SITE REMEDIATION SOLUTIONS

THE COLLECTION OF LANDFILL MONITORING DATA AT THE FORMER FOX-M DEW LINE SITE

Hall Beach, Nunavut

FINAL REPORT– 2012 SEASON

(O/Ref.: CD2655) (Y/Ref.: DLCMON QIKIQ12))

DEFENCE CONSTRUCTION CANADA

April 2013

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DEFENCE CONSTRUCTION CANADA

April 2012

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1 INTRODUCTION

1.1 OBJECTIVE AND SCOPE OF WORK

The objective of Defence Construction Canada's (DCC) Landfill Monitoring Program is to collect sufficient information to assess the performance of the various landfills present on former DEW Line sites from a geotechnical and environmental perspective. DCC has specified the requirements for the Landfill Monitoring Program in the document: Terms of Reference – Services for the Collection of Landfill Monitoring Data CAM-5 Mackar Inlet, FOX-M Hall Beach, FOX-2 Longstaff Bluff, FOX-3 Dewar Lakes DEW Line Sites Nunavut Territory Qikiqtaaluk Region DCC Project #: DLCMON(QIKIQ12), March 20, 2012.

During the 2012 monitoring program a visual inspection was completed to identify and assess erosional features, as well as soil sampling was conducted at all landfills. Groundwater sampling was conducted at the Tier II Disposal Facility, East Beach Landfill and the Non-Hazardous Waste Landfill (NHWL). Thermal monitoring was conducted at the Tier II facility and the East Beach Landfill. Table 1 summarizes the monitoring requirements of the 2012 season.

Table I: 2012 Monitoring Requirements for FOX-M Landfills

Landfill	Visual Inspection	Soil Sampling	Groundwater Sampling	Thermal Monitoring
Non-Hazardous Waste Landfill	✓	✓	✓	
G217 – West Landfill	✓	✓		
Billboards Landfill	✓	✓		
HAZMAT Storage – East Landfill	✓	✓		
Communications North Landfill	✓	✓		
Communications Northwest Landfill	✓	✓		
Tier II Disposal Facility	✓	✓	✓	✓
East Beach Landfill	✓	✓	✓	✓

1.2 FIELD PROGRAM STAFF

The 2012 on-site field program at FOX-M Hall Beach took place from September 1 to 4, 2012. Biogénie sub-contracted Sila Remediation Inc. (Sila) from Igloolik, Nunavut to perform the field work. The Sila field program was executed by Mr. Brandon MacKay and three local Inuit representatives.

The team was made up of the following individuals:

- Brandon MacKay, Site Technician.
- Jonah Curley, Field Assistant.
- Josh Alorut, Field Assistant
- Lamiki Irqittuq, Wildlife Monitor

1.3 WEATHER CONDITIONS

Seasonally average weather conditions were observed during the FOX-M monitoring event, with daily average temperatures of 2 – 8 ºC. Skies were mostly overcast with light precipitation (rain) on September 1st, 2nd and 4th. Wind was moderate for most days with gusts ranging from 20 – 40 km/h with the exception of September 2 which saw gusts of up to 78 km/h.

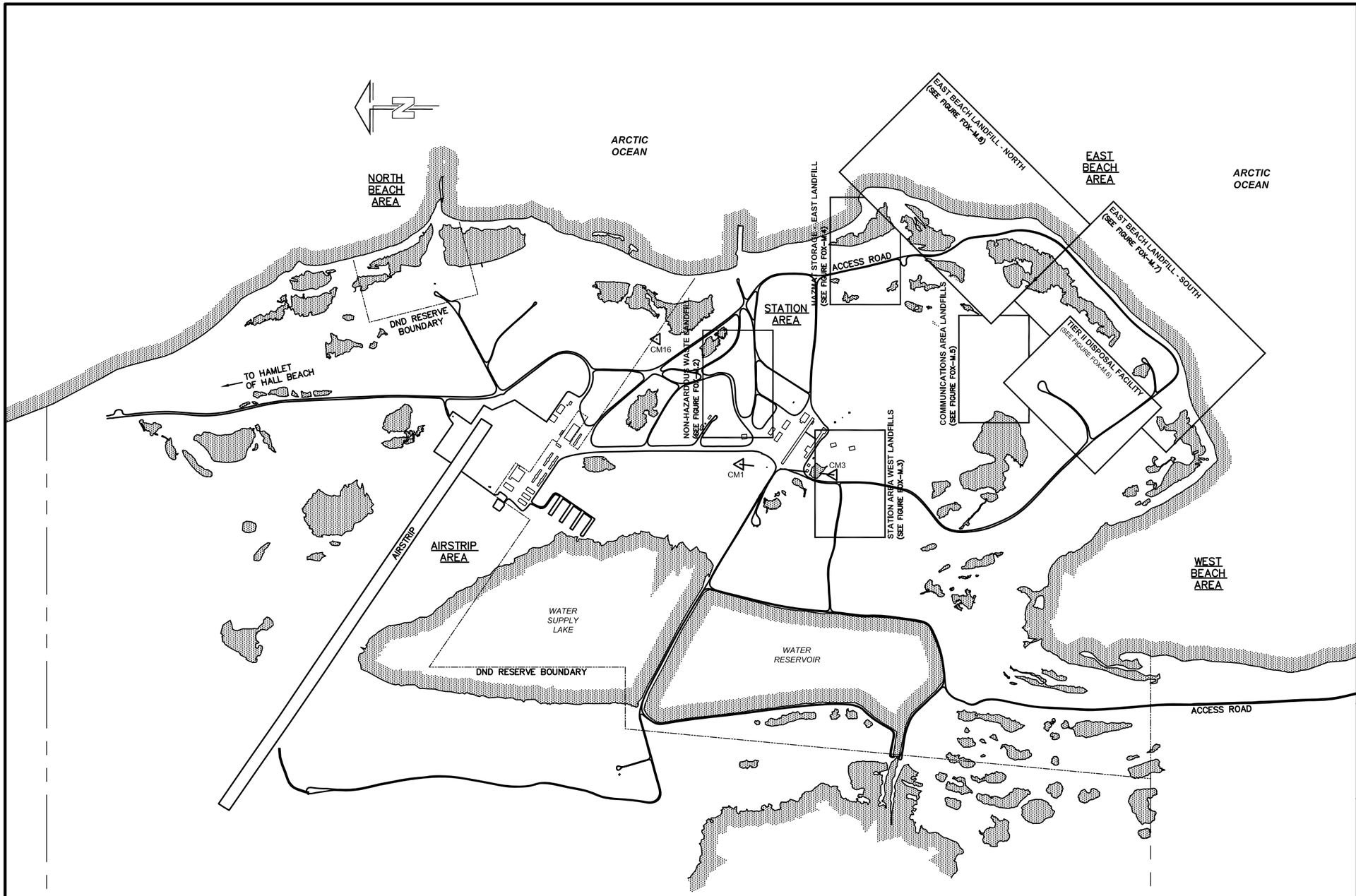
1.4 REPORT FORMAT

This report describes the work carried out in September 2012 at the eight landfill sites at FOX-M Hall Beach. 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 A). An electronic version of the report and its component tables, figures and data files is included in an Addendum DVD-ROM, which is appended to this report.

The report is organized with a separate section for each of the landfill areas. Each section contains all relevant information for that landfill area, for the 2012 Landfill Monitoring Program. The following information is provided in each landfill section:

- Visual inspection checklist.
- Visual inspection drawing mark-up.
- A selection of visual inspection photos.
- Thermal monitoring summary and inspection reports (where applicable).
- Summary of 2012 soil analytical data (where applicable).
- Summary of 2012 groundwater analytical data (where applicable).
- Monitoring well development/sampling reports (where applicable).

For the photographic record, the printed copy of the report includes an index with thumbnail images of photos for each of the landfill areas. The full resolution photos are included in electronic format in the Addendum CD-ROM to this report. Certificates of Analysis, QA/QC analytical results and field notes are attached in the Appendices.



SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 628 008.274	490 743.723	3.577	FOX-M BASELINE STA. 36+00
CM3	7 627 675.453	490 706.281	5.291	FOX-M BASELINE STA. 47+00
CM16	7 628 305.218	491 189.319	1.190	C.L.S. MONUMENT

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

LEGEND

△ SURVEY CONTROL MONUMENT

0 150m 300m 450m 600m 750m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
FOX-M, HALL BEACH, NUNAVUT

OVERALL SITE PLAN

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MEASUREMENT UNIT	SCALE:	DATE (month-year):
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PROJECT NO:	DRAWING NO:	PAGE
CD2655_200_203	CD2655_200_203-FOX-M_A	LS

FIGURE FOX-M.1

P:\P\CD\2655\2012\FINAL REPORTS\FOX-M\AutoCAD Files\CD2655_210_213-FOX-M_1 - Standard\CD2655_210_213-FOX-M_A.dwg, PDF-11X17.pc3, 11 x 17

2 OUTLINE AND METHODOLOGY

2.1 VISUAL INSPECTION

Data and information collected during the visual inspection of the FOX-M landfills are included in the visual inspection data sheets. These data sheets include such inspection data as the location of settlement, erosion, frost action, sloughing and cracking, animal burrows, vegetation cover and stress, staining, seepage points, exposed debris, and any other features of note.

Each feature was identified with an alphabetical tag to be used consistently each year in an effort to track changes in conditions for each specific feature.

Digital photos were taken to illustrate the current state of the landfills as well as features of interest. Annotated sketches/diagrams are included in the report for each landfill.

The photos were taken with an Olympus TG-820 iHS 12 megapixel (MP) digital camera with a 5 mm focal length. Full resolution digital jpg copies are available on the DVD-ROM appended with this report. The photo log, including the local coordinates from where the photo was taken, orientation (relative to map north), feature of note and picture numbers are included with each landfill report. Panoramic photographs were “stitched” using Adobe Photoshop.

2.2 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
- CCME Subsurface Assessment Handbook for Contaminated Sites, March 1994, EPC-NCSRP-48E (http://www.ccme.ca/publications/ceqg_rcqe.html)

For the 2012 monitoring event, 44 soil-sampling stations were visited. One surface sample (0-15 cm depth below surface) and one subsurface sample (40-50 cm depth below surface) were taken at each sampling station. Frozen ground was encountered at 35 cm at the MW-12 sampling station.

As specified in the TOR, the following 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 taken and sent to a second laboratory for quality control purposes
- 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 requested parameters (TPH (F1-F3), total metals and PCBs) as specified by DCC. Table II below summarizes the soil sampling at FOX-M during the September 2012 field program.

Table II: Summary of Soil Sampling at FOX-M, August 2012

Landfill Site	**Soil Sample Locations**					
Non-Hazardous Waste Landfill	FM-12	FM-13	FM-14	FM-15	FM-16	
G217-West Landfill	FM-5	FM-6	FM-7	FM-8		
Billboards Landfill	FM-1	FM-2	FM-3	FM-4		
HAZMAT Storage-East Landfill	FM-9	FM-10	FM-11	FM-12		
Communications Northwest Landfill	FM-13	FM-14	FM-15	FM-16		
Communications North Landfill	FM-17	FM-18	FM-19	FM-20	FM-21	FM-22
Tier II Disposal Facility	MW-1	MW-2	MW-3	MW-4	MW-5	
East Beach Landfill	MW-20	MW-21	MW-22	MW-23	MW-24	MW-25
	MW-26	MW-27	MW-28	MW-29	MW-30	MW-31

Notes:
Soil samples annotated as "MW" were collected as per the TOR between 2-4 metres from monitoring wells.
All soil samples were collected from two depths (0-15 cm and 40-50 cm). For 2012 sampling, total no. of soil samples = 112 samples (44 samples x 2 depths + 8 QA/QC + 8 (Inter-laboratory comparison) + 8 for Owner's Representative (ESG Archives))

2.3 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)
- 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 and measurements of *in situ* temperature, conductivity and pH were taken. Sampling took place when these parameters were stabilized. Turbidity readings were also collected at each station. The samples were not acidified and were not filtered (as directed in TOR).

The 2012 field program included sampling only 11 of the 22 monitoring wells at FOX-M. 10 well locations were dry or contained insufficient water volumes at the time of monitoring and consequently could not be sampled. MW-14 well located at the Non-Hazardous Waste Landfill remains unusable. A summary of the sampled monitoring wells is presented in Table III.

Free phase hydrocarbon product was not detected at any of the monitoring well locations. Monitoring Well Development and Sampling Record forms are included in appropriate sections in this report.

Table III: Summary of Groundwater Sampling at FOX-M, August 2012

Landfill Site	**Groundwater Sample Locations**				
Non-Hazardous Waste Landfill	MW-13	MW-15			
Tier II Disposal Facility	MW-1	MW-2	MW-3	MW-4	MW-5
East Beach Landfill	MW-21	MW-30	MW-29	MW-30	MW-31

Notes:
All monitoring wells were inspected and found to be in good condition with the exception of MW-14 at the NHWL (casing damaged and well vandalized), MW-21 (casing collar loose) and MW-24 (casing cover broken).
For 2012 sampling, total no. of water samples = 13 samples (11 monitoring well samples + 1 blind duplicate + 1 inter-laboratory duplicate) in addition to 1 field blank + 1 travel blank.

2.4 THERMAL MONITORING

All thermistors at the Tier II Disposal Facility and East Beach Landfill were inspected and found to be in good condition with no significant concerns identified. However an error was observed at four dataloggers VT-2, VT-4, VT-9 and VT-10 regarding a power interruption in September 2011, these errors are believed to be a result of improper battery replacement in 2011 by a third-party. Further details regarding the thermistors including inspection reports and data are provided in Sections 9.5 and 10.5.

2.5 FIELD NOTES AND DATA

Field notes from the 2012 Landfill Monitoring Program, including soil and water sampling, are included in Appendix B for reference. Notes were written in field books, previously prepared logs or entered directly into a field computer. The notes were scanned to an Adobe pdf document for future reference and back up. Locations of all observations and features for the visual inspection were recorded using Garmin GPSmap 60CSx hand-held GPS, which included a combination of continuous tracks and discrete waypoints. Datasets collected from the individual vertical thermistors were downloaded directly to a field laptop computer.

2.6 QUALITY CONTROL

Sila implemented standard sample collection techniques to decrease the likelihood of compromising collected samples. The methods used for sample collection are summarized in Sections 2.4 and 2.5 of this report. The following measures were taken to minimize sample cross-contamination:

- All samples were placed directly into the appropriate laboratory supplied containers (for the particular analysis).
- Soil samples were collected with the use of decontaminated sampling equipment and/or nitrile gloves that were used only once.
- Water samples were collected through the use of dedicated Waterra foot valves and tubing.

Chain of Custody (COC) forms were completed by the Field Technician after sample collection. The samples were refrigerated prior to off-site shipment in chilled coolers by First Air Cargo directly to AGAT in Edmonton (via Hall Beach), Maxxam in Montreal (via Hall Beach) and ESG in Kingston (via Iqaluit), where they were checked in by laboratory representatives. All analyses were completed as specified on COC forms.

2.7 QA/QC PROCEDURES

Sila used standard QA/QC procedures as specified in the TOR and CCME Guidance Documents for this project. The following is a summary table of the analytical QA/QC samples collected:

- 10% Blind Duplicate Samples of soil and water were sent to AGAT
- 10% Inter-laboratory Duplicate Samples were sent to Maxxam (looking for variation in procedures causing significant difference in analytical result). Results for both the blind duplicates and the inter-laboratory duplicates can be found in Appendix C as actual values and relative percent differences
- 10% Archival Samples of soil to the Environmental Science Group at the Royal Military College in Kingston Ontario.

2.8 PROJECT REFERENCES

The following references are specifically relevant to the 2012 Landfill Monitoring activities:

A. Invitation to Tender – Contractor Services for the Collection of Landfill Monitoring Data: CAM-5 Mackar Inlet, FOX-M Hall Beach, FOX-2 Longstaff Bluff and FOX-3 Dewar Lakes – DEW Line Sites Nunavut Territory Qikiqtaaluk Region. DCC Project #: DLCMON (QIKIQ12), March 20, 2012.

B. Terms of Reference – Services for the Collection of Landfill Monitoring Data: CAM-5 Mackar Inlet, FOX-M Hall Beach, FOX-2 Longstaff Bluff and FOX-3 Dewar Lakes – DEW Line Sites Nunavut Territory Qikiqtaaluk Region. DCC Project #: DLCMON (QIKIQ12), March 20, 2012.

C. Contractor Services for the Collection of Landfill Monitoring Data: CAM-5 Mackar Inlet, FOX-M Hall Beach, FOX-2 Longstaff Bluff and FOX-3 Dewar Lakes – DEW Line Sites Nunavut Territory Qikiqtaaluk Region. Technical Proposal – May 2012

D. *Post-Field Progress Report, FOX-M Landfill Monitoring 2012*, *September, 2012.*

3 NON-HAZARDOUS WASTE LANDFILL

3.1 SUMMARY

During the 2012 monitoring event of the Non-Hazardous Waste Landfill (NHWL) at FOX-M Hall Beach, a visual inspection was conducted to identify and assess erosional features on the landfill surface, soil samples were collected at 5 locations (2 upgradient and 3 downgradient locations), and groundwater samples were collected at 2 downgradient locations (MW-13 and MW-14), the samples were not collected at the remaining 3 wells (MW-12, MW-15 and MW-16) due to insufficient water.

PCBs were not detected in any of the soil or groundwater samples at the NWHL. TPH was detected at all soil sample locations at surface and at depth with the exception of the depth sample at MW-14. TPH concentrations ranged from 19 to 127 mg/kg with the highest concentration detected at the surface of MW-15. TPH was composed primarily of the F3 fraction. Concentrations remain well below the standard site criteria of 2,500 mg/kg. Relatively high lead concentrations were detected at two sampling locations; the surface sample of MW-13 and the depth sample of MW-16, with concentrations of 144 and 170 mg/kg respectively.

PCBs or relatively high metal concentrations were not detected in either groundwater sample. TPH was detected at one groundwater sample location, MW-13 at a concentration of 3.0 mg/L, a downgradient sample.

No significant or unacceptable erosional features were observed at the NHWL during the 2012 visual inspection. The primary source of erosion/disturbance to the landfill covers remains ATV traffic with increased rutting since the 2010 visual inspection. Although widespread the ATV tracks are of little impact to the overall stability of the lobe. Other minor features were observed with acceptable severity ratings, and are discussed in further detail below.

The overall performance rating of the NHWL is acceptable.

3.2 VISUAL INSPECTION REPORT

The visual inspection of the NHWL was conducted on September 1, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table IV of this report. Please refer to Figure FOX-M.2 for the locations of photographs and erosional features at the NHWL.

Weather Conditions at Time of Inspection

At the time of the inspection of skies were overcast with light rain, temperature was 6°C and wind was 28 km/h from the west.

Settlement

Evidence of settlement was noted at one location on the southern side slope of the landfill – Feature C. The newly observed feature is a minor linear depression with an acceptable severity rating.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

A concentration of small arctic grasses (Feature D) was observed growing on the eastern side slope of the landfill in a 1.5 m x 12 m area; extending along the landfill toe. The vegetation has an acceptable severity rating.

Staining

An area of iron staining not previously observed was noted on the eastern side slope of the landfill, Feature B. The staining may be an indication of seepage; however at the time of the investigation the area was dry. Feature B has an acceptable severity rating.

Seepage Points

Evidence of seepage was not noted.

Debris

Evidence of surface debris was not noted on the landfill, wood debris north of the landfill lobe noted during the 2010 investigation was removed during the 2012 monitoring event.

Presence/Condition of Monitoring Instruments

All monitoring well installations appeared to be in good condition at the landfill, with the exception of MW-14. Although the protective casing was replaced, gravel still remains in the well. Based on measurements it would appear more gravel has been added since the 2010 investigation.

Other Features of Note

Numerous vehicle tracks were observed on the surface and side slopes of the landfill cover, including several deeper ruts noted along the northwest, north and east side slopes and on the northwest corner of the landfill cover (Feature A). The vehicle tracks/ruts typically extended between 0.05 to 0.3 m in depth. The rutting typically impacts the superficial layer of gravel on the landfill cap with little impact to the cap itself. The amount of ATV tracks has increased since 2010, however these areas are relatively shallow (0.05 m) with little impact to the stability of the facility. Feature A has an acceptable severity rating.

Table IV: Visual Inspection Checklist / Report – NHWL

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: Non-Hazardous Waste Landfill (New Landfill)
DATE OF INSPECTION: September 1, 2012
DATE OF PREVIOUS INSPECTION: August 26, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-NHWL-)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE C See Figure FOX-M.2	1	0.2	0.15	Isolated	Minor depression	32, 33	Acceptable	New Observations: Minor linear depression on the southern side slope of the facility.
Erosion	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	Yes	FEATURE D See Figure FOX-M.2	12	2	N/A	Isolated (one area of plant colonization)	Small vegetation	41	Acceptable	New Observation: Vegetation growing on the eastern slope of the landfill, a variety of arctic grasses. Vegetation is concentrated in a band extending 2 m x 12 m.
Staining	Yes	FEATURE B See Figure FOX-M.2	20	1.5	N/A	Isolated	Rust coloured staining	8	Acceptable	New Observation: Rust coloured staining extending along the eastern toe of the landfill.
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Presence/Condition of Monitoring Instruments	Yes	N/A	N/A	N/A	N/A	N/A	N/A	23, 46, 50, 51	Acceptable	Monitoring wells are in good condition, Casing of MW-14 repaired although the monitoring well remains unusable due to suspected gravel obstruction.
Other Features of Note:	Yes	FEATURE A See Figure FOX-M.2	Various	Various	Various	Occasional	N/A	5, 7, 9, 13, 19	Not Observed	A large portion of the landfill surface has been disturbed by ATV traffic - increased from 2010. However the ATV tracks are too shallow to cause concern.
Additional Photos	Yes	See Figure FOX-M.2 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

3.3 PRELIMINARY STABILITY ASSESSMENT

The Preliminary Stability Assessment for NHWL has been completed as per the TOR and is included as Table V hereafter.

Table V: Preliminary Stability Assessment – NHWL

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Not observed	None
Frost Action	Not observed	None
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Not observed	None
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 the NHWL has been completed as per the TOR and is presented in the following page as Figure FOX-M.2.

APPROX. LOCATION OF CRUSHED ROCK STOCKPILE

GEOTEXTILE DEBRIS

NON-HAZARDOUS WASTE LANDFILL

FEATURE A

FEATURE B

FEATURE C

FEATURE D

VARIOUS NASITTUQ EQUIPMENT

POL LINE

O/H POWER

MW–12

MW–13

MW–14

MW–15

MW–16

490 900

490 950

491 000

491 050

491 100

7 628 050

7 628 000

7 627 950

3.0

2.0

0.5

4.0

7.0m

6.5m

6.0m

3.0

4.0

2.0

PP

LEGEND

- MONITORING WELL LOCATION
- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- VEHICLE TRACKS/RUTS (NTS)
- STAINING
- VEGETATION
- SETTLEMENT (NTS)

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13–04–22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
FOX-M, HALL BEACH, NUNAVUT

NON-HAZARDOUS WASTE LANDFILL

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P. ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_B	PAGE PL

FIGURE FOX-M.2

3.5 PHOTOGRAPHIC RECORDS

The Photographic Record for NHWL has been completed as per the TOR and is presented in the following pages as Table VI. The Photographic Record contains only an index and “thumbnail” photographs. Full size photographs are contained in the Addendum DVD-ROM.

Table VI: Landfill Visual Inspection Photo Log – NHWL

Photo (2012-FM-NHWL-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-NHWL-1	2.650	Sept. 1, 2012	491148	7628023	**Feature D:** View south - of eastern side slope of landfill, photo taken from the thermistor located east of the landfill toe. A small cluster of vegetation is visible in the photo.
2		2012-FM-NHWL-2	2.650	Sept. 1, 2012	491148	7628023	View north - of eastern side slope of landfill taken from the thermistor located east of the landfill toe.
3		2012-FM-NHWL-3	2.870	Sept. 1, 2012	491133	7628076	View west - of northern side slope of the landfill, gravel stockpile north of the facility is visible. Taken from the bottom north east corner.
4		2012-FM-NHWL-4	2.740	Sept. 1, 2012	491133	7628076	View south - of eastern side slope of the landfill. Taken from the bottom north east corner.
5		2012-FM-NHWL-5	13.700	Sept. 1, 2012	491129	7628066	Panoramic view south to west - of north eastern landfill surface. ATV tracks are visible across the landfill surface. Taken from the north east corner.
6		2012-FM-NHWL-6	2.650	Sept. 1, 2012	491129	7628066	View north - of gravel stockpiled north of the landfill.
7		2012-FM-NHWL-7	2.460	Sept. 1, 2012	491129	7628066	**Feature A:** Close-up - of ATV tracks at the north east corner of the landfill.
8		2012-FM-NHWL-8	2.510	Sept. 1, 2012	491138	7628051	**Feature B:** View north west - of iron staining on the eastern side slope of the facility.
9		2012-FM-NHWL-9	46.700	Sept. 1, 2012	491112	7628084	Panoramic view south to west - of northeastern landfill surface. ATV tracks are visible across the landfill surface. Taken from on top of the gravel stockpile.
10		2012-FM-NHWL-10	2.400	Sept. 1, 2012	491040	7628075	Close-up - of wooden debris observed during 2010 investigation.
11		2012-FM-NHWL-11	2.400	Sept. 1, 2012	491040	7628075	Close-up - of area post removal of wooden debris.
12		2012-FM-NHWL-12	4.470	Sept. 1, 2012	491001	7628074	Panoramic view east to west - of northern side slope of facility, MW-15, Feature A and the gravel stockpile are visible in the photo.
13		2012-FM-NHWL-13	2.410	Sept. 1, 2012	491003	7628050	View east - of northern side slope of the landfill, gravel removed by ATV traffic.
14		2012-FM-NHWL-14	2.900	Sept. 1, 2012	490998	7628056	View west - of northern side slope of the landfill.
15		2012-FM-NHWL-15	34.100	Sept. 1, 2012	490999	7628046	Panoramic view east to west - of northern surface of the landfill, taken from the landfill surface south of MW-15.
16		2012-FM-NHWL-16	2.800	Sept. 1, 2012	491031	7628014	View east - of commemorative plaque.
17		2012-FM-NHWL-17	2.010	Sept. 1, 2012	491031	7628014	Close-up - of graffiti on commemorative plaque.
18		2012-FM-NHWL-18	1.970	Sept. 1, 2012	491031	7628014	Close-up - of graffiti on commemorative plaque.
19		2012-FM-NHWL-19	2.440	Sept. 1, 2012	491031	7628014	**Feature A:** View northwest - of disturbed gravel on the landfill surface.
20		2012-FM-NHWL-20	2.620	Sept. 1, 2012	490934	7628043	View east - of northern landfill side slope, taken from the bottom of the north west corner.
21		2012-FM-NHWL-21	2.650	Sept. 1, 2012	490934	7628043	View south - of western landfill side slope, taken from the bottom of the north west corner.
22		2012-FM-NHWL-22	15.800	Sept. 1, 2012	490945	7628037	Panoramic view east to south - of northwestern landfill surface taken from the top of the north west corner.
23		2012-FM-NHWL-23	2.440	Sept. 1, 2012	490924	7627984	Close-up - of repaired MW-14.
24		2012-FM-NHWL-24	2.400	Sept. 1, 2012	490924	7627984	View north east - of western side slope of landfill, view obstructed by Nasituq equipment.
25		2012-FM-NHWL-25	2.250	Sept. 1, 2012	490924	7627984	View south east - of western side slope of landfill, view obstructed by Nasituq equipment.
26		2012-FM-NHWL-26	2.610	Sept. 1, 2012	490942	7627988	View north - of western side slope of landfill, taken from the midpoint of the toe.
27		2012-FM-NHWL-27	2.510	Sept. 1, 2012	490942	7627988	View south - of western side slope of landfill, taken from the midpoint of the toe.
28		2012-FM-NHWL-28	4.490	Sept. 1, 2012	490909	7627991	Panoramic view east-northeast to east south east - of western side slope of landfill and stockpiled Nasituq equipment.
29		2012-FM-NHWL-29	2.620	Sept. 1, 2012	490946	7627958	View east - of southern side slope of the landfill, taken from the south west corner.
30		2012-FM-NHWL-30	2.660	Sept. 1, 2012	490946	7627958	View north - of southern side slope of the landfill, taken from the south west corner.

