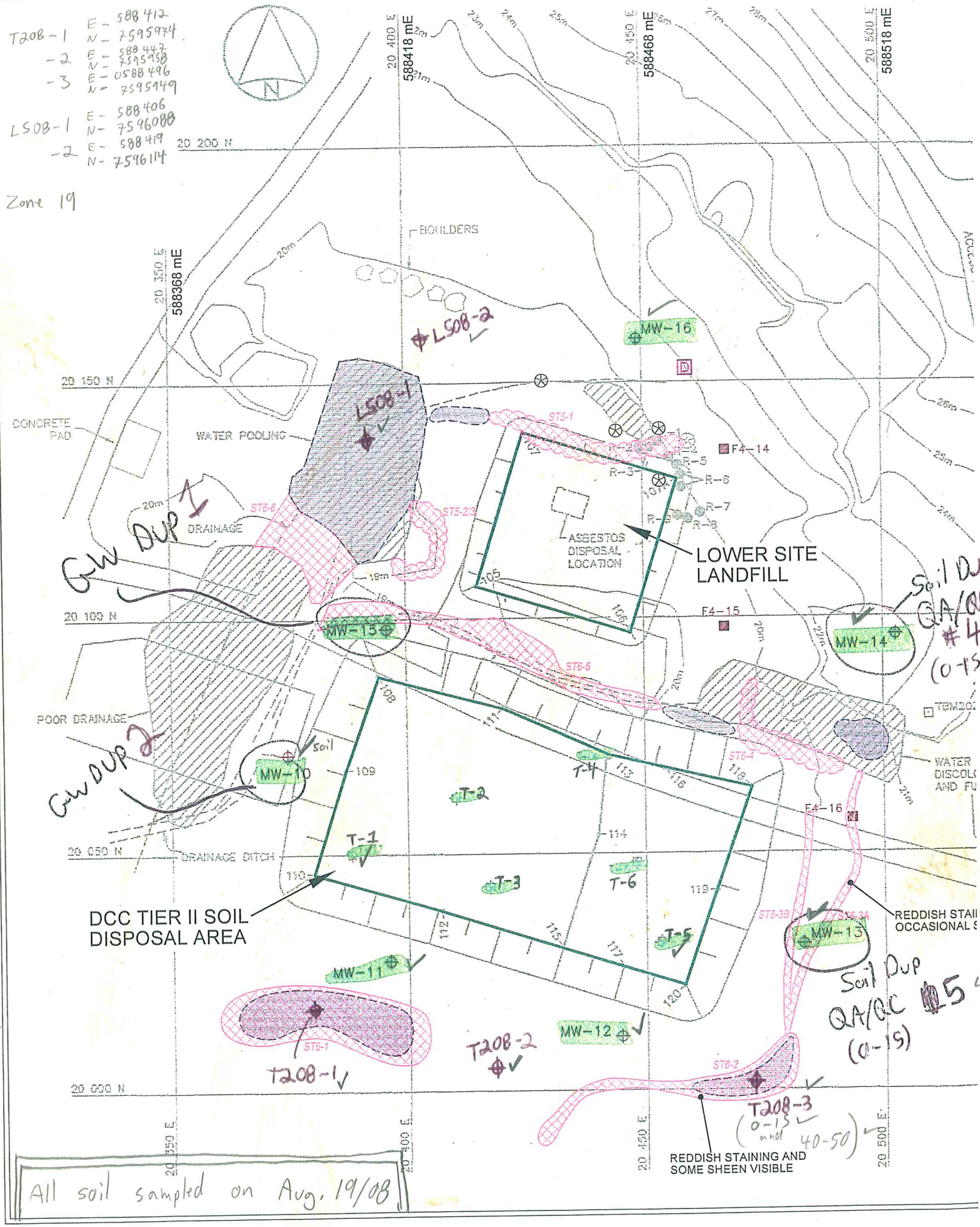
Date: DECEMBER 2007

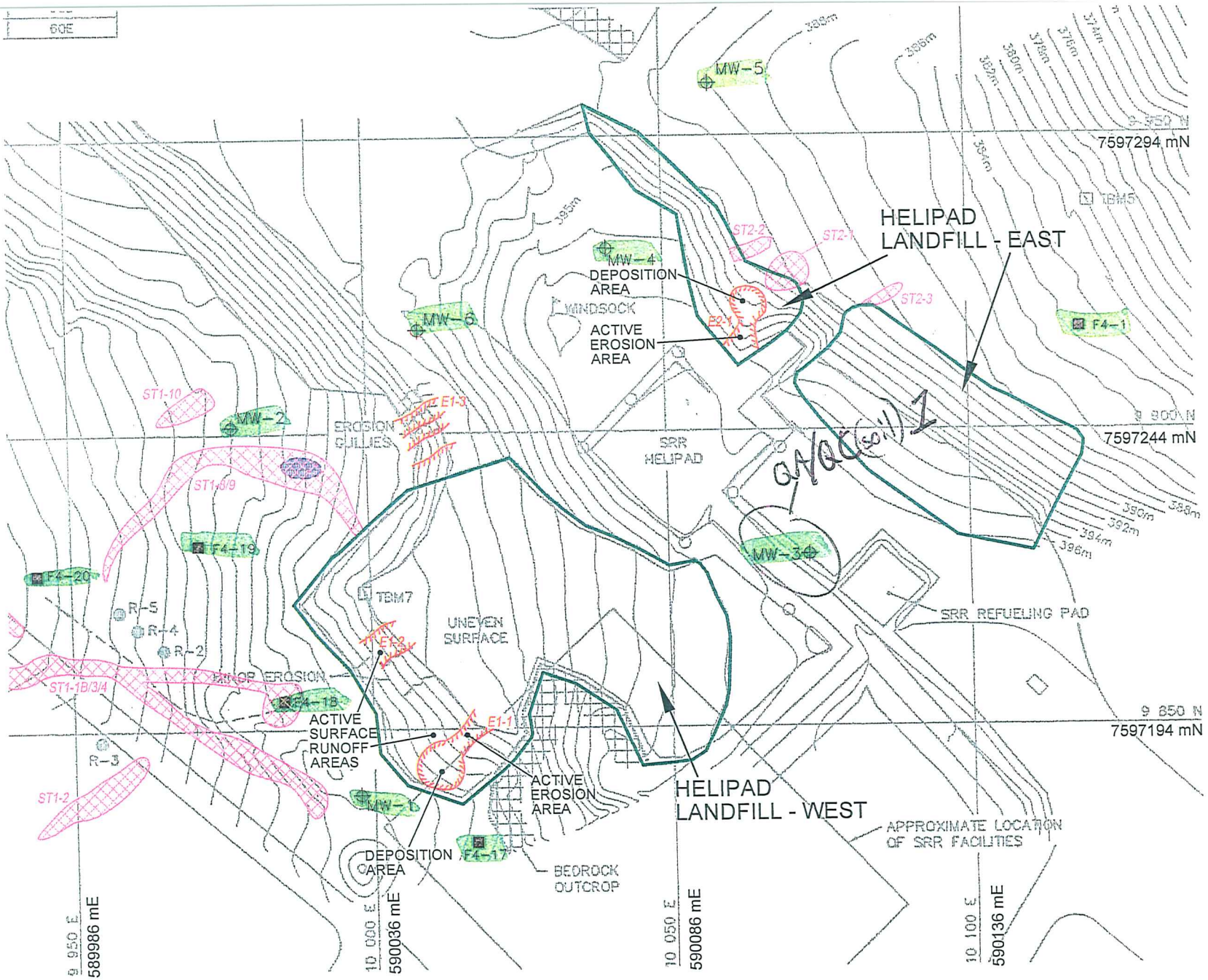
25 20 15 9 3

Projects\2007\1213-0701


Soil Sampled on Aug. 20/08
21 000 E
589015 mE
21 050 E
589065 mE
21 100 E
589115 mE
21 150 E
589165 mE
ACCESS ROAD
19 700 N
19 650 N
19 600 N
19 550 N
19 500 N
QA/QC 6 0-15cm
F4-10
NO
SEEPAGE
F4-7
YES
F4-25
NO
F4-9
NO
AIRSTRIP LANDFILL
ST7-1
E7-1
E7-2
EROSION CHANNEL
DRUM
SINKHOLE
METAL DEBRIS
ST7-3
ST7-2
BM203
STEEL CABLE
F4-6
F4-8
SEEPAGE
Soil QA/QC 6 0-15cm
BM204


