SITE REMEDIATION SOLUTIONS

Biogénie

THE COLLECTION OF LANDFILL MONITORING DATA AT THE FORMER CAM-2 DEW LINE SITE

Gladman Point, Nunavut

FINAL REPORT– 2012 SEASON

(O/Ref.: CD2656) (Y/Ref.: DLCMON (KITIK))

DEFENCE CONSTRUCTION CANADA

April 2013

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DEFENCE CONSTRUCTION CANADA

March 2013

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

1.1 OBJECTIVES AND SCOPE OF WORK

The objective of Defence Construction Canada's (DCC) Landfill Monitoring Program is to collect sufficient information to assess the Landfill's performance 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 – PIN-3 Lady Franklin Point, CAM-M Cambridge Bay, CAM-2 Gladman Point, CAM-3 Shepherd Bay, and CAM-4 Pelly Bay DEW Line Sites, Nunavut Territory, Kitikmeot Region DCC Project #: DLCLFMP2 (KITIK12), March 20, 2012.

During the 2012 monitoring program a visual inspection was completed to identify erosional features as well as soil sampling was conducted at all landfills. Groundwater sampling was conducted at the Tier II and the Non-Hazardous Waste Landfill (NHWL). Thermal monitoring was conducted at the Tier II facility; the datalogger batteries (ULB-15 and ULB-1) were replaced. Datalogger VT-3 was reinstalled as requested since the datalogger had been removed for repairs in 2010, no dataset available for VT-3. Table I summarizes the monitoring requirements of the 2012 season.

Table I: 2012 Monitoring Requirements for CAM-2 Landfills

Landfill	Visual Inspection	Soil Sampling	Groundwater Sampling	Thermal Monitoring
Station Landfill	✓	✓		
West Landfill – North	✓	✓		
West Landfill – South	✓	✓		
Tier II Disposal Facility	✓	✓	✓	✓
Non-Hazardous Waste Landfill	✓	✓	✓	

1.2 FIELD PROGRAM STAFF AND TIMING

The 2012 on-site field program at CAM-2 Gladman Point took place from August 24 to 28, 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 comprised of the following individuals:

- Brandon MacKay, Site Technician.
- Jay Evalik Field Assistant
- Dwayne Allukpik, Field Assistant.
- Joe Koaha, Wildlife Monitor.

1.3 2012 WEATHER CONDITIONS

Seasonably average temperatures were observed during the 2012 monitoring program, consisting of an average daily temperature of 5ºC. Light precipitation and localized fog occurred during the morning, giving way to sun by afternoon. Night time temperature averaged 0ºC.

Further details on weather conditions for each landfill at the time of the visual inspection are provided in the “Visual Inspection” sections of the report (Sections 3.2, 4.2, 5.2, 6.2 and 7.2).

1.4 DEVIATIONS FROM THE TERMS OF REFERENCE

As stipulated by Sections 6.11.1 and 6.12.2 of the Terms of Reference (TOR), inter-laboratory comparison soil and groundwater samples are to be taken and analyzed during each monitoring event. The soil and groundwater samples were taken at a frequency of 10% however, the cooler was lost in transport and consequently the samples were not analyzed. Cambridge Bay experienced several plane delays and cancellations prior to and during the 2012 monitoring program. It is believed the resulting backlog of shipments to and from Cambridge Bay may have resulted in the misplacing of the inter-lab samples.

As stipulated by Section 6.11.8 samples are to be collected from two depths at each sampling location; surface (0 – 15 cm) and depth (40 – 50 cm). A depth sample from sampling location C2-2, (sample ID 12-C2-2-B) was not received at the laboratory facility and subsequently not analyzed. As a meticulous inventory of all samples was conducted in the field after returning to the field camp, it is believed the sample was incorrectly placed within the inter-lab cooler by field staff and as stated above this cooler was ultimately lost during transport.

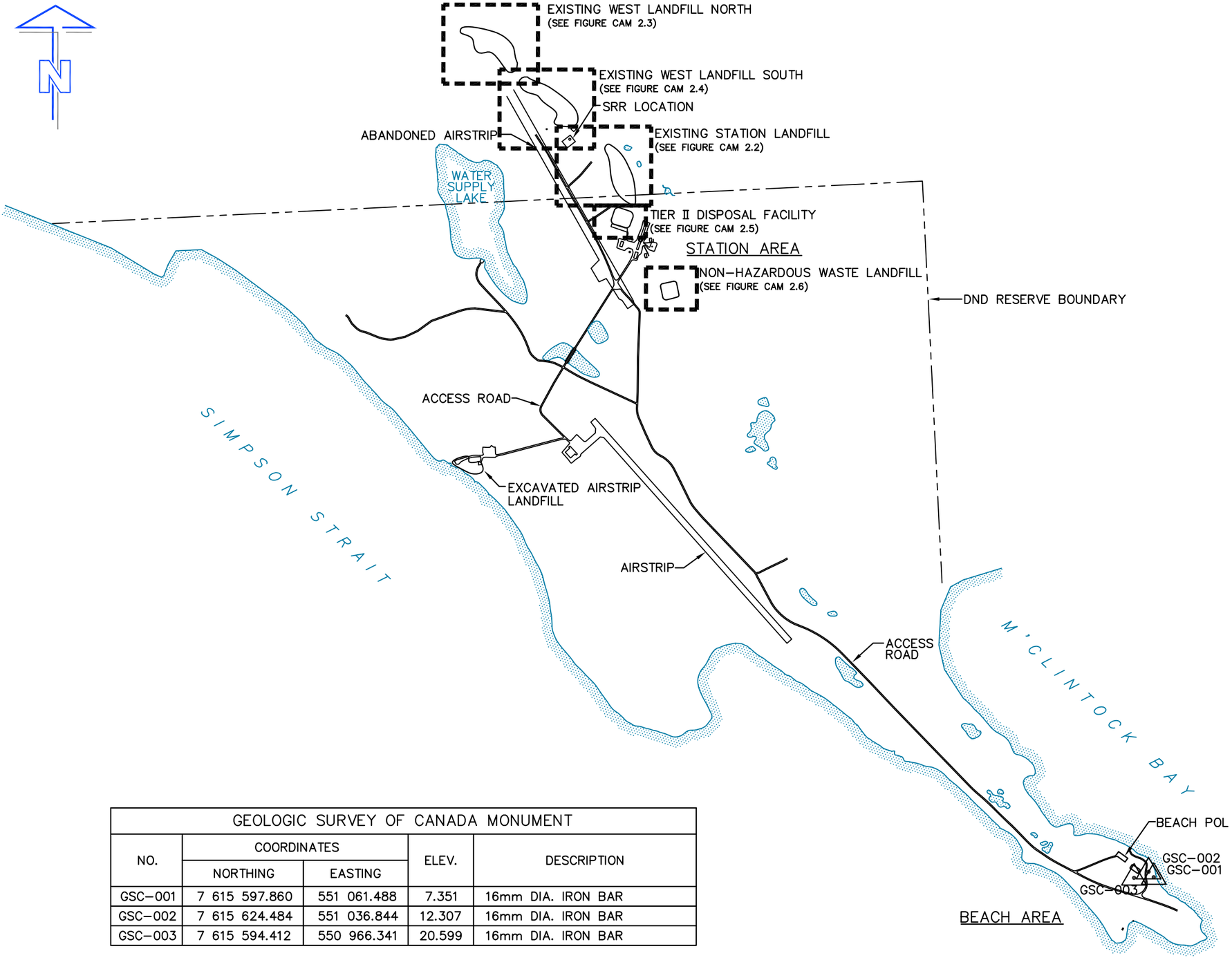
1.5 REPORT FORMAT

This report describes the work carried out in August 2012 at five Landfill sites at CAM-2 Gladman Point. Results from soil and groundwater sampling, thermal monitoring and visual inspection of the Sites are also presented in the formats described in the TOR (Reference B). An electronic version of the report and its component tables, figures and data files is included in an Addendum 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;
- Summary of 2012 groundwater analytical data (where applicable); and
- Monitoring well development/sampling reports (where applicable).

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



GEOLOGIC SURVEY OF CANADA MONUMENT				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
GSC-001	7 615 597.860	551 061.488	7.351	16mm DIA. IRON BAR
GSC-002	7 615 624.484	551 036.844	12.307	16mm DIA. IRON BAR
GSC-003	7 615 594.412	550 966.341	20.599	16mm DIA. IRON BAR

LEGEND

CM2 SURVEY CONTROL MONUMENT

WATERBODY

0 200m 400m 600m 800m 1000m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13-04-19	D.L.	B.M.	A.L.
B	REVISION 1	13-02-14	P.L.	B.M.	A.L.
A	PRELIMINARY	12-11-30	P.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
CAM-2, GLADMAN POINT, NUNAVUT

OVERALL SITE PLAN

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month-year):
Meter	1 : 20,000	FEBRUARY 2013
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2656_200_203	DRAWING NO: CD2656_200_203-CAM-2_1	PAGE LS

FIGURE CAM-2.1

2 METHODOLOGY

2.1 VISUAL INSPECTION

Data and information collected during the visual inspection of the CAM-2 Landfills is included in the visual inspection datasheets. These datasheets include inspection data such 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 condition for each specific feature. New features are added to the checklist and are noted as new observations. This letter is shown on the figures for each Landfill along with the symbol for the particular feature.

Digital photos with a measure of scale were taken to show the actual general state of the Landfills, as well as features of interest. Annotated sketches/diagrams are included in this report for each Landfill.

The photos were taken with an Olympus TG-820 iHS 12 megapixel (MP) digital camera. Full resolution digital jpeg 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; and
- CCME Subsurface Assessment Handbook for Contaminated Sites, March 1994, EPC-NCSRP-48E (CCME catalogue – "http://www.ccme.ca/pdfs/cat_eng.pdf").

For the 2012 monitoring program, 22 soil sampling stations were visited. A surface (0-15 cm depth) and subsurface sample (40-50 cm depth below surface) were taken at each sampling station. No frozen ground or frost was encountered at the soil stations during the August 2012 sampling.

As specified in the TOR (Reference B), the following soil sampling procedures were adhered to:

- where required, the soil samples were collected from locations between a two to four metre radius of the monitoring wells;
- blind field duplicates (10%) were collected for QA/QC purposes;
- duplicate samples (10%) were also taken and sent to a second laboratory for quality control purposes; and
- An additional 10% 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 CAM-2 during the August, 2012 field program.

Table II: Summary of Soil Sampling at CAM-2, August 2012

Landfill Site	**Soil Sample Locations**				
Station Landfill	C2-1	C2-2	C2-3	C2-4	C2-5
West Landfill – North	C2-6	C2-7	C2-8	C2-9	C2-10
West Landfill – South	C2-11	C2-12	C2-13	C2-14	
Tier II Disposal Facility	MW-1	MW-2	MW-3	MW-4	
Non-Hazardous Waste Landfill	MW-5	MW-6	MW-7	MW-8	

Notes:
Soil samples annotated as "MW" were collected as per the TOR (Reference B) between two to four metres from monitoring wells. All soil samples were collected from two depths (0-15 cm and 40-50 cm). For 2012 sampling, total number of soil samples = 48 samples (22 samples x two depths + four QA/QC (Intra + Inter-laboratory comparison) + four for Owner's Representative (ESG Archives).

2.3 GROUNDWATER SAMPLING

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

- CCME EPC-NCS62E Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites – Volume I: Main Report, Dec 93 (CCME catalogue - http://www.ccme.ca/pdfs/cat_eng.pdf").); and
- CCME EPC-NCS66E Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites – Volume II: Analytical Method Summaries, Dec 93 (CCME catalogue – "http://www.ccme.ca/pdfs/cat_eng.pdf").

Wells were purged as specified 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 the TOR).

The 2012 field program included sampling eight monitoring wells at CAM-2. A summary of the groundwater sampling undertaken at CAM-2 is summarized in Table III.

In sampled wells, no signs of free-phase hydrocarbon products were detected. Monitoring Well Development and Sampling Record forms are included in appropriate sections in this report.

Table III: Summary of Groundwater Sampling at CAM-2, August 2012

Landfill Site	**Groundwater Sample Locations**			
Tier II Disposal Facility	MW-1	MW-2	MW-3	MW-4
Non-Hazardous Waste Landfill	MW-5	MW-6	MW-7	MW-8

Notes:
All monitoring wells were inspected and found to be in good condition with no significant concerns identified.
For 2012 sampling, total number of water samples = 11 samples (eight monitoring well samples + three QA/QC (inter and intra-laboratory duplicates + one field blank) + one travel blank (TPH only).

2.4 THERMAL MONITORING

All thermistors at the Tier II Disposal Facility were inspected and found to be in good condition with no significant concerns not identified previously. Further details on thermal monitoring will be discussed in Section 6.6 of this report.

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 or entered directly into a field computer (in the case of thermistor and monitoring well data). 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 a hand-held Garmin GPSmap 60CSx GPS, which included a combination of continuous tracks and discrete waypoints. Data packages collected from the individual vertical thermistors was 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; and
- Water samples were collected through the use of dedicated Waterra foot valves and tubing.

Chain of Custody (COC) forms were completed by the Field Coordinator after sample collection. The samples were refrigerated prior to off-site shipment in chilled coolers by First Air Cargo directly to AGAT in Calgary (via Yellowknife) and ESG in Kingston (via Ottawa), where they were checked in by laboratory representatives. As stated previously, Quality assurance soil and groundwater samples shipped to Maxxam in Montreal were lost during transport and consequently were not received.

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 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). These samples were lost during air transportation and consequently, were not analyzed;
- 10% Archival Samples of soil to ESG; and
- As well as the respective QA/QC procedures of AGAT.

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 Nunavut Territory – Kitikmeot Region at PIN-3 (Lady Franklin Point), CAM-M (Cambridge Bay), CAM-2 (Gladman Point), CAM-3 (Shepherd Bay), CAM-4 (Pelly Bay) – DCC Project Number: DLCMON (KITIK) – March 26, 2012.

B. Terms of Reference – Services for the collection of Landfill Monitoring Data: PIN-3 (Lady Franklin Point), CAM-M (Cambridge Bay), CAM-2 (Gladman Point), CAM-3 (Shepherd Bay), CAM-4 (Pelly Bay). DEW Line Sites, Nunavut Territory, Kitikmeot Region – DCC Project #: DLCLFMP2 (KITIK12).

C. Contractor Services for the Collection of Landfill Monitoring Data Nunavut Territory – Kitikmeot Region at PIN-3 (Lady Franklin Point), CAM-M (Cambridge Bay), CAM-2 (Gladman Point), CAM-3 (Shepherd Bay), CAM-4 (Pelly Bay): Technical Proposal – May 2012.

D. Post-Field Progress Report, CAM-2 Landfill Monitoring 2012, September, 2012

3 STATION LANDFILL

3.1 SUMMARY

During the 2012 monitoring event of the Station Landfill at CAM-2 Gladman Point soil samples were collected at 5 locations (1 upgradient and 4 downgradient locations) and a visual inspection was conducted to identify and assess erosional features on the regraded lobes.

PCBs were not detected in any of the soil samples at the Station Landfill. TPH was detected at all sample locations at surface and depth with the exception of C2-2 and C2-5 where TPH was not detected at depth. TPH concentrations ranged from 12 to 485 mg/kg with the highest concentration detected at the C2-2 at surface (0 – 15 cm). All detected TPH was primarily in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg and are therefore acceptable. A relatively high concentration of arsenic (13.9 mg/kg) was detected at the surface of C2-1 based on the CCME soil quality guidelines.

Over the course of two years since the last monitoring program of the Station Landfill, there have been increases in settlement, erosion and the onset of plant colonization. Despite the increases in settlement and erosion no significant or unacceptable features were observed. Erosion features on the east slope of Lobe 2 are self-armouring and the newly observed erosion channels on the slope remain minor at this time. The areas of settlement are not currently impacting the overall stability of the lobe.

The current overall performance rating of the Station Landfill is acceptable.

3.2 VISUAL INSPECTION REPORT

The visual inspection of the Station Landfill was conducted on August 26, 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 CAM-2.2 for the locations of photographs and erosional features at the Station Landfill.

Weather Conditions at Time of Inspection

At the time of the visual inspection of the Station, the temperature was approximately 2°C; skies were overcast with light rain. Little to no wind was observed at the Station Landfill

Settlement

Four areas of minor settlement were noted at the Station Landfill at Lobes: 1 (Feature M), 2 (Feature B) and 5 (Features A and Q) during the 2012 monitoring program.