Photo (2012-FM-NHWL-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
31		2012-FM-NHWL-31	6.740	Sept. 1, 2012	490954	7627969	Panoramic view north to east - of southwestern landfill surface.
32		2012-FM-NHWL-32	2.440	Sept. 1, 2012	490960	7627963	**Feature C:** Close-up - of linear depression southern side slope of facility (1 m x 0.20 m x 0.15 m).
33		2012-FM-NHWL-33	2.420	Sept. 1, 2012	490954	7627962	**Feature C:** View west - of linear depression southern side slope of facility (1 m x 0.20 m x 0.15 m).
34		2012-FM-NHWL-34	2.640	Sept. 1, 2012	491072	7627972	View west - of southern side slope of landfill, taken at the landfill toe north of MW-13.
35		2012-FM-NHWL-35	2.640	Sept. 1, 2012	491072	7627972	View east - of southern side slope of landfill, taken at the landfill toe north of MW-13.
36		2012-FM-NHWL-36	2.460	Sept. 1, 2012	491070	7627980	View east of south - of east landfill surface, taken from the crest of the landfill north of MW-15.
37		2012-FM-NHWL-37	2.320	Sept. 1, 2012	491142	7627985	View west - of southwestern landfill surface, taken from the crest of the landfill north of MW-15.
38		2012-FM-NHWL-38	2.640	Sept. 1, 2012	491144	7628000	View north - of eastern side slope of landfill taken from the south east corner.
39		2012-FM-NHWL-39	2.710	Sept. 1, 2012	491144	7628000	View west - of southern side slope of the landfill, taken from the south east corner.
40		2012-FM-NHWL-40	8.170	Sept. 1, 2012	491135	7627993	Panoramic view west to north - of southeastern landfill surface, taken from the south west corner.
41		2012-FM-NHWL-41	2.410	Sept. 1, 2012	491144	7627998	**Feature D:** View north - of vegetation growing on the eastern slope of the landfill.
42		2012-FM-NHWL-42	2.450	Sept. 1, 2012	491125	7628066	**Feature A:** Example of ATV tracks at the north east corner.
43		2012-FM-NHWL-43	2.390	Sept. 1, 2012	490999	7628039	View north - of ponded water, taken from landfill surface south of MW-15.
44		2012-FM-NHWL-44	2.470	Sept. 1, 2012	490999	7628039	View north-northeast - of ponded water, taken from landfill surface south of MW-15.
Soil Sampling							
45		2012-FM-NHWL-45	2.360	Sept. 3, 2012	491156	7628014	**MW-12:** Open test pit.
46		2012-FM-NHWL-46	2.400	Sept. 3, 2012	491156	7628014	**MW-12:** Closed test pit.
47		2012-FM-NHWL-47	2.350	Sept. 3, 2012	491156	7628014	**MW-12:** View west - sampling location.
48		2012-FM-NHWL-48	2.590	Sept. 3, 2012	491073	7627973	**MW-13:** Open test pit.
49		2012-FM-NHWL-49	2.620	Sept. 3, 2012	491073	7627973	**MW-13:** Closed test pit.
50		2012-FM-NHWL-50	2.480	Sept. 3, 2012	491073	7627973	**MW-13:** View west - of sampling location.
51		2012-FM-NHWL-51	2.660	Sept. 3, 2012	490926	7627983	**MW-14:** Close-up - of damaged well.
52		2012-FM-NHWL-52	2.410	Sept. 3, 2012	490926	7627983	**MW-14:** Open test pit.
53		2012-FM-NHWL-53	2.380	Sept. 3, 2012	490926	7627983	**MW-14:** Closed test pit.
54		2012-FM-NHWL-54	2.540	Sept. 3, 2012	490998	7628059	**MW-15:** Open test pit.
55		2012-FM-NHWL-55	2.600	Sept. 3, 2012	490998	7628059	**MW-15:** Closed test pit.
56		2012-FM-NHWL-56	2.670	Sept. 3, 2012	490998	7628059	**MW-15:** View north east - of sampling location.
57		2012-FM-NHWL-57	2.410	Sept. 3, 2012	490839	7628038	**MW-16:** Open test pit.
58		2012-FM-NHWL-58	2.420	Sept. 3, 2012	490839	7628038	**MW-16:** Closed test pit.
59		2012-FM-NHWL-59	2.450	Sept. 3, 2012	490839	7628038	**MW-16:** View north east - of sampling location.

3.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 NHWL samples are presented in Tables VII and VIII respectively. Certificates of analysis results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table VII: Non-Hazardous Waste Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-MW-14-A	MW-14	0-15	6.3	24.2	3.5	<0.5	23.8	21	15.5	2.5	<0.5	<0.05	<10	<10	19	19
FM12-MW-14-B		40-50	4.3	15.1	2.3	<0.5	5.7	10	9.0	1.4	<0.5	<0.05	<10	<10	<10	<10
FM12-MW-16-A	MW-16	0-15	7.0	19.9	3.2	<0.5	170.0	47	23.0	2.6	<0.5	<0.05	<10	<10	66	66
FM12-MW-16-A-D		0-15	8.6	21.8	3.5	<0.5	170.0	42	22.2	3.1	<0.5	<0.05	<10	<10	67	67
FM12-MW-16-B		40-50	4.9	16.1	2.8	<0.5	48.9	24	13.6	2.6	<0.5	<0.05	<10	<10	34	34
Downgradient Samples																
FM12-MW-12-A	MW-12	0-15	6.4	25.9	3.8	<0.5	35.7	23	14.6	2.1	<0.5	<0.05	<10	<10	61	61
FM12-MW-12-B		40-50	5.7	24.3	3.6	<0.5	24.8	19	13.2	2.0	<0.5	<0.05	<10	20	15	35
FM12-MW-13-A	MW-13	0-15	5.4	20.5	3.1	<0.5	55.9	20	14.2	2.3	<0.5	<0.05	<10	11	26	37
FM12-MW-13-B		40-50	9.4	25.7	4.2	<0.5	144.0	21	15.1	2.2	<0.5	<0.05	10	15	11	36
FM12-MW-15-A	MW-15	0-15	8.8	21.6	3.2	<0.5	29.6	38	15.5	2.5	<0.5	<0.05	<10	<10	127	127
FM12-MW-15-B		40-50	5.5	20.0	3.0	<0.5	13.7	21	14.4	1.8	<0.5	<0.05	<10	<10	42	42

Table VIII: Evaluation of 2012 Soil Analytical Data – NHWL

Parameter	2012
Copper	Copper concentrations ranged from 4.3 to 9.4 mg/kg with a mean concentration of 6.6 mg/kg. The highest concentration was observed at the surface of the MW-13 sample location.
Nickel	Nickel concentrations ranged from 15.1 to 25.9 mg/kg with a mean concentration of 21.4 mg/kg. The highest concentration was observed at the surface of the MW-12 sample location.
Cobalt	Cobalt concentrations ranged from 2.3 to 4.2 mg/kg with a mean concentration of 3.3 mg/kg. The highest concentration was observed in the depth sample of the MW-13 sample location.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 5.7 to 170.0 mg/kg with a mean concentration of 65.7 mg/kg. The highest concentration was observed at the surface of the MW-16 sampling location. Relatively high lead concentrations were detected at the depth of MW-16 as well at depth at the MW-13 sampling location (144 mg/kg).
Zinc	Zinc concentrations ranged from 10 to 47 mg/kg with a mean concentration of 26 mg/kg. The highest concentration was observed at the surface of the MW-16 sampling location.
Chromium	Chromium concentrations ranged from 9.0 to 23.0 mg/kg with a mean concentration of 15.5 mg/kg. The highest concentration was observed at the surface of the MW-16 sampling location.
Arsenic	Arsenic concentrations ranged from 1.4 to 3.1 mg/kg with a mean concentration of 2.3 mg/kg. The highest concentration was observed at the surface of the MW-16 sampling location.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 127 mg/kg, with a mean concentration of 52.4 mg/kg. The highest concentration detected at the surface of the MW-15 sampling location. TPH was detected in all samples, with the exception of the MW-14 depth sample.

3.7 GROUNDWATER SAMPLE ANALYTICAL DATA

The groundwater chemical analysis results and evaluation of analytical data for the 2012 NHWL samples are presented in Tables IX and X below. Certificates of analysis and groundwater samples collected as part of the QA/QC program are presented in Appendix C.

Table IX: Non-Hazardous Waste Landfill Summary Table of Groundwater Analytical results

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 [µg/l]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Downgradient Samples																
FM12-MW-13	MW-13	2.42	0.005	0.024	0.002	0.00005	0.002	0.015	0.005	<0.001	<0.000025	<0.01	1.5	1.5	<0.1	3.0
FM12-MW-15	MW-15	1.75	0.005	0.024	0.003	<0.00005	0.001	0.047	0.011	<0.001	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1

Table X: Evaluation of 2012 Groundwater Analytical Data – NHWL

Parameter	2012
Copper	Copper concentrations were 0.005 mg/L with equal concentrations detected at the two sampling wells (with sufficient water), MW-13 and MW-15.
Nickel	Nickel concentrations were 0.024 mg/L with equal concentrations detected at the two sampling wells, MW-13 and MW-15.
Cobalt	Cobalt concentrations ranged from 0.002 to 0.003 mg/L with a mean concentration of 0.0025 mg/kg. The highest concentration was detected at MW-15.
Cadmium	Cadmium concentrations ranged from non-detect to 0.0005 mg/L. The highest concentration was detected at MW-13.
Lead	Lead concentrations ranged from 0.001 to 0.002 mg/L with a mean concentration of 0.0015 mg/kg. The highest concentration was detected at MW-13.
Zinc	Zinc concentrations ranged from 0.015 to 0.047 mg/L with a mean concentration of 0.031 mg/kg. The highest concentration was detected at MW-15.
Chromium	Chromium concentrations ranged from 0.005 to 0.011 mg/L with a mean concentration of 0.008 mg/L. The highest concentration was detected at MW-15.
Arsenic	All reported concentrations were lower than the method detection limit (0.001 mg/L).
Mercury	All reported concentrations were lower than the method detection limit (0.000025 mg/L).
PCBs	All reported concentrations were lower than the method detection limit (0.01 µg/L).
TPH	TPH was detected at MW-13 at a concentration of 3.0 mg/L.

3.8 MONITORING WELL SAMPLING / INSPECTION LOGS

The monitoring well sampling and inspection logs for MW-12, MW-13, MW-14, MW-15 and MW-16 are included in this section.

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-Sep-12	Time:	1:33 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Non-Hazardous Waste Landfill		
Monitoring Well ID:	MW-12		
Sample Number:			
Condition of Well:	Good, casing is slightly slanted		
Measured Data			
Well pipe height above ground (cm) =	67.0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	135.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-Sep-12	Time:	10:26 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Non-Hazardous Waste Landfill		
Monitoring Well ID:	MW-13		
Sample Number:	FM12-MW-13		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	51.0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	109.0	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	58.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	169.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	60.0		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	3000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7.9		
Final Conductivity (uS/cm) =	1918		
Final Temperature (°C) =	0.6		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-Sep-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Non-Hazardous Waste Landfill		
Monitoring Well ID:	MW-14		
Sample Number:	N/A		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	49		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	112.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-Sep-12	Time:	10:13 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Non-Hazardous Waste Landfill		
Monitoring Well ID:	MW-15		
Sample Number:	FM12-MW-15		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	63		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	88	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	25		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	167.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	79		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	2000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	8.1		
Final Conductivity (uS/cm) =	1610		
Final Temperature (°C) =	0.8		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-Sep-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Non-Hazardous Waste Landfill		
Monitoring Well ID:	MW-16		
Sample Number:	N/A		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	56		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	150.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

4 G217 – WEST LANDFILL

4.1 SUMMARY

During the 2012 monitoring event of the G217 – West Landfill soil samples were collected at 4 locations (1 upgradient and 3 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobe.

PCBs were not detected in any of the soil samples at the G217 – West Landfill. TPH was detected at two downgradient locations, at surface and depth at FM-6 and at depth at FM-7. TPH concentration ranged from 14 – 648 mg/kg, with the highest concentration recorded in the depth sample of FM-6. TPH concentrations remain below the standard site criteria of 2500 mg/kg.

Two significant metal concentrations were detected at the G217 – West Landfill. A lead concentration of 79.3 mg/kg was detected at depth at the FM-7 sample location; which is above the CCME criteria for agricultural land, but remains below the criteria for Residential/parkland, Commercial or Industrial land. A relatively high zinc concentration of 234 mg/kg was detected at depth at the FM-6 sample location.

As with most landfills at FOX-M Hall Beach, ruts caused by ATVs are the predominant feature at the G217 – West Landfill, however unlike other landfills very little increases were observed from the 2010 observations. The ATV ruts cover approximately 2% of the landfill surface and have an acceptable severity rating.

The current overall performance rating of the G217 – West Landfill is acceptable.

4.2 VISUAL INSPECTION REPORT

The visual inspection of the G217 – West Landfill was conducted on September 1, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XI of this report. Please refer to Figure FOX-M.3 for the locations of photographs and erosional feature at the G217 – West Landfill.

Weather Conditions at Time of Inspection

At the time of the inspection of skies were overcast, temperature was 8°C and wind was 30 km/h from the west.

Settlement

A new area of settlement was observed during the 2012 monitoring event, Feature B. The minor depression is located on the landfill surface and has an acceptable severity rating.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Evidence of vegetation was not noted.

Staining

Evidence of staining was not noted on the landfill.

Seepage Points

Evidence of seepage was not noted.

Debris

Evidence of surface debris was not noted on the landfill.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this landfill.

Other Features of Note

Several vehicle tracks/ruts were observed on the northeast and southeast corners of the landfill cover (Feature A). The vehicle tracks/ruts extended between 0.05 to 0.1 m in depth and covered approximately 2% of the landfill surface. Unlike the other landfills located at the FOX-M site, the G217 – West has seen little increase in rutting caused by ATV traffic.

Ponded water was also noted in proximity to the southwestern corner of the lobe, an area of ponded water observed during the 2010 season along the northern toe was not observed.

A small tension crack was observed on the western crest of the landfill (Feature C). This feature currently of little impact to the stability of the landfill and has an acceptable severity rating.

Table XI: Visual Inspection Checklist / Report – G217 – West Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: G217 – West (Existing Landfill – Regrade)
DATE OF INSPECTION: September 1, 2012
DATE OF PREVIOUS INSPECTION: August 25, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent (m)	Description	Photographic Record (2012-FM-G217)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE B See Figure FOX-M.3	2.5	0.4	0.1	Occasional	Linear depression	11	Acceptable	New Observation: Singular depression of the landfill surface.
Erosion	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Staining	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Presence/Condition of Monitoring	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Features of Note:	Yes	FEATURE A See Figure FOX-M.3	4.0 - 20.0	0.2 - 0.3	0.05 - 0.01	Occasional	Vehicle tracks/ruts	8, 28 - 30	Acceptable	ATV tracks and rutting on the landfill surface.
		FEATURE C See Figure FOX-M.3	4.00	0.2	Unknown	Isolated	Tension crack	18	Acceptable	New Observation: Small tension crack on the western crest of the landfill, running parallel to the toe.
		Ponding See Figure FOX-M.3	3	2	0.2	Isolated	Isolated	9, 10	Acceptable	Ponding no longer visible at 1 location indicated during the 2010 investigation. An additional area of ponding was observed of the western slope.
Additional Photos	Yes	See Figure FOX-M.3 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

4.3 PRELIMINARY STABILITY ASSESSMENT

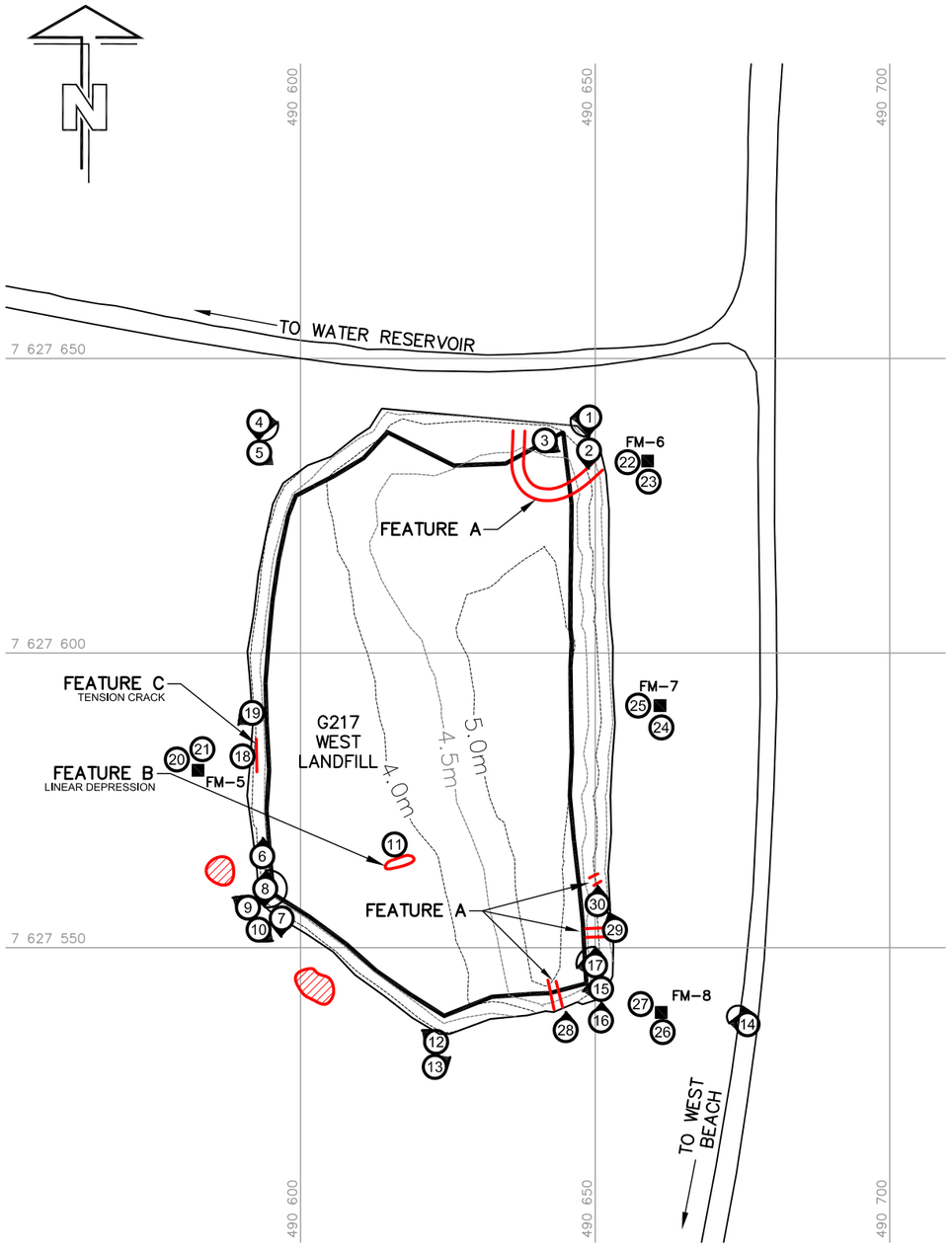
The Preliminary Stability Assessment for G217 – West Landfill has been completed as per the TOR and is included as Table XII hereafter.

Table XII: Preliminary Stability Assessment – G217 - West Landfill

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

4.4 LOCATION PLAN

The Location Plan for the G217 – West Landfill has been completed as per the TOR and is presented as Figure FOX-M.3.



LEGEND

- MONITORING WELL LOCATION
- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- PONDED WATER
- VEHICLE TRACKS/RUTS (NTS)
- SETTLEMENT (NTS)
- CRACK (NTS)

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

G217 - WEST LANDFILL

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
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MEASUREMENT UNIT	SCALE:	DATE (month-year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY:	VERIFIED BY:	APPROVED BY:
P. LÉGARÉ	B. MACKAY	A. LECLAIR P.ENG
PROJECT NO:	DRAWING NO:	PAGE
CD2655_210_213	CD2655_210_213-FOX-M_C	PL

FIGURE FOX-M.3

P:\P\CD2655\2012\FINAL REPORTS\FOX-M\AutoCAD Files\CD2655_210_213-FOX-M_3 - Standard\CD2655_210_213-FOX-M_C.dwg, PDF-11X17.pc3, 11 x 17

4.5 PHOTOGRAPHIC RECORDS

The Photographic Record for G217 – West Landfill has been completed as per the TOR and is presented in the following page as Table XIII. The Photographic Record contains only an index and “thumbnail” photographs. Full-size photographs are contained in the Addendum DVD-ROM.

Table XIII: Landfill Visual Inspection Photo Log – G217 – West Landfill

Photo (2012-FM-G217-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-G217-1	14.600	Sept. 1, 2012	490649	7627640	Panoramic view south to west - of northeastern landfill surface, taken from the north east corner.
2		2012-FM-G217-2	2.630	Sept. 1, 2012	490649	7627640	View south - of eastern toe of landfill.
3		2012-FM-G217-3	2.520	Sept. 1, 2012	490637	7627638	View south east - of Feature A at the north east surface of the landfill.
4		2012-FM-G217-4	9.310	Sept. 1, 2012	490593	7627638	Panoramic view east to south - of northwestern landfill surface taken from the north west corner of the landfill.
5		2012-FM-G217-5	2.450	Sept. 1, 2012	490593	7627634	View south east - of area where water was observed to be ponding during the 2010 investigation. As of 2012 no water remains.
6		2012-FM-G217-6	2.660	Sept. 1, 2012	490594	7627560	View north - of western landfill toe, taken from the south west corner.
7		2012-FM-G217-7	2.840	Sept. 1, 2012	490594	7627560	View southeast - of landfill toe, taken from the south west corner.
8		2012-FM-G217-8	10.600	Sept. 1, 2012	490594	7627560	Panoramic view north to southeast - of southern landfill surface taken from the south west corner of the landfill. ATV tracks are visible on the landfill surface.
9		2012-FM-G217-9	2.720	Sept. 1, 2012	490594	7627560	View northwest - of ponded water off the western toe of the landfill, taken from the south west corner.
10		2012-FM-G217-10	2.720	Sept. 1, 2012	490594	7627560	View southeast - of ponded water off the western toe of the landfill, taken from the south west corner.
11		2012-FM-G217-11	2.490	Sept. 1, 2012	490616	7627568	**Feature B:** Close-up - of a small depression on the landfill surface, 25 m of the south west corner (0.2 m x 0.2 m x 0.20 m).
12		2012-FM-G217-12	2.900	Sept. 1, 2012	490623	7627534	View northwest - of the southwestern landfill toe, taken from the south corner of the landfill.
13		2012-FM-G217-13	2.810	Sept. 1, 2012	490623	7627534	View northeast - of the southwestern landfill toe, taken from the south corner of the landfill.
14		2012-FM-G217-14	9.537	Sept. 1, 2012	490671	7627537	Panoramic view west to north-northwest - of landfill surface, taken from the West Beach access road.
15		2012-FM-G217-15	2.510	Sept. 1, 2012	490651	7627543	View west - of southeastern landfill toe, taken from the southeast corner.
16		2012-FM-G217-16	2.830	Sept. 1, 2012	490651	7627543	View north of southeastern landfill toe, taken from the southeast corner.
17		2012-FM-G217-17	9.030	Sept. 1, 2012	490650	7627544	Panoramic view west to north - of the southern landfill surface, taken from the south east corner.
18		2012-FM-G217-18	2.370	Sept. 3, 2012	490593	7627581	**Feature C:** Close-up of a 4 m long tension crack.
28		2012-FM-G217-28	2.600	Sept. 1, 2012	490645	7627536	**Feature A:** View north - of ruts caused by ATV tracks on the southern side slope of the regrade.
29		2012-FM-G217-29	2.490	Sept. 1, 2012	490647	7627553	**Feature A:** View north-northwest - of ruts caused by ATV tracks on the eastern side slope of the regrade.
30		2012-FM-G217-30	4.600	Sept. 1, 2012	490645	7627536	**Feature A:** View north - of ruts caused by ATV tracks on the eastern side slope of the landfill.
Soil Samples							
19		2012-FM-G217-19	2.690	Sept. 3, 2012	490581	7627573	**FM-5:** View south west - of sampling location.
20		2012-FM-G217-20	2.500	Sept. 3, 2012	490581	7627582	**FM-5:** Open test pit.
21		2012-FM-G217-21	2.540	Sept. 3, 2012	490581	7627582	**FM-5:** Closed test pit.
22		2012-FM-G217-22	2.470	Sept. 3, 2012	490654	7627631	**FM-6:** Open test pit.
23		2012-FM-G217-23	2.390	Sept. 3, 2012	490654	7627631	**FM-6:** Closed test pit.
24		2012-FM-G217-24	2.590	Sept. 3, 2012	490660	7627587	**FM-7:** Open test pit.
25		2012-FM-G217-25	2.600	Sept. 3, 2012	490660	7627587	**FM-7:** Closed test pit.
26		2012-FM-G217-26	2.650	Sept. 3, 2012	490660	7627544	**FM-8:** Open test pit.
27		2012-FM-G217-27	2.460	Sept. 3, 2012	490660	7627544	**FM-8:** Closed test pit.