STOP-1
STOP-2
STOP-3
STOP-4
DUP QA/QC 3
MW-8
MW-9
MW-7
ST1
ST2
ST3
ST4
ST4-1/5
ST4-4
ST4-6
ST5
ST6
ST7
FUEL SHEEN AND FUEL ODOUR DETECTED
STATION AREA LANDFILL
POOLING AREA
WAREHOUSE FOUNDATION
9 650 N
9 750 N
9 800 N
10 300 E
590344 mE
10 350 E
590394 mE
10 400 E
590444 mE
10 450 E
590494 mE
MONITORING W
COORDIN
NO.
NORTHING
MW-7
9 822.0
MW-8
9 726.1
MW-9
9 736.0


T208-1 E- 588 412 N- 7595974
-2 E- 588 447 N- 7595958
-3 E- 0588 496 N- 7595949
LS08-1 E- 588 406 N- 7596088
-2 E- 588 419 N- 7596114
Zone 19
588418 mE
588468 mE
588518 mE
588368 mE
20 400 E
20 450 E
20 500 E
20 350 E
20 200 N
20 150 N
20 100 N
20 050 N
20 000 N
BOULDERS
CONCRETE PAD
WATER POOLING
DRAINAGE
POOR DRAINAGE
DRAINAGE DITCH
ASBESTOS DISPOSAL LOCATION
LOWER SITE LANDFILL
DCC TIER II SOIL DISPOSAL AREA
REDDISH STAINING AND SOME SHEEN VISIBLE
REDDISH STAII
OCCASIONAL S
LS08-1
LS08-2
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
T208-1
T208-2
T208-3
T-1
T-2
T-3
T-4
T-5
T-6
F4-14
F4-15
F4-16
ST5-1
ST5-2/3
ST6-1
ST6-2
ST6-3A
ST6-3B
ST6-4
ST6-5
ST6-6
R-1
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-9
Gw Dup 1
Gw Dup 2
Soil Dup QA/QC #4 (0-15)
Soil Dup QA/QC #5 (0-15)
T208-3 (0-15 and 40-50)
All soil sampled on Aug. 19/08