Feature M, a new observation, consists of two circular depressions ("potholes") on the northern surface of Lobe 1. Lobe 1 continues to function as designed; the depressions have little to no impact on the overall stability of the Lobe at this time.

Further settlement has been observed in the vicinity of Feature B which was first identified during the 2010 monitoring program; two additional linear depressions were observed within 5 m of the original feature. Despite the increases in the settlement, the features are relatively minor and the Landfill Lobe continues to function as designed.

Indications of settlement have increased at Lobe 5 of the Station Landfill. An additional two depressions have been observed at Feature A, for total of four. Feature Q consists of a depression associated with large cobble and vegetation. Based on the size of the extent of the vegetation although small, Feature Q is believed to have existed for some time (potentially since construction, given its associated cobble). Lobe 5 continues to function as designed.

Erosion

Erosion was observed at two of the five Lobes at the Station Landfill, Lobes 2 and 3. Observations of shallow erosion on the east and west side slopes of Lobe 3 remain consistent with the 2010 sampling program. The performance of Lobe 3 is considered acceptable.

Lobe 2 has several pronounced areas of erosion that occur at the geometric inflection points of the Lobe where localized runoff converges on the Landfill surface. Six general areas of erosion (Features D, E, F, G, N and O) have been identified, an addition of two features since 2010. The 2012 observations of Features D, E and F are relatively consistent with 2010 measurements with slight increases in the depth of erosion. Each erosion channel appears to be self-armouring and features a large deposition of fine material on the tundra at the toe of the Landfill. Feature O consists of a relatively minor erosion channel located 12 m north of Feature F on the east slope of the Landfill. The feature is self-armouring and of little impact to the stability of the Lobe. Feature N consists of a small erosion channel on the north Landfill surface, the erosion channel does not extend onto the east side slope. Although not indicated on the drawings, the slope at this location has been armoured with a coarser material (Type 2) than at the southern extent of the east slope. Feature N has an acceptable severity rating. Minor erosion was also noted along the

base of the engineered drainage channel constructed along the north side of Lobe 2 (Feature G). The level of erosion appears consistent with observations from previous years and planned remedial measures to direct flow around the Landfill. The erosion is not in direct contact with the Landfill.

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 noted at one location on Lobe 5 of the Station Landfill. Feature R associated with the depression, (Feature Q) consists of a small concentration of vegetation growing on the base of the depression, and a few scattered plants to the north of the depression. At the time of the monitoring program, the plants within the depression had dried with the change in season, making them difficult to identify. During the 2015 monitoring program, an attempt will be made to identify the plants colonizing on Lobe 5.

Staining

One area of rust-coloured staining (Feature H) was observed on the northeast corner of Lobe 2, extending from the Landfill toe to a nearby pond situated approximately 25 m to the east, and from the pond north; encompassing a low lying area approximately 75 x 50 m. Similar staining was observed at other low lying areas not associated with the Landfill, and in keeping with the conclusions drawn in the 2010 monitoring report, appear to be a natural feature of the area. Bacterial sheen was observed on the surface of ponded water at the toe of the Landfill.

A hydrocarbon stain (Feature P) was observed approximately in the middle of Lobe 4. As it was not observed during previous monitoring programs, it is assumed the stain is a result of recent activities or was simply an oversight (although unlikely). A consultation with the Field Assistants and Bear Monitors revealed that the area is frequented by members of a nearby community for Ranger duties and hunting trips. ATVs and snowmobiles are used to access the site and are thus, a potential source of leaks and therefore stains.

Seepage Points

Although there are increases in the extent of rust-coloured staining (Feature H) with this feature, the area of seepage on the northern section of Lobe 2 remains consistent with previous observations. Wet and saturated soil conditions were observed on the down gradient slope within 5 m of the toe.

Debris

There were no observations of exposed debris during the 2012 monitoring program.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this Landfill.

Other Features of Note

During the 2010 monitoring program, several tension/desiccation cracks were noted on the surface and/side slope of Lobes 2 and 3. During the 2012 monitoring program, Features I, K and L were not observed, and Feature J was ¼ the length previously observed. In the week leading up to the monitoring program, as well as during the site visit, the area experienced several precipitation events which may have eliminated any cracks caused by desiccation and/or filled in smaller cracks through erosion processes. Features J and L on Lobe 2 consisted of relatively short parallel cracks that extended approximately 45 degrees to the slope direction. What remains of Feature J has an acceptable severity rating.

Table IV: Visual Inspection Checklist / Report – Station Landfill

DEW LINE CLEANUP: POST-CONSTRUCTION - LANDFILL MONITORING
VISUAL INSPECTION CHECKLIST
INSPECTION REPORT – PAGE 1 of 3

SITE NAME: CAM-2 Gladman Point
LANDFILL/AREA DESIGNATION: Station Landfill (Existing Landfill – Regrade)
DATE OF INSPECTION: August 26, 2012
DATE OF PREVIOUS INSPECTION: August 14, 2010
INSPECTED BY: Brandon MacKay
REPORT PREPARED BY: Brandon MacKay
LANDFILL MONITORING EVENT #: 7
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-C2-Station-)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE A See Figure CAM-2.2 (Lobe 5)	0.3 - 0.5	0.3 - 0.5	0.1	Occasional	Minor depressions	63-66	Acceptable	Number of depressions at this location has increased as of the 2012 monitoring program from one to four.
		FEATURE B See Figure CAM-2.2 (Lobe 2)	1.2 - 3.0	0.2 - 0.4	0.05 - 0.10		Minor depressions	29, 30, 31	Acceptable	Three minor depression along crest of lobe, previously only one depression was observed.
		FEATURE M See Figure CAM-2.2 (Lobe 1)	1	0.7	0.15		Minor depressions	15,16,17	Acceptable	New Observation: Two minor depressions on the northern section of the landfill cap.
		FEATURE Q See Figure CAM-2.2 (Lobe 5)	0.5	0.3	0.1		Minor depressions	67	Acceptable	New Observation: Minor depressions on the northern toe of the landfill, associated with a large cobble stone and vegetation.
Erosion	Yes	FEATURE C See Figure CAM-2.2 (Lobe 3)	2.5 - 3.0	0.1 - 0.2	< 0.05	Occasional	Minor surficial erosion	51 - 55	Acceptable	Minor erosion noted at five locations on the west side and two locations on the east side lobe, extending from top to toe.
		FEATURE D See Figure CAM-2.2 (Lobe 2)	15 8	0.10 - 2.00 0.05 - 0.20	0.10 - 0.15 0.05 - 0.10		Minor surficial erosion	41 - 44	Acceptable	Two areas of minor erosion where water drains from the southern portion of the landfill cap, self-armouring.
		FEATURE E See Figure CAM-2.2 (Lobe 2)	12.2	0.1 0 - 0.50	0.10 - 0.15		Minor surficial erosion	39, 40	Acceptable	Three erosion channels extending from the landfill surface to the toe, depositing fine sediment on the tundra.
		FEATURE F See Figure CAM-2.2 (Lobe 2)	36	0.30 - 2.0	0.05 - 0.20		Minor surficial erosion	36, 37, 38	Acceptable	Minor erosion noted on surface of landfill (2 cm), increasing to 5-20 cm depth on downgradient slope. Self-armouring.
		FEATURE G See Figure CAM-2.2 (drainage channel on north side of Lobe 2)	60	1	0.10 - 0.15		Minor erosion along base of engineered drainage channel	20, 21, 22, 23	Acceptable	Minor erosion noted along drainage channel extending along north side of lobe. Little to no change since previous inspection. Self-armouring.
		FEATURE N See Figure CAM-2.2 (Lobe 2)	10	0.05	0.03		Minor surficial erosion	27, 28	Acceptable	New Observation: Minor erosion channel on the landfill surface extending to the side slope at the north end of the east side slope of the lobe.
		FEATURE O See Figure CAM-2.2 (Lobe 2)	10	0.15 - 0.50	0.05 - 0.25		Minor surficial erosion	34, 35	Acceptable	New Observation: Minor erosion channel on the landfill surface extending to the side slope.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record (2012-C2-Station-)	Severity Rating	Additional Comments
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 R See Figure CAM-2.2 (Lobe 2)	N/A	N/A	N/A	N/A	Small vegetation	67	Acceptable	New Observation: Vegetation growing in the base of feature Q, with a few scattered smaller plants around the outside of the depression.
Staining	Yes	FEATURE H See Figure CAM-2.2 (north east of Lobe 2)	~75	~50	Unknown	N/A	Rust coloured staining	24	Acceptable	Rust coloured staining extending from the northeast toe of landfill to adjacent pond and to the northwest for approximately 75 m.
		FEATURE P See Figure CAM-2.2 (Lobe 4)	0.6	0.5	unknown	Isolated	Hydrocarbon stain	58	Acceptable	New Observation: Hydrocarbon stain on the landfill cap, assumed to be from leaking off-road equipment.
Vegetation Stress	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Seepage Points	Yes	FEATURE H See Figure CAM-2.2 (north east area of Lobe 2)	8.0	4.0	N/A	Isolated <1%	Seepage along toe of slope	24, 25, 26	Acceptable	Seepage along the toe extending to the pool of water to the east of the landfill, iron bacteria present on surface of ponded water. Iron staining present on soil in a much larger area than previously reported, potentially the area flooded during spring melt.
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	FEATURE J See Figure CAM-2.2 (south end of Lobe 2)	1.2	0.01 - 0.05	0.05	Isolated <1%	Parallel cracks extending from crest in north east direction	45, 46	Acceptable	Thin tension cracks extending from crest on south end of lobe, no longer visible to the same extent as in 2010.
Additional Photos	Yes	See Figure CAM-2.2 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	Not Observed	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

3.3 PRELIMINARY STABILITY ASSESSMENT

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

Table V: Preliminary Stability Assessment – Station Landfill

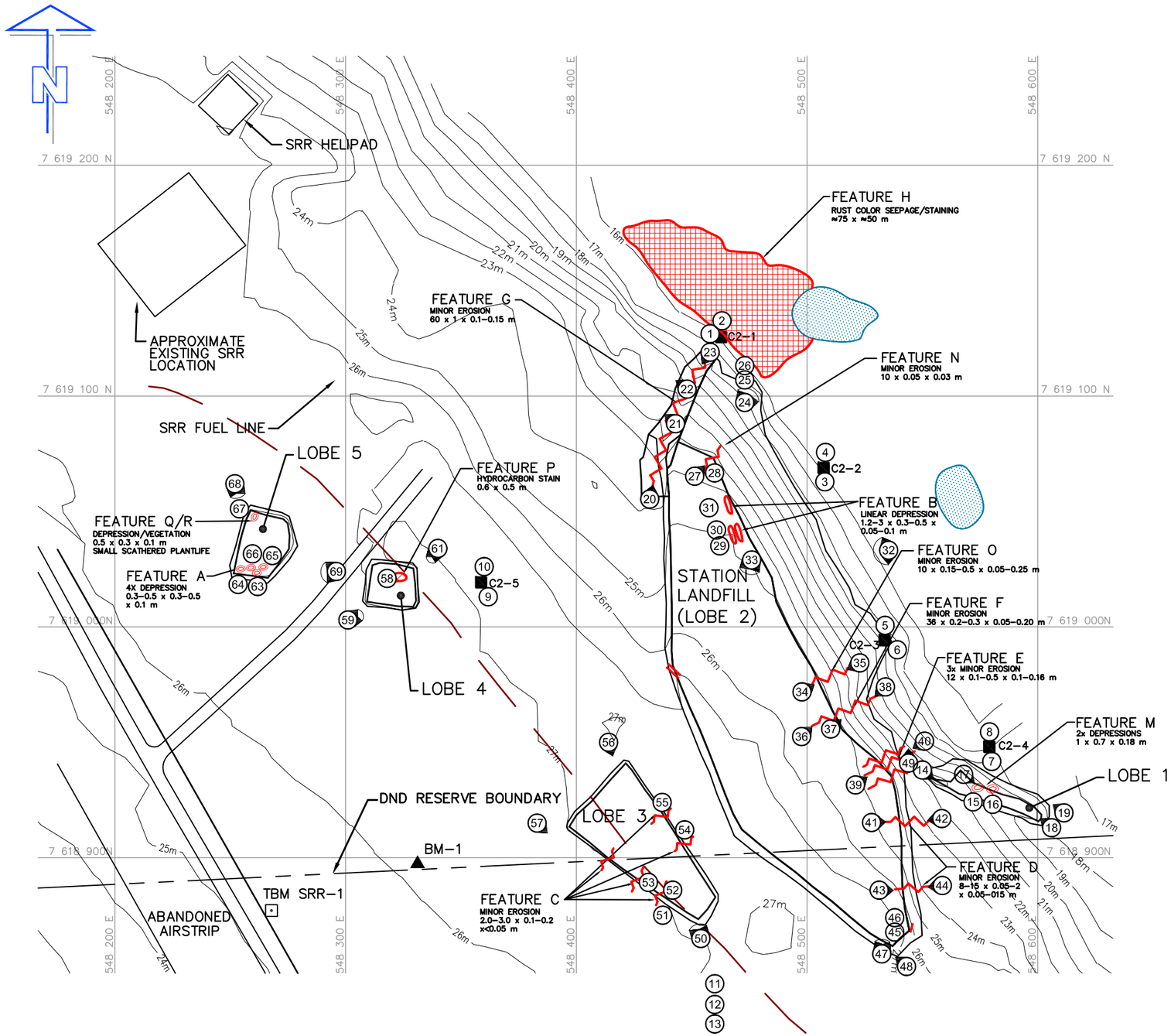
Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Occasional
Frost Action	Not observed	None
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	None
Seepage/Ponded Water	Acceptable	Isolated
Debris exposure	Not observed	None
Overall Landfill Performance	**Acceptable**	

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 Station Landfill has been completed as per the TOR and is included in the following page as Figure CAM-2.2 Gladman Point – Station Landfill.



PERMANENT BENCHMARK				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM–1	7 618 897.363	548 331.191	26.595	25mm DIA. STEEL PIPE
SRR–1	7 618 877.108	548 267.873	24.975	16mm DIA. IRON BAR

LEGEND

- TBM4 ⊡ TEMPORARY BENCHMARK
- BM–1 ▲ PERMANENT BENCHMARK
- (33) PHOTOGRAPH LOCATION
- SURFICIAL EROSION (NTS)
- TENSION CRACK (NTS)
- SETTLEMENT (NTS)
- STAINING AND SEEPAGE
- POND

0 20m 40m 60m 80m 100m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13–04–19	D.L.	B.M.	A.L.
B	REVISION 1	13–02–14	A.L.	B.M.	A.L.
A	PRELIMINARY	12–11–30	P.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
CAM-2, GLADMAN POINT, NUNAVUT

STATION LANDFILL

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Meter	1 : 2,000	FEBRUARY 2013
DRAWN BY:	VERIFIED BY:	APPROVED BY:
P. LÉGARÉ	B. MACKAY	A. LECLAIR P.ENG
PROJECT NO:	DRAWING NO:	PAGE
CD2656_200_203	CD2656_200_203-CAM-2_2	PL

FIGURE CAM-2.2

3.5 PHOTOGRAPHIC RECORDS

The Photographic Record for Station Landfill has been completed as per the TOR and is included as Table VI hereafter. The Photographic Record only contains an index and “thumbnail” photographs. Full-sized photographs are contained in the Addendum DVD-ROM.