4.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 G217 – West Landfill samples are presented in Tables XIV and XV below. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XIV: G217 West Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-5-A	FM-5	0-15	2.0	7.9	1.5	<0.5	1.7	9	7.5	0.6	<0.5	<0.05	<10	<10	<10	<10
FM12-5-B		40-50	2.2	8.9	1.7	<0.5	1.7	9	7.7	1.0	<0.5	<0.05	<10	<10	<10	<10
Downgradient Samples																
FM12-6-A	FM-6	0-15	9.2	18.7	3.1	<0.5	32.3	121	15.5	2.7	<0.5	<0.05	<10	<10	149	149
FM12-6-A-D		0-15	21.5	21.3	3.4	<0.5	27.4	119	15.0	2.5	<0.5	<0.05	<10	<10	176	176
FM12-6-B		40-50	8.9	14.5	2.4	<0.5	19.9	234	10.0	1.9	<0.5	<0.05	<10	<10	648	648
FM12-7-A	FM-7	0-15	11.8	21.9	3.3	<0.5	46.8	24	19.4	3.5	<0.5	<0.05	<10	<10	<10	<10
FM12-7-B		40-50	13.3	20.5	3.4	0.7	79.3	30	27.0	3.2	<0.5	<0.05	<10	<10	14	14
FM12-8-A	FM-8	0-15	6.6	13.1	2.1	<0.5	4.9	11	8.0	1.7	<0.5	<0.05	<10	<10	<10	<10
FM12-8-B		40-50	17.2	19.8	3.1	<0.5	5.4	27	13.0	3.5	<0.5	<0.05	<10	<10	<10	<10

Table XV: Evaluation of 2012 Soil Analytical Data – G217 – West Landfill

Parameter	2012
Copper	Copper concentrations ranged from 2.0 to 21.5 mg/kg with a mean concentration of 10.3 mg/kg. The highest concentration was observed at the surface of the FM-6 sample location.
Nickel	Nickel concentrations ranged from 7.90 to 21.9 mg/kg with a mean concentration of 16.3 mg/kg. The highest concentration was observed at the surface of the FM-7 sample location.
Cobalt	Cobalt concentrations ranged from 1.5 to 3.4 mg/kg with a mean concentration of 2.7 mg/kg. The highest concentration was observed at two locations; in the surface sample of the FM-6 and the depth sample of FM-7.
Cadmium	Cadmium was detected in the depth sample at one sample location FM-7 at a concentration of 0.7 mg/kg. All other samples were non-detect (<0.5).
Lead	Lead concentrations ranged from 1.7 to 79.3 mg/kg with a mean concentration of 24.4 mg/kg. The highest concentration was observed in the depth sample of the FM-7 location and is considered to be a relatively high metal concentration.
Zinc	Zinc concentrations ranged from 9 to 234 mg/kg with a mean concentration of 64.9 mg/kg. The highest concentration was observed in the depth sample of the FM-6 location and is considered to be a relatively high metal concentration.
Chromium	Chromium concentrations ranged from 7.5 to 27.0 mg/kg with a mean concentration of 13.7 mg/kg. The highest concentration was observed in the depth sample of the FM-7 sampling site.
Arsenic	Arsenic concentrations ranged from 0.6 to 3.5 mg/kg with a mean concentration of 2.3 mg/kg. The highest concentration was observed in the surface sample of the FM-7 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 648 mg/kg, with a mean concentration of 246.8 mg/kg. The highest concentration was detected in the depth sample of the FM-6 sample site. Sample locations, FM-5 and FM-8 as well as the surface sample of FM-7 were all non-detect for TPH.

5 BILLBOARDS LANDFILL

5.1 SUMMARY

During the 2012 monitoring event of the Billboards Landfill at FOX-M Hall Beach soil samples were collected at 4 locations (1 upgradient and 3 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobes.

PCBs or relatively high metal concentrations were not detected in any of the soil samples at the Billboards Landfill. TPH was detected at all soil sample locations with the exception of FM-4. TPH concentrations ranged from 29 to 117 mg/kg with the highest concentration detected at depth at FM-1. TPH concentrations remain below the standard site criteria of 2500 mg/kg. Detected TPH was composed primarily of the F3 fraction.

No significant or unacceptable erosional features were observed at the Billboards Landfill during the 2012 visual inspection. Very few minor features were observed, including ponded water and iron staining. Overall the Billboards Landfill has seen little to no increase in erosional features since the 2010 investigation.

The overall performance rating of the Billboards is acceptable.

5.2 VISUAL INSPECTION REPORT

The visual inspection of the Billboards Landfill was conducted on September 2, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XIX of this report. Please refer to Figure FOX-M.4 for the locations of photographs and erosional features at the Billboards Landfill.

Weather Conditions at Time of Inspection

At the time of the inspection of skies were overcast with light rain, temperature was 4°C and wind was 68 km/h from the north.

Settlement

Evidence of settlement was not noted.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Evidence of vegetation was not noted.

Staining

Feature A has increased since the 2010 investigation. Iron staining was observed at three locations (up from one in 2010) on gravel at the bottom of pools of water along the north and south toe of the landfill. The Billboards Landfill is located in a low lying area; the iron staining is believed to be a feature of the natural environment.

Seepage Points

Evidence of seepage was not noted.

Debris

Evidence of surface debris was not noted on the landfill.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this landfill.

Other Features of Note

The landfill is located within a low lying area bordered by the station access road to the west and communication pads to the north and east. Ponded water was observed in proximity along the north and south sides of the landfill. At one location along southern toe of the landfill, the organic material associated with the ponded water caused some staining on the gravel cover of the landfill toe.

ATV tracks were observed on the landfill surface. The ATV tracks were not noted as a feature as there is no significant rutting, only slight superficial disturbance to the gravel layer.

Table XVI: Visual Inspection Checklist / Report – Billboards Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: Billboards Landfill (Existing Landfill – Regrade)
DATE OF INSPECTION: September 2, 2012
DATE OF PREVIOUS INSPECTION: August 25, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-Billboard-)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Staining	Yes	FEATURE A See Figure FOX-M.4	1.0 - 6.0	1.0 - 3.0	Unknown	Occasional	3 areas of Iron Staining	3, 6, 7, 11	Acceptable	Staining on gravel associated with ponded water along the north and south landfill toes.
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Presence/Condition of Monitoring Instruments	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Other Features of Note:	Yes	See Figure FOX-M.4	N/A	N/A	Unknown	Occasional	Ponded water along North and south toes of landfill	1,2,3,6,7,10,11,12	Acceptable	Ponded water along the north and south landfill toes.
Additional Photos	Yes	See Figure FOX-M.4	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

5.3 PRELIMINARY STABILITY ASSESSMENT

The Preliminary Stability Assessment for Billboards Landfill has been completed as per the TOR and is included as Table XVII of this report.

Table XVII: Preliminary Stability Assessment – Billboards Landfill

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

5.4 LOCATION PLAN

The Location Plan for the Billboards Landfill has been completed as per the TOR and is presented as Figure FOX-M.4.

LEGEND

- SURVEY CONTROL MONUMENT
- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- PONDED WATER
- STAINING

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

BILLBOARDS LANDFILL

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month-year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_D	PAGE PL

FIGURE FOX-M.4

5.5 PHOTOGRAPHIC RECORDS

The Photographic Record for the Billboards Landfill has been completed as per the TOR and is presented in the following page as Table XVIII. The Photographic Record contains only an index and “thumbnail” photographs. Full size photographs are contained in the Addendum DVD-ROM.

Table XVIII: Landfill Visual Inspection Photo Log – Billboards Landfill

Photo (2012-FM-BillBoard-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-Billboard-1	6.420	Sept. 2, 2012	490695	7627569	Panoramic view north-northeast to east-northeast - of landfill taken 10 m west of access road.
2		2012-FM-Billboard-2	6.420	Sept. 2, 2012	490707	7627673	Panoramic view east-southeast to southeast - of landfill surface, taken from CM3.
3		2012-FM-Billboard-3	2.450	Sept. 2, 2012	490716	7627645	**Feature A:** View east - of ponded water, stained gravel on the bottom of the pool, taken from the western landfill toe (4 m x 3 m).
4		2012-FM-Billboard-4	11.700	Sept. 2, 2012	490720	7627649	Panoramic view east - south of the landfill surface, taken from the north west corner of the landfill.
5		2012-FM-Billboard-5	2.560	Sept. 2, 2012	490720	7627649	View north west - of water pooled taken from the north west corner.
6		2012-FM-Billboard-6	2.600	Sept. 2, 2012	490720	7627649	**Feature A:** View northeast - of drainage feature, taken from the north west corner. Staining visible.
7		2012-FM-Billboard-7	2.610	Sept. 2, 2012	490738	7627671	**Feature A:** View southwest - of drainage feature, taken north of the northern toe of the landfill.
8		2012-FM-Billboard-8	5.660	Sept. 2, 2012	490748	7627665	Panoramic view southeast to southwest - of northern landfill surface.
9		2012-FM-Billboard-9	4.160	Sept. 2, 2012	490728	7627616	Panoramic view north-northwest to east - of the southwestern landfill surface.
10		2012-FM-Billboard-10	2.500	Sept. 2, 2012	490730	7627614	View south east - of drainage feature from the landfill toe.
11		2012-FM-Billboard-11	2.530	Sept. 2, 2012	490753	7627609	View south - of ponded water on the southern toe of the landfill.
12		2012-FM-Billboard-12	2.530	Sept. 2, 2012	490753	7627609	Close-up - of organic staining associated with ponded water along toe.
13		2012-FM-Billboard-13	8.180	Sept. 2, 2012	490789	7627607	Panoramic view west to northwest - of landfill cap, ATV tracks are visible . Taken from south Billboard.
14		2012-FM-Billboard-14	6.230	Sept. 2, 2012	490792	7627661	Panoramic view south to west - of landfill cap, ATV tracks are visible. Taken from north Billboard.
Soil Sampling							
15		2012-FM-Billboard-15	2.370	Sept. 3, 2012	490778	7627633	**FM-1:** Open test pit.
16		2012-FM-Billboard-16	2.430	Sept. 3, 2012	490778	7627633	**FM-1:** Closed test pit.
17		2012-FM-Billboard-17	2.410	Sept. 3, 2012	490752	7627586	**FM-2:** Open test pit.
18		2012-FM-Billboard-18	2.370	Sept. 3, 2012	490752	7627586	**FM-2:** Closed test pit.
19		2012-FM-Billboard-19	2.580	Sept. 3, 2012	490710	7627635	**FM-3:** Open test pit.
20		2012-FM-Billboard-20	2.530	Sept. 3, 2012	490710	7627635	**FM-3:** Closed test pit.
21		2012-FM-Billboard-21	2.470	Sept. 3, 2012	490749	7627668	**FM-4:** Open test pit.
22		2012-FM-Billboard-22	2.370	Sept. 3, 2012	490749	7627668	**FM-4:** Closed test pit.

5.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Billboards Landfill samples are presented in Tables XIX and XX below. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XIX: Billboards Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-1-A	FM-1	0-15	7.0	17.2	2.6	<0.5	12.0	29	10.8	1.9	<0.5	<0.05	<10	<10	29	29
FM12-1-B		40-50	11.7	19.4	2.9	<0.5	7.4	23	11	1.9	<0.5	<0.05	<10	<10	117	117
Downgradient Samples																
FM12-2-A	FM-2	0-15	7.9	16.1	2.7	<0.5	7.6	18	10.5	1.6	<0.5	<0.05	<10	<10	36	36
FM12-2-B		40-50	10.1	18.7	3.3	<0.5	5.8	18	11.9	1.7	<0.5	<0.05	<10	<10	<10	<10
FM12-3-A	FM-3	0-15	13.1	20.3	3.2	<0.5	8.9	22	11.6	2.6	<0.5	<0.05	<10	<10	48	48
FM12-3-B		40-50	19.6	23.5	3.8	<0.5	10.3	28	16.3	3.4	<0.5	<0.05	<10	<10	44	44
FM12-4-A	FM-4	0-15	2.0	7.8	1.5	<0.5	1.4	8	5.6	0.5	<0.5	<0.05	<10	<10	<10	<10
FM12-4-B		40-50	1.6	8.1	1.3	<0.5	1.1	7	5.0	<0.5	<0.5	<0.05	<10	<10	<10	<10

Table XX: Evaluation of 2012 Soil Analytical Data – Billboards West Landfill

Parameter	2012
Copper	Copper concentrations ranged from 1.6 to 19.6 mg/kg with a mean concentration of 9.1 mg/kg. The highest concentration was detected in the depth sample of the FM-3 sampling site.
Nickel	Nickel concentrations ranged from 7.80 to 23.5 mg/kg with a mean concentration of 16.4 mg/kg. The highest concentration was observed at the depth sample of the FM-3 sampling site.
Cobalt	Cobalt concentrations ranged from 1.3 to 3.8 mg/kg with a mean concentration of 2.7 mg/kg. The highest concentration was observed in the depth sample of the FM-3 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 1.1 to 12.0 mg/kg with a mean concentration of 6.8 mg/kg. The highest concentration was observed in the surface sample of the FM-3 sampling site.
Zinc	Zinc concentrations ranged from 7 to 29 mg/kg with a mean concentration of 19.1 mg/kg. The highest concentration was observed in the surface sample of the FM-1 sampling site.
Chromium	Chromium concentrations ranged from 5.0 to 16.3 mg/kg with a mean concentration of 10.3 mg/kg. The highest concentration was observed in the depth sample of the FM-3 sampling site.
Arsenic	Arsenic concentrations ranged from non-detect to 3.4 mg/kg with a mean concentration of 1.9 mg/kg. The highest concentration was observed in the depth sample of the FM-3 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 117 mg/kg, with a mean concentration of 54.8 mg/kg. The highest concentration was detected in the depth sample of the FM-1 sample site. Sample locations FM-4 and the depth sample of FM-2 were non-detect for TPH.

6 HAZMAT STORAGE – EAST LANDFILL

6.1 SUMMARY

During the 2012 monitoring event of the HAZMAT Storage – East Landfill at FOX-M Hall Beach soil samples were collected at 4 locations (1 upgradient and 3 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobes.

PCBs or relatively high metal concentrations were not detected in any of the soil samples at the HAZMAT Storage - East Landfill. TPH was detected at all soil sample locations at surface and depth with the exception of FM-9, where TPH was only detected at depth. TPH concentrations ranged from 11 to 43 mg/kg with the highest concentration detected at the surface of FM-11. TPH concentrations remain below the standard site criteria of 2500 mg/kg. Detected TPH was composed primarily of the F3 fraction.

No significant or unacceptable erosional features were observed at the HAZMAT Storage - East Landfill during the 2012 visual inspection. Since the 2010 investigation the HAZMAT Storage has saw an increase in rutting caused by ATV traffic and evidence of erosion along the eastern toe, at this time of the severity of these erosional features remains minor.

The overall performance rating of the HAZMAT Storage – East Landfill is acceptable.

6.2 VISUAL INSPECTION REPORT

The visual inspection of the HAZMAT Storage – East Landfill was conducted on September 2 & 3, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XXI of this report. Please refer to Figure FOX-M.5 for the locations of photographs and erosional features at the HAZMAT Landfill.

Weather Conditions at Time of Inspection

At the time of the inspection on September 2, skies were overcast, temperature was 5°C and wind was 68–72 km/h from the north. On September 3, skies were clear, temperature was 2°C and wind was 26 km/h with gusts of 57 km/h.

Settlement

Evidence of settlement was not noted.

Erosion

A single area of erosion was observed during the 2012 monitoring event. Feature D, consists of minor erosion along the eastern toe of the landfill. The erosion channel has removed a 2 m x 0.15 m x 0.1 m section from the toe of the landfill. Erosion may be result of spring melt flooding the nearby area of ponded water.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Evidence of vegetation was not noted.

Staining

Iron staining was observed on gravel at the bottom of ponded water surrounding the landfill (detailed below). Iron staining has been observed at several locations at the FOX-M site and is believed to be a feature of the natural environment.

Seepage Points

Evidence of seepage was not noted.

Debris

Evidence of debris was noted adjacent to the east and northeast sides of the landfill (Feature A). The debris consisted primarily of surface and partially buried metal debris, including corrugated sheet metal, rebar, wire and plywood. The debris is not associated with the landfill.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this landfill.

Other Features of Note

Vehicle tracks/ruts were observed on the east and northwest corners of the landfill (Feature B). The vehicle tracks/ruts generally extended 0.1 m in depth. The vehicle ruts identified as Feature B have not changed in size or severity since the 2010 investigation. However, it is apparent that the areas are still being used by ATVs as one section of Feature B was still wet

from recent ATV traffic at the time the picture was taken (this particular rut is adjacent to an area of ponded water).

A new area of rutting Feature C, caused by ATVs was observed on the southern slope of the landfill. This area of rutting is deeper than those present in Feature B, but is still of little impact to the stability of the lobe and has an acceptable severity rating.

The landfill is located within a low lying area bordered by the East Beach access road to the west and the beach ridge to the east. Like the 2010 investigation, at the time of the 2012 inspection, ponded water surrounded approximately 70% of the landfill perimeter, including the west, south and east sides of the landfill.

Table XXI: Visual Inspection Checklist / Report – HAZMAT Storage – East Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: HAZMAT Storage – East (Existing Landfill – Regrade)
DATE OF INSPECTION: September 2 & 3, 2012
DATE OF PREVIOUS INSPECTION: August 26, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-Haz-)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Erosion	Yes	Feature D See Figure FOX-M.5	2	0.15	0.1	Isolated	Minor erosion	14	Acceptable	New Observation: Erosion on the eastern toe of the landfill. Appears to be caused by flooding during the spring melt. Approximately 0.15 m of the toe has been removed in a 2 m section.
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Staining	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	Yes	Feature A See Figure FOX-M.5	Various		At Surface or partially buried	Occasional	Corrugated sheet metal, rebar, wire.	9	Acceptable	Partially buried debris located beyond the toe of the landfill, not a reflection of the performance of the landfill.
Presence/Condition of Monitoring	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Other Features of Note:	Yes	Feature B See Figure FOX-M.5	1	0.2 - 0.3	0.1	Occasional	Rutting caused by ATV traffic	4, 15	Acceptable	Particular set of rutting remains consistent with 2010 findings, one area was still wet from recent ATV traffic during the time of photographing.
		Feature C See Figure FOX-M.5	1.5	0.2 - 0.4	0.1 - 0.3			11, 12		New Observation: Rutting caused by ATV on the southern slope of the landfill, ruts are deeper then those observed at Feature B.
		See Figure FOX-M.5	Irregular 75 - 100	Irregular 2 - 25	Unknown	Extensive	Ponded water	1, 2, 6, 7, 8, 10, 13, 18, 21	Acceptable	Ponded waster along the east, west and south sides of the landfill.
Additional Photos	Yes	See Figure FOX-M.5	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

6.3 PRELIMINARY STABILITY ASSESSMENT

The Preliminary Stability Assessment for HAZMAT Storage – East Landfill has been completed as per the TOR and is included as Table XXII hereafter.

Table XXII: Preliminary Stability Assessment – HAZMAT Storage – East Landfill

Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Acceptable	Isolated
Frost Action	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Acceptable	Extensive (perimeter only)
Debris exposure	Acceptable	Occasional (beyond the bounds of the landfill)
Overall Landfill Performance	**Acceptable**	

6.4 LOCATION PLAN

The Location Plan for the HAZMAT Storage – East Landfill has been completed as per the TOR and is included in Figure FOX-M.5.

LEGEND

- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- EROSION (NTS)
- PONDED WATER
- VEHICLE TRACKS / RUTS (NTS)
- DEBRIS (NTS)

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

HAZMAT STORAGE - EAST LANDFILL

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
Phone: (418) 653-4422 Fax.: (418) 653-3583

MEASUREMENT UNIT	SCALE:	DATE (month-year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_E	PAGE PL

FIGURE FOX-M.5

P:\P\CD\2655\2012\FINAL REPORTS\FOX-M\AutoCAD files\CD2655_210_213-FOX-M_5 - Standard\CD2655_210_213-FOX-M_E.dwg, PDF-11X17.pc3, 11 x 17

6.5 PHOTOGRAPHIC RECORDS

The Photographic Record for HAZMAT Storage – East Landfill has been completed as per the TOR and is presented in the following page as Table XXIII. The Photographic Record contains only an index and “thumbnail” photographs. Full-size photographs are contained in the Addendum DVD-ROM.

Table XXIII: Landfill Visual Inspection Photo Log – HAZMAT Storage – East Landfill

Photo (2012-FM-Haz-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
General Photos							
1		2012-FM-Haz-1	2.490	Sept. 2, 2012	491458	7627653	View south - of western landfill toe, taken from the northwest corner of the landfill. Water is ponded along toe.
2		2012-FM-Haz-2	2.650	Sept. 2, 2012	491458	7627653	View northeast - of northern toe of the landfill, taken from the north west corner of the landfill. Water is pooled along toe.
3		2012-FM-Haz-3	6.560	Sept. 2, 2012	491458	7627653	Panoramic view northeast to south - of landfill surface, taken from north west corner of the landfill.
4		2012-FM-Haz-4	2.560	Sept. 2, 2012	491461	7627665	**Feature B:** View south - of rutting on the crest of the landfill caused by ATV traffic.
5		2012-FM-Haz-5	8.430	Sept. 2, 2012	491483	7627677	View southeast to southwest - of landfill surface, taken from the northeast corner of the landfill.
6		2012-FM-Haz-6	7.110	Sept. 2, 2012	491448	7627687	Panoramic view east to south-southwest - of the northern toe of the landfill.
7		2012-FM-Haz-7	2.720	Sept. 3, 2012	491462	7627625	**Feature C:** View north - of the western landfill toe, taken from the northwest corner of the landfill. Several ruts caused by ATV traffic are visible along the toe
8		2012-FM-Haz-8	2.540	Sept. 3, 2012	491462	7627625	View east - of southern landfill toe and ponded water, taken from the southwest landfill toe.
9		2012-FM-Haz-9	2.480	Sept. 3, 2012	491467	7627611	**Feature A:** Close-up - of partially buried metal debris south of the landfill Lobe.
10		2012-FM-Haz-10	10.100	Sept. 3, 2012	491467	7627611	Panoramic view north to east - of landfill surface from the southwest corner.
11		2012-FM-Haz-11	2.530	Sept. 3, 2012	491486	7627620	**Feature C:** Close-up - of ATV tacks on the southern slope of the landfill.
12		2012-FM-Haz-12	2.500	Sept. 3, 2012	491485	7627623	**Feature C:** View north-northeast - of ATV tacks on the southern slope of the landfill.
13		2012-FM-Haz-13	6.720	Sept. 3, 2012	491504	7627629	Panoramic view west to northeast - of the southern landfill surface, taken from the south east corner.
14		2012-FM-Haz-14	2.600	Sept. 3, 2012	491508	7627621	**Feature D:** Erosion along the eastern landfill toe, assumed to be caused by water along toe during spring melt.
15		2012-FM-Haz-15	2.560	Sept. 3, 2012	491503	7627648	**Feature B:** View east - of ruts caused by ATV traffic, trail freshly used, stone still wet from ATV tires.
Soil Sampling							
16		2012-FM-Haz-16	2.450	Sept. 3, 2012	491448	7627649	**FM-9:** Open test pit.
17		2012-FM-Haz-17	2.420	Sept. 3, 2012	491448	7627649	**FM-9:** Closed test pit.
18		2012-FM-Haz-18	2.430	Sept. 3, 2012	491447	7627649	**FM-9:** View east - of sampling location.
19		2012-FM-Haz-19	2.600	Sept. 3, 2012	491509	7627663	**FM-10:** Open test pit.
20		2012-FM-Haz-20	2.440	Sept. 3, 2012	491509	7627663	**FM-10:** Closed test pit.
21		2012-FM-Haz-21	2.620	Sept. 3, 2012	491509	7627663	**FM-10:** View west - of sampling location.
22		2012-FM-Haz-22	2.460	Sept. 3, 2012	491508	7627621	**FM-11:** Open test pit.
23		2012-FM-Haz-23	2.440	Sept. 3, 2012	491508	7627621	**FM-11:** Closed test pit.
24		2012-FM-Haz-24	2.610	Sept. 3, 2012	491508	7627621	**FM-11:** View west - of sampling location.
25		2012-FM-Haz-25	2.450	Sept. 3, 2012	491509	7627663	**FM-12:** Open test pit.
26		2012-FM-Haz-26	2.480	Sept. 3, 2012	491509	7627663	**FM-12:** Closed test pit.
27		2012-FM-Haz-27	2.700	Sept. 3, 2012	491509	7627663	**FM-12:** View north - of sampling location.