2007 OBSERVATIONS:

ST1-2 STAINS

D DEBRIS

E1-2 EROSION

TEMPORAR

NO.	COORDINATES	
	NORTHING	EASTING
5	9 938.442	10 120.491
7	9 873.107	9 595.105

SURVEY CON

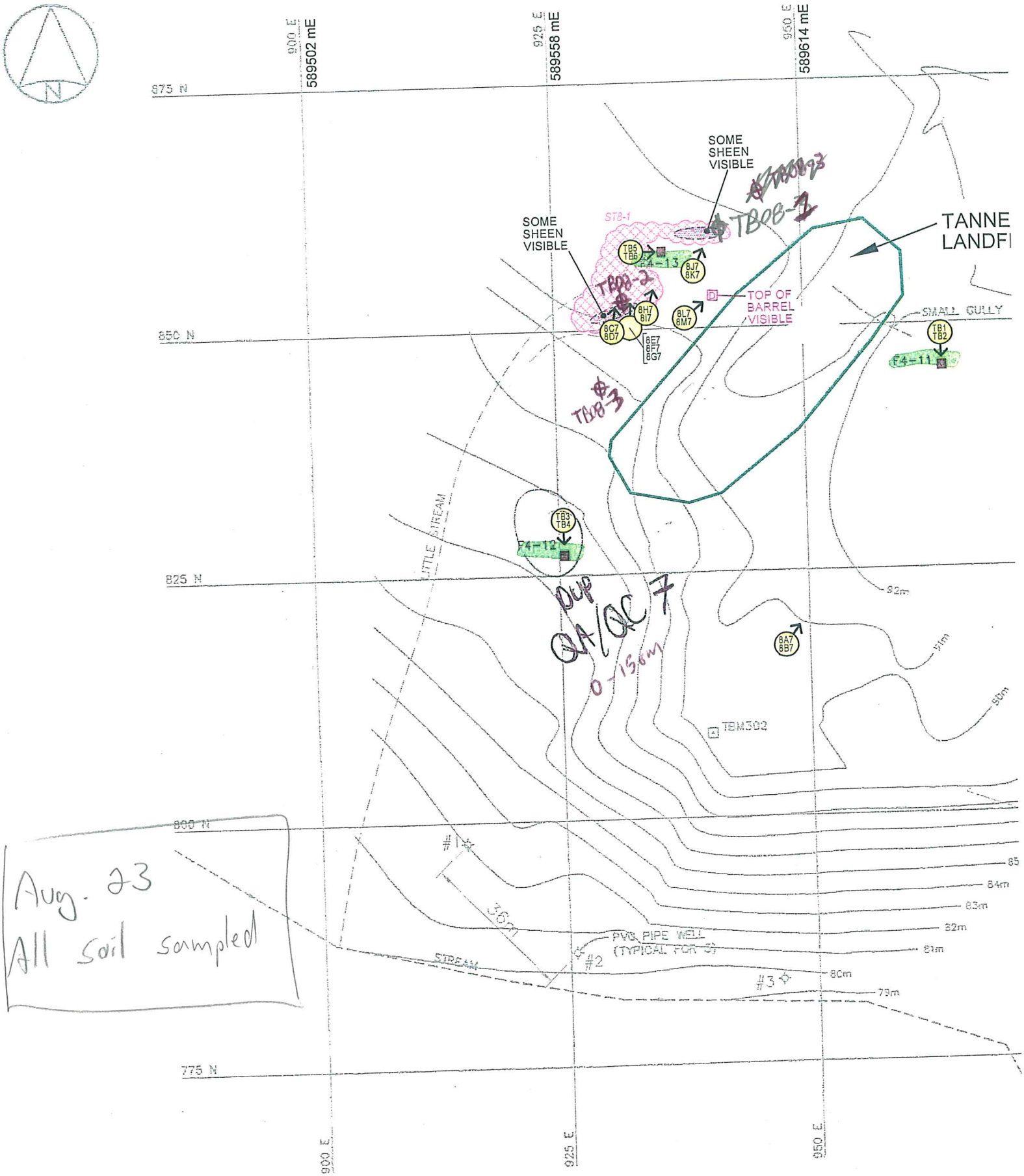
NO.	COORDINATES	
	NORTHING	EASTING
CM1	10 000.000	10 000.000