Table VI: Landfill Visual Inspection Photo Log – Station Landfill

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 1							
14		2012-C2-Station-14	2.650	26/08/2012	548550	7618938	View SE of the northwestern portion of the Lobe 1 Cap
15		2012-C2-Station-15	2.390	26/08/2012	548567	7618932	**Feature M:** Close-up view of one of two depressions observed on the landfill surface, this being the western of the two. Depression is marked in photograph by fine material below the field note book.
16		2012-C2-Station-16	2.380	26/08/2012	548567	7618932	**Feature M:** Close-up view of one of two shallow circular depressions observed on the landfill surface, this being the eastern of the two. Depression is marked in photograph by fine material below the field note book.
17		2012-C2-Station-17	2.290	26/08/2012	548567	7618932	Feature M. View SE of two shallow circular depressions. (1.00 m x 0.70 m x 0.15 m)
18		2012-C2-Station-18	2.820	26/08/2012	548606	7618913	View NW of northern portion of landfill cap, taken from the south west corner
19		2012-C2-Station-19	2.660	26/08/2012	548606	7618920	View NW of southern portion of landfill cap, taken from the south west corner
Lobe 2							
20		2012-C2-Station-20	2.580	26/08/2012	548433	7619069	**Feature G:** View NNE of engineered drainage channel, minor erosion present along the base of the channel. Taken from the southern end of the channel (highest point).
21		2012-C2-Station-21	2.870	26/08/2012	548443	7619088	**Feature G:** View NE of engineered drainage channel, minor erosion present along the base of the channel, taken 21 m NNE of southern end of the drainage channel
22		2012-C2-Station-22	2.580	26/08/2012	548448	7619103	**Feature G:** View NE of engineered drainage channel, minor erosion present along the base of the channel, taken 37 m NNE of southern end of the drainage channel
23		2012-C2-Station-23	2.590	26/08/2012	548458	7619119	**Feature G:** View SSW of engineered drainage channel, taken at the NNE extent of the channel.
24		2012-C2-Station-24	59.400	26/08/2012	548473	7619104	**Feature H:** Panoramic view NNW-E of Feature H, seepage/staining.
25		2012-C2-Station-25	2.760	26/08/2012	548473	7619107	**Feature H:** Close up of iron bacteria present at ponded water at landfill toe
26		2012-C2-Station-26	2.880	26/08/2012	548473	7619107	**Feature H:** Close up of clumped iron bacteria present at ponded water at landfill toe.
27		2012-C2-Station-27	2.290	26/08/2012	584579	7619070	**Feature N:** View NE of a minor erosion channel extending from the landfill cap to the side slope. (10 m x 0.05 m x 0.03 m)
28		2012-C2-Station-28	2.570	26/08/2012	584579	7619070	**Feature N:** Close-up view of minor erosion channel.
29		2012-C2-Station-29	2.390	26/08/2012	548478	7619026	**Feature B:** 1 of 3 (southern) minor depressions on east crest of lobe, (3 m x 0.4 m x 0.10 m).
30		2012-C2-Station-30	2.430	26/08/2012	548476	7619034	**Feature B:** 2 of 3 (middle) minor depressions on east crest of lobe, (2 m x 0.2 m x 0.05 m).
31		2012-C2-Station-31	2.500	26/08/2012	548476	7619034	**Feature B:** 3 of 3 (northern) minor depressions on east crest of lobe, (1.5 m x 0.3 m x 0.10 m).
32		2012-C2-Station-32	38.000	26/08/2012	548543	7619031	Panoramic view S - NNW of East slope of lobe 2.
33		2012-C2-Station-33	52.000	26/08/2012	548476	7619029	Panoramic view SSE - SW of the southern portion of the landfill cap of lobe 2.
34		2012-C2-Station-34	2.530	26/08/2012	548509	7618964	**Feature O:** View NE of minor superficial erosion starting at the crest of the landfill and continuing across the east slope to the toe. (10 m x 0.15-0.50 m x 0.05 - 0.25 m)
35		2012-C2-Station-35	2.380	26/08/2012	548512	7618967	**Feature O:** View SW of minor superficial erosion starting at the crest of the landfill and continuing across the east slope to the toe. (10 m x 0.15-0.50 m x 0.05 - 0.25 m)
36		2012-C2-Station-36	2.430	26/08/2012	548504	7618952	**Feature F:** View NE of minor erosion on the landfill surface. (36 m x 0.30 - 2.0 m x 0.02 - 0.30m).

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 2							
37		2012-C2-Station-37	2.450	26/08/2012	548510	7618957	**Feature F:** View NE of the continuation of the erosion channel on the eastern slope of the landfill, self-armouring, taken from the landfill crest (36 m x 0.20 - 2.0 m x 0.02 - 0.30m).
38		2012-C2-Station-38	2.510	26/08/2012	548534	7618974	**Feature F:** View SW of the erosion channel from the bottom, channel continues onto the local tundra (36 m x 0.30 - 2.0 m x 0.02 - 0.20 m).
39		2012-C2-Station-39	2.520	26/08/2012	548532	7618937	**Feature E:** View NE from the landfill crest of three erosion channels, sediment can be seen deposited on the local tundra. (12.2 m x 0.10 - 0.50 m x 0.10 - 0.15m)
40		2012-C2-Station-40	2.560	26/08/2012	548542	7618944	**Feature E:** View SW from the bottom of three erosion channels, sediment can be seen deposited on the local tundra. (12.2 m x 0.10 - 0.50 m x 0.10 - 0.15m)
41		2012-C2-Station-41	2.560	26/08/2012	548538	7618916	**Feature D:** View east of the northern erosion channels associated with this feature, two channels converge at the landfill toe to form one channel self armouring. (15 m x 0.10 - 1.5 m x 0.10 m)
42		2012-C2-Station-42	2.570	26/08/2012	548553	7618919	**Feature D:** View west of the southern channels, two channels converge to form a larger channel at the landfill toe. (8 m x 0.20 - 0.50 m x 0.10 - 0.15 m).
43		2012-C2-Station-43	2.490	26/08/2012	548540	7618879	**Feature D:** View east of smaller erosion channel associated with this feature, to the south of the larger channels, self armouring (8 m x 0.20 - 0.50 m x 0.05 - 0.10 m).
44		2012-C2-Station-44	2.460	26/08/2012	548548	7618882	**Feature D:** View west of smaller erosion channel associated with this feature, to the south of the larger channels, self armouring (8 m x 0.05 - 0.20 m x 0.10 - 0.15 m).
45		2012-C2-Station-45	2.390	26/08/2012	548538	7618874	**Feature J:** Tension crack, no longer visible for the full extend observed in 2010. (1.20 m x 0.01 - 0.05 m x 0.05 m)
46		2012-C2-Station-46	2.580	26/08/2012	548538	7618874	**Feature J:** Close-up of tension crack.
47		2012-C2-Station-47	64.200	26/08/2012	548534	7618861	Panoramic view NNW to NNE of the southern portion of the landfill cap and the western toe/crest. Taken from the S end of the landfill.
48		2012-C2-Station-48	2.640	26/08/2012	548534	7618861	View NW of W toe of the landfill.
49		2012-C2-Station-49	2.480	26/08/2012	548544	7618941	View N of the E toe of the landfill.
Lobe 3							
50		2012-C2-Station-50	75.400	26/08/2012	548454	7618865	Panoramic view NW - NNE of the southeastern section of Lobe 3
51		2012-C2-Station-51	2.490	26/08/2012	548440	7618870	**Feature C:** View of minor erosion on the west landfill toe
52		2012-C2-Station-52	2.480	26/08/2012	548433	7618882	**Feature C:** View of minor erosion on the west landfill toe
53		2012-C2-Station-53	2.520	26/08/2012	548430	7618885	**Feature C:** View of minor erosion on the west landfill toe
54		2012-C2-Station-54	2.440	26/08/2012	548442	7618914	**Feature C:** View of minor erosion on the east landfill toe
55		2012-C2-Station-55	2.420	26/08/2012	548436	7618922	**Feature C:** View of minor erosion on the east landfill toe
56		2012-C2-Station-56	2.500	26/08/2012	548414	7618950	View SSE of east toe of landfill, Tier II visible in the background
57		2012-C2-Station-57	2.650	26/08/2012	548383	7618915	View SE of W corner of landfill.

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 4							
58		2012-C2-Station-58	2.390	26/08/2012	548318	7619021	**Feature P:** Hydrocarbon stain, approximately center on the lobe. (0.60 m x 0.50 m)
59		2012-C2-Station-59	115.000	26/08/2012	548301	7619003	Panoramic view NE - E of landfill
61		2012-C2-Station-61	118.000	26/08/2012	548340	7619034	Panoramic view SSW - WSW of landfill
Lobe 5							
63		2012-C2-Station-63	2.390	26/08/2012	548256	7619023	**Feature A:** Four minor depressions on the landfill surface, an increase from 2 as previously reported.
64		2012-C2-Station-64	2.390	26/08/2012	548255	7619025	**Feature A:** Four minor depressions on the landfill surface, an increase from 2 as previously reported.
65		2012-C2-Station-65	2.400	26/08/2012	548254	7619027	**Feature A:** Four minor depressions on the landfill surface, an increase from 2 as previously reported.
66		2012-C2-Station-66	2.470	26/08/2012	548251	7619026	**Feature A:** Four minor depressions on the landfill surface, an increase from 2 as previously reported.
67		2012-C2-Station-67	2.500	26/08/2012	548264	7619049	**Feature Q/R:** Minor depression on the north tore of the landfill, associated with a large coble (Q). Vegetation present in the bottom and adjacent to depression (R).
68		2012-C2-Station-68	79.500	26/08/2012	548252	7619062	Panoramic view SE - SSW of landfill
69		2012-C2-Station-69	86.400	26/08/2012	548296	7619024	Panoramic view SW to NW of landfill
General							
11		2012-C2-Station-11	2.620	26/08/2012	548460	7618828	View from Tier II of Lobes 4 and 5 as well as the west corner of lobe 3
12		2012-C2-Station-12	2.240	26/08/2012	548460	7618828	View from the Tier II of lobe 3
13		2012-C2-Station-13	2.200	26/08/2012	548460	7618828	View from Tier II of Lobes 2
70		2012-C2-Station-70	64.500	28/08/2012	Aerial		Aerial view of the Station landfill, taken from a Twin Otter.
Soil Sampling							
1		2012-C2-Station-1	2.420	24/08/2012	548458	7619127	**C2-1:** Close-up of open soil test pit
2		2012-C2-Station-2	2.340	24/08/2012	548458	7619127	**C2-1:** Close-up of closed soil test pit
3		2012-C2-Station-3	2.390	24/08/2012	548508	7619065	**C2-2:** Close-up of open soil test pit
4		2012-C2-Station-4	2.370	24/08/2012	548508	7619065	**C2-2:** Close-up of closed soil test pit
5		2012-C2-Station-5	2.410	24/08/2012	548537	7618996	**C2-3:** Close-up of open soil test pit
6		2012-C2-Station-6	2.410	24/08/2012	548537	7618996	**C2-3:** Close-up of closed soil test pit
7		2012-C2-Station-7	2.370	24/08/2012	548579	7618949	**C2-4:** Close-up of open soil test pit
8		2012-C2-Station-8	2.300	24/08/2012	548579	7618949	**C2-4:** Close-up of closed soil test pit
9		2012-C2-Station-9	2.400	24/08/2012	548363	7619022	**C2-5:** Close-up of open soil test pit
10		2012-C2-Station-10	2.360	24/08/2012	548363	7619022	**C2-5:** Close-up of closed soil test pit

3.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Station Landfill samples are presented in Tables VII and VIII respectively. Certificates of Analysis and results from field duplicates collected as part of the QA/QC program are presented in Appendix C at the end of this report.

Table VII: Station 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																
C2-12-5-A	C2-5	0-15	5.5	5.7	2.1	<0.5	3.6	14	6.3	1.0	<0.5	<0.05	<10	<10	101	101
C2-12-5-B		40-50	1.8	3.3	1.1	<0.5	2.5	4	4.2	0.6	<0.5	<0.05	<10	<10	<10	<10
Downgradient Samples																
C2-12-1-A	C2-1	0-15	7.8	4.5	1.3	<0.5	4.0	11	4.7	13.9	<0.5	<0.05	<10	<10	438	438
C2-12-1-B		40-50	1.7	3.3	1.2	<0.5	3.1	6	4.1	0.7	<0.5	<0.05	<10	<10	20	20
C2-12-2-A	C2-2	0-15	5.3	4.5	1.4	<0.5	3.9	12	7.6	1.3	<0.5	<0.05	<10	11	382	393
C2-12-2-A-D		0-15	5.9	3.6	1.2	<0.5	3.5	14	7.0	0.9	<0.5	<0.05	<10	<10	485	485
C2-12-2-B		40-50	1.8	2.8	0.9	<0.5	2.7	8	3.4	<0.5	<0.5	<0.05	<10	<10	<10	<10
C2-12-3-A	C2-3	0-15	2.0	2.9	1.0	<0.5	2.2	5	3.1	0.6	<0.5	<0.05	<10	<10	13	13
C2-12-3-B		40-50	3.9	4.0	1.3	<0.5	3.3	6	4.3	1.0	<0.5	<0.05	<10	<10	21	21
C2-12-4-A	C2-4	0-15	2.3	3.7	1.1	<0.5	2.7	7	4.5	<0.5	<0.5	<0.05	<10	<10	44	44
C2-12-4-B		40-50	1.8	3.1	0.9	<0.5	2.1	4	3.4	<0.5	<0.5	<0.05	<10	<10	12	12

Table VIII: Evaluation of 2012 Soil Analytical Data – Station Landfill

Parameter	Evaluation
Copper (Cu)	Copper was detected at all sample locations. Concentrations ranged from 1.7 – 7.8 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of copper was detected in the surface sample of C2-2. All values were below CCME guidelines.
Nickel (Ni)	Nickel was detected at all sample locations. Results were consistent at upgradient and downgradient locations with concentrations ranging from 2.8 – 5.7 mg/kg. The highest concentration was detected in the surface sample of C2-5, the upgradient sample. All values were below CCME guidelines.
Cobalt (Co)	Cobalt was detected at all sample locations. Concentrations ranged from 0.9 – 2.1 mg/kg. Concentrations were similar at upgradient and downgradient sample locations The highest concentration of cobalt was detected in the surface sample of C2-2. All values were below CCME guidelines.
Cadmium (Cd)	Cadmium was below the method detection limit at all sampling locations.
Lead (Pb)	Lead was detected at all sample locations. Concentrations ranged from 2.1 – 4.0 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of lead was detected in the surface sample of C2-1. All values were below CCME guidelines.
Zinc (Zn)	Zinc was detected at all sample locations. Concentrations ranged from 4 – 14 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of zinc was detected at two locations in the surface sample of C2-2 and C2-5. All values were below CCME guidelines.
Chromium (Cr)	Chromium was detected at all sample locations. Concentrations ranged from 3.1 – 7.6 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of chromium was detected in the surface sample of C2-2. All values were below CCME guidelines.
Arsenic (As)	Arsenic was detected at surface and depth for all locations with the exception of C2-4 where it was not detected and C2-2 where it was only detected in the surface sample. The highest detected concentration 13.9 mg/kg at C2-1 is above the CCME criteria of 12 mg/kg. All other detected arsenic concentrations were relatively low, ranging from 0.6 – 1.3.
Mercury (Hg)	Mercury was below the method detection limit at all sampling locations.
PCBs	PCBs were below the method detection limit at all sampling locations.
TPH	TPH was detected at all sampling locations at surface and depth with the exception of sampling locations C2-2 and C2-5 where TPH was only detected in the surface samples. Detected TPH concentrations ranged from 12 – 485 mg/kg with the highest concentration detected at the surface of C2-2. All TPH concentrations are below standard DEW Line remediation criterion for TPH concentrations in soil.

4 WEST LANDFILL - NORTH

4.1 SUMMARY

During the 2012 monitoring event of the West Landfill - North at CAM-2 Gladman Point soil samples were collected at 5 locations (1 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 at any of the soil sampling locations. TPH was detected at all sampling locations and in all samples with the exception of the surface sample at C2-6. Detectable TPH concentrations ranged from 14 to 446 mg/kg with the highest concentration detected at the surface of the C2-7 sampling location. All detected TPH was primarily in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg and are therefore acceptable.

During the 2012 monitoring program, little change was observed at the West Landfill – North in comparison to the 2010 monitoring program. No significant or unacceptable erosional features were observed and therefore the West Landfill – North is rated as acceptable.

4.2 VISUAL INSPECTION REPORT

The visual inspection of the West Landfill – North area was conducted on August 26, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table IX of this report. Please refer to Figure CAM-2.3 for the location of photographs and erosional features at the West Landfill – North.

Weather Conditions at Time of Inspection

At the time of the visual inspection of the West Landfill - North, the temperature was approximately 2°C, skies were overcast and winds of 20 km/h from the south were observed.

Settlement

Settlement was noted at two locations during the 2012 monitoring program at Lobe 2 (Feature B) and Lobe 3 (Feature C). Feature B on the south/middle surface of Lobe 2 is a long shallow depression of little consequence to the stability of the Lobe. Feature C consists of three depressions, one on the south side slope, a linear depression running parallel to the toe and a

group depression on the southeast surface of the Landfill. The cover of the Landfill continues to remain stable. Feature B and C have acceptable severity ratings.