6.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 HAZMAT Storage – East Landfill samples are presented in Tables XXIV and XXV respectively. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XXIV: HAZMAT Storage – East Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-9-A	FM-9	0-15	13.0	23.6	3.4	<0.5	5.9	18	13.4	2.2	<0.5	<0.05	<10	<10	<10	<10
FM12-9-B		40-50	9.2	26.0	4.2	<0.5	6.1	21	18.1	2.5	<0.5	<0.05	<10	<10	11	11
Downgradient Samples																
FM12-10-A	FM-10	0-15	4.6	17.7	2.7	<0.5	7.8	15	11.3	0.9	<0.5	<0.05	<10	<10	20	20
FM12-10-A-D		0-15	4.1	17.9	2.7	<0.5	5.5	14	11.3	0.7	<0.5	<0.05	<10	<10	39	39
FM12-10-B		40-50	9.0	23.0	2.8	<0.5	2.2	11	9.8	0.9	<0.5	<0.05	<10	<10	23	23
FM12-11-A	FM-11	0-15	4.4	20.4	2.7	<0.5	6.4	12	10.2	1.6	<0.5	<0.05	<10	<10	43	43
FM12-11-B		40-50	5.0	20.8	3.6	<0.5	4.2	15	13.4	1.4	<0.5	<0.05	<10	<10	19	19
FM12-12-A	FM-12	0-15	7.7	21.6	3.2	<0.5	16.4	27	14.3	2.3	<0.5	<0.05	<10	<10	29	29
FM12-12-B		40-50	5.1	15.7	2.4	<0.5	7.0	17	9.9	1.7	<0.5	<0.05	<10	<10	27	27

Table XXV: Evaluation of 2012 Soil Analytical Data – HAZMAT Storage – East Landfill

Parameter	2012
Copper	Copper concentrations ranged from 4.1 to 13.0 mg/kg with a mean concentration of 6.9 mg/kg. The highest concentration was detected in the surface sample of the FM-9 sampling site.
Nickel	Nickel concentrations ranged from 15.7 to 23.6 mg/kg with a mean concentration of 20.7 mg/kg. The highest concentration was observed in the depth sample of the FM-9 sampling site.
Cobalt	Cobalt concentrations ranged from 2.4 to 4.2 mg/kg with a mean concentration of 3.1 mg/kg. The highest concentration was observed in the depth sample of the FM-9 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 2.2 to 16.4 mg/kg with a mean concentration of 6.8 mg/kg. The highest concentration was observed in the surface sample of the FM-12 sampling site.
Zinc	Zinc concentrations ranged from 11 to 27 mg/kg with a mean concentration of 16.7 mg/kg. The highest concentration was observed in the surface sample of the FM-12 sampling site.
Chromium	Chromium concentrations ranged from 9.8 to 18.1 mg/kg with a mean concentration of 12.4 mg/kg. The highest concentration was observed in the depth sample of the FM-9 sampling site.
Arsenic	Arsenic concentrations ranged from 0.7 to 2.5 mg/kg with a mean concentration of 1.6 mg/kg. The highest concentration was observed in the depth sample of the FM-9 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 43 mg/kg, with a mean detected concentration of 26.4 mg/kg. The highest concentration was detected in the surface sample of the FM-11 sample site.

7 COMMUNICATIONS NORTH LANDFILL

7.1 SUMMARY

During the 2012 monitoring event of the Communications North Landfill at FOX-M Hall Beach soil samples were collected at 6 locations (2 upgradient and 4 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobes.

PCBs or relatively high metal concentrations were not detected in any of the soil samples at the Communications North Landfill. TPH was detected at all soil sample locations with the exception of FM-22, as well as the depth samples of FM-19 and FM-20. TPH concentrations ranged from 10 to 50 mg/kg with the highest concentration detected at the surface of FM-18. TPH concentrations remain below the standard site criteria of 2500 mg/kg. Detected TPH was composed primarily of the F3 fraction for most samples.

No significant or unacceptable erosional features were observed at the Communications North Landfill during the 2012 visual inspection. It appears since the 2010 investigation, locals from Hall Beach have begun to use the landfill as a roadway. Although large in size the roadway does not appear to be compromising the integrity of the lobe as it has only removed the superficial layer of gravel.

The overall performance rating of the Communications North Landfill is acceptable.

7.2 VISUAL INSPECTION REPORT

The visual inspection of the Communications North Landfill was conducted on September 3, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XXVI of this report. Please refer to Figure FOX-M.6 for the locations of photographs and erosional features at the Communications North Landfill.

Weather Conditions at Time of Inspection

At the time of the inspection of skies were clear, temperature was 4°C and wind was 26 km/h with gusts of 57 km/h.

Settlement

Evidence of settlement was not noted.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Evidence of vegetation was not noted.

Staining

Evidence of staining was not noted on the landfill.

Seepage Points

Evidence of seepage was not noted.

Debris

Debris was observed at two distinct areas along the landfill surface. At the south end of the landfill cover, where the landfill lobe buts up against the pad for the communication billboards, there is a variety of scattered metal debris on the surface of the lobe and adjacent pad (Feature A). At the time of the 2010 investigation this debris was partially buried. It appears the debris may have been exposed by vehicle activity on the communication billboard pad. The debris has an acceptable severity rating. The second area at the northeast end of the landfill consists of an iron bar and a partially buried piece of sheet metal or a piece of a metal drum (Feature B). The feature, unchanged since 2010, has an acceptable severity rating.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this landfill.

Other Features of Note

Since the 2010 investigation there has been minor increases to Feature C, rutting caused by machinery and/or ATVs on the landfill side slopes and surface. The feature has an acceptable severity rating. Feature D, not previously observed consists of a roadway used by local traffic, which extends almost the entire length of the landfill. The roadway has removed the superficial

layer of gravel that covers the landfill in several areas, but does not appear to be affecting the stability of the lobe and has an acceptable severity rating.

In addition, an isolated area of ponded water was noted in 2010 along the southeast toe of the landfill has increased slightly in size. Evidence of erosion or staining was not observed within the ponded area. There are a few other areas of ponded water in the vicinity of the lobe; however, none of these areas come in contact with the landfill.

Table XXVI: Visual Inspection Checklist / Report – Communications North Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION - LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: Communications North Landfill (Existing Landfill – Regrade)
DATE OF INSPECTION: September 3, 2012
DATE OF PREVIOUS INSPECTION: August 25-26, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-ComN-)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not Observed	N/A
Debris Exposed	Yes	Feature A See Figure FOX-M.6	Various sizes		Unknown	Occasional	Miscellaneous metal debris	2, 3	Acceptable	Scattered metal debris on the landfill surface.
		Feature B See Figure FOX-M.6	0.1 - 0.2	0.5 - 0.2	0.02 - 0.05		Metal pipe and debris	20, 21	Acceptable	Exposed Iron pipe and partially buried metal debris.
Presence/Condition of Monitoring Instruments	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Other Features of Note:	Yes	Feature C See Figure FOX-M.6	2.0 - 5.0	0.2 - 0.5	0.1 - 0.2	Occasional	Vehicle rutting and tracks	6, 7, 17, 18	Acceptable	Rutting on the landfill side slopes and surface.
		Feature D See Figure FOX-M.6	150	10	0.1	Isolated	Road	8, 9, 12, 13, 24	Acceptable	New Observation: Road used by locals that passes over the landfill surface for 150 m.
		See Figure FOX-M.6	10	4	0.1	Isolated	Ponded water	5, 41, 44	Acceptable	Ponded water along the southeastern toe of the landfill, increased slightly in size from 2010. Several other areas of ponded water are located in the vicinity of the landfill, but nowhere else is the water in contact with the lobe.
Additional Photos	Yes	See Figure FOX-M.6 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

7.3 PRELIMINARY STABILITY ASSESSMENT

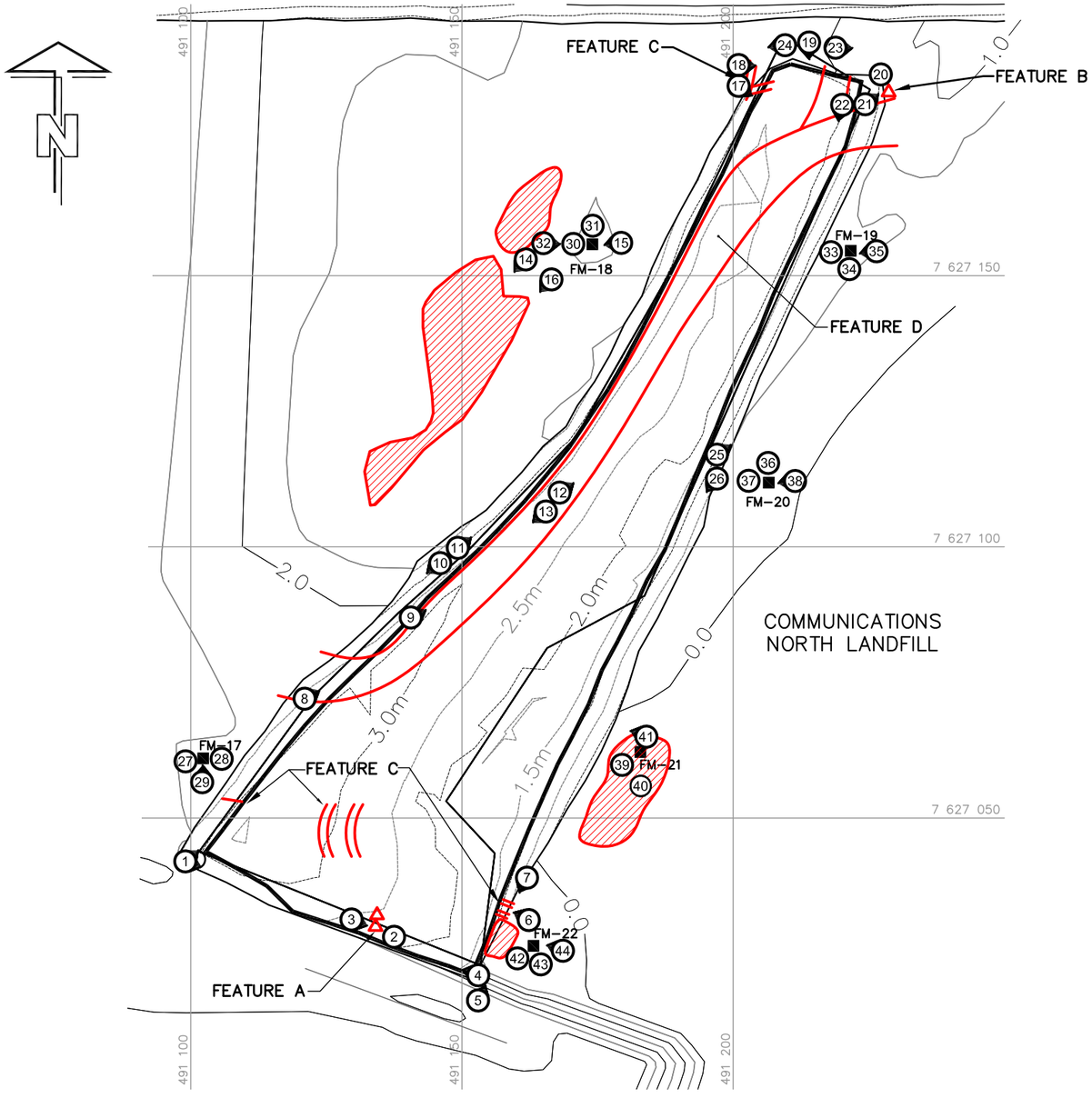
The Preliminary Stability Assessment for Communications North Landfill has been completed as per the TOR and is included as Table XXVII hereafter.

Table XXVII: Preliminary Stability Assessment – Communications North Landfill

Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Not observed	None
Frost Action	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Acceptable	Isolated (perimeter only)
Debris exposure	Acceptable	Occasional
Overall Landfill Performance	**Acceptable**	

7.4 LOCATION PLAN

The Location Plan for the Communications North Landfill has been completed as per the TOR and is included in Figure FOX-M.6.



LEGEND

- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- PONDED WATER
- VEHICLE TRACKS / RUTS (NTS)
- DEBRIS (NTS)

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

COMMUNICATIONS NORTH LANDFILL

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
Phone: (418) 653-4422 Fax.: (418) 653-3583

MEASUREMENT UNIT	SCALE:	DATE (month-year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY:	VERIFIED BY:	APPROVED BY:
P. LÉGARÉ	B. MACKAY	A. LECLAIR P.ENG
PROJECT NO:	DRAWING NO:	PAGE
CD2655_210_213	CD2655_210_213-FOX-M_F	PL

FIGURE FOX-M.6

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7.5 PHOTOGRAPHIC RECORDS

The Photographic Record for Communications North Landfill has been completed as per the TOR and is presented in the following pages as Table XXVIII. The Photographic Record contains only an index and “thumbnail” photographs. Full-size photographs are contained in the Addendum DVD-ROM.

Table XXVIII: Landfill Visual Inspection Photo Log – Communications North Landfill

Photo (2012-FM-ComN-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-ComN-1	1.600	Sept. 3, 2012	491099	7627042	Panoramic view northeast to east-southeast - of landfill surface, taken from south west corner of the landfill.
2		2012-FM-ComN-2	2.410	Sept. 3, 2012	491132	7627029	**Feature A:** Close-up - of partially buried metal debris at the southern end of the landfill.
3		2012-FM-ComN-3	2.420	Sept. 3, 2012	491135	7627029	**Feature A:** View east-southeast - of partially buried debris.
4		2012-FM-ComN-4	2.820	Sept. 3, 2012	491153	7627021	View west north west - of southern of extent of landfill, where the landfill meets the communications Billboard pad. Taken from the southeast corner of the landfill.
5		2012-FM-ComN-5	2.650	Sept. 3, 2012	491153	7627021	View north-northeast - of the eastern toe of the landfill, taken from the south east corner.
6		2012-FM-ComN-6	2.500	Sept. 3, 2012	491163	7627034	**Feature C:** View west-northwest - of rutting caused by ATVs on the eastern side slope of the landfill.
7		2012-FM-ComN-7	2.480	Sept. 3, 2012	491162	7627039	**Feature C:** View south-southwest - of rutting caused by ATVs along the eastern landfill toe.
8		2012-FM-ComN-8	2.510	Sept. 3, 2012	491121	7627072	**Feature D:** View northeast - of roadway on top of the landfill surface, taken from the southwestern exit of the road.
9		2012-FM-ComN-9	2.430	Sept. 3, 2012	491135	7627088	**Feature D:** View northeast - of roadway on top of the landfill surface
10		2012-FM-ComN-10	2.540	Sept. 3, 2012	491146	7627097	View - southwest of the landfill toe western landfill toe.
11		2012-FM-ComN-11	2.560	Sept. 3, 2012	491146	7627097	View northeast - of the western landfill toe.
12		2012-FM-ComN-12	2.520	Sept. 3, 2012	491168	7627110	**Feature D:** View northeast - of roadway on top of the landfill surface.
13		2012-FM-ComN-13	2.660	Sept. 3, 2012	491168	7627110	**Feature D:** View southwest - of roadway on landfill surface.
14		2012-FM-ComN-14	2.800	Sept. 3, 2012	491168	7627153	View southwest - of ponded water in depression west of landfill.
15		2012-FM-ComN-15	2.890	Sept. 3, 2012	491168	7627153	View west - of ponded water, from FM-18.
16		2012-FM-ComN-16	2.058	Sept. 3, 2013	491165	7627150	View south - of ponded water in depression west of landfill.
17		2012-FM-ComN-17	2.490	Sept. 3, 2012	491201	7627185	**Feature C:** View southeast - of area disturbed by vehicle traffic, including ATVs and heavy machinery.
18		2012-FM-ComN-18	2.640	Sept. 3, 2012	491201	7627185	**Feature C:** View east - of area disturbed by vehicle traffic, including ATVs and heavy machinery.
19		2012-FM-ComN-19	2.540	Sept. 3, 2012	491214	7627193	View south - of northern toe of landfill.
20		2012-FM-ComN-20	2.600	Sept. 3, 2012	491214	7627193	**Feature B:** Close-up - of metal debris at the north east corner of the landfill.
21		2012-FM-ComN-21	2.510	Sept. 3, 2012	491214	7627193	**Feature B:** View northeast - of scattered metal debris.
22		2012-FM-ComN-22	2.590	Sept. 3, 2012	491223	7627182	View south-southwest - of eastern landfill toe from the north west corner, north east exit of roadway is visible.

Photo (2012-FM-ComN-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
23		2012-FM-ComN-23	2.430	Sept. 3, 2012	491214	7627193	View east - of roadway which connects and passes through landfill.
24		2012-FM-ComN-24	2.470	Sept. 3, 2012	491214	7627193	**Feature D:** View west - of road entrance to landfill.
25		2012-FM-ComN-25	2.660	Sept. 3, 2012	491197	7627117	View northeast - of landfill toe from west of FM-20.
26		2012-FM-ComN-26	2.600	Sept. 3, 2012	491197	7627117	View southwest - of landfill toe from west of FM-20.
Soil Sampling							
27		2012-FM-ComN-27	2.460	Sept. 3, 2012	491103	7627063	**FM-17:** Open.
28		2012-FM-ComN-28	2.430	Sept. 3, 2012	491103	7627063	**FM-17:** Closed.
29		2012-FM-ComN-29	2.450	Sept. 3, 2012	491099	7627065	**FM-17:** View north - of sampling location.
30		2012-FM-ComN-30	2.460	Sept. 3, 2012	491168	7627153	**FM-18:** Open.
31		2012-FM-ComN-31	2.470	Sept. 3, 2012	491168	7627153	**FM-18:** Closed.
32		2012-FM-ComN-32	2.580	Sept. 3, 2012	491165	7627156	**FM-18:** View east - of sampling location.
33		2012-FM-ComN-33	2.430	Sept. 3, 2012	491218	7627151	**FM-19:** Open.
34		2012-FM-ComN-34	2.460	Sept. 3, 2012	491218	7627151	**FM-19:** Closed.
35		2012-FM-ComN-35	2.580	Sept. 3, 2012	491222	7627151	**FM-19:** View west - of sampling location.
36		2012-FM-ComN-36	2.460	Sept. 3, 2012	491205	7627114	**FM-20:** Open.
37		2012-FM-ComN-37	2.420	Sept. 3, 2012	491205	7627114	**FM-20:** Closed.
38		2012-FM-ComN-38	2.480	Sept. 3, 2012	491207	7627113	**FM-20:** View west - of sampling location.
39		2012-FM-ComN-39	2.500	Sept. 3, 2012	491184	7627063	**FM-21:** Open.
40		2012-FM-ComN-40	2.440	Sept. 3, 2012	491184	7627063	**FM-21:** Closed.
41		2012-FM-ComN-41	2.430	Sept. 3, 2012	491184	7627065	**FM-21:** View west-northwest - of sampling location.
42		2012-FM-ComN-42	2.390	Sept. 3, 2012	491165	7627024	**FM-22:** Open.
43		2012-FM-ComN-43	2.330	Sept. 3, 2012	491165	7627024	**FM-22:** Closed.
44		2012-FM-ComN-44	2.620	Sept. 3, 2012	491165	7627025	**FM-22:** View west-northwest - of sampling location.

7.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Communications North Landfill samples are presented in Tables XXIX and XXX respectively. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XXIX: Communications North Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-17-A	FM-17	0-15	4.8	18.9	2.7	<0.5	3.8	13	10.8	1.5	<0.5	<0.05	<10	<10	26	26
FM12-17-B		40-50	4.8	20.5	3.1	<0.5	4.0	13	12.1	2.0	<0.5	<0.05	<10	<10	26	26
FM12-18-A	FM-18	0-15	4.1	19.4	2.7	<0.5	5.2	13	10.5	1.7	<0.5	<0.05	<10	<10	40	40
FM12-18-A-D		0-15	4.2	20.6	2.8	<0.5	6.3	14	11.0	1.9	<0.5	<0.05	<10	<10	50	50
FM12-18-B		40-50	4.8	21.2	3.3	<0.5	9.8	16	12.1	2.0	<0.5	<0.05	<10	<10	49	49
Downgradient Samples																
FM12-19-A	FM-19	0-15	4.6	21.2	3.2	<0.5	4.9	13	11.6	2.2	<0.5	<0.05	<10	<10	14	14
FM12-19-B		40-50	4.6	22.5	3.0	<0.5	3.8	12	11.2	2.0	<0.5	<0.05	<10	<10	<10	<10
FM12-20-A	FM-20	0-15	6.2	22.4	4.8	<0.5	5.6	18	15.4	1.6	<0.5	<0.05	20	<10	<10	20
FM12-20-B		40-50	8.5	26.6	5.3	<0.5	11.7	27	18.8	2.4	<0.5	<0.05	<10	<10	<10	<10
FM12-21-A	FM-21	0-15	6.2	27.6	4.3	<0.5	5.7	19	18.2	1.4	<0.5	<0.05	<10	<10	12	12
FM12-21-B		40-50	6.5	28.1	4.6	<0.5	5.5	27	19.3	1.0	<0.5	<0.05	<10	<10	10	10
FM12-22-A	FM-22	0-15	5.2	21.5	3.3	<0.5	4.0	16	16.2	1.3	<0.5	<0.05	<10	<10	<10	<10
FM12-22-B		40-50	3.3	20.3	2.8	<0.5	2.7	13	11.4	0.8	<0.5	<0.05	<10	<10	<10	<10

Table XXX: Evaluation of 2012 Soil Analytical Data – Communications North Landfill

Parameter	2012
Copper	Copper concentrations ranged from 3.3 to 8.5 mg/kg with a mean concentration of 5.2 mg/kg. The highest concentration was detected in the depth sample of the FM-20 sampling site.
Nickel	Nickel concentrations ranged from 18.9 to 28.1 mg/kg with a mean concentration of 22.4 mg/kg. The highest concentration was observed in the depth sample of the FM-21 sampling site.
Cobalt	Cobalt concentrations ranged from 2.7 to 5.3 mg/kg with a mean concentration of 3.5 mg/kg. The highest concentration was observed in the depth sample of the FM-20 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 2.7 to 11.7 mg/kg with a mean concentration of 5.6 mg/kg. The highest concentration was observed in the depth sample of the FM-20 sampling site.
Zinc	Zinc concentrations ranged from 12 to 27 mg/kg with a mean concentration of 16.5 mg/kg. The highest concentration was observed at two locations, the depth samples of sampling sites FM-20 and FM-21
Chromium	Chromium concentrations ranged from 10.5 to 19.3 mg/kg with a mean concentration of 13.7 mg/kg. The highest concentration was observed in the depth sample of the FM-21 sampling site.
Arsenic	Arsenic concentrations ranged from 0.8 to 2.4 mg/kg with a mean concentration of 1.7 mg/kg. The highest concentration was observed in the depth sample of the FM-20 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 50 mg/kg, with a mean detected concentration of 27.4 mg/kg. The highest concentration was detected in the surface sample of the FM-19 sample site. TPH was not detected at the depth samples of FM-19 and FM-20 as well as both samples from FM-22.

8 COMMUNICATIONS NORTHWEST LANDFILL

8.1 SUMMARY

During the 2012 monitoring event of the Communications Northwest Landfill at FOX-M Hall Beach soil samples were collected at 4 locations (1 upgradient and 3 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobes.

PCBs were detected at one location at the Communication Northwest Landfill. A below criteria concentration of 0.11 mg/kg was detected at surface at the FM-14 sample location. Relatively high metal concentrations were not detected in any of the soil samples at the Communications Landfill. TPH was detected at surface and depth at all soil sample locations. TPH concentrations ranged from 14 to 223 mg/kg with the highest concentration detected at the surface of FM-16. Detected TPH was composed primarily of the F3 fraction.

No significant or unacceptable erosional features were observed at the Communications Northwest Landfill during the 2012 visual inspection. As with the 2010 investigation, rutting caused by ATV traffic remains the only source of disturbance/erosion at the Communications Northwest Landfill. As of 2012 the ATV rutting has an acceptable severity rating.

The overall performance rating of the Communications Northwest Landfill is acceptable.

8.2 VISUAL INSPECTION REPORT

The visual inspection of the Communications Northwest Landfill was conducted on September 3, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XXXI of this report. Please refer to Figure FOX-M.7 for the locations of photographs and erosional features at the Communications Northwest Landfill.

Weather Conditions at Time of Inspection

At the time of the inspection skies were clear, temperature was 4°C and wind was 26 km/h with gusts of 57 km/h.

Settlement

Evidence of settlement was not noted.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Evidence of vegetation was not noted.

Staining

Evidence of staining was not noted on the landfill.

Seepage Points

Evidence of seepage was not noted.

Debris

Evidence of surface debris was not noted on the landfill.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this landfill.

Other Features of Note

Several vehicle tracks/ruts were observed on the northeast, southeast and southwest sides of the landfill as well as the landfill surface (Feature A). The vehicle tracks/ruts extended between 0.1 to 0.25 m in depth. An increase in rutting and tracks caused by ATVs was observed during the 2012 investigation. Despite its extent Feature A remains of little consequence to the stability of the landfill and has an acceptable severity rating.