Title: FOX-4 CAPE HOO

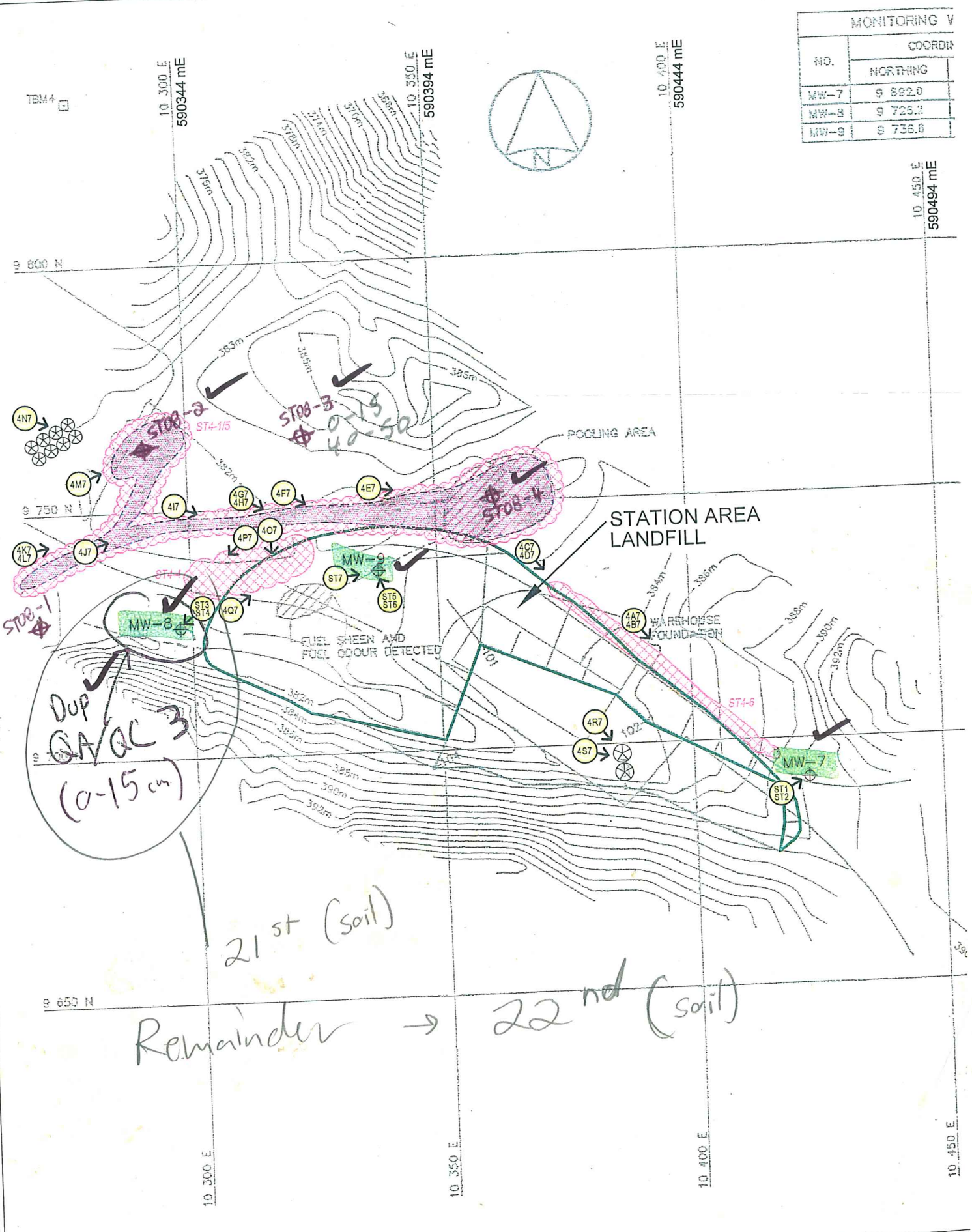
Date: DECEMBER 200

25 20 15 9

Projects\2007\1213-070



Aug. 23
All soil sampled


MONITORING W
NO.
COORDIN
NORTHING
MW-7 9 882.0
MW-8 9 726.2
MW-9 9 736.6
10 300 E
590344 mE
10 350 E
590394 mE
10 400 E
590444 mE
10 450 E
590494 mE
9 800 N
9 750 N
9 700 N
9 650 N
TBM4
ST08-1
ST08-2
ST08-3
0-15
40-50
ST08-4
ST4-1/5
ST4-2
ST4-6
POOLING AREA
STATION AREA
LANDFILL
MW-8
MW-9
MW-7
ST1
ST2
ST3
ST4
ST5
ST6
ST7
4N7
4M7
4I7
4G7
4H7
4F7
4E7
4K7
4L7
4J7
4P7
4O7
4Q7
4C7
4D7
4A7
4B7
4R7
4S7
FUEL SHEEN AND
FUEL ODOUR DETECTED
WAREHOUSE
FOUNDATION
Dup
QA/QC 3
(0-15 cm)
21st (soil)
Remainder → 22nd (soil)