Erosion

Minor surface erosion was noted along a runoff channel that extends between two closely spaced Lobes (Lobes 4 and 5) in the central area of the Landfill (Feature A). The erosion extends along the toe of Lobe 4 and is not in direct contact with the Landfill. 2012 observations of Feature A remain consistent with the 2010 findings.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Evidence of an animal was observed at the south corner (on the side slope) of Lobe 4, Feature D. Similar burrows were observed at different areas on the Site but the feature at Lobe 4 was the only burrow observed on a Landfill Lobe. The small size of the burrow suggests it was made by a small rodent of an unknown type, no animals were observed entering or leaving the burrow. Feature D has an acceptable severity rating.

Vegetation

Evidence of vegetation was not noted.

Staining

Areas of staining were not observed at the time of the inspection.

Seepage Points

No seepage points were observed at this Landfill.

Debris

There was no evidence of exposed debris at this Landfill.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this Landfill.

Other Features of Note

A single area of ponding water was noted at the toe of one of the down gradient Lobes. The ponded water was contained to a small dugout area located immediately adjacent to Lobe 6.

Another feature of note (Feature E) was observed on the north eastern surface of Lobe 4, a raised area approximately 10 m in diameter and 1.5 m above the grade of the surrounding Landfill surface. The change in gradient is not indicated on the drawings and was not mentioned in the 2010 report.

Table IX: Visual Inspection Checklist / Report – West Landfill – North

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

SITE NAME: CAM-2 Gladman Point
LANDFILL DESIGNATION: West Landfill - North (Existing Landfill – Regrade)
DATE OF INSPECTION: August 27, 2012
DATE OF PREVIOUS INSPECTION: August 16, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: 7
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-C2-West-N)	Severity Rating	Additional Comments
Settlement	Yes	FEATURE B See Figure CAM-2.3 (between Lobe 2)	2.5	0.4	0.1	Occasional	Linear depression	18	Acceptable	New Observation: Singular depression of the landfill surface.
		FEATURE C See Figure CAM-2.3 (between Lobe 3)	1.5 - 4.0	0.20 - 0.50	0.10 - 0.15		Depression	22, 22B	Acceptable	New Observation: Three areas of settlement including a linear depression of the north landfill toe, and two areas of settlement on the landfill surface.
Erosion	Yes	FEATURE A See Figure CAM-2.3 (between Lobes 4 and 5)	20 m	0.4 m	5 cm	Isolated <1%	Minor erosion between regrade lobes	23, 24	Acceptable	Runoff channel located between regrade areas, extending NE along the toe of Lobe 4. Feature has not significantly changed in size since the previous inspection.
Frost Action	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Observed	N/A
Animal Burrows	Yes	FEATURE D See Figure CAM-2.3 (between Lobe 4)	0.05	0.04	Unknown	Isolated	Small animal burrow	30	Acceptable	New Observation: Small animal burrow in the side of the landfill, suspected to be of a lemming due to the dimensions of the hole.
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 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	Feature E	10	10	1.5	Isolated	Above grade section	31	Acceptable	New Observation: Area 10 m in diameter that is 1.5 m above the surrounding grade of the landfill - not previously reported and not indicated on drawings as part of the natural contours of the landfill cap.
		See Figure CAM-2.3 (ponding)	3	2	0.2	<1	Isolated	38	Acceptable	Dug-out area at edge of regrade area.
Additional Photos	Yes	See Figure CAM-2.3 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	Not Observed	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

4.3 PRELIMINARY STABILITY ASSESSMENT

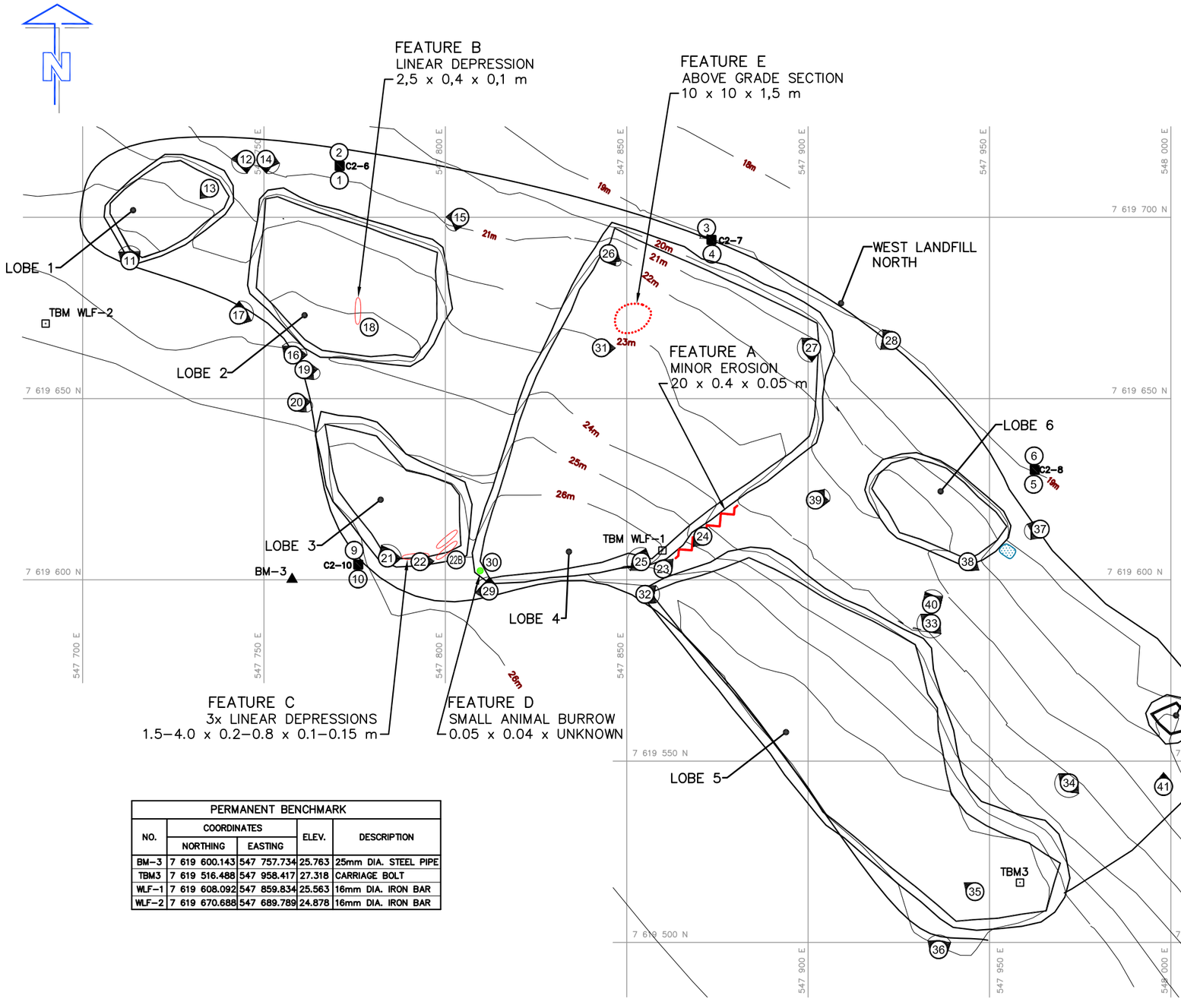
The Preliminary Stability Assessment for West Landfill – North has been completed as per the TOR and is included as Table X hereafter.

Table X: Preliminary Stability Assessment – West Landfill – North

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Isolated
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 West Landfill – North has been completed as per the TOR and is included in the following page as Figure CAM-2.3 Gladman Point – West Landfill – North.



PERMANENT BENCHMARK				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM–3	7 619 600.143	547 757.734	25.763	25mm DIA. STEEL PIPE
TBM3	7 619 516.488	547 958.417	27.318	CARRIAGE BOLT
WLF–1	7 619 608.092	547 859.834	25.563	16mm DIA. IRON BAR
WLF–2	7 619 670.688	547 689.789	24.878	16mm DIA. IRON BAR

LEGEND

- TBM4 — TEMPORARY BENCHMARK
- BM–1 — PERMANENT BENCHMARK
- MONITORING SOIL SAMPLE LOCATION
- 33 — PHOTOGRAPH LOCATION
- EROSION (NTS)
- SETTLEMENT (NTS)
- RAISED AREA
- POND
- ANIMAL BURROW

0 12.5m 25m 37.5m 50m 62.5m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13–04–19	D.L.	B.M.	A.L.
B	REVISION 1	13–02–14	A.L.	B.M.	A.L.
A	PRELIMINARY	12–11–30	P.L.	B.M.	A.L.

Construction de Défense Canada
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FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
CAM-2, GLADMAN POINT, NUNAVUT

WEST LANDFILL-NORTH

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Meter	1 : 1,250	FEBRUARY 2013
DRAWN BY:	VERIFIED BY:	APPROVED BY:
P. LÉGARÉ	B. MACKAY	A. LECLAIR P.ENG
PROJECT NO:	DRAWING NO:	PAGE
CD2656_200_203	CD2656_200_203-CAM-2_3	PL

FIGURE CAM-2.3

4.5 PHOTOGRAPHIC RECORDS

The Photographic Record for the West Landfill – North has been completed as per the TOR and is included in the following pages as Table XI. The Photographic Record only contains an index and "thumbnail" photographs. Full-sized photographs are contained in the Addendum DVD-ROM.

Table XI: Landfill Visual Inspection Photo Log – West Landfill – North

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 1							
11		2012-C2-West-N-11	116.000	27/08/2012	547713	7619688	Panoramic view NW - NNE of SW side of landfill
12		2012-C2-West-N-12	82.500	27/08/2012	547745	7619716	Panoramic view SE - SW of the north side of the landfill
13		2012-C2-West-N-13	2.600	27/08/2012	547735	7619708	View SW of the landfill cap from the NE corner
Lobe 2							
14		2012-C2-West-N-14	111.000	27/08/2012	547749	7619716	Panoramic view ESE - S of the N and W landfill toes
15		2012-C2-West-N-15	95.000	27/08/2012	547804	7619700	Panoramic view SSW - W of the N and E landfill toes
16		2012-C2-West-N-16	66.800	27/08/2012	547758	7619662	Panoramic view NW - E of the south landfill toe and a portion of the eastern cap.
17		2012-C2-West-N-17	85.000	27/08/2012	547743	7619673	Panoramic view N - ESE taken from the SW corner of the lobe
18		2012-C2-West-N-18	2.430	27/08/2012	547773	7619672	**Feature B:** Close-up of a minor depression on the landfill surface (2.5 m x 0.40 m x 0.10 m)
Lobe 3							
19		2012-C2-West-N-19	80.300	27/08/2012	547761	7619658	Panoramic view E - SE of regraded area between Lobes 2 and 3
20		2012-C2-West-N-20	174.000	27/08/2012	547759	7619649	Panoramic view E - SE of the NE corner and associated toes of the lobe.
21		2012-C2-West-N-21	57.900	27/08/2012	547784	7619606	Panoramic view NNW - E of the landfill cap, taken from the southern corner of the lobe
22		2012-C2-West-N-22	2.480	27/08/2012	547793	7619605	**Feature C:** View E of linear depression on the south toe of the landfill (4 m x 0.25 m x 0.15 m)
22B		2012-C2-West-N-22B	2.450	27/08/2012	547801	7619607	**Feature C:** View of two shallow depressions on the landfill surface, GPS device is in the middle of the two depressions. (1.5 m x 0.20 - 0.50 m x 0.10 m)
Lobe 4							
23		2012-C2-West-N-23	2.530	27/08/2012	547860	7619603	**Feature A:** View NE of minor erosion of the base of the runoff channel between lobes 4 and 5. (20 m x 0.40 m x 0.05 m)
24		2012-C2-West-N-24	2.650	27/08/2012	547871	7619612	**Feature A:** View SW of minor erosion of the base of the runoff channel between lobes 4 and 5. (20 m x 0.40 m x 0.05 m)
25		2012-C2-West-N-25	51.000	27/08/2012	547854	7619605	Panoramic view WSW - NNE of the landfill cap, taken from the SE corner of the lobe, adjacent to the drainage channel
26		2012-C2-West-N-26	87.800	27/08/2012	547845	7619690	Panoramic view SE - SSE of the landfill cap, taken from the NW corner of the lobe.
27		2012-C2-West-N-27	60.400	27/08/2012	547901	7619664	Panoramic view S - NW of the landfill cap, taken from the NE corner of the lobe.
28		2012-C2-West-N-28	64.100	27/08/2012	547923	761966	Panoramic view SW - NW of the landfill cap, taken from the tundra, 20 m ENE of the NE corner.
29		2012-C2-West-N-29	112.000	27/08/2012	547810	7619597	Panoramic view N - W of the landfill cap, taken from the SW corner of the landfill.
30		2012-C2-West-N-30	2.580	27/08/2012	547810	7619597	**Feature D:** Close-up of an animal burrow at the SW corner of the landfill.
31		2012-C2-West-N-31	2.850	27/08/2012	547843	7619664	View E of a portion of the regrade that is 1.5 m then the surrounding grade, approximately 10 m in diameter.

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 5							
32		2012-C2-West-N-32	123.000	27/08/2012	547855	7619596	Panoramic view SE - NE of the landfill cap, taken from the NW corner of the lobe adjacent to the drainage channel. Lobe 6 is visible in the background of the photo.
33		2012-C2-West-N-33	64.700	27/08/2012	547934	7619588	Panoramic view SE - NW of the northern landfill toe.
34		2012-C2-West-N-34	70.000	27/08/2012	547972	7619544	Panoramic view SE - NW of the northern landfill toe.
35		2012-C2-West-N-35	2.660	27/08/2012	547946	7619514	View NW of landfill cap taken from the SE corner of the landfill.
36		2012-C2-West-N-36	66.900	27/08/2012	547936	7619498	Panoramic view NW - NE of southern landfill toe, taken from the SE corner of the landfill
Lobe 6							
37		2012-C2-West-N-37	96.200	27/08/2012	547964	7619614	Panoramic view SW - WNW of NE landfill toe.
38		2012-C2-West-N-38	2.530	27/08/2012	547944	7619605	View SE of water pooled in a dug-out area adjacent to the lobe.
39		2012-C2-West-N-39	178.000	27/08/2012	547902	7619627	Panoramic view NE - E of the S landfill toe
40		2012-C2-West-N-40	101.000	27/08/2012	547934	7619588	Panoramic view NNW - NE of the SE landfill toe.
41		2012-C2-West-N-41	2.600	27/08/2012	547998	7619543	View N of lobe.
General							
42		2012-C2-West-N-42	6.400	28/08/2012	Aerial		Aerial view of the regrades
Soil Samples							
1		2012-C2-West-N-1	2.430	25/08/2012	547771	7619712	**C2-6:** Close-up of open soil test pit
2		2012-C2-West-N-2	2.350	25/08/2012	547771	7619712	**C2-6:** Close-up of closed soil test pit
3		2012-C2-West-N-3	2.470	25/08/2012	547872	7619696	**C2-7:** Close-up of open soil test pit
4		2012-C2-West-N-4	2.340	25/08/2012	547872	7619696	**C2-7:** Close-up of closed soil test pit
5		2012-C2-West-N-5	2.440	25/08/2012	547966	7619632	**C2-8:** Close-up of open soil test pit
6		2012-C2-West-N-6	2.440	25/08/2012	547966	7619632	**C2-8:** Close-up of closed soil test pit
7		2012-C2-West-N-7	2.630	25/08/2012	548025	7619574	**C2-9:** Close-up of open soil test pit
8		2012-C2-West-N-8	2.360	25/08/2012	548025	7619574	**C2-9:** Close-up of closed soil test pit
9		2012-C2-West-N-9	2.410	25/08/2012	547768	7619599	**C2-10:** Close-up of open soil test pit
10		2012-C2-West-N-10	2.410	25/08/2012	547768	7619599	**C2-10:** Close-up of closed soil test pit

4.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2010 West Landfill – North area samples are presented in Tables XII and XIII hereafter. Certificates of Analysis and results from field duplicates collected as part of the QA/QC program are presented in Appendix C at the end of this report.