Table XXXI: Visual Inspection Checklist / Report – Communications Northwest Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: Communications Northwest Landfill (Existing Landfill – Regrade)
DATE OF INSPECTION: September 3, 2012
DATE OF PREVIOUS INSPECTION: August 25, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent (m)	Description	Photographic Record (2012-FM-ComNW-)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Staining	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Presence/Condition of Monitoring	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Features of Note:	Yes	FEATURE A See Figure FOX-M.7	4.0 - 50	0.2 - 0.3	0.05 - 0.25	Occasional	Vehicle tracks/ruts	3, 4, 6, 8, 9, 10	Acceptable	ATV tracks and rutting on the landfill surface and side slopes.
Additional Photos	Yes	See Figure FOX-M.7 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

8.3 PRELIMINARY STABILITY ASSESSMENT

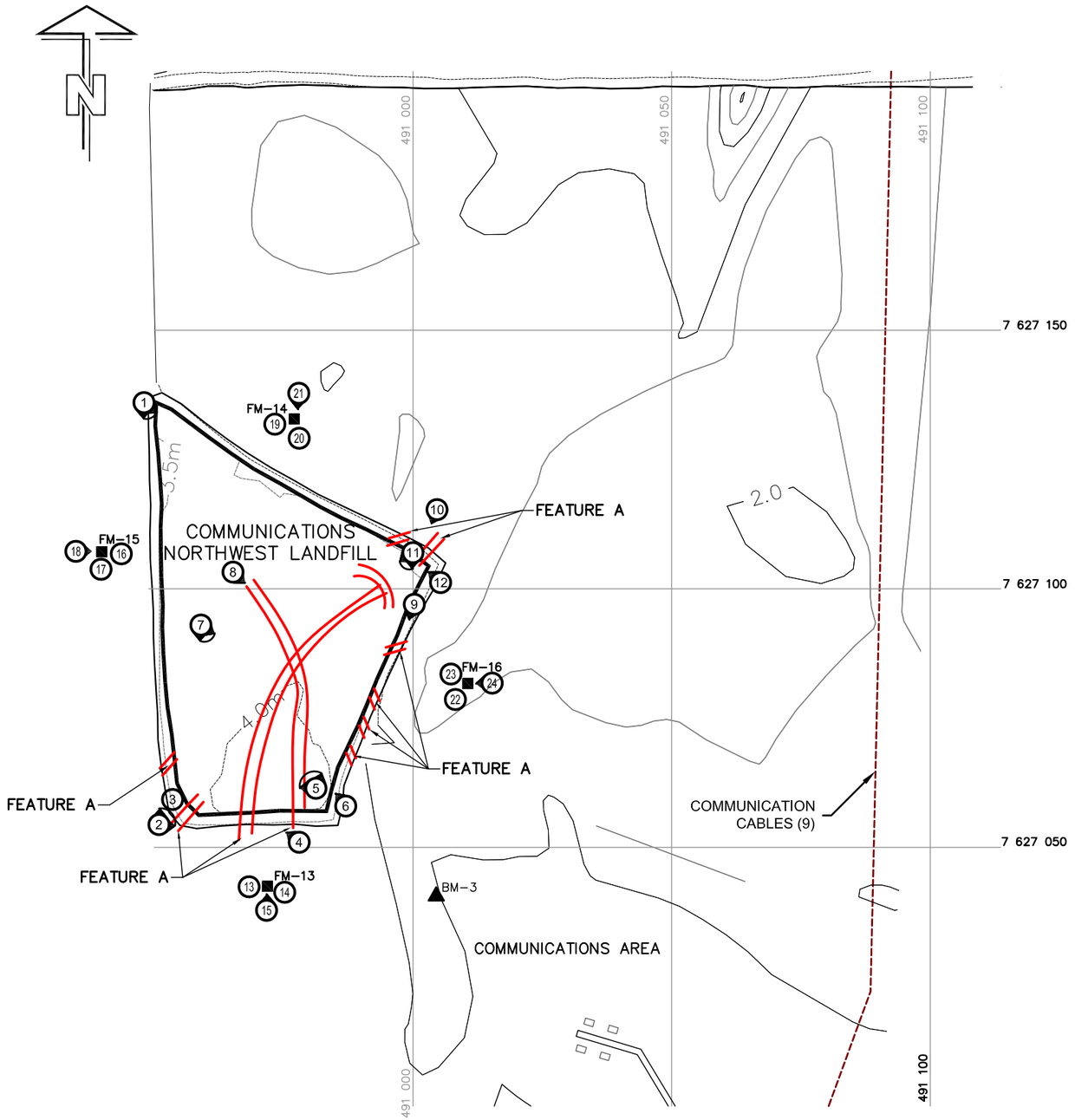
The Preliminary Stability Assessment for Communications Northwest Landfill has been completed as per the TOR and is included as Table XXXII hereafter.

Table XXXII: Preliminary Stability Assessment – Communications Northwest Landfill

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

8.4 LOCATION PLAN

The Location Plan for the Communications Northwest Landfill has been completed as per the TOR and is included in Figure FOX-M.7



LEGEND

- PERMANENT BENCHMARK
- SOIL SAMPLING LOCATION
- 21 PHOTOGRAPH VIEWPOINT LOCATION
- PONDED WATER
- VEHICLE TRACKS / RUTS (NTS)

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13–04–22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
FOX-M, HALL BEACH, NUNAVUT

COMMUNICATIONS NORTHWEST LANDFILL

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
Phone: (418) 653-4422 Fax.: (418) 653-3583

MEASUREMENT UNIT	SCALE:	DATE (month–year):
Metre	1 : 1,000	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_G	PAGE PL

FIGURE FOX-M.7

8.5 PHOTOGRAPHIC RECORDS

The Photographic Record for Communications Northwest Landfill has been completed as per the TOR and is presented in the following page as Table XXXIII. The Photographic Record contains only an index and “thumbnail” photographs. Full-size photographs are contained in the Addendum DVD-ROM.

Table XXXIII: Landfill Visual Inspection Photo Log – Communications Northwest Landfill

Photo (2012-FM-ComNW-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-ComNW-1	1.2	Sept. 3, 2012	490948	7627136	Panoramic view southeast to south - of northern landfill surface, taken from the north west corner.
2		2012-FM-ComNW-2	1.67	Sept. 3, 2012	490953	7627056	Panoramic view north to east - of southern landfill surface, taken from the south west corner.
3		2012-FM-ComNW-3	2.45	Sept. 3, 2012	490953	7627058	**Feature A:** Close up - of rutting on the western side of the landfill caused by ATV traffic.
4		2012-FM-ComNW-4	2.76	Sept. 3, 2012	490978	7627051	**Feature A:** View north to west - of rutting caused by ATV traffic along the southern landfill toe.
5		2012-FM-ComNW-5	9.19	Sept. 3, 2012	490980	7627060	Panoramic view west to north-northeast - of southern landfill surface taken from the south east landfill corner.
6		2012-FM-ComNW-6	2.63	Sept. 3, 2012	490967	7627058	**Feature A:** View north-northwest - of rutting caused by ATV traffic on the eastern landfill toe.
7		2012-FM-ComNW-7	1.33	Sept. 3, 2012	490959	7627093	Panoramic view southeast to south - of middle landfill surface, slight disturbances caused by ATV traffic.
8		2012-FM-ComNW-8	2.37	Sept. 3, 2012	490965	7627107	**Feature A:** View southeast - of rutting caused by ATV traffic at the landfill centre.
9		2012-FM-ComNW-9	2.5	Sept. 3, 2012	491001	7627102	**Feature A:** View south-southwest - of rutting caused by ATVs on the eastern side of the landfill.
10		2012-FM-ComNW-10	2.41	Sept. 3, 2012	491005	7627115	**Feature A:** View south-southwest - of rutting caused by ATVs on the northern side of the landfill adjacent to the north east corner.
11		2012-FM-ComNW-11	18.162	Sept. 3, 2012	491000	7627107	Panoramic view south-southwest to north west - of the landfill surface, taken from the northeast landfill corner.
12		2012-FM-ComNW-12	2.5	Sept. 3, 2012	491005	7627101	View north west - of the northern landfill toe, taken from the northeast corner.
Soil Sampling							
13		2012-FM-ComNW-13-A	2.41	Sept. 3, 2012	90970	7627042	**FM-13:** Open.
14		2012-FM-ComNW-14	2.41	Sept. 3, 2012	90970	7627042	**FM-13:** Closed.
15		2012-FM-ComNW-15	2.83	Sept. 3, 2012	490970	7627042	**FM-13:** View north - of sampling location.
16		2012-FM-ComNW-16	2.29	Sept. 3, 2012	490944	7627107	**FM-15:** Open.
17		2012-FM-ComNW-17	2.31	Sept. 3, 2012	490944	7627107	**FM-15:** Closed.
18		2012-FM-ComNW-18	2.49	Sept. 3, 2012	490935	7627107	**FM-15:** View east - of sampling location.
19		2012-FM-ComNW-19	2.37	Sept. 3, 2012	490978	7627134	**FM-14:** Open.
20		2012-FM-ComNW-20	2.34	Sept. 3, 2012	490978	7627134	**FM-14:** Closed.
21		2012-FM-ComNW-21	2.45	Sept. 3, 2012	490979	7627138	**FM-14:** View south - of sampling location.
22		2012-FM-ComNW-22	2.37	Sept. 3, 2012	491016	7627090	**FM-16:** Open.
23		2012-FM-ComNW-23	2.36	Sept. 3, 2012	491016	7627090	**FM-16:** Closed.
24		2012-FM-ComNW-24	2.48	Sept. 3, 2012	491021	7627088	**FM-16:** View west - of sampling location.

8.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Communications Northwest Landfill samples are presented in Tables XXXIV and XXXV respectively. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XXXIV: Communications Northwest Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-13-A	FM-13	0-15	5.3	21.4	2.9	<0.5	7.0	15	10.4	2.5	<0.5	<0.05	<10	<10	17	17
FM12-13-A-D			6.3	23.1	3.5	<0.5	8.6	20	13.5	2.8	<0.5	<0.05	<10	<10	20	20
FM12-13-B		40-50	4.5	21.3	2.8	<0.5	3.1	11	10.1	1.7	<0.5	<0.05	<10	<10	14	14
Downgradient Samples																
FM12-14-A	FM-14	0-15	10.0	17.1	2.5	<0.5	7.7	14	10.2	2.7	<0.5	0.11	<10	<10	46	46
FM12-14-B		40-50	7.5	21.6	3.2	<0.5	4.7	13	13.0	1.9	<0.5	<0.05	<10	<10	90	90
FM12-15-A	FM-15	0-15	6.1	19.3	2.9	<0.5	4.3	16	14.6	1.6	<0.5	<0.05	<10	17	163	163
FM12-15-B		40-50	6.9	20.2	3.3	<0.5	5.2	19	17.7	1.9	<0.5	<0.05	<10	<10	101	101
FM12-16-A	FM-16	0-15	9.4	23.9	4.1	<0.5	13.4	21	17.3	3.3	<0.5	<0.05	<10	42	181	223
FM12-16-B		40-50	5.9	20.5	2.9	<0.5	9.7	14	12.2	1.9	<0.5	<0.05	<10	<10	106	106

Table XXXV: Evaluation of 2012 Soil Analytical Data – Communications Northwest Landfill

Parameter	2012
Copper	Copper concentrations ranged from 4.5 to 10.0 mg/kg with a mean concentration of 6.9 mg/kg. The highest concentration was detected in the surface sample of the FM-14 sampling site.
Nickel	Nickel concentrations ranged from 17.1 to 23.9 mg/kg with a mean concentration of 20.9 mg/kg. The highest concentration was observed in the surface sample of the FM-16 sampling site.
Cobalt	Cobalt concentrations ranged from 2.5 to 4.1 mg/kg with a mean concentration of 3.1 mg/kg. The highest concentration was observed in the surface sample of the FM-16 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 3.1 to 13.4 mg/kg with a mean concentration of 7.1 mg/kg. The highest concentration was observed in the surface sample of the FM-16 sampling site.
Zinc	Zinc concentrations ranged from 11 to 21 mg/kg with a mean concentration of 15.9 mg/kg. The highest concentration was observed in the surface sample of the FM-16 sampling site.
Chromium	Chromium concentrations ranged from 10.1 to 17.7 mg/kg with a mean concentration of 13.2 mg/kg. The highest concentration was observed in the depth sample of the FM-15 sampling site.
Arsenic	Arsenic concentrations ranged from 1.6 to 3.3 mg/kg with a mean concentration of 2.3 mg/kg. The highest concentration was observed in the surface sample of the FM-16 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	PCBs were detected in the surface sample of one sampling location; FM-14 at a concentration of 0.11 mg/kg.
TPH	TPH concentration ranged from 14 to 223 mg/kg, with a mean concentration of 86.7 mg/kg. The highest concentration was detected in the surface sample of the FM-16 sample site.

9 TIER II DISPOSAL FACILITY

9.1 SUMMARY

During the 2012 monitoring event of the Tier II Disposal Facility at FOX-M Hall Beach, soil and groundwater samples were collected at 5 locations (1 upgradient and 4 downgradient), a visual inspection was conducted to identify and assess erosional features on the facility and thermal monitoring data was downloaded from 5 datalogger and manual readings were completed and recorded.

PCBs or relatively high metal concentrations were not detected at any of the soil sampling locations. TPH was detected at all sampling locations and in all samples with the exception of the depth sample at MW-1. Detectable TPH concentrations ranged from 11 to 252 mg/kg with the highest concentration detected at the surface of the MW-3. All detected TPH was primarily in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg.

PCBs were not detected in any of the groundwater samples. No relatively high metal concentrations were detected in the Tier II groundwater samples. Very low concentrations (0.1 mg/L) of TPH were detected at one monitoring well MW-1 (upgradient). As TPH were detected at the upgradient well, it does not appear to be reflection of the performance of the Tier II facility. MW-3 provided sufficient water only for metal analyses.

There are currently no significant or unacceptable features at the Tier II facility. Since the 2010 investigation significant increases in ATV traffic were observed at the Tier II facility, however these features are not affecting the overall stability of the landfill cover and have an acceptable severity rating. A few other minor erosional features were observed and are discussed in more detail below.

Thermal monitoring equipment is functioning properly, although two dataloggers experienced and error caused by a power outage on September 16, 2011. The error was potentially caused by improper battery replacement procedures as it is assumed the batteries were changed since 2010. In spite of the errors the thermistor are functioning properly.

Based on the results of the soil and groundwater results as well as the visual inspection the Tier II Disposal facility has an acceptable overall performance rating.

9.2 VISUAL INSPECTION REPORT

The visual inspection of the Tier II Disposal Facility was conducted on September 4, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XXXVI of this report. Please refer to Figure FOX-M.8 for the locations of photographs and erosional feature at the Tier II Disposal Facility.

Weather Conditions at Time of Inspection

At the time of the inspection of skies were overcast with light rain, temperature was 6°C and wind was 23 km/h with gusts of 35 km/h.

Settlement

Evidence of minor settlement was noted at one location on the east side of the facility (Feature A). Feature A consisted of a subtle surface depression 1 m west of the landfill crest just north of VT-03 along the east side of the facility. The feature has an acceptable severity rating although it increased in size from the 2010 investigation.

Erosion

A minor erosion channel was observed for the first time during the 2012 investigation (Feature E). The erosional channel appears to drain the area around VT-03, extending from the surface of the lobe to just below the eastern crest. The channel is self-armouring and has an acceptable severity rating.

Frost Action

Evidence of frost action was not observed.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Indications of vegetation were not noted.

Staining

Iron staining (Feature G) was observed along the Southeastern toe of the landfill, the staining is associated with an area of ponded water. The area between the Tier II and the East Beach landfill is low lying and has several areas of ponded water, the iron staining is assumed to be a natural feature of the area. Feature G has an acceptable severity rating.

Seepage Points

Indications of seepage were not noted.

Debris

Scattered debris was noted at two locations. The first location consisted of a piece of geotextile and a piece of metal debris; both were removed from the landfill surface. The second area consisted of three pieces of metal debris on the northwest side of the landfill. Feature B has an acceptable severity rating

Presence/Condition of Monitoring Instruments

All monitoring well and thermistor installations were found to be in good condition at the facility.

Other Features of Note

Rutting and tracks from ATV tracks are prevalent on the landfill surface and side slopes. Based on details from the 2010 monitoring report, tracks and rutting have increased significantly. Features C and D remain at relatively the same size as 2010, while Feature F has been used to denote new ATV related features for the 2012. Feature F includes extensive rutting on the SW side slope of the landfill, a “doughnut” on the landfill surface N of VT-01 and at VT-05 and long singular features in excess of 100 m on the western landfill surface and southeastern side slope. Although extensive covering approximately 3% of the landfill surface, the ruts are minor rarely exceeding 0.15 m in depth and have an acceptable severity rating.

Areas of continuous and discontinuous areas of ponded water were present along the south, southeast and northeast sides of the facility. Ponded areas along the south side of the facility were associated with active surface runoff and drainage channel extending from the area to the northwest of the access road, whereas ponding along the northeast side appeared to be localized.

Table XXXVI: Visual Inspection Checklist / Report – Tier II Disposal Facility

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: Tier II Disposal Facility (New Landfill)
DATE OF INSPECTION: September 4, 2012
DATE OF PREVIOUS INSPECTION: August 26, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-TierII-)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE A See Figure FOX-M.8	2	1	0.2	Isolated	Minor depression	3, 4	Acceptable	Minor depression 1 m west from crest, increased in size since 2010.
Erosion	Yes	FEATURE E See Figure FOX-M.8	5	0.4 - 3	0.05 - 0.1	Isolated	Minor erosion	5, 6	Acceptable	New Observation: Minor erosion channel 1 m south of Feature A. Drains area around VT-03, self armouring.
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Staining	Yes	FEATURE G See Figure FOX-M.8	15	1.75	N/A	Isolated	Rust coloured staining	42, 43	Acceptable	New Observation: Rust coloured staining associated with ponded water along the SE toe of the landfill.
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	Yes	FEATURE B See Figure FOX-M.8	0.1 - 0.2	0.1 - 0.2	0.02	Isolated	Metal debris	25, 26, 33, 34	Not Observed	Three pieces of metal debris on the surface of the landfill, geotextile and metal were removed from other location.
Presence/Condition of Monitoring Instruments	Yes	N/A	N/A	N/A	N/A	N/A	N/A	9, 28, 29, 38, 46	Acceptable	Apart from flaking paint on the cover of some thermistors and monitoring wells, all monitoring equipment was in acceptable condition.
Other Features of Note:	Yes	FEATURE C See Figure FOX-M.8	10 - 25	0.2 - 0.4	0.1 - 0.2	Occasional	ATV ruts and tracks on the landfill surface	7 - 9, 12, 15	Acceptable	Minor rutting from ATV traffic on the landfill surface (2010).
		FEATURE D See Figure FOX-M.8	4 - 20	0.2 - 0.4	0.1 -0.25		ATV ruts and tracks on the landfill surface NS side slopes	16, 28		Minor rutting from ATV traffic on the landfill surface and side slopes (2010).
		FEATURE F See Figure FOX-M.8	5 - 150	0.2 - 0.5	0.1 - 0.25		ATV ruts and tracks on the landfill surface NS side slopes	10, 11, 17, 19, 20		New Observation: Minor rutting observed in 2012 caused by ATV traffic on the landfill surface and side slopes.
		FEATURE H See Figure FOX-M.8	8 - 200 m	2 - 20 m	Unknown		Ponded water	24, 36, 38, 40, 41, 42, 43		Ponded water in low lying areas around the perimeter of the landfill. Water remains within the vicinity of MW-2, MW-4 and MW-5, new areas of ponded water were observed along the south east toe of the landfill.
Additional Photos	Yes	See Figure FOX-M.8 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

9.3 PRELIMINARY STABILITY ASSESSMENT

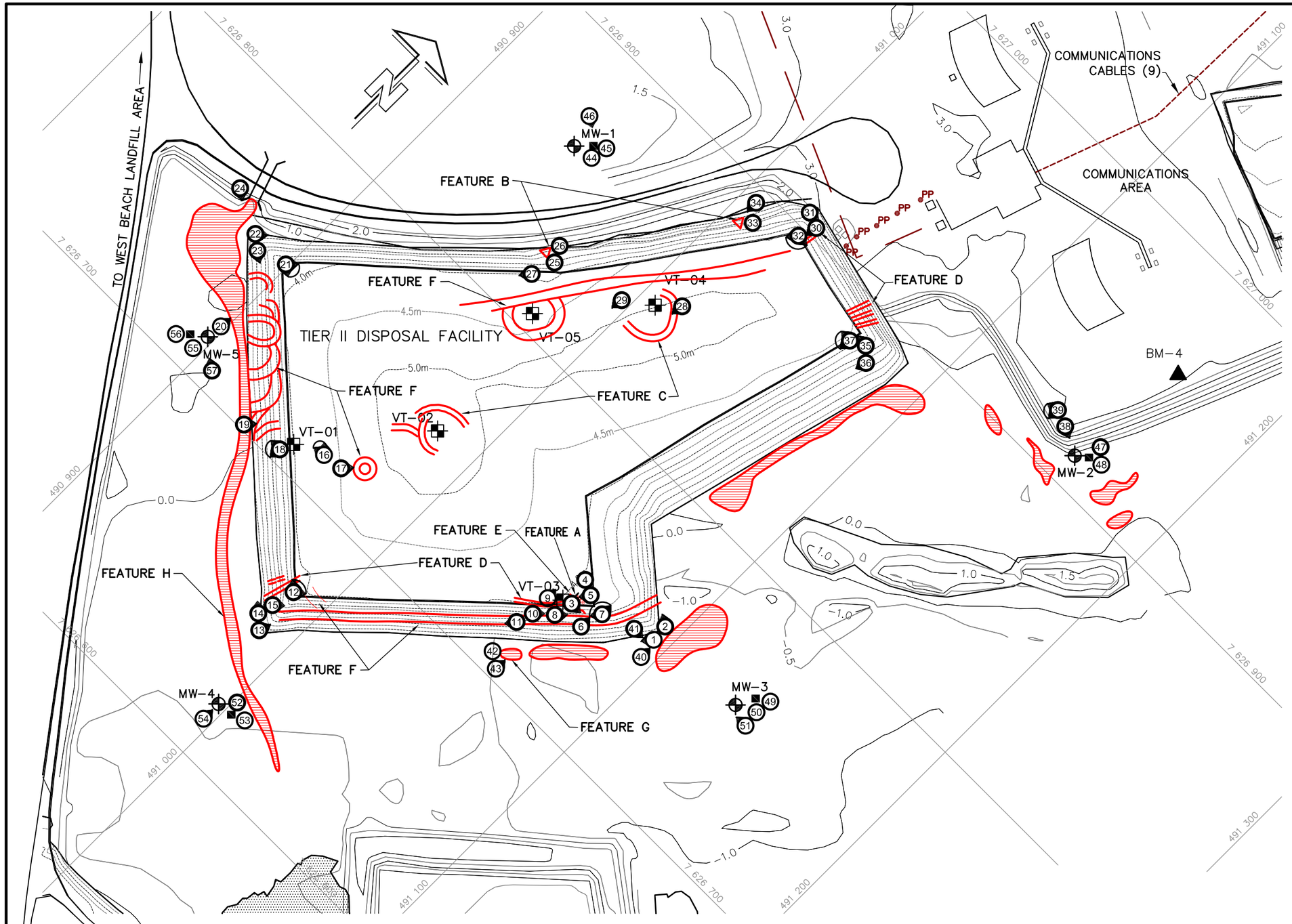
The Preliminary Stability Assessment for Tier II Disposal Facility has been completed as per the TOR and is included as Table XXXVII hereafter.

Table XXXVII: Preliminary Stability Assessment – Tier II Disposal Facility

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Acceptable	Isolated
Frost Action	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Acceptable	Occasional (perimeter only)
Debris exposure	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

9.4 LOCATION PLAN

The Location Plan for the Tier II Disposal Facility has been completed as per the TOR and is included in Figure FOX-M.8.



LEGEND

- PERMANENT BENCHMARK
- SOIL SAMPLING LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- EROSION (NTS)
- PONDED WATER
- SETTLEMENT (NTS)
- VEHICLE TRACKS / RUTS (NTS)
- DEBRIS (NTS)

0 15m 30m 45m 60m 75m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13-04-22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

TIER II DISPOSAL FACILITY

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
Phone: (418) 653-4422 Fax.: (418) 653-3583

MEASUREMENT UNIT	SCALE:	DATE (month-year):
Metre	1 : 1,500	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_H	PAGE PL

FIGURE FOX-M.8

9.5 THERMAL MONITORING DATA

An error was observed at VT-2 and 4 indicated as a “Power interruption that occurred at 09/16/11 the clock may have been frozen at that time” An anomaly is present in the data on this date. It is unknown when the batteries for the thermistors were changed last, the provided information indicates a date in August of 2007, however given the lifetime of the batteries and the fact they were not changed as part of the 2012 monitoring program it is suspected the batteries were replaced (and the data downloaded) by a third party sometime in 2011. It is possible that the power interruption occurred during the changing of batteries if both batteries were disconnected at the same time.

Apart from the above discussed error, all thermistors at the Tier II Disposal Facility were inspected and found to be in good condition with no significant concerns identified. Data from all thermistors was successfully retrieved and all analogues/thermocouples were observed to be functioning properly at the time of inspection. Further review of the downloaded data identified no anomalous temperature readings from any of the thermistor sensors. All clocks exhibited slight drift and were synchronized using the Prolog software.

Manual resistive and temperature data readings were collected from the thermistor strings as per the TOR. Manual readings and inspection results for each thermistor are presented on the Thermistor Annual Maintenance Reports included in section 9.6. A complete datalogger RAW data set for 2011-2012 period has been forwarded to DCC as per the TOR and is available in the DVD provided with the reports.