Table XII: West Landfill – North Summary Table for 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																
C2-12-10-A	C2-10	0-15	3.3	6.0	2.0	<0.5	3.9	11	6.8	1.1	<0.5	<0.05	<10	<10	32	32
C2-12-10-B		40-50	3.0	5.4	2.1	<0.5	3.4	11	6.4	1.2	<0.5	<0.05	<10	<10	14	14
Downgradient Samples																
C2-12-6-A	C2-6	0-15	2.2	1.9	0.7	<0.5	1.2	6	2.9	<0.5	<0.5	<0.05	<10	<10	<10	<10
C2-12-6-B		40-50	1.3	2.9	0.7	<0.5	1.3	3	2.6	<0.5	<0.5	<0.05	<10	<10	31	31
C2-12-7-A	C2-7	0-15	20.8	6.6	1.4	<0.5	3.0	6	5.4	1.4	<0.5	<0.05	<10	11	435	446
C2-12-7-B		40-50	3.9	3.9	1.0	<0.5	2.2	5	4.5	0.6	<0.5	<0.05	<10	<10	115	115
C2-12-8-A	C2-8	0-15	5.7	4.3	2.4	<0.5	2.3	6	4.6	2.2	<0.5	<0.05	<10	<10	106	106
C2-12-8-B		40-50	16.2	15.4	6.9	<0.5	14.7	37	24.6	2.9	<0.5	<0.05	<10	<10	59	59
C2-12-9-A	C2-9	0-15	3.3	7.6	3.4	<0.5	2.8	18	8.8	1.9	<0.5	<0.05	<10	<10	24	24
C2-12-9-B		40-50	11.5	12.6	5.5	<0.5	10.4	32	21.9	2.9	<0.5	<0.05	<10	<10	42	42

Table XIII: Evaluation of 2012 Soil Analytical Data – West Landfill – North

Parameter	Evaluation
Copper (Cu)	Copper was detected at all sample locations. Concentrations ranged from 1.3 – 20.8 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of copper was detected at the surface of C2-7. All values were below CCME guidelines.
Nickel (Ni)	Nickel was detected at all sample locations. Results were consistent at upgradient and downgradient locations with concentrations ranging from 1.9 – 15.4 mg/kg. The highest concentration was detected at depth at C2-8, a downgradient sample. All values were below CCME guidelines.
Cobalt (Co)	Cobalt was detected at all sample locations. Concentrations ranged from 0.7 – 6.9 mg/kg. Concentrations were similar at upgradient and downgradient sample locations The highest concentration of cobalt was detected at depth at C2-8, a downgradient sample. All values were below CCME guidelines.
Cadmium (Cd)	Cadmium was below the method detection limit at all sampling locations.
Lead (Pb)	Lead was detected at all sample locations. Concentrations ranged from 1.2 – 14.7mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of lead was detected at depth at C2-8, a downgradient sample 1. All values were below CCME guidelines.
Zinc (Zn)	Zinc was detected at all sample locations. Concentrations ranged from 3 – 37 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of zinc was detected at depth at C2-8, a downgradient sample. All values were below CCME guidelines.
Chromium (Cr)	Chromium was detected at all sample locations. Concentrations ranged from 2.6 – 24.6 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of chromium was detected at depth at C2-8, a downgradient sample. All values were below CCME guidelines.
Arsenic (As)	Arsenic was detected at all sample locations with the exception of C2-6. Detected concentrations ranged from 0.6 – 2.9 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of arsenic was detected at depth at two locations C2-8 and C2-9, a downgradient samples. All values were below CCME guidelines.
Mercury (Hg)	Mercury was below the method detection limit at all sampling locations.
PCBs	PCBs were below the method detection limit at all sampling locations.
TPH	TPH was detected at all sampling locations at surface and depth with the exception of C2-6 where TPH was only detected at depth. Detected TPH concentrations ranged from 14 – 446 mg/kg with the highest concentration detected at the surface of C2-7. All TPH concentrations are below standard DEW Line remediation criterion for TPH concentrations in soil.

5 WEST LANDFILL – SOUTH

5.1 SUMMARY

During the 2012 monitoring event of the West Landfill - South at CAM-2 Gladman Point 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 at any of the soil sampling locations. TPH was detected at all sampling locations and in all samples with the exception of the depth samples at locations C2-12, 13 and 14. Detectable TPH concentrations ranged from 12 to 210 mg/kg with the highest concentration detected at the surface of the C2-11 sampling location. All detected TPH was in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg and are therefore acceptable.

The West Landfill – South has experienced little change in the overall stability since the 2010 monitoring program, with only a few indications of increased settlement and one area of seepage. As all of the features present at the West Landfill – South have an acceptable severity rating and soil analytical results are acceptable, the Landfill's overall performance is rated as acceptable.

5.2 VISUAL INSPECTION REPORT

The visual inspection of the West Landfill – South area was conducted on August 27, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XIV of this report. Please refer to Figure CAM-2.4 for the location of photographs and erosional features at the West Landfill – South.

Weather at Time of Visual Inspection

At the time of the visual inspection of the West Landfill – South, the temperature was approximately 2°C, skies were partly cloudy and winds of 20 km/h from the south were observed.

Settlement

During the 2012 monitoring program, minor indications of settlement were noted at three locations at the West Landfill – South, including two areas at Lobe 8 (Feature A and C) and a third location at Lobe 10 (Feature E)

Feature A, first noted in the 2010 monitoring program, showed a series of three closely spaced depressions on the east surface of Lobe 8, which have experienced little to no significant change. Feature C includes six depressions east of Feature A on the surface of the Lobe, four of which are a tight cluster of potholes, while two slightly to the south appear to be the remnants of pick-up tire tracks. It appears as though settlement has increased since the 2010 monitoring program however, at least two of the depressions are a relic of the remediation contract.

Feature E, a new observation, consists of a small linear depression on the northern slope of Lobe 10, which runs parallel to the Landfill toe.

All areas of settlement observed at the West Landfill – South are considered to have an acceptable severity rating.

Erosion

Indications of erosion were not noted.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Re-establishment of Vegetation

Evidence of vegetation was not noted.

Staining

Areas of staining were not observed at the time of the inspection.

Seepage Points

Feature D, first noted during the 2012 monitoring program, consists of surface wetting across the north portion of the Landfill toe, extending 5 m onto the surface of the Lobe. Ponded water in direct contact with the toe is present in two locations, on the northwest and the northeast side of the landfill. The tundra on the northwest side has evidence of rutting from machinery traffic which is now collecting water.

Debris

Feature B, a piece of partially exposed black geotextile associated with the engineered drainage channel at the southeast end of Lobe 11 remains unchanged from previous years.

Presence/Condition of Monitoring Instruments

There are no monitoring instruments installed at this Landfill.

Other Features of Note

A single area of ponding water was noted in a low lying area extending between Lobe 11 and adjacent to Lobe 10 to the north. There were no seepage points or staining associated with the ponded water.

Table XIV: Visual Inspection Checklist / Report – West Landfill – South

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

SITE NAME: CAM-2 Gladman Point
LANDFILL DESIGNATION: West Landfill – South (Existing Landfill – Regrade)
DATE OF INSPECTION: August 27, 2012
DATE OF PREVIOUS INSPECTION: August 14, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: 7
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	Severity Rating	Additional Comments
Settlement	Yes	FEATURE A See Figure CAM-2.4 (east side of Lobe 8)	0.5 - 0.8	0.5 - 0.8	0.05 - 0.15	Occasional	Three small depressions (potholes) on surface of lobe	11, 12	Acceptable	Three small depressions on the east side of the lobe, shows little or no change in dimension since the previous inspection in 2010.
		FEATURE C See Figure CAM-2.4 (east side of Lobe 8)	0.5 - 2.0	0.5 - 1.0	0.1 - 0.2		Six small depressions (potholes) on surface of lobe	13, 14, 15	Acceptable	New Observation: Six small depressions on the surface of the landfill, four of which are located in the east corner of the landfill with the remaining two on the south west side of the landfill. Depressions on the south west side appear to be from a pick-up truck and thus, an oversight on previous inspections.
		FEATURE E See Figure CAM-2.4 (Lobe 10)	0.3	0.2	0.1		Small depression on the north slope	22	Acceptable	New Observation: Small depression on the north slope of Lobe 10.
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	Yes	FEATURE D See Figure CAM-2.4 (North side of Lobe 9)	20	5	Unknown	Isolated	Seepage, surface wetting and ponded water	18, 19	Acceptable	New Observation: Feature consists of surface wetting across the north portion of the landfill toe, extending 5 m onto the surface of the lobe. Ponded water in direct contact with toe is present in two locations, on the northwest side of the landfill and the north east. The tundra on the northwest side has evidence of rutting from machinery traffic which is now collecting water.
Debris Exposed	Yes	FEATURE B See Figure CAM-2.4 (east end of drainage channel - Lobe 11)	0.3	0.4	Unknown	Isolated	Black geotextile fabric	28, 29	Acceptable	Similar material used in construction of drainage channel.
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 CAM-2.4 (ponding north of Lobe 11)	25	41186	41187	N/A	Ponding in downgradient area north of Lobe 11	25	Acceptable	Localized ponding between lobes.
Additional Photos	Yes	See Figure CAM-2.4 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	Not Observed	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

5.3 PRELIMINARY STABILITY ASSESSMENT

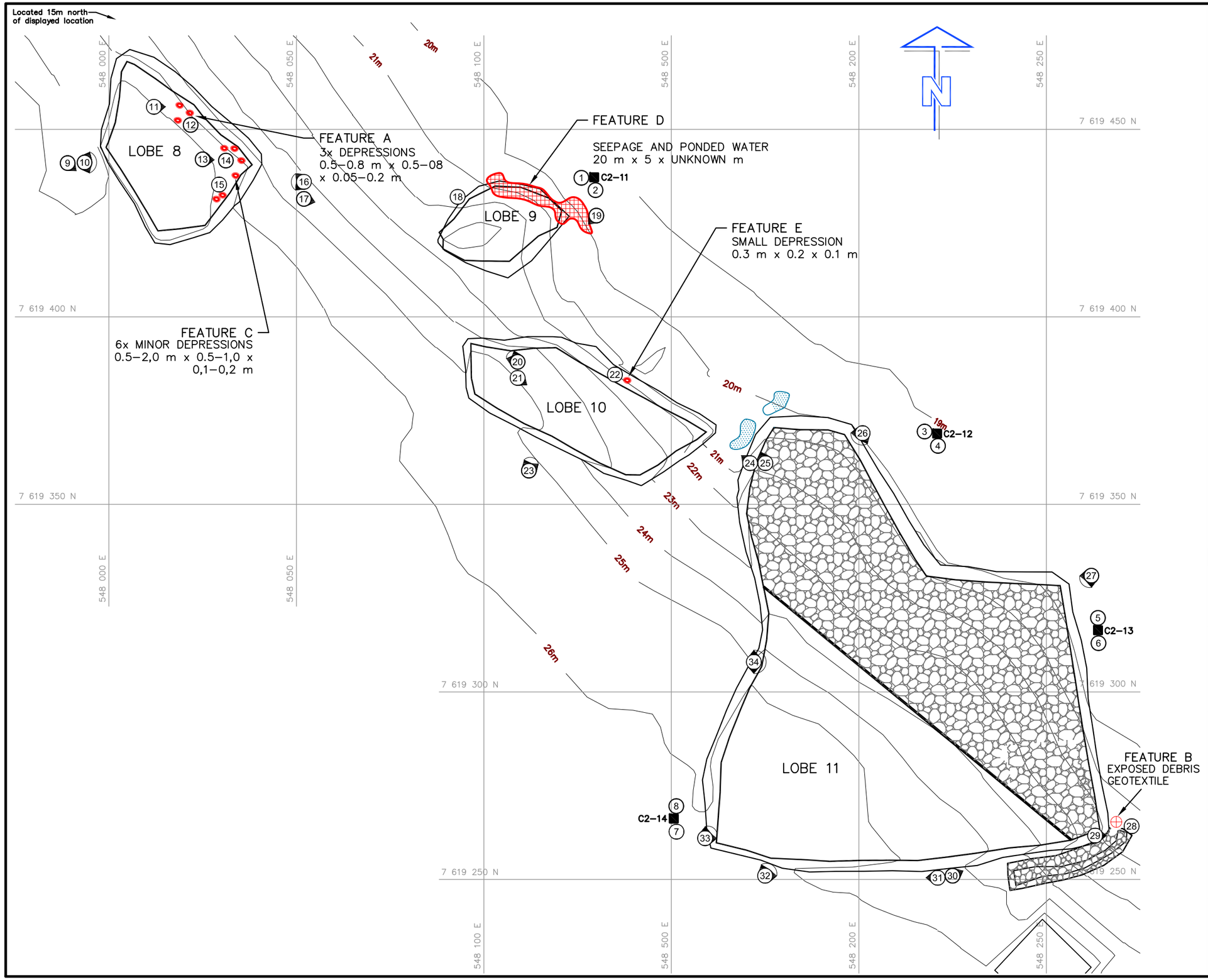
The Preliminary Stability Assessment for West Landfill – South has been completed as per the TOR and is included as Table XV hereafter.

Table XV: Preliminary Stability Assessment – West Landfill – South

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	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

5.4 LOCATION PLAN

The Location Plan for the West Landfill – South has been completed as per the TOR and is included in the following page as Figure CAM-2.4 Gladman Point – West Landfill – South.



LEGEND

- TBM4 — TEMPORARY BENCHMARK
- BM–1 — PERMANENT BENCHMARK
- MONITORING SOIL SAMPLE LOCATION
- PHOTOGRAPH LOCATION
- SEEPAGE AND PONDING
- SETTLEMENT (NTS)
- POND
- DEBRIS

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13–04–19	D.L.	B.M.	A.L.
B	REVISION 1	13–02–14	A.L.	B.M.	A.L.
A	PRELIMINARY	12–11–30	P.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

CAM-2, GLADMAN POINT, NUNAVUT

WEST LANDFILL-SOUTH

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Meter	1 : 1,000	FEBRUARY 2013
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2656_200_203	DRAWING NO: CD2656_200_203-CAM-2_4	PAGE PL

FIGURE CAM-2.4

5.5 PHOTOGRAPHIC RECORDS

The Photographic Record for the West Landfill – South has been completed as per the TOR and is included in the following pages as Table XVI. The Photographic Record only contains an index and “thumbnail” photographs. Full-sized photographs are contained in the Addendum DVD-ROM.

Table XVI: Landfill Visual Inspection Photo Log – West Landfill – South

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 8							
9		2012-C2-West-S-9	2.650	27/08/2012	547989	7619441	View SE of the NE portion of the landfill cap.
10		2012-C2-West-S-10	100.000	27/08/2012	547989	7619441	Panoramic view NNE - SSE of the W toe of the landfill.
11		2012-C2-West-S-11	2.420	27/08/2012	548012	7619456	**Feature A:** View E of three small depressions on the E side of Lobe 8, the GPS indicates the middle and most prominent depression (0.5-0.8 m x 0.5-0.8 m x 0.05 - 0.15 m)
12		2012-C2-West-S-12	2.410	27/08/2012	548012	7619456	**Feature A:** Close-up of the most prominent of the three depressions (0.80 m x 0.75 m x 0.15 m)
13		2012-C2-West-S-13	2.440	27/08/2012	548025	7619442	**Feature C:** View E of 4 of 6 new depressions observed on the landfill surface. These particular depressions are in the E corner of the lobe. (0.5-2.0 m x 0.5-1.0 m x 0.1-0.20 m)
14		2012-C2-West-S-14	2.400	27/08/2012	548025	7619442	**Feature C:** Close-up of depression
15		2012-C2-West-S-15	2.410	27/08/2012	548030	7619434	**Feature C:** View of 2 of 6 depressions along the SW side of the lobe
16		2012-C2-West-S-16	1.050	27/08/2012	548052	7619436	Panoramic view SW - NW of the E landfill toe.
Lobe 9							
17		2012-C2-West-S-17	2.800	27/08/2012	548052	7619436	View SE of the W portion of the lobe.
18		2012-C2-West-S-18	2.410	27/08/2012	548093	7619432	**Feature D:** Close-up of seepage/ponded water at the N landfill toe.
19		2012-C2-West-S-19	2.460	27/08/2012	548130	7619427	**Feature D:** View SW of NE portion of the landfill, ponded water is visible along the toe in the ruts of heavy machinery.
20		2012-C2-West-S-20	1.420	27/08/2012	548109	7619388	Panoramic view WNW - NNW of S portion of the landfill cap.
Lobe 10							
21		2012-C2-West-S-21	2.700	27/08/2012	548109	7619388	View SE of N landfill toe and cap, taken from the north corner of the landfill (Coordinate 352)
22		2012-C2-West-S-22	2.520	27/08/2012	548122	7619382	**Feature E:** Close-up linear depression on the N slope of the landfill.
23		2012-C2-West-S-23	7.810	27/08/2012	548112	7619359	Panoramic view NNW - NE of the landfill cap and S toe.
24		2012-C2-West-S-24	2.720	27/08/2012	548171	7619361	View NW of the E corner of the lobe, taken from Lobe 11.