9.6 THERMISTOR ANNUAL MAINTENANCE REPORTS

The thermistor annual maintenance reports for VT-1 to VT-5 are presented in this section.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-1	Inclination: Vertical			
Install Date:	08/23/2007	First Date Event: August 17, 2011		Last Date Event: September 2, 2012	
Coordinates and Elevation	N 7626709	E	490947.00	Elev	0.00
Length of Cable (m)	9.23	Cable Lead Above Ground (m)	4.2	Nodal Points	11
Datalogger Serial #	7050014			Cable Serial Number	TS07050014 B-9.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux	13.14

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	11.421	7.1633	9	20.060	-3.9329
2	12.583	5.1994	10	20.790	-4.6118
3	14.520	2.3402	11	21.580	-5.3172
4	15.926	0.5212			
5	16.866	-0.6203			
6	17.698	-1.5303			
7	18.509	-2.3938			
8	19.392	-3.2869			

Observations and Proposed Maintenance

Clock was 31 mins and 21 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-2	Inclination: Vertical			
Install Date:	08/23/2007	First Date Event: August 16, 2011		Last Date Event: September 2, 2012	
Coordinates and Elevation	N 7626747	E	490982.00	Elev	0.00
Length of Cable (m)	7.32	Cable Lead Above Ground (m)	4.32	Nodal Points	7
Datalogger Serial #	7060009			Cable Serial Number	TS07060009 B-7.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux	13.39

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	13.131	4.3428
2	14.585	2.2519
3	16.385	-0.0339
4	17.495	-1.3073
5	18.581	-2.4684
6	20.080	-3.9519
7	21.040	-4.8383

Bead	ohms	Degrees C

Observations and Proposed Maintenance

Error: power interruption between 09/16/11 clock may have frozen at that time

Clock was 1 hour, 7 mins and 39 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-3	Inclination: Vertical			
Install Date:	08/23/2007	First Date Event: August 16, 2011		Last Date Event: September 2, 2012	
Coordinates and Elevation	N	7626738	E	491057.00	Elev 0.00
Length of Cable (m)	9.21	Cable Lead Above Ground (m)	4.2	Nodal Points	11
Datalogger Serial #	6030090			Cable Serial Number	TS06030090 B-9.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux 13.14	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	13.182	4.2651	9	21.100	-4.8922
2	14.410	2.4908	10	21.860	-5.5603
3	16.084	0.3281	11	22.380	-6.0027
4	17.120	-0.8875			
5	18.073	-1.9350			
6	18.872	-2.7666			
7	19.656	-3.5451			
8	20.250	-4.1122			

Observations and Proposed Maintenance

Clock was 51 mins and 14 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	Tier II Disposal Facility				
Thermistor Number:	VT-4	Inclination: Vertical					
Install Date:	08/23/2007	First Date Event: August 16, 2011				Last Date Event: September 1, 2012	
Coordinates and Elevation	N	7626841	E	491005.00		Elev	0.00
Length of Cable (m)	7.32	Cable Lead Above Ground (m)	4.32	Nodal Points			7
Datalogger Serial #	706060020			Cable Serial Number			TS07060020

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux 13.38	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	13.669	3.5401
2	14.058	2.9815
3	15.877	0.5815
4	16.892	-0.6272
5	18.057	-1.9179
6	18.980	-2.8760
7	19.870	-3.7516

Bead	ohms	Degrees C

Observations and Proposed Maintenance

Error: power interruption between 09/16/11 clock may have frozen at that time
Clock was 48 mins and 48 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-5	Inclination: Vertical			
Install Date:	08/23/2007	First Date Event: August 16, 2011		Last Date Event:	September 2, 2012
Coordinates and Elevation	N 7626809	E	490979.00	Elev	0.00
Length of Cable (m)	7.33	Cable Lead Above Ground (m)	4.33	Nodal Points	7
Datalogger Serial #	7060023			Cable Serial Number	TS07060023 B-7.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	Paint is flaking
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux	13.14

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	13.490	3.8032
2	14.312	2.6261
3	16.243	0.1359
4	17.250	-1.0342
5	18.593	-2.4808
6	19.457	-3.3509
7	20.160	-4.0275

Bead	ohms	Degrees C

Observations and Proposed Maintenance

Clock was 50 mins and 0 second slow. Corrected with Prolog software.

9.7 PHOTOGRAPHIC RECORDS

The Photographic Record for Tier II Disposal Facility has been completed as per the TOR and is included in the following pages as Table XXXVIII. The Photographic Record contains only an index and “thumbnail” photographs. Full-size photographs are contained in the Addendum DVD-ROM.

Table XXXVIII: Landfill Visual Inspection Photo Log – Tier II Disposal Facility

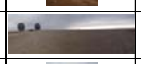
Photo (2012-FM-Tier-II-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-Tier-II-1	2.700	Sept. 4, 2012	491094	7626753	View southwest - of the southeast landfill toe and side slope.
2		2012-FM-Tier-II-2	2.450	Sept. 4, 2012	491094	7626753	View northwest - of the landfill toe and side slope, taken from the east corner of the landfill.
3		2012-FM-Tier-II-3	2.550	Sept. 4, 2012	491063	7626741	**Feature A:** View east - of an area of settlement on the landfill surface at the east corner of the facility, taken from VT-03.
4		2012-FM-Tier-II-4	2.390	Sept. 4, 2012	491063	7626741	**Feature A**: Close-up - of an area of settlement on the landfill surface at the east corner of the facility.
5		2012-FM-Tier-II-5	2.530	Sept. 4, 2012	491065	7626746	**Feature E:** View southwest - of minor erosion channel extending from the surface of the landfill to the side slope.
6		2012-FM-Tier-II-6	2.450	Sept. 4, 2012	491069	7626743	**Feature E:** View northeast - of minor erosion channel extending from the surface of the landfill to the side slope.
7		2012-FM-Tier-II-7	5.360	Sept. 4, 2012	491073	7626746	Panoramic view southwest to north - of the landfill surface, taken from the east corner. ATV tire tracks (**Feature D**) are visible at various locations on the landfill surface.
8		2012-FM-Tier-II-8	2.410	Sept. 4, 2012	491061	7626739	**Feature D:** View northeast - of rutting caused by ATV traffic in proximity to VT-03.
9		2012-FM-Tier-II-9	2.780	Sept. 4, 2012	491061	7626739	**Feature D:** View north - of rutting caused by ATV traffic in proximity to VT-03.
10		2012-FM-Tier-II-10	2.500	Sept. 4, 2012	491058	7626730	**Feature F:** View northeast - of ATV rutting running the length of the south east side slope.
11		2012-FM-Tier-II-11	2.500	Sept. 4, 2012	491058	7626730	**Feature F:** View southwest - of ATV rutting running the length of the south east side slope.
12		2012-FM-Tier-II-12	7.170	Sept. 4, 2012	490987	7626671	Panoramic view northwest to northeast - of the landfill surface, taken from the south corner. ATV tire tracks (**Feature D**) are visible at various locations on the landfill surface.
13		2012-FM-Tier-II-13	2.570	Sept. 4, 2012	490988	7626652	View northeast - of southeast side slope and toe, taken from the south corner.
14		2012-FM-Tier-II-14	2.650	Sept. 4, 2012	490988	7626652	View northwest - of southwest side slope and toe, taken from the south corner.
15		2012-FM-Tier-II-15	2.840	Sept. 4, 2012	490975	7626660	**Feature D**: View northeast - of ATV rutting on the southeast side slope.
16		2012-FM-Tier-II-16	8.360	Sept. 4, 2012	490959	7626715	Panoramic view northwest to north - of the landfill surface, taken north of VT-01. ATV tire tracks (**Feature C**) are visible at various locations on the landfill surface.
17		2012-FM-Tier-II-17	2.530	Sept. 4, 2012	490967	7626716	**Feature F**: View northeast - of a "Doughnut" Style of ATV rutting on the south east landfill surface.
18		2012-FM-Tier-II-18	7.830	Sept. 4, 2012	490948	7626707	Panoramic view southwest to northwest - of the southwest side slope and surrounding tundra, taken from VT-01.
19		2012-FM-Tier-II-19	2.540	Sept. 4, 2012	490930	7626702	**Feature F:** View northeast - of ATV rutting on the southwest landfill side slope. VT-01 is visible in the background, taken 5 m from the toe.
20		2012-FM-Tier-II-20	2.600	Sept. 4, 2012	490900	7626712	**Feature F:** View north - of ATV rutting on the SW side slope, taken from MW-5
21		2012-FM-Tier-II-21	7.150	Sept. 4, 2012	490899	7626755	Panoramic view northeast to southeast - of the landfill surface from the west corner.
22		2012-FM-Tier-II-22	2.650	Sept. 4, 2012	490883	7626755	View northeast - of northwest side slope, taken from the bottom west corner.
23		2012-FM-Tier-II-23	2.830	Sept. 4, 2012	490883	7626755	View southeast - of southwest side slope, taken from the bottom west corner.
24		2012-FM-Tier-II-24	2.690	Sept. 4, 2012	490867	7626763	View southeast - of ponded water along the southwest toe of the landfill and MW-05, taken from the access road.
25		2012-FM-Tier-II-25	2.400	Sept. 4, 2012	490969	7626826	**Feature B:** Close-up - of geotextile and metal debris.
26		2012-FM-Tier-II-26	2.410	Sept. 4, 2012	490969	7626826	**Feature B:** Removed Geotextile and metal debris.
27		2012-FM-Tier-II-28	2.530	Sept. 4, 2012	490966	7626817	View southwest - of northwest side slope, note ATV rutting.
28		2012-FM-Tier-II-29	2.600	Sept. 4, 2012	491014	7626848	**Feature C:** View southwest - of ATV rutting around VT-04.
29		2012-FM-Tier-II-30	2.160	Sept. 4, 2012	491002	7626847	View southwest - of ATV rutting around VT-05.
30		2012-FM-Tier-II-31	2.660	Sept. 4, 2012	491027	7626902	View southwest - of northwest landfill toe and side slope taken from the north corner.
31		2012-FM-Tier-II-32	2.860	Sept. 4, 2012	491027	7626902	View east - of north landfill toe and side slope taken from the north corner.

Photo (2012-FM-Tier-II-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
32		2012-FM-Tier-II-33	14.300	Sept. 4, 2012	491026	7626897	Panoramic view east to southwest - of the northern landfill surface taken from the north corner.
33		2012-FM-Tier-II-34	2.480	Sept. 4, 2012	491020	7626890	**Feature B:** Close-up - of scattered metal debris on the northwest side slope of the facility.
34		2012-FM-Tier-II-35	2.510	Sept. 4, 2012	491021	7626894	**Feature B:** View south - of scattered metal debris.
35		2012-FM-Tier-II-36	2.610	Sept. 4, 2012	491072	7626885	View west - of north landfill toe and side slope, taken from the northeast corner.
36		2012-FM-Tier-II-37	2.710	Sept. 4, 2012	491072	7626885	View south-southwest - of northeast side slope of the landfill taken from the northeast corner.
37		2012-FM-Tier-II-38	7.850	Sept. 4, 2012	491067	7626883	Panoramic view south-southwest to west - of the northern landfill surface, taken from the top of the northeast corner.
38		2012-FM-Tier-II-39	2.600	Sept. 4, 2012	491146	7626917	View south east - of MW-2.
39		2012-FM-Tier-II-40	6.870	Sept. 4, 2012	491146	7626917	Panoramic view south to west south west - of the Tier II facility, taken from the Communication Pad.
40		2012-FM-Tier-II-41	2.730	Sept. 4, 2012	491094	7626753	View north - of ponded water along the northeast toe of the landfill.
41		2012-FM-Tier-II-42	2.590	Sept. 4, 2012	491094	7626753	View east - of ponded water along the southeast toe of the landfill.
42		2012-FM-Tier-II-43	2.520	Sept. 4, 2012	491058	7626709	**Feature G:** Close-up - of iron staining associated with ponded water along south east toe.
43		2012-FM-Tier-II-44	2.510	Sept. 4, 2012	491054	7626710	**Feature G:** View north - of iron staining associated with ponded water along southeast toe.
Soil Sampling							
44		2012-FM-Tier-II-45	2.420	Sept. 4, 2012	490945	7626859	**MW-1:** Open test pit.
45		2012-FM-Tier-II-46	2.390	Sept. 4, 2012	490945	7626859	**MW-1:** Closed test pit.
46		2012-FM-Tier-II-47	2.460	Sept. 4, 2012	490944	7626861	**MW-1:** View southeast - of sampling location.
47		2012-FM-Tier-II-48	2.400	Sept. 4, 2012	491157	7626911	**MW-2:** Open test pit.
48		2012-FM-Tier-II-49	2.370	Sept. 4, 2012	491157	7626911	**MW-2:** Closed test pit.
49		2012-FM-Tier-II-50	2.410	Sept. 4, 2012	491130	7626759	**MW-3:** Open test pit.
50		2012-FM-Tier-II-51	2.410	Sept. 4, 2012	491130	7626759	**MW-3:** Closed test pit.
51		2012-FM-Tier-II-52	2.500	Sept. 4, 2012	491133	7626759	**MW-3:** View west - of sampling location.
52		2012-FM-Tier-II-53	2.410	Sept. 4, 2012	490995	7626621	**MW-4:** Open test pit.
53		2012-FM-Tier-II-54	2.360	Sept. 4, 2012	490995	7626621	**MW-4:** Closed test pit.
54		2012-FM-Tier-II-55	2.440	Sept. 4, 2012	490995	7626619	**MW-4:** View north - of sampling location.
55		2012-FM-Tier-II-56	2.360	Sept. 4, 2012	490900	7626712	**MW-5:** Open test pit.
56		2012-FM-Tier-II-57	2.270	Sept. 4, 2012	490900	7626712	**MW-5:** Closed test pit.
57		2012-FM-Tier-II-58	2.440	Sept. 4, 2012	490899	7626711	**MW-5:** View northwest - of sampling location.

9.8 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Tier II Disposal Facility samples are presented in Tables XXXIX and XL respectively. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XXXIX: Tier II Disposal Facility Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-MW-1-A	MW-1	0-15	5.8	22.7	3.5	<0.5	5.7	18	13.5	2.7	<0.5	<0.05	<10	<10	11	11
FM12-MW-1-B		40-50	5.9	23.8	4.1	<0.5	5.0	16	15.0	2.9	<0.5	<0.05	<10	<10	<10	<10
Downgradient Samples																
FM12-MW-2-A	MW-2	0-15	7.0	23.0	3.5	<0.5	8.8	20	14.5	2.0	<0.5	<0.05	<10	<10	39	39
FM12-MW-2-A-D			10.8	26.7	4.1	<0.5	20.5	26	20.1	2.3	<0.5	<0.05	<10	<10	58	58
FM12-MW-2-B		40-50	6.5	24.0	3.2	<0.5	5.0	21	12.7	1.3	<0.5	<0.05	<10	19	48	67
FM12-MW-3-A	MW-3	0-15	6.7	25.2	3.4	<0.5	6.0	18	12.1	2.0	<0.5	<0.05	<10	15	86	101
FM12-MW-3-B		40-50	7.3	26.6	4.3	<0.5	5.2	19	19.7	3.4	<0.5	<0.05	<10	<10	32	32
FM12-MW-4-A	MW-4	0-15	6.1	18.9	3.1	<0.5	5.7	25	13.0	1.4	<0.5	<0.05	<10	38	214	252
FM12-MW-4-B		40-50	4.6	19.3	2.9	<0.5	3.4	14	13.7	1.3	<0.5	<0.05	<10	<10	35	35
FM12-MW-5-A	MW-5	0-15	5.2	27.0	3.1	<0.5	6.3	14	10.9	2.7	<0.5	<0.05	<10	<10	20	20
FM12-MW-5-B		40-50	6.3	22.5	4.1	<0.5	3.4	21	19.9	1.3	<0.5	<0.05	<10	<10	45	45

Table XL: Evaluation of 2012 Soil Analytical Data – Tier II Disposal Facility

Parameter	2012
Copper	Copper concentrations ranged from 4.6 to 10.8 mg/kg with a mean concentration of 6.6 mg/kg. The highest concentration was detected in the surface sample of the MW-2 sampling site.
Nickel	Nickel concentrations ranged from 18.9 to 27.0 mg/kg with a mean concentration of 23.6 mg/kg. The highest concentration was detected in the surface sample of the MW-5 sampling site.
Cobalt	Cobalt concentrations ranged from 2.9 to 4.3 mg/kg with a mean concentration of 3.6 mg/kg. The highest concentration was detected in the depth sample of the MW-3 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 3.4 to 20.5 mg/kg with a mean concentration of 6.8 mg/kg. The highest concentration was detected in the surface sample of the MW-2 sampling site.
Zinc	Zinc concentrations ranged from 14 to 26 mg/kg with a mean concentration of 19.3 mg/kg. The highest concentration was detected in the surface sample of the MW-2 sampling site.
Chromium	Chromium concentrations ranged from 10.9 to 20.1 mg/kg with a mean concentration of 15.0 mg/kg. The highest concentration was detected in the surface sample of the MW-2 sampling site.
Arsenic	Arsenic concentrations ranged from 1.3 to 3.4 mg/kg with a mean concentration of 2.1 mg/kg. The highest concentration was detected in the depth sample of the MW-3 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	All reported concentrations were lower than the method detection limit (0.05 mg/kg).
TPH	TPH concentration ranged from non-detect to 252 mg/kg, with a mean detected concentration of 66.0 mg/kg. The highest concentration was detected in the surface sample of the MW-4 sample site. TPH was not detected in the depth sample of MW-1.

9.9 GROUNDWATER SAMPLE ANALYTICAL DATA

The groundwater chemical analysis results and evaluation of analytical data for the 2012 Tier II Disposal Facility samples are presented in Tables XLI and XLII respectively. Certificates of analysis and groundwater samples collected as part of the QA/QC program are presented in Appendix C.

Table XLI: Tier II Disposal Facility Summary Table of Soil Analytical results

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 [µg/l]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-MW-1	MW-1	0.58	0.009	0.017	0.002	0.0016	0.003	0.052	0.018	0.003	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
Downgradient Samples																
FM12-MW-2	MW-2	-0.56	0.004	0.015	<0.001	<0.00005	<0.001	0.753	0.012	<0.001	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW-3*	MW-3	-0.25	0.007	0.011	0.00038	0.000236	0.004	0.047	0.021	<0.001	<0.000025	N/A	N/A	N/A	N/A	N/A
FM12-MW-4	MW-4	-0.16	0.006	0.017	0.012	0.00009	0.003	0.053	0.030	0.002	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW-5	MW-5	0.05	0.005	0.009	<0.001	0.00008	<0.001	0.010	0.035	<0.001	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1

* Groundwater well lacked sufficient water to take samples for PCB and TPH parameters.

Table XLII: Evaluation of 2012 Groundwater Analytical Data – Tier II Disposal Facility

Parameter	2012
Copper	Copper concentrations ranged from 0.004 to 0.007 mg/kg with a mean concentration of 0.0062. The highest concentration was detected at MW-3.
Nickel	Nickel concentrations ranged from 0.009 to 0.017 mg/kg with a mean concentration of 0.0138. The highest concentration was detected at two locations MW-1 and MW-4.
Cobalt	Cobalt concentrations ranged from non-detect to 0.012 mg/kg with a mean detected concentration of 0.0048 mg/kg. The highest concentration was detected at MW-3, while no cobalt was detected at MW-2 and MW-5.
Cadmium	Cadmium concentrations ranged from non-detect to 0.016 mg/kg with a mean detected concentration of 0.00050 mg/kg. The highest concentration was detected at MW-3.
Lead	Lead concentrations ranged from non-detect to 0.004 mg/kg with a mean detected concentration of 0.0033 mg/kg. The highest concentration was detected at MW-3.
Zinc	Zinc concentrations ranged from 0.010 to 0.753 mg/kg with a mean concentration of 0.183 mg/kg. The highest concentration was detected at MW-2.
Chromium	Chromium concentrations ranged from 0.012 to 0.035 mg/kg with a mean concentration of 0.023 mg/kg. The highest concentration was detected at MW-5.
Arsenic	Arsenic concentrations ranged from non-detect to 0.003 with a mean detected concentration of 0.0025. The highest concentration was detected at MW-1 while arsenic was not detected at MW-2, MW-3 and MW-5.
Mercury	All reported concentrations were lower than the method detection limit (0.000025 mg/L).
PCBs	All reported concentrations were lower than the method detection limit (0.1 µg/L).
TPH	All reported concentrations were lower than the method detection limit (0.1 mg/L)

9.10 MONITORING WELL SAMPLING/INSPECTION LOGS

The monitoring well sampling and inspection logs for MW-1, MW-2, MW-3, MW-4 and MW-5 are included in this section.

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	9:32 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW-1		
Sample Number:	FM12-MW-1		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	52,0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	92	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	40		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	199,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	107		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	3000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7,9		
Final Conductivity (uS/cm) =	853		
Final Temperature (°C) =	0,2		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	9:09 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW-2		
Sample Number:	FM12-MW-2		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	78,0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	84,0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	6,0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	195,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	111,0		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	4000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7,6		
Final Conductivity (uS/cm) =	981		
Final Temperature (°C) =	1,3		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	8:32 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW-3		
Sample Number:	FM12-MW-3		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	58,0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	183,0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	125,0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	210,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	27,0		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	500 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	8		
Final Conductivity (uS/cm) =	1027		
Final Temperature (°C) =	2,2		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	8:19 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW-4		
Sample Number:	FM-MW-4		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	78,0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	94,0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	16,0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	219,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	125		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	2000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7,6		
Final Conductivity (uS/cm) =	824		
Final Temperature (°C) =	2,3		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	9:46 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW-5		
Sample Number:	FM-MW-5		
Condition of Well:	Requires new J-Plug		
Measured Data			
Well pipe height above ground (cm) =	64,0		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	79,0	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	15,0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	268,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	189,0		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	3000 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7,9		
Final Conductivity (uS/cm) =	1081		
Final Temperature (°C) =	3,6		

10 EAST BEACH LANDFILL

10.1 SUMMARY

During the 2012 monitoring event of the East Beach Landfill at FOX-M Hall Beach, soil and groundwater samples were collected at 12 locations (3 upgradient and 9 downgradient), a visual inspection was conducted to identify and assess erosional features on the facility and thermal monitoring data was downloaded from 6 datalogger and manual readings were completed and recorded.

PCBs were detected in soil samples at three locations at the East Beach Landfill. A concentration of 0.1 mg/kg was detected at depth at MW-23 (downgradient), a concentration of 0.14 mg/kg was detected at depth at MW-28 (downgradient) and a concentration of 0.20 mg/kg was detected in the surface sample of MW-30 an upgradient location. All detected PCB concentrations are below criteria. Relatively high concentrations of lead were detected at surface and at depth at MW-25. At the surface a concentration of 139.0 mg/kg was detected while a concentration of 87.6 mg/kg was detected at depth.

TPH was detected at all sampling locations and in soil all samples with the exception of the surface sample at MW-28. Detectable TPH concentrations ranged from 12 to 1123 mg/kg with the highest concentration detected at the surface of the MW-30, an upgradient sample. All detected TPH was primarily in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg.

PCBs were not detected in any of the groundwater samples. No relatively high metal concentrations were detected in the East Beach groundwater samples. Very low concentrations (0.2 mg/L) of TPH were detected at two monitoring wells MW-30 (upgradient) and MW-21 (downgradient). As TPH were detected at the upgradient well, it does not appear to be reflection of the performance of the East Beach Landfill.

There are currently no significant or unacceptable features at the East Beach Landfill. A few minor erosional features were observed and are discussed in more detail below.

Thermal monitoring equipment is functioning properly, although two dataloggers experienced an error caused by a power outage, with two thermistors experiencing power outages on September 15, 2011. The error was potentially caused by improper battery replacement procedures as it is assumed the batteries were changed since 2010. In spite of the errors the thermistor are functioning properly.

Based on the results of the soil and groundwater results as well as the visual inspection the East Beach Landfill facility has an acceptable overall performance rating.

10.2 VISUAL INSPECTION REPORT

The visual inspection of the East Beach Landfill was conducted on September 4th, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XLIII of this report. Please refer to Figure FOX-M.9 for the locations of photographs and erosional feature at the East Beach Landfill South and Figure FOX-M.10 for the East Beach landfill North and a small section of the East Beach Landfill South.

Weather Conditions at Time of Inspection

At the time of the inspection, skies were overcast with light rain, temperature was 7°C and wind was 23 km/h with gusts of 35 km/h.

Settlement

Evidence of minor settlement was noted at two locations on the south lobe (Features A and F) and one location at the north lobe (Feature G) of the East Beach landfill. Feature A, noted during the 2010 investigation has increased in size. This feature in particular seems to be caused by multiple passes by ATV and subsequent rutting rather than settlement. Feature A has an acceptable severity rating. Feature F is a minor linear depression below the crest of the south lobe and has an acceptable severity rating. Feature G on the surface of the north lobe is a minor linear depression and has an acceptable severity rating.

Erosion

Evidence of erosion was not noted.

Frost Action

Evidence of frost action was not observed.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Vegetation (Feature H) was observed growing in a 4 m x 3 m area on the side slope of the landfill. The plants consisted of small tufts of arctic grasses. Few scattered plants were observed throughout the landfill but nowhere else at such concentrations.

Staining

Evidence of staining was not observed.

Seepage Points

Indications of seepage were not noted.

Debris

One piece of partially exposed wire was noted on the west side slope of the landfill (Feature B). The bolt cutters observed during the 2010 investigation were no longer present on the lobe. Feature B has an acceptable severity rating.

Partially buried or exposed debris were observed between the two landfill lobes, approximately 20 m from the southern lobe. The debris is not associated with either landfill lobe.

Presence/Condition of Monitoring Instruments

All monitoring well and thermistor installations were found to be in good condition, protective well covers at MW-21 and MW-24 were repaired. Several lock sets were found to be heavily rusted and inoperable and were subsequently replaced with new locks. All existing lock sets were lubricated at the time of monitoring.

Other Features of Note

The East Beach Landfill as with most landfills at the FOX-M site has been subjected to rutting by ATVs, Trucks and Heavy Machinery. In the case of the East Beach Landfill only the severe ruts were noted as features. Feature C, consists of several deep ruts on the south lobe of the landfill, these ruts have changed little in size or scale since the 2010 investigation and have an acceptable severity rating. Feature D consists of several deep ruts on the side slopes of the North lobe, minor increases have been noted in Feature D. Local field assistants indicated that the North lobe is often used as a ramp for local ATV and dirt bike enthusiasts. Feature I a new observation, consists of a roadway that runs almost the entire length of the South lobe of the landfill, the roadway does not simply cross the lobe as indicated by the drawings. Several vehicles were observed using the roadway over the course of the investigation. The roadway is causing minor superficial erosion to the landfill and has an acceptable severity rating.

Feature J consisted of rutting caused by ATV and Pick-up traffic observed during the 2012 investigation on the side slopes of the south landfill lobe and includes a large 10 m x 10 m area disturbed by vehicle traffic. Feature J has an acceptable severity rating.