Photo	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
Lobe 11							
25		2012-C2-West-S-25	2.660	27/08/2012	548172	7619361	View NW of ponded water at the NW corner of the lobe
26		2012-C2-West-S-26	7.240	27/08/2012	548201	7619369	Panoramic view SSE - W of northern portion of the landfill cap and associated toe.
27		2012-C2-West-S-27	9.990	27/08/2012	548262	7619331	Panoramic view S - W of NE portion of the landfill cap and associated toe, taken from the NE corner of the lobe (Coordinate 359)
28		2012-C2-West-S-28	2.350	27/08/2012	548269	7619262	**Feature B:** Close-up of exposed geotextile debris in the engineered drainage channel along the SE toe of the lobe.
29		2012-C2-West-S-29	2.460	27/08/2012	548269	7619262	**Feature B:** View E of exposed geotextile debris
30		2012-C2-West-S-30	2.590	27/08/2012	548225	7619251	View ENE of engineered channel
31		2012-C2-West-S-31	2.590	27/08/2012	548226	7619251	View W of S landfill toe
32		2012-C2-West-S-32	8.728	27/08/2012	548175	7619251	Panoramic view NNW - E of the S portion of the landfill, including the S toe and SE corner.
33		2012-C2-West-S-33	7.380	27/08/2012	548159	7619261	Panoramic view N - E of S portion of the landfill cap, taken from the NW corner.
34		2012-C2-West-S-34	17.400	27/08/2012	548172	7619308	Panoramic view N-S of landfill cap taken at the approximate midpoint of the W side of the landfill.
Soil Sampling							
1		2012-C2-West-S-1	2.590	25/08/2012	548133	7619437	**C2-11:** Close-up of open soil test pit
2		2012-C2-West-S-2	2.350	25/08/2012	548133	7619437	**C2-11:** Close-up of closed soil test pit
3		2012-C2-West-S-3	2.290	25/08/2012	548222	7619371	**C2-12:** Close-up of open soil test pit
4		2012-C2-West-S-4	2.370	25/08/2012	548222	7619371	**C2-12:** Close-up of closed soil test pit
5		2012-C2-West-S-5	2.380	25/08/2012	548266	7619315	**C2-13:** Close-up of open soil test pit
6		2012-C2-West-S-6	2.400	25/08/2012	548266	7619315	**C2-13:** Close-up of closed soil test pit
7		2012-C2-West-S-7	2.430	25/08/2012	548147	7619262	**C2-14:** Close-up of open soil test pit
8		2012-C2-West-S-8	2.360	25/08/2012	548147	7619262	**C2-14:** Close-up of closed soil test pit

5.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of 2012 analytical data for the West Landfill – South area samples are presented in Tables XVII and XVIII respectively. Certificates of Analysis and results from field duplicates collected as part of the QA/QC program are presented in Appendix C at the end of this report.

Table XVII: West Landfill – South Summary Table of Soil Analytical Data

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																
C2-12-14-A	C2-14	0-15	3.3	4.5	1.6	<0.5	2.9	16	4.9	0.8	<0.5	<0.05	<10	<10	58.0	58.0
C2-12-14-B		40-50	2.8	3.5	1.3	<0.5	2.3	6	4.3	0.8	<0.5	<0.05	<10	<10	<10	<10
Downgradient Samples																
C2-12-11-A	C2-11	0-15	4.2	5.7	1.7	<0.5	3.6	10	6.8	0.6	<0.5	<0.05	<10	<10	130.0	130.0
C2-12-11-A-D		0-15	5.7	4.9	1.4	<0.5	3.0	9	6.6	0.7	<0.5	<0.05	<10	<10	210.0	210.0
C2-12-11-B		40-50	5.3	6.3	2.2	<0.5	3.1	12	7.7	0.8	<0.5	<0.05	<10	<10	12.0	12.0
C2-12-12-A	C2-12	0-15	2.0	4.7	2.1	<0.5	2.1	14	7.0	0.6	<0.5	<0.05	<10	<10	32.0	32.0
C2-12-12-B		0-15	4.0	4.2	1.9	<0.5	1.3	11	6.3	<0.5	<0.5	<0.05	<10	<10	<10	<10
C2-12-13-A	C2-13	0-15	1.3	3.4	1.2	<0.5	2.0	5	3.0	<0.5	<0.5	<0.05	<10	<10	14.0	14.0
C2-12-13-B		40-50	1.6	3.5	0.9	<0.5	2.1	4	3.3	0.7	<0.5	<0.05	<10	<10	<10	<10

Table XVIII: Evaluation of 2012 Soil Analytical Data – West Landfill – South

Parameter	Evaluation
Copper (Cu)	Copper was detected at all sample locations. Concentrations ranged from 1.3 – 5.7 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of copper was detected at the surface of C2-11. All values were below CCME guidelines.
Nickel (Ni)	Nickel was detected at all sample locations. Results were consistent at upgradient and downgradient locations with concentrations ranging from 3.4 – 6.3 mg/kg. The highest concentration was detected at depth at C2-11, a downgradient sample. All values were below CCME guidelines.
Cobalt (Co)	Cobalt was detected at all sample locations. Concentrations ranged from 0.9 – 2.2 mg/kg. Concentrations were similar at upgradient and downgradient sample locations The highest concentration of cobalt was detected at depth at C2-11, a downgradient sample. All values were below CCME guidelines.
Cadmium (Cd)	Cadmium was below the method detection limit at all sampling locations.
Lead (Pb)	Lead was detected at all sample locations. Concentrations ranged from 1.3 – 3.6 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of lead was detected at surface at C2-11, a downgradient sample. All values were below CCME guidelines.
Zinc (Zn)	Zinc was detected at all sample locations. Concentrations ranged from 4 – 16 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of zinc was detected at depth at C2-14, the upgradient sample. All values were below CCME guidelines.
Chromium (Cr)	Chromium was detected at all sample locations. Concentrations ranged from 3.0 – 7.7 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of chromium was detected at depth at C2-11, a downgradient sample. All values were below CCME guidelines.
Arsenic (As)	Arsenic was detected at all sample locations; at C2-12 it was not detected at depth while at C2-13 it was not detected at surface, at all other locations it was detected at the surface and at depth. Detected concentrations ranged from 0.6 – 0.8 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of arsenic was detected at two locations C2-11 at depth and C2-14 at surface and depth. All values were below CCME guidelines.
Mercury (Hg)	Mercury was below the method detection limit at all sampling locations.
PCBs	PCBs were below the method detection limit at all sampling locations.
TPH	TPH was detected at all sampling locations at surface and depth with the exception of C2-12, 13 and 14 where TPH was only detected at the surface. Detected TPH concentrations ranged from 14 – 210 mg/kg with the highest concentration detected at the surface of C2-11. All TPH concentrations are below standard DEW Line remediation criterion for TPH concentrations in soil.

6 TIER II DISPOSAL FACILITY

6.1 SUMMARY

During the 2012 monitoring event of the Tier II Disposal Facility at CAM-2 Gladman Point soil and groundwater samples were collected at 4 locations (1 upgradient and 3 downgradient), a visual inspection was conducted to identify and assess erosional features on the facility and thermal monitoring data was downloaded from three locations, the datalogger for a fourth location was reinstalled this year. Manuel readings of thermistors were conducted at all four locations, the batteries were also replaced.

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 MW4. Detectable TPH concentrations ranged from 11 to 162 mg/kg with the highest concentration detected at the surface of the MW3. All detected TPH was primarily in the F3 fraction. Currently all TPH readings are below the standard site criteria of 2500 mg/kg and are therefore acceptable.

PCBs were not detected in any of the groundwater samples. No relatively high metal concentrations were detected in the Tier II groundwater samples. Low concentrations of TPH were detected at two monitoring wells MW1 (upgradient) and MW3 (downgradient). As the relatively high metal concentrations and TPH were detected at both up and downgradient wells, it does not appear to be reflection of the performance of the Tier II facility.

Upon comparing the 2010 and 2012 monitoring program results, it is clear the Tier II Disposal Facility has experienced little in the way of changes over the past two years. There are currently no significant or unacceptable features at the Tier II facility.

Thermal monitoring equipment is functioning properly.

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

6.2 VISUAL INSPECTION REPORT

The visual inspection of the Tier II Disposal Facility was conducted on August 26, 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 CAM-2.5 for the location of photographs and erosional features at the Tier II Disposal Facility.

Weather at Time of Visual Inspection

At the time of the visual inspection of the Tier II Disposal, the temperature was approximately 5°C, skies were overcast with light right, fog was observed and little to no wind was observed. Precipitation was heavier during the early morning hours of August 26, 2012.

Settlement

Indications of settlement were noted at five locations (Features A through D and K) on the surface and side slopes of the Tier II Disposal Facility, an increase of one area from the 2010 monitoring program.

Feature A consists of subtle narrow linear depressions extending along the north and south crests of the landfill, whereas Features B, C, D and K consist of more localized depressions. Observations of Feature A are consistent with the dimensions observed during the 2010 monitoring program however, the small tension crack associated with this feature is no longer visible. Feature B on the eastern slope of the Landfill has decreased in size from the 2010 monitoring program, potentially the result of deposition of material eroded from further up the slope. Feature C, a relatively small depression at the time of the 2010 monitoring program at 0.4 m in length, has increased to 12 m in length extending along the crest of the Landfill. Feature D remains constant in size and extent. Newly observed Feature K consists of a small linear depression close to the middle of the slope and runs parallel to the Landfill toe.

Currently the severity rating of the observed depressions is rated as acceptable.

Erosion

Evidence of minor surface erosion was noted at two locations on the surface of the Tier II Disposal Facility including Feature E located on the slope southwest of VT-4 and Feature F located on the northeast corner of the Landfill. Both features extend perpendicular to the slope, appear to be self-armouring, and have an acceptable severity rating. Features E and F exhibited little to no change since 2009 and have an acceptable severity rating.

One additional area (Feature G), of minor erosion, was noted along the northwest toe and is not in direct contact with the Tier II Disposal Facility. Overall, the Tier II Disposal Facility cover appears stable and relatively unchanged from the 2010 report.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Vegetation

Indications of vegetation were noted on the southern slope of the Tier II Disposal Facility. Plants have colonized the slope at an approximate density of 1 plant per 3 m^2.

Staining

Areas of staining were not observed at the time of the inspection.

Seepage Points

Due to precipitation events in the timeframe of the monitoring program, it is difficult to assess the extent of the seepage at the Tier II Disposal Facility, as all slopes were to some degree wet for the duration of the monitoring program.

Debris

Evidence of debris was noted at one location on the northwest toe of the Tier II Disposal Facility (Feature I), consisting of a partially exposed piece of 50 mm diameter iron pipe. The iron pipe was subsequently removed and disposed of. Feature I will not be included in 2015 monitoring program.

Presence/Condition of Monitoring Instruments

All monitoring well and thermistor installations were found to be in good condition at the Tier II Disposal Facility.

Other Features of Note

Tension and desiccation cracks were not as numerous as reported in the 2010 monitoring program with only Feature J observed on the north slope of the Landfill. The previously observed desiccation cracks were likely eliminated by the precipitation events experienced during the monitoring program and the week leading up to the monitoring program. A new discontinuous crack (Feature K) was observed on the east slope of the Landfill.

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

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

SITE NAME: CAM-2 Gladman Point
LANDFILL DESIGNATION: Tier II Disposal Facility (New Landfill)
DATE OF INSPECTION: August 26, 2012
DATE OF PREVIOUS INSPECTION: August 13-14, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: 7
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	Severity Rating	Additional Comments
Settlement	Yes	Feature A See Figure CAM-2.5 (north and south crests)	20 - 30	0.2 - 0.4	0.05 - 0.1	Occasional	Linear depressions extending along north and south crests	9, 10, 11, 12	Acceptable	Cover and slopes appear stable. Small tension crack previously noted associated with the depression on the north crest was not visible during the 2012 field program.
		Feature B See Figure CAM-2.5 (east of VT-3)	2	0.75	0.1		Localized depression on slope perpendicular to toe	35	Acceptable	Feature has decreased slightly in size from 2010, potentially as a result of erosion and deposition on the side slopes of the facility.
		Feature C See Figure CAM-2.5 (south east corner)	12	0.1 - 0.5	0.1		Linear depressions extending along east crest	42, 43	Acceptable	Feature has increased significantly in length, now extending 12 m along the landfill crest. The previously identified area was clearly observed, however as of 2012, an additional area of linear settlement was observed extending the length of the depression from 0.4 m to 12 m.
		Feature D See Figure CAM-2.5 (south of VT-4)	1	0.05 - 0.2	0.05 - 0.15		Localized linear depression on surface	37	Acceptable	Dimensions of feature have remained relatively constant, feature appears stable.
		Feature K See Figure CAM-2.5 (east of VT-3)	0.75	0.2	0.05		Localized linear depression on surface	36	Acceptable	New Observation: Minor depression on the east slope of the landfill running parallel to the landfill toe.
Erosion	Yes	Feature E See Figure CAM-2.5 (south of VT-4)	16	1 - 1.25	0.05 - 0.10	Occasional	Minor surficial erosion	38, 39	Acceptable	Minor erosion noted on surface of landfill. Slope appears stable with minor change from 2010 and consequently from 2009 (based on 2010 Report). Self-armouring.
		Feature F See Figure CAM-2.5 (north east corner)	15	0.5	0.05 - 0.1		Minor surficial erosion	34	Acceptable	Minor erosion noted on surface of landfill. Cover appears stable and unchanged from 2010 and consequently 2009. Self armouring.
		Feature G See Figure CAM-2.5 (north west toe)	10	0.5 m	2 cm		Minor surficial erosion	12	Acceptable	Minor erosion noted along toe of landfill, little change since 2010. 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	Yes	Feature L See Figure CAM-2.5 (south slope)	N/A	N/A	N/A	N/A	Small plants colonizing the south slope of the landfill	41, 45	Acceptable	Plants have begun to colonize the south slope of the Tier II Facility, plant density is approximately 1 plant/3 m^2

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record	Severity Rating	Additional Comments
Settlement	Yes	Feature A See Figure CAM-2.5 (north and south crests)	20 - 30	0.2 - 0.4	0.05 - 0.1	Occasional	Linear depressions extending along north and south crests	9, 10, 11, 12	Acceptable	Cover and slopes appear stable. Small tension crack previously noted associated with the depression on the north crest was not visible during the 2012 field program.
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	Yes	Feature H See Figure CAM-2.5 (south west, south and north slopes)	Unknown	Unknown	N/A	Occasional	Wetted areas on side slopes	N/A	Acceptable	Unable to properly assess wetting on slopes of Tier II Facility due to precipitation events experienced throughout the field program.
Debris Exposed	Yes	Feature I See Figure CAM-2.5 (north west toe)	1.65	0.05	N/A	Isolated	Partially exposed iron pipe at toe of landfill	17, 18, 19, 20	Acceptable	Iron pipe was removed from the landfill cover, Feature I will no longer be a concern for future monitoring programs.
Presence/Condition of Monitoring Instruments	Yes	See Figure CAM-2.5	N/A	N/A	N/A	N/A	Thermistors and monitoring wells	Various	N/A	Sampled and monitored in 2012, monitoring equipment is functioning properly
Other Features of Note	Yes	Feature J See Figure CAM-2.5 (north slope)	Variable, 5.0 - 10.0	0 - 0.05	Unknown	Occasional	Continuous and discontinuous tension cracks extending perpendicular to side slopes (majority within 1 - 5 m of toe)	22, 23, 27, 28, 29, 40	Acceptable	Cracks less frequent than 2010, being only observed on the north slope where observed previously.
		Feature M See Figure CAM-2.5 (East slope)	2.0 - 4.0	0.01 - 0.05	Unknown		Discontinuous tension cracks extending parallel to side slopes	27-29	Acceptable	New Observation: Two cracks running parallel to the toe of the landfill, located on the east side slope of the landfill
Additional Photos	Yes	See Figure CAM-2.5 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	Not Observed	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

6.3 PRELIMINARY STABILITY ASSESSMENT

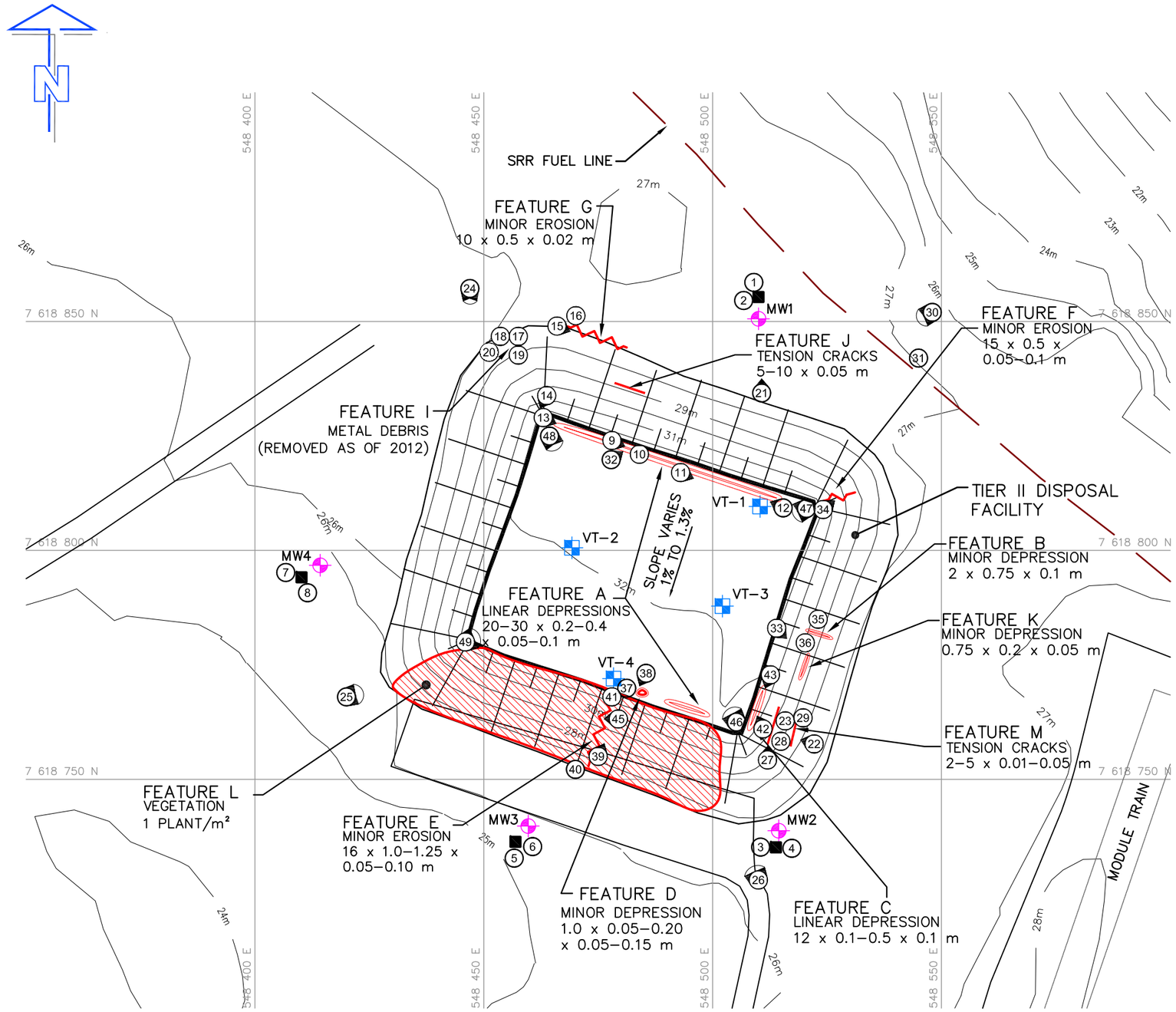
The Preliminary Stability Assessment for Tier II Disposal Facility has been completed as per the TOR and is included as Table XX hereafter.

Table XX: Preliminary Stability Assessment – Tier II Disposal Facility

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

6.4 LOCATION PLAN

The Location Plan for the Tier II Disposal Facility has been completed as per the TOR and is included in the following page as Figure CAM-2.5 Gladman Point – Tier II Disposal Facility.



LEGEND

- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- PHOTOGRAPH LOCATION
- SURFICIAL EROSION (NTS)
- TENSION CRACK (NTS)
- SETTLEMENT (NTS)
- VEGETATION

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13–04–19	D.L.	B.M.	A.L.
B	REVISION 1	13–02–14	A.L.	B.M.	A.L.
A	PRELIMINARY	12–11–30	P.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA

CAM-2, GLADMAN POINT, 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):
Meter	1 : 1,000	FEBRUARY 2013
DRAWN BY: P. LÉGARÉ	VERIFIED BY: B. MACKAY	APPROVED BY: A. LECLAIR P.ENG
PROJECT NO: CD2656_200_203	DRAWING NO: CD2656_200_203-CAM-2_5	PAGE PL

FIGURE CAM-2.5

6.5 THERMAL MONITORING DATA

Manual readings and monitoring program results for each thermistor are presented on the Thermistor Annual Maintenance Reports included in this report as well as Table XXI as requested by the TOR. A complete datalogger RAW data set for the 2010–2012 period has been forwarded to DCC under separate cover as per the TOR and is provided in the attached DVD.

All thermistors at the Tier II Disposal Facility were inspected and found to be in good condition with no significant concerns identified. VT-3, which was removed during the 2010 monitoring program, was successfully reinstalled.

Manual resistive and temperature data readings were collected from the thermistor strings as per the TOR. All analogues/thermocouples were observed to be functioning properly at the time of the monitoring program, with the exception of the bottom sensors at VT-2 (#12), VT-3 (#12) and VT-4 (#16), consistent with observations from the previous 2010 monitoring program. New to 2012, the #9 sensor of VT-3 was observed to be off-line. Further review of the downloaded data identified a consistent error in temperature readings obtained from these sensors throughout the monitoring period.

Batteries were replaced in all dataloggers on August 25 and 26, 2012 as specified in the TOR. All clocks exhibited slight drift and were synchronized using the Prolog software.

It is suggested that two of the locks be replaced during the next monitoring event, the locks are still functional but heavily rusted and required extra effort to be removed, it is anticipated the locks will need to be cut during the next monitoring event. As well VT-2 is missing a cover for the small P1/25 port.

Table XXI: Tabulated Thermistor Data – Tier II Disposal Facility

Thermistor	Bead	Ohms	Degrees °C
1	1	7.968	14.676
	2	7.644	15.565
	3	11.116	7.716
	4	10.983	7.963
	5	12.985	4.567
	6	14.334	2.596
	7	17.188	-0.964
	8	18.255	-2.128
	9	19.306	-3.202
	10	20.100	-3.971
	11	21.000	-4.802
	12	21.720	-5.439
	13	22.500	-6.103
	14	23.250	-6.718
	15	24.070	-7.365
	16	24.590	-7.763
2	1	10.186	9.514
	2	11.676	6.714
	3	12.626	5.131
	4	13.952	3.132
	5	16.594	-0.281
	6	17.797	-1.638
	7	18.903	-2.798
	8	20.220	-4.084
	9	21.520	-5.265
	10	22.540	-6.137
	11	23.370	-6.814
	12	OL	N/A
3	1	9.195	11.646
	2	11.338	7.312
	3	12.287	5.68
	4	13.608	3.629
	5	16.094	0.316
	6	17.191	-0.968
	7	18.440	-2.322
	8	20.400	-4.253
	9	OL	N/A
	10	22.750	-6.311
	11	23.610	-7.005
	12	OL	N/A
4	1	7.530	15.888
	2	8.824	12.511
	3	11.231	7.506
	4	12.365	5.552
	5	13.525	3.751
	6	16.649	-0.345
	7	17.418	-1.222
	8	18.275	-2.149
	9	19.141	-3.038
	10	19.914	-3.794
	11	20.640	-4.475
	12	21.370	-5.133
	13	21.540	-5.282
	14	22.730	-6.294
	15	23.350	-6.798
	16	23.930	-7.256

6.6 THERMISTOR ANNUAL MAINTENANCE REPORTS

The Thermistor Annual Maintenance Reports, VT-1 to VT-4, are presented in this section.

Thermistor Annual Maintenance Report

Contractor Name:	Biogenie/ Sila Remediation	Inspection Date:	26-Aug-12
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	CAM-2 Gladman Point	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-1	Inclination	Vertical		
Install Date:	08/30/2005	First Date Event: August 14, 2012		Last Date Event: August 26, 2012	
Coordinates and Elevation	N 7618811	E	548508.81	Elev	32.48
Length of Cable (m)	10.5	Cable Lead Above Ground (m)	3.6	Nodal Points	16
Datalogger Serial #	207019			Cable Serial Number	1690

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	August 26/2012		
Battery Levels	Main 11.34	Aux	13.4

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	7.968	14.676	9	19.306	-3.202
2	7.644	15.565	10	20.1	-3.971
3	11.116	7.716	11	21	-4.802
4	10.983	7.963	12	21.72	-5.439
5	12.985	4.567	13	22.5	-6.103
6	14.334	2.596	14	23.25	-6.718
7	17.188	-0.964	15	24.07	-7.365
8	18.255	-2.128	16	24.59	-7.763

Observations and Proposed Maintenance

Clock was 1 hour and 10 minutes slow, reset using prolog software.

Verified known Data: Yes

Thermistor Annual Maintenance Report

Contractor Name:	Biogenie/ Sila Remediation	Inspection Date: August 26, 2012	
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	CAM-2 Gladman Point	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-2	Inclination: Vertical			
Install Date:	08/30/2005	First Date Event: August 14, 2010		Last Date Event: August 26, 2012	
Coordinates and Elevation	N 7618799	E 548474.24		Elev	32.07
Length of Cable (m)	8	Cable Lead Above Ground (m)	2.75	Nodal Points	12
Datalogger Serial #	207107			Cable Serial Number	1691

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	August 26/2012		
Battery Levels	Main 11.34	Aux 12.9	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	10.186	9.514	9	21.52	-5.265
2	11.676	6.714	10	22.54	-6.137
3	12.626	5.131	11	23.37	-6.814
4	13.952	3.132	12	OL	N/A
5	16.594	-0.281			
6	17.797	-1.638			
7	18.903	-2.798			
8	20.22	-4.084			

Observations and Proposed Maintenance

Original bolts are not used to keep cover In place, a smaller set has been used - functional.
Missing cover to port P1/15, may need replacement.
Clock was 1 hour and 5 minutes slow, reset using prolog software.
Bead 12 is offline, consistent with 2010 observations.

Verified known Data: Yes

Thermistor Annual Maintenance Report

Contractor Name:	Biogenie/ Sila Remediation	Inspection Date: August 25, 2012	
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	CAM-2 Gladman Point	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-3	Inclination: Vertical			
Install Date:	08/30/2005	First Date Event: N/A		Last Date Event: N/A	
Coordinates and Elevation	N 7618792	E 548495.38	Elev 32.06		
Length of Cable (m)	8	Cable Lead Above Ground (m)	2.9	Nodal Points	12
Datalogger Serial #	5070039			Cable Serial Number	1692

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	
Cover	☐	X	Lock will need replacement
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Aug-25		
Battery Levels	Main 11.34	Aux 13.9	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	9.195	11.646	9	OL	N/A
2	11.338	7.312	10	22.75	-6.311
3	12.287	5.680	11	23.61	-7.005
4	13.608	3.629	12	OL	N/A
5	16.094	0.316	13		
6	17.191	-0.968	14		
7	18.44	-2.322	15		
8	20.4	-4.253	16		

Observations and Proposed Maintenance

Reinstalled data logger.
Data logger is functioning properly.
Reset memory.
Beads 9 and 12 are offline.
Lock will need replacement during next monitoring event, was oiled but is heavily rusted.

Verified known Data: Yes

Thermistor Annual Maintenance Report

Contractor Name:	Biogenie/ Sila Remediation	Inspection Date: August 25, 2012	
Prepared By:	Brandon MacKay		

Thermistor Information

Site Name:	CAM-2 Gladman Point	Thermistor Location	Tier II Disposal Facility		
Thermistor Number:	VT-4	Inclination: Vertical			
Install Date:	08/30/2005	First Date E\	14-Aug-10	Last Date Event	25-Aug-12
Coordinates and Elevation	N	7618772	E	548479.02	Elev 31.89
Length of Cable (m)	10.5	Cable Lead Above Ground (m)	3.5	Nodal Points	16
Datalogger Serial #	2020130			Cable Serial Number	1693

Thermistor Inspection

	Good	Needs Maintenance	
Casing	X	☐	Some flaking of Paint
Cover	☐	X	Lock should be replaced next monitoring even
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Battery Installation Date	Aug-25		
Battery Levels	Main 11.34	Aux 11.4	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	7.53	15.888	9	19.141	-3.038
2	8.824	12.511	10	19.914	-3.794
3	11.231	7.506	11	20.64	-4.475
4	12.365	5.552	12	21.37	-5.133
5	13.525	3.751	13	21.54	-5.282
6	16.649	-0.345	14	22.73	-6.294
7	17.418	-1.222	15	23.35	-6.798
8	18.275	-2.149	16	23.93	-7.256

Observations and Proposed Maintenance

Clock was 1 hour and 5 minutes slow, reset using prolog software

Lock will need replacement during next monitoring event, was oiled but is heavily rusted.

Verified known Data: Yes

6.7 PHOTOGRAPHIC RECORDS

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

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

Photo (2012-C2-Tier II-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
General Photos							
9		2012-C2-Tier II-9	2.570	26/08/2012	548478	7618824	**Feature A:** View ESE of linear depression running parallel to the N crest of the landfill surface, taken from the W most point of the feature.
10		2012-C2-Tier II-10	2.570	26/08/2012	548484	7618821	**Feature A:** Close-up of the depression
11		2012-C2-Tier II-11	2.630	26/08/2012	548493	7618817	**Feature A:** View ESE of linear depression running parallel to the N crest of the landfill surface, taken from the midpoint of the feature.
12		2012-C2-Tier II-12	2.630	26/08/2012	548511	7618811	**Feature A:** View WNW of linear depression running parallel to the N crest of the landfill surface, taken from the NE corner of the landfill
13		2012-C2-Tier II-13	2.860	26/08/2012	548463	7618829	View ESE from the NW corner of the the N side slope.
14		2012-C2-Tier II-14	2.670	26/08/2012	548463	7618829	View SSW from the NW corner of the W side slope.
15		2012-C2-Tier II-15	2.490	26/08/2012	548466	7618849	**Feature G:** View ESE of minor erosion along the N landfill toe
16		2012-C2-Tier II-16	2.510	26/08/2012	548466	7618849	**Feature G:** Close-up of minor erosion along the toe of the landfill
17		2012-C2-Tier II-17	2.530	26/08/2012	548453	7618849	**Feature I:** Metal debris on the side slope of the NW corner of the landfill
18		2012-C2-Tier II-18	2.460	26/08/2012	548453	7618849	**Feature I:** Exposure of the metal debris to determine its full extent
19		2012-C2-Tier II-19	2.520	26/08/2012	548453	7618849	**Feature I:** Removal of metal debris from side slope of facility.
20		2012-C2-Tier II-20	2.440	26/08/2012	548453	7618849	**Feature I:** Soil was placed to fill the void left by the metal debris.
21		2012-C2-Tier II-21	2.230	26/08/2012	548505	7618836	View N of MW-1, taken from the N toe of the landfill.
22		2012-C2-Tier II-22	2.510	26/08/2012	548447	7618857	**Feature J:** View WNW of tension crack on the N side slope of the landfill, taken roughly center on the side slope, 3 m from the landfill toe.
23		2012-C2-Tier II-23	2.530	26/08/2012	548447	7618857	**Feature J:** Close-up of tension crack on the N side slope.
24		2012-C2-Tier II-24	0.467	26/08/2012	548420	7618768	Panoramic view ESE - SSW of NW corner of the landfill.
25		2012-C2-Tier II-25	0.463	26/08/2012	548415	7618777	Panoramic view NNE - ESE of SW corner of the landfill.
26		2012-C2-Tier II-26	0.454	26/08/2012	548510	7618728	Panoramic view WNW - NNE of SE corner of the landfill.
27		2012-C2-Tier II-27	2.490	26/08/2012	548510	7618750	**Feature K:** View N of discontinuous tension crack on the E side slope. Crack runs parallel to the landfill toe.
28		2012-C2-Tier II-28	2.640	26/08/2012	548510	7618750	**Feature K:** Close up of tension crack
29		2012-C2-Tier II-29	2.490	26/08/2012	548519	7618760	**Feature K:** Close-up of second tension crack 13 m NE of other crack on the east slope.