Relatively continuous and extensive areas of ponded water were present along the west side of the landfill. Ponded areas appear consistent with previous observations. There were no points of seepage or staining noted to be associated with any of the ponded areas.

A tension crack Feature E, noted in 2010 was not observed during the 2012 investigation.

Discussion

The East Beach Landfill performance with respect to containment of the debris within the landfill is rated as acceptable. Visual inspection report, including supporting photos and drawing, is presented in the following pages.

Table XLIII: Visual Inspection Checklist / Report – East Beach Landfill

DEW LINE CLEAN-UP: POST-CONSTRUCTION – LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 2

SITE NAME: FOX-M Hall Beach
LANDFILL DESIGNATION: East Beach Landfill (New Landfill)
DATE OF INSPECTION: September 4, 2012
DATE OF PREVIOUS INSPECTION: August 27, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: Year 5
The inspector/reporter represents to the best of his/her knowledge that 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.

Checklist Item	Present (Yes/No)	Location	Lobe	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-FM-East-)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE A See Figure FOX-M.9	South	3	3	0.5	Occasional	Minor depression	14	Acceptable	Minor depression increased in size since the 2010 investigation.
		FEATURE F See Figure FOX-M.9	South	1	0.25	0.1		Minor linear depression	26, 27		New Observation: minor linear depression below the crest of the landfill, running parallel to the toe.
		FEATURE G See Figure FOX-M.10	North	2	0.25	0.2		Minor linear depression	12		New Observation: Minor linear depression on the landfill surface adjacent to VT-11.
Erosion	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation	Yes	FEATURE H See Figure FOX-M.9	South	4	3	N/A	Isolated	Area of plant colonization	31	Acceptable	New Observation: Small area of plant colonization on the side slope of the landfill.
Staining	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Debris Exposed	Yes	FEATURE B See Figure FOX-M.9	South	3	0.02	Unknown	Isolated	Metal wire	34	Acceptable	Partially exposed guy wire.
Presence/Condition of Monitoring Instruments	Yes	See Figure FOX-M.9 and 10	South and North	N/A	N/A	N/A	N/A	VT-06 - 11 & MW-20 - 31	South - 9, 10, 41, 49, 58, 67, 74, 79, 82, 83, 87, 88, 91, 94, 96, 100, 104, 107 North -11, 15, 19, 25	Acceptable	Monitoring wells and thermistors in acceptable condition. MW-21 and MW-24 repaired.
Other Features of Note:	Yes	FEATURE C See Figure FOX-M.9	South	2 - 4	2 - 4	0.1 - 0.3	Occasional	ATV ruts and tracks on the landfill surface	4 - 8, 21, 45, 52	Acceptable	Minor rutting from ATV traffic on the landfill surface.
		FEATURE D See Figure FOX-M.10	North	1 - 3	1 - 3	0.1 - 0.2		ATV ruts and tracks on the landfill surface NS side slopes	3, 9, 10, 16, 17		Minor rutting from ATV traffic on the landfill surface and side slopes.
		FEATURE I See Figure FOX-M.9/10	South	~700	10	0.1	Numerous (one large feature)	Roadway	22, 35		New Observation: Road on landfill surface used by the general public.
		FEATURE J See Figure FOX-M.9/10	South	2 - 10	0.2 - 10	0.1 - 0.35	Occasional	Rutting caused by ATV and vehicle traffic	48, 53, 69		New Observation: Rutting caused by ATV and vehicle traffic on the side slopes of the landfill.
		See Figure FOX-M.9/10	South and North	Irregular	Irregular	Unknown	Extensive	Ponded water	South - 12, 19, 20, 23, 32, 36, 37, 42, 43, 44, 46, 47, 55, 57, 63, 64, 67 North - 1, 5, 6, 11		Extensive water ponding along the west side of the south lobe and west and north side of the North lobe.
Additional Photos	Yes	See Figure FOX-M.9/10 and Photographic Record		N/A	N/A	N/A	N/A	General Photographic Record	N/A	N/A	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**										

10.3 PRELIMINARY STABILITY ASSESSMENT

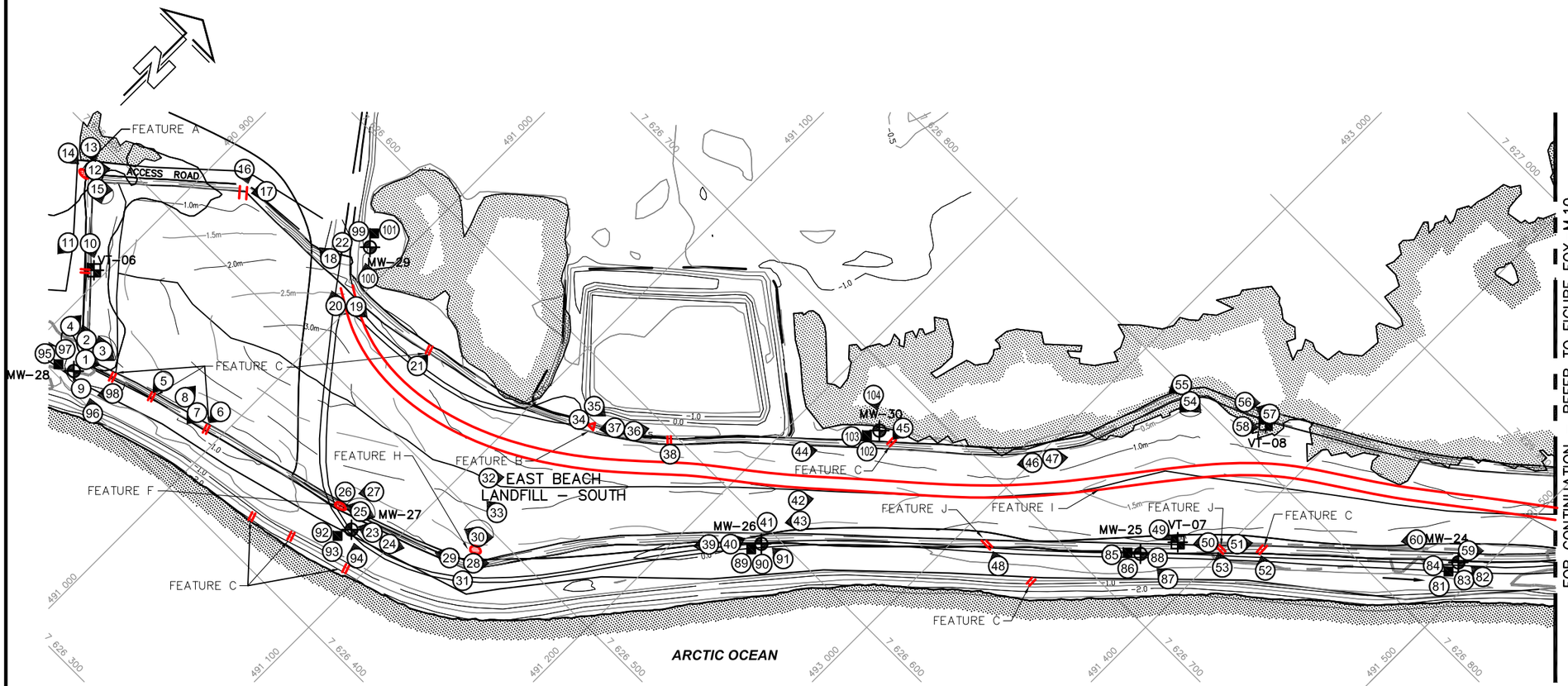
The Preliminary Stability Assessment for East Beach Landfill has been completed as per the TOR and is included as Table XLIV hereafter.

Table XLIV: Preliminary Stability Assessment – East Beach Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Not observed	None
Frost Action	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Acceptable	Extensive (perimeter only)
Debris exposure	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

10.4 LOCATION PLAN

The Location Plan for the East Beach Landfill has been completed as per the TOR and is included in Figures FOX-M.9 and FOX-M.10.



LEGEND

- SOIL SAMPLING LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- VEHICLE TRACKS / RUTS (NTS)
- TENSION CRACK (NTS)
- MINOR SETTLEMENT (NTS)
- VEGETATION (NTS)
- PARTIALLY EXPOSED DEBRIS (NTS)

0 25m 50m 75m 100m 125m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13–04–22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

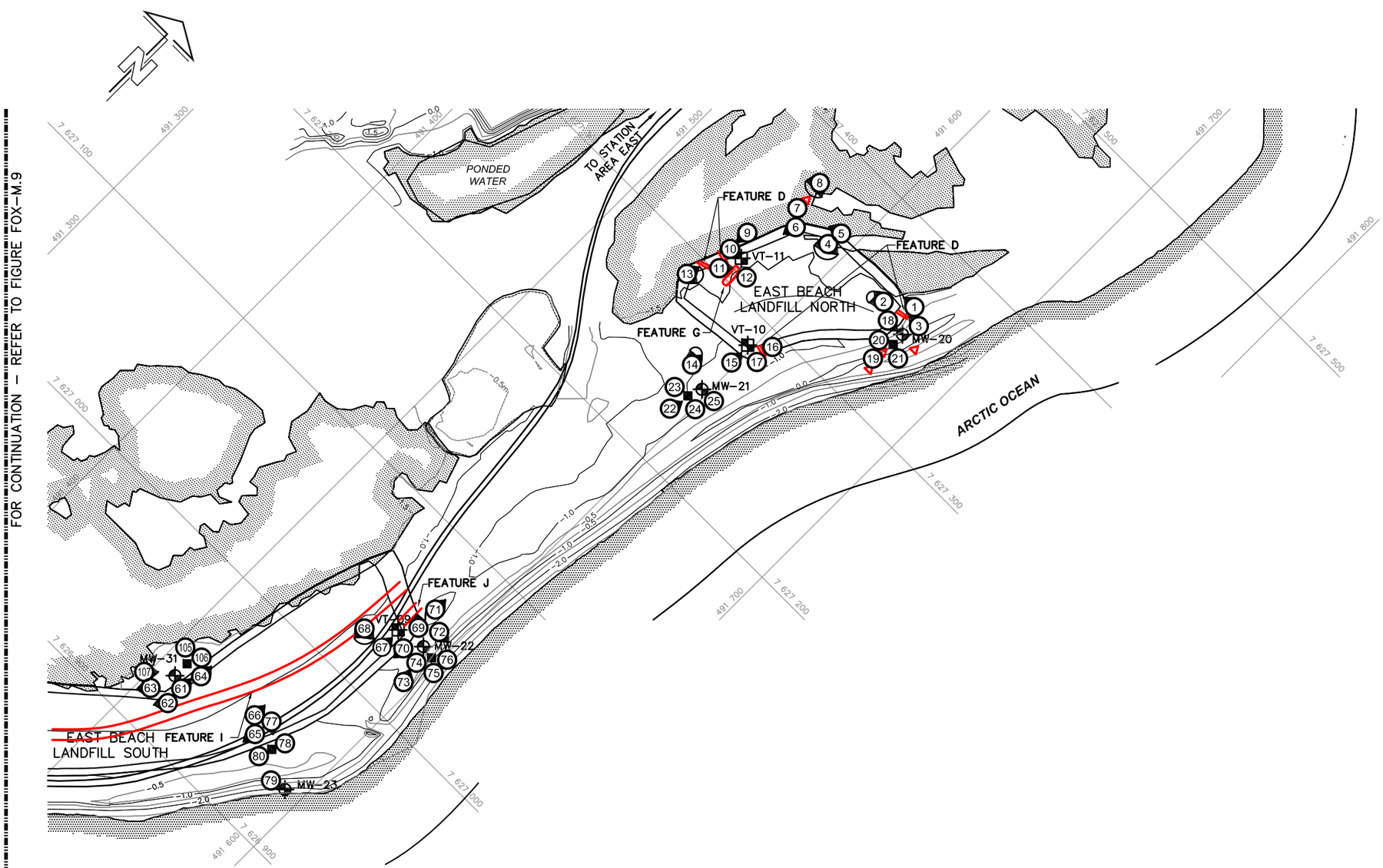
EAST BEACH LANDFILL SOUTH

SITE REMEDIATION SOLUTIONS

Biogenie, a division of EnGlobe Corp.
4495 Wilfrid-Hamel Blvd., Suite 200
Quebec (Quebec) CANADA G1P 2J7
Phone: (418) 653-4422 Fax.: (418) 653-3583

MEASUREMENT UNIT	SCALE:	DATE (month–year):
Metre	1 : 2,500	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_I	PAGE PL

FIGURE FOX-M.9



LEGEND

- SOIL SAMPLING LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- VEHICLE TRACKS / RUTS (NTS)
- PARTIALLY EXPOSED/SURFACE DEBRIS (NTS)
- MINOR SETTLEMENT (NTS)

0 25m 50m 75m 100m 125m

NO.	VERSION	DATE	BY	VERIF.	APPR.
A	FINAL	13–04–22	D.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

FOX-M, HALL BEACH, NUNAVUT

EAST BEACH LANDFILL NORTH

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Metre	1 : 2,500	DECEMBER 2012
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2655_210_213	DRAWING NO: CD2655_210_213-FOX-M_J	PAGE PL

FIGURE FOX-M.10

10.5 THERMAL MONITORING DATA

As with VT-2 and 4 at the Tier II facility, VT-9 and 10 of the East Beach Landfill experienced an error detailed “Power interruption 09/15/2011clock may have frozen at this time” as discussed previously it is believed this error may have been have occurred during a possible battery exchange in 2011. Apart from the error, all thermistors at the East Beach Landfill were inspected and found to be in good condition with no significant concerns identified. Data from all thermistors was successfully retrieved and all analogues/thermocouples were observed to be functioning properly at the time of the inspection. Further review of the downloaded data identified no anomalous temperature readings. All clocks exhibited slight drift and were synchronized using the Prolog software.

Apart from the above discussed error, all thermistors at the East Beach Landfill were inspected and found to be in good condition with no significant concerns identified. Data from all thermistors was successfully retrieved and all analogues/thermocouples were observed to be functioning properly at the time of inspection. Further review of the downloaded data identified no anomalous temperature readings from any of the thermistor sensors. All clocks exhibited slight drift and were synchronized using the Prolog software.

Manual resistive and temperature data readings were collected from the thermistor strings as per the TOR. Manual readings and inspection results for each thermistor are presented on the Thermistor Annual Maintenance Reports included in section 10.6. A complete datalogger RAW data set for 2011-2012 period has been forwarded to DCC as per the TOR and is available in the DVD provided with the reports.

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10.6 THERMISTOR ANNUAL MAINTENANCE REPORTS

The thermistor annual maintenance reports for VT-6 to VT-11 are presented in this section.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill South Lobe				
Thermistor Number:	VT-6	Inclination: Vertical					
Install Date:	08/24/2007	First Date Event: August 16, 2011				Last Date Event:	September 2, 2012
Coordinates and Elevation	N	7626449	E	490895.00		Elev	0.00
Length of Cable (m)	8.23	Cable Lead Above Ground (m)	4.23	Nodal Points			9
Datalogger Serial #	7060018			Cable Serial Number		B-8-2	TS07060018

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	11.295	7.3897	9	20.18	-4.0464
2	13.314	4.0657			
3	15.173	1.4719			
4	16.512	-0.1844			
5	17.121	-0.8886			
6	17.86	-1.7063			
7	18.608	-2.4962			
8	19.458	-3.3518			

Observations and Proposed Maintenance

Clock was 50 mins and 36 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill South Lobe				
Thermistor Number:	VT-7	Inclination: Vertical					
Install Date:	08/24/2007	First Date Event: August 16, 2011				Last Date Event:	September 2, 2012
Coordinates and Elevation	N	7626740	E	491378.00		Elev	0.00
Length of Cable (m)	8.22	Cable Lead Above Ground (m)	4.22	Nodal Points			9
Datalogger Serial #	7019996	701006		Cable Serial Number			TS07010006 B-8.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	☐	X	Requires new lock
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	

Battery Installation Date: Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)

Battery Levels: Main 11.34 Aux 13.38

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	11.300	7.3806
2	12.537	5.2732
3	14.420	2.4771
4	16.068	0.3476
5	16.866	-0.5972
6	17.655	-1.4833
7	18.590	-2.4777
8	19.411	-3.3056

Bead	ohms	Degrees C
9	20.270	-4.1310

Observations and Proposed Maintenance

Clock was 39 mins and 52 seconds slow. Corrected with Prolog software.

Cut lock: corroded, would not open

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill South Lobe				
Thermistor Number:	VT-8	Inclination: Vertical					
Install Date:	08/24/2007	First Date Event: August 16, 2011				Last Date Event:	September 2, 2012
Coordinates and Elevation	N	7626818	E	491372.00		Elev	0.00
Length of Cable (m)	8.32	Cable Lead Above Ground (m)	4.32	Nodal Points			9
Datalogger Serial #	7040022			Cable Serial Number			TS070400022 B-8.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	11.186	7.5878
2	12.805	4.8474
3	14.492	2.3784
4	16.177	0.2154
5	17.100	-0.8648
6	17.954	-1.8076
7	18.798	-2.6912
8	19.631	-3.5209

Bead	ohms	Degrees C
9	20.36	-4.2

Observations and Proposed Maintenance

Bead 9 is offline - new observation

Clock was 42 mins and 1 second slow. Corrected with Prolog software. Reset.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill South Lobe		
Thermistor Number:	VT-9	Inclination: Vertical			
Install Date:	08/22/2007	First Date Event: August 16, 2011		Last Date Event:	September 2, 2012
Coordinates and Elevation	N 7627038	E 491574.00	Elev 0.00		
Length of Cable (m)	8.22	Cable Lead Above Ground (m)	4.22	Nodal Points	9
Datalogger Serial #	07060017			Cable Serial Number	TS07060017 B-8.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	Paint chipping
Cover	☐	X	Needs new lock
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main		Aux

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	11.389	7.2205
2	11.459	7.0956
3	13.071	4.4346
4	15.085	1.5864
5	16.619	-0.3102
6	17.352	-1.1484
7	18.332	-2.2090
8	19.107	-3.0037

Bead	ohms	Degrees C
9	19.950	-1.8033

Observations and Proposed Maintenance

Cut lock: Was too corroded to open, requires new lock

Error: power interruption between 09/15/11 clock may have frozen at that time

Clock was 50 mins and 31 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill North Lobe				
Thermistor Number:	VT-10	Inclination: Vertical					
Install Date:	08/24/2007	First Date Event: August 16, 2011				Last Date Event:	September 2, 2012
Coordinates and Elevation	N	7627282	E	491605.00		Elev	0.00
Length of Cable (m)	8.22	Cable Lead Above Ground (m)	4.22	Nodal Points			9
Datalogger Serial #	7060003			Cable Serial Number			TS07060003 B-8.2

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	☐	X	Needs new lock
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux	13.26

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	11.324	7.3373
2	12.676	5.0511
3	14.532	2.3239
4	16.135	0.2662
5	16.972	-0.7189
6	17.772	-1.6109
7	18.698	2.5889
8	19.477	-3.3705

Bead	ohms	Degrees C
9	20.180	-4.0464

Observations and Proposed Maintenance

Cut lock: Was too corroded to open, requires new lock
Error: power interruption between 09/15/11 clock may have frozen at that time
Clock was 59 mins and 29 seconds slow. Corrected with Prolog software.

Thermistor Annual Maintenance Report

Contractor Name:	Biogénie/Sila Remediation	Inspection Date:	September 2, 2012
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	FOX-M Hall Beach	Thermistor Location	East Beach Landfill North Lobe				
Thermistor Number:	VT-11	Inclination: Vertical					
Install Date:	08/24/2007	First Date Event: August 16, 2011				Last Date Event: September 2, 2012	
Coordinates and Elevation	N	7627318	E	491566,00	Elev	0,00	
Length of Cable (m)	8,22	Cable Lead Above Ground (m)	4,22	Nodal Points		9	
Datalogger Serial #	7060002			Cable Serial Number		TS07060002	

Thermistor Inspection

	Good	Needs Maintenance	
Casing	x	☐	
Cover	☐	x	Needs new lock
Data Logger	x	☐	
Cable	x	☐	
Beads	x	☐	
Battery Installation Date	Unknown (July 1, 2007 is last provided record, although it is suspected a third party has changed the batteries since this date)		
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	11.253	7.4658
2	11.886	6.3515
3	14.185	2.8029
4	15.877	0.5815
5	16.977	-0.7247
6	17.812	-1.6544
7	18.730	-2.6217
8	19.578	-3.4693

Bead	ohms	Degrees C
9	20.500	-4.3454

Observations and Proposed Maintenance

Clock was 42 mins and 47 seconds slow. Corrected with Prolog software.

Cut lock: Was too corroded to open, requires new lock

10.7 PHOTOGRAPHIC RECORDS

The Photographic Record for East Beach Landfill has been completed as per the TOR and is included in the following pages as Table XLV. The Photographic Record contains only an index and “thumbnail” photographs. Full size photographs are contained in the Addendum DVD-ROM.

Table XLV: Landfill Visual Inspection Photo Log – East Beach Landfill

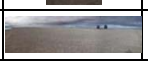
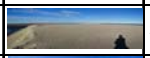
Photo (2012-FM-East-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
1		2012-FM-East-1	2.640	Sept. 4, 2012	490924	7626416	View east-northeast - of western extent of the south side slope and toe, taken from the southwest corner.
2		2012-FM-East-2	2.890	Sept. 4, 2012	490924	7626416	View northwest - of the west side slope and toe, taken from the southwest corner.
3		2012-FM-East-3	11.100	Sept. 4, 2012	490925	7626419	Panoramic view northwest - east-northeast of the western landfill surface, taken from the southwest corner.
4		2012-FM-East-4	2.460	Sept. 4, 2012	490924	7626416	**Feature C:** View north - of ruts caused by ATV traffic on the south landfill side slope (3 occurrences).
5		2012-FM-East-5	2.420	Sept. 4, 2012	490964	7626429	**Feature C:** View south - of ruts caused by ATV traffic on south landfill side slope (3 occurrences).
6		2012-FM-East-6	2.460	Sept. 4, 2012	490989	7626438	**Feature C:** View south of ruts - caused by ATV traffic on the south landfill side slope (3 occurrences).
7		2012-FM-East-7	2.410	Sept. 4, 2012	490983	7626437	**Feature C:** View south of ruts - caused by ATV traffic on the south landfill side slope (3 occurrences).
8		2012-FM-East-8	2.640	Sept. 4, 2012	490983	7626437	**Feature C:** View north - of ruts caused by ATV traffic on the landfill surface.
9		2012-FM-East-9	2.660	Sept. 4, 2012	490924	7626408	Close-up - of MW-28, lock is required.
10		2012-FM-East-10	2.660	Sept. 4, 2012	490985	7626455	View southeast - of VT-06.
11		2012-FM-East-11	2.460	Sept. 4, 2012	490985	7626455	View south of ruts - caused by ATVs on the west side slope, below VT-06.
12		2012-FM-East-12	2.650	Sept. 4, 2012	490858	7626486	View northeast - of north side slope (west of the access road) taken from the northwest corner.
13		2012-FM-East-13	2.600	Sept. 4, 2012	490858	7626486	View southeast - of the west side slope and toe, taken from the northwest corner.
14		2012-FM-East-14	2.580	Sept. 4, 2012	490858	7626486	**Feature A:** View east - of the west corner of the landfill, depression 3 m x 3 m x 0.5 m is visible.
15		2012-FM-East-15	7.780	Sept. 4, 2012	490863	7626484	Panoramic view northeast to southeast - of the western landfill surface, taken from the northwest corner.
16		2012-FM-East-16	2.490	Sept. 4, 2012	490917	7626537	View southeast - of ATV tracks on the north landfill side slope, (west of access road).
17		2012-FM-East-17	2.460	Sept. 4, 2012	490917	7626537	View southwest - of rutting caused by ATV traffic along the north landfill side slope.
18		2012-FM-East-18	2.540	Sept. 4, 2012	490975	7626542	View west - of north landfill side slope and toe from the access road.
19		2012-FM-East-19	2.780	Sept. 4, 2012	491002	7626532	View east - of the north side slope and toe from the access road.
20		2012-FM-East-20	2.630	Sept. 4, 2012	491002	7626532	View north-northwest - of access road.
21		2012-FM-East-21	2.430	Sept. 4, 2012	491045	7626545	**Feature C:** View north - of rutting caused by heavy machinery on the north side slope of the landfill.
22		2012-FM-East-22	2.460	Sept. 4, 2012	490974	7626550	**Feature I:** Entrance to roadway on the landfill surface, roadway extends the length of the landfill, does not simply cross the landfill as indicated by the drawings.
23		2012-FM-East-23	2.520	Sept. 4, 2012	491077	7626459	View west-southwest - of southern landfill toe and side slope, heavy machinery tracks are visible on the side slope (where roadway is indicated on 2010 drawings). Taken from the toe north of MW-27.
24		2012-FM-East-24	2.570	Sept. 4, 2012	491077	7626459	View east-northeast - of southern landfill toe and side slope, taken from toe north of MW-27.
25		2012-FM-East-25	5.870	Sept. 4, 2012	491077	7626460	Panoramic west-southwest to east-northeast view - of the landfill surface, taken from the landfill surface north of MW-27.
26		2012-FM-East-26	2.370	Sept. 4, 2012	491072	7626461	**Feature F:** Close-up - of linear depression running parallel to the landfill toe just below the landfill crest (1 m x 0.25 m x 0.1 m).
27		2012-FM-East-27	2.460	Sept. 4, 2012	491073	7626460	**Feature F:** View southwest - of linear depression.
28		2012-FM-East-28	2.640	Sept. 4, 2012	491136	7626482	View northeast - of southern landfill toe and side slope.
29		2012-FM-East-29	2.640	Sept. 4, 2012	491136	7626482	View west-southwest - of southern landfill toe and side slope.
30		2012-FM-East-30	7.690	Sept. 4, 2012	491136	7626485	Panoramic view west-southwest to northeast - of the landfill surface.

Photo (2012-FM-East-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
31		2012-FM-East-31	2.530	Sept. 4, 2012	491136	7626482	**Feature H:** Close-up - of vegetation on the south slope.
32		2012-FM-East-32	2.390	Sept. 4, 2012	491119	7626516	View northeast - of the landfill surface.
33		2012-FM-East-33	2.440	Sept. 4, 2012	491119	7626516	View west- of the landfill surface
34		2012-FM-East-34	2.400	Sept. 4, 2012	491129	7626573	**Feature B:** Close-up - of guy wire exposed on the northern side slope of the landfill.
35		2012-FM-East-35	2.270	Sept. 4, 2012	491129	7626573	**Feature I:** View east - of truck using landfill surface road.
36		2012-FM-East-36	2.650	Sept. 4, 2012	491141	7626579	View northeast - of northern landfill side slope and toe.
37		2012-FM-East-37	2.820	Sept. 4, 2012	491141	7626579	View southwest - of northern landfill side slope and toe.
38		2012-FM-East-38	2.450	Sept. 4, 2012	491166	7626593	View west - of ATV ruts on the northern side slope.
39		2012-FM-East-39	2.740	Sept. 4, 2012	491228	7626591	View southwest - of southern landfill toe.
40		2012-FM-East-40	2.860	Sept. 4, 2012	491228	7626591	View north-northeast - of southern landfill toe.
41		2012-FM-East-41	2.510	Sept. 4, 2012	491232	7626589	Close-up - of MW-26.
42		2012-FM-East-42	2.640	Sept. 4, 2012	491230	7626621	View northeast - of landfill surface.
43		2012-FM-East-43	2.720	Sept. 4, 2012	491230	7626621	View southwest - of landfill surface.
44		2012-FM-East-44	2.530	Sept. 4, 2012	491218	7626643	View northeast - of where Feature E was located, tension crack was not visible at the time of the investigation.
45		2012-FM-East-45	2.400	Sept. 4, 2012	491237	7626674	**Feature C:** View south - of rutting caused by ATV travel on the northern side slope of the landfill.
46		2012-FM-East-46	2.660	Sept. 4, 2012	491297	7626722	View southwest - of the northern side slope of the landfill.
47		2012-FM-East-47	2.650	Sept. 4, 2012	491297	7626722	View northeast - of the northern side slope of the landfill.
48		2012-FM-East-48	2.380	Sept. 4, 2012	491312	7626673	**Feature J:** View northwest - of rutting caused by a pick-up truck on the southern side slope of the landfill.
49		2012-FM-East-49	2.650	Sept. 4, 2012	491377	7626739	View northeast - of VT-07.
50		2012-FM-East-50	2.850	Sept. 4, 2012	491394	7626755	View southwest - of the southern crest of the landfill.
51		2012-FM-East-51	2.610	Sept. 4, 2012	491394	7626755	View northeast - of the southern crest of landfill.
52		2012-FM-East-52	2.410	Sept. 4, 2012	491403	7626759	**Feature C:** View northwest - of rutting caused by an ATV on the southern side slope.
53		2012-FM-East-53	2.540	Sept. 4, 2012	491394	7626755	**Feature J:** View northwest - of rutting caused by a pick-up truck on the southern side slope of the landfill, 5 m north east of VT-07
54		2012-FM-East-54	9.180	Sept. 4, 2012	491335	7626797	Panoramic view east to south - of the landfill surface.
55		2012-FM-East-55	2.600	Sept. 4, 2012	491326	7626800	View south-southwest - of northern landfill toe and side slope.
56		2012-FM-East-56	2.880	Sept. 4, 2012	491368	7626821	View north east - of northern landfill toe and side slope.
57		2012-FM-East-57	2.720	Sept. 4, 2012	491368	7626821	View west-southwest - of northern landfill toe and side slope.
58		2012-FM-East-58	2.660	Sept. 4, 2012	491368	7626816	View north east - of VT-8.
59		2012-FM-East-59	2.590	Sept. 4, 2012	491486	7626840	View northeast - of southern landfill toe and side slope.
60		2012-FM-East-60	2.510	Sept. 4, 2012	491486	7626840	View southwest - of southern landfill toe and side slope.

Photo (2012-FM-East-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
61		2012-FM-East-61	2.660	Sept. 4, 2012	491519	7626933	View north - of the northern landfill surface and crest.
62		2012-FM-East-62	2.740	Sept. 4, 2012	491519	7626933	View southwest - of the surface and crest of the landfill.
63		2012-FM-East-63	2.710	Sept. 4, 2012	491515	7626934	View southwest - of the landfill side slope and toe.
64		2012-FM-East-64	2.600	Sept. 4, 2012	491515	7626934	View north - of the landfill side slope and toe.
65		2012-FM-East-65	2.660	Sept. 4, 2012	491565	7626944	View south-southwest - of the landfill surface.
66		2012-FM-East-66	2.810	Sept. 4, 2012	491565	7626944	View north - of the landfill surface and toe.
67		2012-FM-East-67	2.590	Sept. 4, 2012	491582	7627034	View north - of VT-09.
68		2012-FM-East-68	1.290	Sept. 4, 2012	491582	7627034	Panoramic view south to east - of the far northern extent of the landfill surface.
69		2012-FM-East-69	2.670	Sept. 4, 2012	491587	7627048	**Feature J:** View northwest - of eastern side slope and toe, rutting caused by ATV visible at the corner of the landfill.
70		2012-FM-East-70	2.530	Sept. 4, 2012	491587	7627048	View south - of the southern toe and side slope of landfill.
71		2012-FM-East-71	2.820	Sept. 4, 2012	491587	7627048	View north - of area between the south and north Lobes.
72		2012-FM-East-72	2.460	Sept. 4, 2012	491600	7627068	View east - of miscellaneous metal debris between the two Lobes.
Soil Sampling							
73		2012-FM-East-73	2.510	Sept. 4, 2012	491595	7627040	**MW-22:** View north-northwest - of sampling location.
74		2012-FM-East-74	2.650	Sept. 4, 2012	491595	7627040	**MW-22:** Close up - of monitoring well.
75		2012-FM-East-75	2.440	Sept. 4, 2012	491596	7627043	**MW-22:** Open test pit.
76		2012-FM-East-76	2.410	Sept. 4, 2012	491596	7627043	**MW-22:** Closed test pit.
77		2012-FM-East-77	2.440	Sept. 4, 2012	491570	7626941	**MW-23:** View - southeast of test pit.
78		2012-FM-East-78	2.440	Sept. 4, 2012	491572	7626941	**MW-23:** Open test pit.
79		2012-FM-East-79	2.470	Sept. 4, 2012	491570	7626941	**MW-23:** Close-up - of monitoring well.
80		2012-FM-East-80	2.430	Sept. 4, 2012	491572	7626941	**MW-23:** Closed test pit.
81		2012-FM-East-81	2.480	Sept. 4, 2012	491488	7626838	**MW-24:** Open test pit.
82		2012-FM-East-82	2.360	Sept. 4, 2012	491489	7626836	**MW-24:** View west - of monitoring well.
83		2012-FM-East-83	2.710	Sept. 4, 2012	491486	7626834	**MW-24:** Close-up - of monitoring well.
84		2012-FM-East-84	2.480	Sept. 4, 2012	491488	7626838	**MW-24:** Closed test pit.
85		2012-FM-East-85	2.370	Sept. 4, 2012	491372	7626724	**MW-25:** Open test pit.
86		2012-FM-East-86	2.350	Sept. 4, 2012	491372	7626724	**MW-25:** Closed test pit.
87		2012-FM-East-87	2.360	Sept. 4, 2012	491374	7626722	**MW-25:** View west - of monitoring well.
88		2012-FM-East-88	2.510	Sept. 4, 2012	491372	7626724	**MW-25:** Close-up - of monitoring well.
89		2012-FM-East-89	2.450	Sept. 4, 2012	491234	7626590	**MW-26:** Open test pit.
90		2012-FM-East-90	2.440	Sept. 4, 2012	491234	7626590	**MW-26:** Closed test pit.
91		2012-FM-East-91	2.450	Sept. 4, 2012	491235	7626589	**MW-26:** View west - of monitoring well.

Photo (2012-FM-East-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Soil Sampling							
92		2012-FM-East-92	2.510	Sept. 4, 2012	491079	7626447	**MW-27:** Open test pit.
93		2012-FM-East-93	2.520	Sept. 4, 2012	491079	7626447	**MW-27:** Closed test pit.
94		2012-FM-East-94	2.570	Sept. 4, 2012	491072	7626538	**MW-27:** View northwest - of monitoring well.
95		2012-FM-East-95	2.540	Sept. 4, 2012	490917	7626404	**MW-28:** Open test pit.
96		2012-FM-East-96	2.600	Sept. 4, 2012	490919	7626402	**MW-28:** View northwest - of monitoring well.
97		2012-FM-East-97	2.400	Sept. 4, 2012	490917	7626404	**MW-28:** Closed test pit.
98		2012-FM-East-98	2.440	Sept. 4, 2012	490974	7626550	**MW-28:** View southwest - of wood debris washed on shore from the ocean.
99		2012-FM-East-99	2.510	Sept. 4, 2012	490987	7626558	**MW-29:** Open test pit.
100		2012-FM-East-100	2.660	Sept. 4, 2012	490985	7626559	**MW-29:** View northwest - of monitoring well.
101		2012-FM-East-101	2.450	Sept. 4, 2012	490987	7626558	**MW-29:** Closed test pit.
102		2012-FM-East-102	2.440	Sept. 4, 2012	491236	7626673	**MW-30:** Open test pit.
103		2012-FM-East-103	2.360	Sept. 4, 2012	491236	7626673	**MW-30:** Closed test pit.
104		2012-FM-East-104	2.360	Sept. 4, 2012	491233	7626677	**MW-30:** View southeast - of monitoring well.
105		2012-FM-East-105	2.450	Sept. 4, 2012	491507	7626937	**MW-31:** Open test pit.
106		2012-FM-East-106	2.440	Sept. 4, 2012	491507	7626937	**MW-31:** Closed test pit.
107		2012-FM-East-107	2.570	Sept. 4, 2012	491509	7626937	**MW-31:** View southeast - of monitoring well.

Photo (2012-FM-East-N-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
North Lobe							
1		2012-FM-East-N-1	2.590	Sept. 4, 2012	491650	7627360	View west - of northern toe and side slope of the landfill.
2		2012-FM-East-N-2	1.560	Sept. 4, 2012	491653	7627350	Panoramic view southwest to west - of landfill surface.
3		2012-FM-East-N-3	2.410	Sept. 4, 2012	491660	7627347	**Feature D:** View west - of rutting caused by ATV travel on the northeastern landfill toe.
4		2012-FM-East-N-4	9.200	Sept. 4, 2012	491597	7627354	Panoramic view east to southwest - of the landfill surface.
5		2012-FM-East-N-5	2.580	Sept. 4, 2012	491597	7627357	View west-southwest - of northern landfill toe and side slope, note ponded water along toe.
6		2012-FM-East-N-6	2.550	Sept. 4, 2012	491578	7627348	View south-southwest - of western landfill side slope and toe, note ponded water along toe.
7		2012-FM-East-N-7	2.350	Sept. 4, 2012	491571	7627364	Close-up - of two buried steel drums north west of the landfill Lobe.
8		2012-FM-East-N-8	11.200	Sept. 4, 2012	491571	7627364	Panoramic view southeast to southwest - of the northwestern landfill toe and side slope.
9		2012-FM-East-N-9	2.460	Sept. 4, 2012	491565	7627322	**Feature D:** View south - of rutting caused by ATV travel on the western landfill toe.
10		2012-FM-East-N-10	2.430	Sept. 4, 2012	491563	7627311	**Feature D:** Close-up - of rutting.
11		2012-FM-East-N-11	2.440	Sept. 4, 2012	491568	7627312	View northeast - of VT-11, large block of wood was stacked in front of the thermistor.
12		2012-FM-East-N-12	2.370	Sept. 4, 2012	491571	7627312	**Feature G:** Close-up - of linear depression adjacent to VT-11 (2 m x 0.25 m x 0.20 m)
13		2012-FM-East-N-13	1.680	Sept. 4, 2012	491554	7627288	Panoramic view north-northeast to east - of the landfill surface.
14		2012-FM-East-N-14	1.320	Sept. 4, 2012	491591	7627255	Panoramic view northwest to north - of the southern side slope and toe of the landfill, areas of rutting visible on the side slope.
15		2012-FM-East-N-15	2.580	Sept. 4, 2012	491606	7627278	View north west - of VT-10.
16		2012-FM-East-N-16	2.400	Sept. 4, 2012	491610	7627284	**Feature D:** View from landfill crest - of rutting caused by ATV traffic on the southeastern side slope of the landfill.
17		2012-FM-East-N-17	2.710	Sept. 4, 2012	491615	7627281	**Feature D:** View from landfill toe - of rutting caused by ATV traffic on the southeastern side slope of the landfill.
Soil Sampling							
18		2012-FM-East-N-18	2.440	Sept. 4, 2012	491660	7627347	**MW-20:** View east - of various debris surrounding monitoring well.
19		2012-FM-East-N-19	2.590	Sept. 4, 2012	491660	7627347	**MW-20:** Close up - of monitoring well.
20		2012-FM-East-N-20	2.480	Sept. 4, 2012	491660	7627347	**MW-20:** Open test pit.
21		2012-FM-East-N-21	2.410	Sept. 4, 2012	491660	7627347	**MW-20:** Closed test pit.
22		2012-FM-East-N-22	2.410	Sept. 4, 2012	491609	7627455	**MW-21:** View north-northeast - of test pit.
23		2012-FM-East-N-23	2.410	Sept. 4, 2012	491606	7627453	**MW-21:** Open test pit.
24		2012-FM-East-N-24	2.460	Sept. 4, 2012	491606	7627453	**MW-21:** Closed test pit.
25		2012-FM-East-N-25	2.400	Sept. 4, 2012	491604	7627249	**MW-21:** Close-up - of monitoring well.

10.8 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 East Beach Landfill samples are presented in Tables XLVI and XLVII respectively. Certificates of analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C.

Table XLVI: East Beach Landfill Summary Table of Soil Analytical results

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]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-MW-29-A	MW-29	0-15	5.4	21.5	3.3	<0.5	4.3	15	12.8	2.1	<0.5	<0.05	<10	<10	15	15
FM12-MW-29-B		40-50	5.0	24.8	3.2	<0.5	3.6	15	12.2	2.1	<0.5	<0.05	<10	<10	37	37
FM12-MW-30-A	MW-30	0-15	7.4	25.5	3.7	<0.5	19.4	26	13.6	2.5	<0.5	0.20	<10	13.00	1110	1123
FM12-MW-30-B		40-50	5.1	25.6	3.6	<0.5	5.8	21	13.4	2.6	<0.5	<0.05	<10	<10	84	84
FM12-MW-31-A	MW-31	0-15	5.4	24.5	3.7	<0.5	11.9	18	13.6	4.1	<0.5	<0.05	<10	<10	24	24
FM12-MW-31-B		40-50	5.8	22.4	3.3	<0.5	10.5	20	13.0	2.1	<0.5	<0.05	<10	<10	20	20
Downgradient Samples																
FM12-MW-20-A	MW-20	0-15	8.3	22.6	3.3	<0.5	18.8	17	12.3	2.2	<0.5	<0.05	<10	10	43	53
FM12-MW-20-B		40-50	6.8	22.9	3.4	<0.5	7.8	17	13.5	2.2	<0.5	<0.05	<10	<10	47	47
FM12-MW-21-A	MW-21	0-15	13.9	26.8	3.8	<0.5	56.9	27	14.3	2.8	<0.5	<0.05	<10	<10	37	37
FM12-MW-21-A-D		0-15	10.7	25.2	3.5	<0.5	20.3	18	12.5	2.6	<0.5	<0.05	<10	<10	39	39
FM12-MW-21-B		40-50	7.6	26.0	3.7	<0.5	17.6	29	13.0	2.4	<0.5	<0.05	<10	<10	88	88
FM12-MW-22-A	MW-22	0-15	10.0	24.3	3.3	<0.5	12.6	17	12.1	2.3	<0.5	<0.05	<10	<10	34	34
FM12-MW-22-B		40-50	8.8	23.6	3.2	<0.5	39.9	16	13.5	2.6	<0.5	<0.05	<10	<10	35	35
FM12-MW-23-A	MW-23	0-15	8.4	28.6	4.3	<0.5	10.0	22	15.7	3.9	<0.5	<0.05	<10	<10	36	36
FM12-MW-23-B		40-50	8.1	27.4	4.3	<0.5	11.6	21	15.9	3.4	<0.5	0.10	<10	<10	31	31
FM12-MW-24-A	MW-24	0-15	5.4	28.6	4.4	<0.5	5.4	15	12.3	3.6	<0.5	<0.05	<10	<10	20	20
FM12-MW-24-B		40-50	5.2	27.8	4.2	<0.5	5.0	14	11.8	3.2	<0.5	<0.05	<10	<10	20	20
FM12-MW-25-A	MW-25	0-15	8.9	25.7	3.5	<0.5	139.0	21	12.9	2.6	<0.5	<0.05	<10	<10	84	84
FM12-MW-25-B		40-50	6.9	26.2	3.8	<0.5	87.6	18	14.5	2.4	<0.5	<0.05	<10	11	81	92
FM12-MW-26-A	MW-26	0-15	16.1	28.1	4.0	<0.5	16.7	22	15.2	3.3	<0.5	<0.05	<10	<10	32	32
FM12-MW-26-A-D		0-15	15.3	22.4	3.2	<0.5	52.4	24	11.3	2.4	<0.5	<0.05	<10	<10	33	33
FM12-MW-26-B		40-50	11.3	23.1	3.2	<0.5	8.3	13	10.1	2.6	<0.5	<0.05	<10	<10	16	16
FM12-MW-27-A	MW-27	0-15	13.9	27.4	4.1	<0.5	15.2	20	13.6	4.2	<0.5	<0.05	<10	<10	12	12
FM12-MW-27-B		40-50	11.1	23.8	3.7	<0.5	22.0	24	11.9	3.6	<0.5	<0.05	<10	<10	13	13
FM12-MW28-A	MW-28	0-15	3.1	24.4	3.2	<0.5	3.0	10	9.6	2.6	<0.5	<0.05	<10	<10	<10	<10
FM12-MW28-B		40-50	10.8	21.8	3.1	<0.5	14.1	20	9.6	2.4	<0.5	0.14	<10	<10	19	19

Table XLVII: Evaluation of 2012 Soil Analytical Data – East Beach Landfill

Parameter	2012
Copper	Copper concentrations ranged from 3.1 to 16.1 mg/kg with a mean concentration of 8.6 mg/kg. The highest concentration was detected in the surface sample of the MW-26 sampling site.
Nickel	Nickel concentrations ranged from 21.5 to 28.6 mg/kg with a mean concentration of 25.0 mg/kg. The highest concentration was detected in the surface sample of two sampling sites; MW-23 and MW-24.
Cobalt	Cobalt concentrations ranged from 3.1 to 4.4 mg/kg with a mean concentration of 3.6 mg/kg. The highest concentration was detected in the surface sample of the MW-24 sampling site.
Cadmium	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
Lead	Lead concentrations ranged from 3.0 to 139.0 mg/kg with a mean concentration of 23.8 mg/kg. The highest concentration was detected in the surface sample of the MW-25 sampling site and is considered a relatively high concentration.
Zinc	Zinc concentrations ranged from 13 to 29 mg/kg with a mean concentration of 19.2 mg/kg. The highest concentration was detected in the depth sample of the FM-21 sampling site.
Chromium	Chromium concentrations ranged from 9.6 to 15.9 mg/kg with a mean concentration of 12.9 mg/kg. The highest concentration was detected in the depth sample of the FM-23 sampling site.
Arsenic	Arsenic concentrations ranged from 2.1 to 4.2 mg/kg with a mean concentration of 2.8 mg/kg. The highest concentration was detected in the surface sample of the MW-27 sampling site.
Mercury	All reported concentrations were lower than the method detection limit (0.5 mg/kg).
PCBs	PCBs were detected at three sampling sites; the depth sample of MW-23, the depth sample of MW-28 and in the surface sample of MW-30. Detected PCB concentrations ranges from 0.10 to 0.20 mg/kg with a mean concentration of 0.15 mg/kg. The highest concentration was detected at MW-30.
TPH	TPH concentration ranged from non-detect to 1123 mg/kg, with a mean detected concentration of 81.8 mg/kg. The highest concentration was detected in the surface sample of the MW-30 sample site. TPH was not detected in the surface sample of MW-28.

10.9 GROUNDWATER SAMPLE ANALYTICAL DATA

The groundwater chemical analysis results and evaluation of analytical data for the 2012 East Beach Landfill samples are presented in Tables XLVIII and XLIX hereafter. As noted above, all of the downgradient wells and upgradient well MW-31 contained insufficient sample volumes (dry conditions) to complete the specified analysis. Certificates of analysis and groundwater samples collected as part of the QA/QC program are presented in Appendix C.

Table XLVIII: East Beach Landfill Summary Table of Groundwater Analytical results

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 [µg/l]	PHC(F1) C_6-C_{10}	PHC(F2) C_{10}-C_{16}	PHC(F3) C_{16}-C_{34}	TPH C_6-C_{34}
Upgradient Samples																
FM12-MW-29	MW-29	0.22	0.027	0.044	0.003	0.00031	0.005	0.158	0.050	0.005	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW-30	MW-30	0.05	0.011	0.028	0.002	0.00012	0.002	0.182	0.044	0.005	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW-30-D			0.011	0.031	0.002	0.00012	0.003	0.187	0.052	0.006	<0.000025	<0.01	<0.1	<0.1	0.2	0.2
FM12-MW-31	MW-31	-0.27	0.026	0.030	0.001	0.00049	0.002	0.095	0.021	0.001	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
Downgradient Samples																
FM12-MW21	MW-21	-1.69	0.031	0.027	0.003	0.00026	0.016	0.244	0.035	0.003	<0.000025	<0.01	<0.1	<0.1	0.2	0.2

Table XLIX: Evaluation of 2012 Groundwater Analytical Data – East Beach Landfill

Parameter	2012
Copper	Copper concentrations ranged from 0.011 to 0.031 mg/L, with a mean concentration of 0.021 mg/L. The highest concentration was detected at MW-21.
Nickel	Nickel concentrations ranged from 0.027 to 0.044 mg/L, with a mean concentration of 0.032 mg/L. The highest concentration was detected at MW-29.
Cobalt	Cobalt concentrations ranged from 0.001 to 0.003 mg/L, with a mean concentration of 0.0022 mg/L. The highest concentration detected at two locations MW-21 and MW-29.
Cadmium	Cadmium concentrations ranged from 0.00012 to 0.00049 mg/L, with a mean concentration of 0.0026 mg/L. The highest concentration was detected at MW-31.
Lead	Lead concentrations ranged from 0.002 to 0.016 mg/L, with a mean concentration of 0.0056 mg/L. The highest concentration was detected at MW-21.
Zinc	Zinc concentrations ranged from 0.095 to 0.244 mg/L, with a mean concentration of 0.173 mg/L. The highest concentration was detected at MW-21.
Chromium	Chromium concentrations ranged from 0.021 to 0.052 mg/L, with a mean concentration of 0.040 mg/L. The highest concentration was detected at MW-30.
Arsenic	Arsenic concentrations ranged from 0.001 to 0.006 mg/L, with a mean concentration of 0.004 mg/L. The highest concentration was detected at MW-30.
Mercury	All reported concentrations were lower than the method detection limit (0.000025 mg/L).
PCBs	All reported concentrations were lower than the method detection limit (0.01 µg/L).
TPH	TPH was detected at MW-21 as well as MW-30 at a concentration of 0.2 mg/L; TPH was not detected at any other sampling locations at the East Beach Landfill.

10.10 MONITORING WELL SAMPLING/INSPECTION LOGS

The monitoring well sampling and inspection logs for MW-20 through MW-31 are presented in this section

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	East Beach Landfill		
Monitoring Well ID:	MW-20		
Sample Number:	N/A		
Condition of Well:	Lock Requires Replacement		
Measured Data			
Well pipe height above ground (cm) =	45		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	112,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	6:46 PM
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	East Beach Landfill		
Monitoring Well ID:	MW-21		
Sample Number:	FM12-MW-21		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	51		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	120	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	69		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	145,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	25		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	1500 mL		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N - Dedicated waterra tubing		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	7,4		
Final Conductivity (uS/cm) =	1040		
Final Temperature (°C) =	1,4		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	East Beach Landfill		
Monitoring Well ID:	MW-22		
Sample Number:	N/A		
Condition of Well:	Gravel in well		
Measured Data			
Well pipe height above ground (cm) =	57		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	68,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	East Beach Landfill		
Monitoring Well ID:	MW-23		
Sample Number:	N/A		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	46		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	122,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		

Monitoring Well Sampling Record			
Site Name:	FOX-M	Hall Beach	Nunavut
Date of Sampling Event	04-sept-12	Time:	N/A
Names of Samplers:	Brandon MacKay	Jonah Curley	Josh Alorut
Landfill Name:	East Beach Landfill		
Monitoring Well ID:	MW-24		
Sample Number:	N/A		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	54		
Diameter of well (cm) =	5		
Depth of well installation (cm) = (from ground surface)	350		
Length screened section (cm) =	200		
Depth to top of screen (cm) = (from ground surface)	50		
Depth to water surface (cm) = (from top of pipe)	Dry	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	N/A		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	121,0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	N/A		
Static volume of water in well (mL) =			
Free product thickness (mm) =	N/A	Measurement method: (meter, paste, etc.)	Interface meter
Purging: (Y/N)	N	Purging/Sampling Equipment:	Waterra Tubing and Foot Valve
Volume Purged Water =	N/A		Oakton Turbidimeter T-100
Decontamination required: (Y/N)	N/A		WTW 3401 pH/conductivity meter
Number washes:	N/A		
Number rinses:	N/A		
Final pH =	N/A		
Final Conductivity (uS/cm) =	N/A		
Final Temperature (°C) =	N/A		