Photo (Tier II-)	Thumbnail	Filename	Size (MB)	Date	Vantage Point		Caption
					Easting	Northing	
General Photos							
30		2012-C2-Tier II-30	0.533	26/08/2012	548548	7618852	Panoramic view SSW - WNW of E corner of the landfill.
31		2012-C2-Tier II-31	0.435	26/08/2012	548545	7618842	Close-up of debris removed from Tier II landfill and surrounding area.
32		2012-C2-Tier II-32	2.580	26/08/2012	548478	7618823	View NE of ponded water off the N slope of the landfill, Lobe 2 of the Station landfill is visible in the background.
33		2012-C2-Tier II-33	2.440	26/08/2012	548514	7618783	View SE of ponded water of the E slope of the landfill, the former Module train area is visible in the background.
34		2012-C2-Tier II-34	2.510	26/08/2012	548523	7618809	**Feature F:** View NE of minor erosion extending 15 m from the crest of landfill.
35		2012-C2-Tier II-35	2.430	26/08/2012	548522	7618795	**Feature B:** Minor depression on E side slope of the landfill, the depression runs perpendicular to the toe of the landfill. (2 m x 0.75 m x 0.10 m)
36		2012-C2-Tier II-36	2.500	26/08/2012	548521	7618784	**Feature K:** Minor depression on the E slope of the landfill, running parallel to the landfill toe. (0.75 m x 0.20 m x 0.05 m)
37		2012-C2-Tier II-37	2.410	26/08/2012	548480	7618770	**Feature D:** Minor depression on the landfill surface, running parallel to the crest of the S crest of the landfill. (1 m x 0.20 m x 0.15 m).
38		2012-C2-Tier II-38	2.450	26/08/2012	548480	7618770	**Feature E:** View SSW from the landfill surface of minor erosion extending from the landfill surface to the toe. (16 m x 1.0 - 1.25 m x 0.05 - 0.10 m).
39		2012-C2-Tier II-39	2.580	26/08/2012	548475	7618755	**Feature E:** View NNE from the landfill toe of erosion channel.
40		2012-C2-Tier II-40	2.420	26/08/2012	548476	7618751	**Feature J:** Small section of crack along the south toe of the landfill.
41		2012-C2-Tier II-41	2.650	26/08/2012	548478	7618768	**Feature L:** Close-up of an example of the vegetation growing on the S slope of the Tier II facility, plant density is approximately 1 plant/3 m^2.
42		2012-C2-Tier II-42	2.560	26/08/2012	548511	7618761	**Feature C:** View NNE of linear depression at the crest of the landfill crest. (12 m x 0.10 - 0.50 m x 0.10 m)
43		2012-C2-Tier II-43	2.440	26/08/2012	548511	7618773	**Feature C:** View SSW of linear depression at the crest of the landfill crest. (12 m x 0.10 - 0.50 m x 0.10 m)
45		2012-C2-Tier II-45	2.440	26/08/2012	548478	7618768	**Feature L:** View W of small vegetation growing on the S slope of the landfill.
46		2012-C2-Tier II-46	9.280	26/08/2012	548507	7618761	Panoramic view WNW - NNE of the landfill surface from the SE corner.
47		2012-C2-Tier II-47	11.700	26/08/2012	548521	7618810	Panoramic view SSW - WNW of the landfill surface from the NE corner.
48		2012-C2-Tier II-48	12.800	26/08/2012	548560	7618828	Panoramic view ESE - SSW of the landfill surface from the NW corner.
49		2012-C2-Tier II-49	12.000	26/08/2012	548446	7618780	Panoramic view NNE - ESE of the landfill surface from the SW corner.
Soil Sampling							
1		2012-C2-Tier II-1	2.35	25/08/2012	548556	76118738	**MW-1:** Close-up of open soil test pit
2		2012-C2-Tier II-2	2.360	25/08/2012	548556	76118738	**MW-1:** Close-up of closed soil test pit
3		2012-C2-Tier II-3	2.570	25/08/2012	548526	7618731	**MW-2:** Close-up of open soil test pit
4		2012-C2-Tier II-4	2.510	25/08/2012	548526	7618731	**MW-2:** Close-up of closed soil test pit
5		2012-C2-Tier II-5	2.400	25/08/2012	548509	7618853	**MW-3:** Close-up of open soil test pit
6		2012-C2-Tier II-6	2.320	25/08/2012	548509	7618853	**MW-3:** Close-up of closed soil test pit
7		2012-C2-Tier II-7	2.340	25/08/2012	548412	7618797	**MW-4:** Close-up of open soil test pit
8		2012-C2-Tier II-8	2.350	25/08/2012	548412	7618797	**MW-4:** Close-up of closed soil test pit

6.8 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of the analytical data for the 2012 Tier II Disposal Facility samples are presented in Tables XXIII and XXIV hereafter. Certificates of Analysis and results of field duplicates collected as part of the QA/QC program are presented in Appendix C at the end of this report.

Table XXIII: Tier II Disposal Facility Summary Table for Soil Analytical Data

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																
C2-12-MW1-A	MW1	0-15	2.5	2.9	0.9	<0.5	2.5	6.0	0.1	0.7	<0.5	<0.05	<10	<10	29.0	29.0
C2-12-MW1-B		40-50	5.7	5.2	1.6	<0.5	4.3	13.0	4.0	1.0	<0.5	<0.05	<10	17.0	52.0	69.0
Downgradient Samples																
C2-12-MW2-A	MW2	0-15	5.7	6.5	2.1	<0.5	11.7	15.0	6.9	1.3	<0.5	<0.05	<10	<10	47.0	47.0
C2-12-MW2-A-D		0-15	5.4	6.6	2.0	<0.5	9.5	15.0	6.4	1.4	<0.5	<0.05	<10	<10	47.0	47.0
C2-12-MW2-B*		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C2-12-MW3-A	MW3	0-15	9.3	8.2	2.5	<0.5	10.9	16.0	8.4	1.4	<0.5	<0.05	<10	<10	162.0	162.0
C2-12-MW3-B		40-50	13.1	10.9	3.2	<0.5	6.2	13.0	7.8	1.8	<0.5	<0.05	<10	<10	11.0	11.0
C2-12-MW4-A	MW4	0-15	16.7	5.9	2.0	<0.5	7.1	20.0	5.9	1.3	<0.5	<0.05	<10	<10	119.0	119.0
C2-12-MW4-B		40-50	8.3	10.1	4.3	<0.5	7.0	21.0	11.1	1.8	<0.5	<0.05	<10	<10	<10	<10

*Sample C2-12-MW2-B was not analyzed please refer to Section 1.4

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

Parameter	Evaluation
Copper (Cu)	Copper was detected at all sample locations. Concentrations ranged from 2.5 – 16.7 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of copper was detected at the surface of MW4, a downgradient location. All values were below CCME guidelines.
Nickel (Ni)	Nickel was detected at all sample locations. Results were consistent at upgradient and downgradient locations with concentrations ranging from 2.9 – 10.9 mg/kg. The highest concentration was detected at depth at MW3, a downgradient sample. All values were below CCME guidelines.
Cobalt (Co)	Cobalt was detected at all sample locations. Concentrations ranged from 0.9 – 4.3 mg/kg. Concentrations were slightly higher at downgradient sample locations The highest concentration of cobalt was detected at depth at MW4, a downgradient sample. All values were below CCME guidelines.
Cadmium (Cd)	Cadmium was below the method detection limit at all sampling locations.
Lead (Pb)	Lead was detected at all sample locations. Concentrations ranged from 2.5 – 10.9 mg/kg. Concentrations were slightly higher at downgradient sample locations. The highest concentration of lead was detected at surface at MW3, a downgradient location. All values were below CCME guidelines.
Zinc (Zn)	Zinc was detected at all sample locations. Concentrations ranged from 6 – 21 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of zinc was detected at depth MW4, a downgradient sample. All values were below CCME guidelines.
Chromium (Cr)	Chromium was detected at all sample locations. Concentrations ranged from 0.1 – 11.1 mg/kg. Concentrations were slightly higher at downgradient sample locations. The highest concentration of chromium was detected at depth at MW4, a downgradient sample. All values were below CCME guidelines.
Arsenic (As)	Arsenic was detected at all sample locations. Concentrations ranged from 0.7 – 1.8 mg/kg. Concentrations were slightly higher at downgradient sample locations. The highest concentration of arsenic was detected at two locations at depth MW3 and MW4 both downgradient locations. All values were below CCME guidelines.
Mercury (Hg)	Mercury was below the method detection limit at all sampling locations.
PCBs	PCBs were below the method detection limit at all sampling locations.
TPH	TPH was detected at all sampling locations at surface and depth with the exception of MW4 where TPH was not detected at depth. Detected TPH concentrations ranged from 11 – 162 mg/kg with the highest concentration detected at the surface of MW3. All TPH concentrations are below standard DEW Line remediation criterion for TPH concentrations in soil.

6.9 GROUNDWATER SAMPLE ANALYTICAL DATA

The groundwater chemical analysis results and evaluation for the analytical data for the 2012 Tier II Disposal Facility samples are presented in Tables XXV and XXVI hereafter. Certificates of Analysis and results for groundwater samples collected as part of the QA/QC program are presented in Appendix C, at the end of this report.

Table XXV: Tier II Disposal Facility Summary Table for Groundwater Analytical Data

Sample #	Location	Groundwater Elevation (masl)	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	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																
C2-12-MW1	MW1	12.5*	0.011	0.05	0.013	0.000102	0.003	18.4	0.007	0.005	<0.000025	<0.01	<0.1	0.2	<0.1	0.2
Downgradient Samples																
C2-12-MW2	MW2	12.6*	0.019	0.14	0.007	0.000071	0.004	10.3	0.165	0.006	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
C2-12-MW3	MW3	12.4*	0.018	0.06	0.003	0.000043	0.004	0.978	0.020	0.007	<0.000025	<0.01	<0.1	<0.1	0.2	0.2
C2-12-MW4	MW4	12.4*	0.015	0.03	0.002	0.000104	0.001	26.0	0.348	0.005	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1

*masl values are to be considered within +/- 3 m as elevations were not provided in the TOR and masl was measured with a handheld GPS

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

Parameter	Evaluation
Copper (Cu)	Copper was detected at all monitoring well locations, concentrations ranged from 0.011 – 0.019 mg/L with the highest concentration occurring at MW2. Results were consistent at upgradient and downgradient locations.
Nickel (Ni)	Nickel was detected at all monitoring well locations, concentrations ranged from 0.03 – 0.14 mg/L with the highest concentration occurring at MW2. Results are consistent at upgradient and downgradient locations.
Cobalt (Co)	Cobalt was detected at all monitoring locations, concentrations ranged from 0.002 – 0.013 mg/L with the highest concentration occurring at the upgradient sample MW1. Results were consistent at upgradient and downgradient locations.
Cadmium (Cd)	Cadmium was detected at all monitoring well locations, concentrations ranging from 0.000043 – 0.000104 mg/L with the highest concentration occurring at MW4.
Lead (Pb)	Lead was detected at all monitoring well locations, concentrations ranged from 0.001 – 0.004 mg/L with the highest concentration occurring at MW3. Results were consistent at upgradient and downgradient locations.
Zinc (Zn)	Zinc was detected at all monitoring well locations, concentrations ranged from 0.978 – 26.0 mg/L, with the highest concentration occurring at MW4. Results were consistent at upgradient and downgradient locations.
Chromium (Cr)	Chromium was detected at all monitoring well locations, concentrations ranged from 0.007 – 0.348 mg/L, with the highest concentration occurring at MW4. Results were consistent at upgradient and downgradient locations.
Arsenic (As)	Arsenic was detected at all monitoring well locations, concentrations ranged from 0.05 – 0.007 mg/L, with the highest concentration occurring at MW4. Results were consistent at upgradient and downgradient locations.
Mercury (Hg)	Mercury was not detected at any monitoring well locations
PCBs	Mercury was not detected at any monitoring well locations
TPH	TPH was detected at two locations, MW1 the upgradient location and MW3, a downgradient location. TPH concentrations were 0.2 mg/L at both locations. Free Phase was not detected at either of these locations during sampling.

6.10 MONITORING WELL SAMPLING / INSPECTION LOGS

The monitoring well sampling logs for MW-1 to MW-4 are presented in this section.

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	25-Aug-12	Time:	9:50 AM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW1		
Sample Number:	12-C2-MW1		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	50.0		
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)	112.5	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	62.5		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	215.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	102.5		
Static volume of water in well (mL) =	2013.0		
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 =	6.92		
Final Conductivity (uS/cm) =	5120		
Final Temperature (°C) =	4.9		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	25-Aug-12	Time:	9:10 AM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW2		
Sample Number:	12-C2-MW2		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	20.0		
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)	57.0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	37.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	178.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	121.0		
Static volume of water in well (mL) =	2375.8		
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 =	3500 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 =	7.11		
Final Conductivity (uS/cm) =	7010		
Final Temperature (°C) =	5.1		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	25-Aug-12	Time:	8:30 AM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW3		
Sample Number:	12-C2-MW3		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	54.0		
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)	80.0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	26.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	190.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	110.0		
Static volume of water in well (mL) =	2159.8		
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 =	9.62		
Final Conductivity (uS/cm) =	6710		
Final Temperature (°C) =	5.3		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	25-Aug-12	Time:	10:05 AM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	Tier II Disposal Facility		
Monitoring Well ID:	MW4		
Sample Number:	12-C2-MW4		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	70.0		
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)	134.0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	64.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	223.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	89		
Static volume of water in well (mL) =	1747.5		
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 =	2500 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 =	7.34		
Final Conductivity (uS/cm) =	7160		
Final Temperature (°C) =	5		

7 NON-HAZARDOUS WASTE LANDFILL (NHWL)

7.1 SUMMARY

During the 2012 monitoring event of the Non-Hazardous Waste Landfill at CAM-2 Gladman Point soil and groundwater samples were collected at 4 locations (1 upgradient and 3 downgradient), and a visual inspection was conducted to identify and assess erosional features on the facility.

A PCB concentration of 123 mg/kg was detected at depth at MW5, at this concentration the soil is classified as hazardous. MW5 is the upgradient monitoring well location and therefore it is unlikely that the NHWL is the source as well as PCBs were not detected at any other location at site cross contamination is very unlikely. No relatively high metal concentrations were detected at the NWHL. TPH was detected at all sampling locations and in all samples with the exception of the depth sample at MW5 and MW6. Detectable TPH concentrations ranged from 25 to 1366 mg/kg with the highest concentration detected at the surface of the MW3. All detected TPH was primarily in the F3 fraction. Although relatively high, currently all TPH readings are below the standard site criteria of 2500 mg/kg and are therefore acceptable.

A relatively high concentration of chromium was detected at the MW7 monitoring well, at 1.02 mg/L the concentration was significantly higher than results from other wells sampled at the NHWL. A TPH concentration of 1.2 mg/L was detected at MW8. PCBs were not detected in any groundwater samples.

The NHWL has experienced slight changes since the 2010 monitoring program, including slight increases in settlement and small increases in erosion. Currently there are no erosional features with significant or unacceptable severity ratings. The erosion features on the southern slope of the Landfill are the most severe observed at the CAM-2 site however, they pose little to no concern for the near future as the erosion channels are self-armouring and have changed little in a three year period. The overall performance of the NHWL is considered acceptable

7.2 VISUAL INSPECTION REPORT

The visual inspection of the NHWL was conducted on August 27, 2012. The Visual Inspection Checklist/Report has been completed as per the TOR and is included as Table XXVII of this report. Please refer to Figure CAM-2.6 for the location of photographs and erosional features at the NHWL.

Weather Conditions at the Time of the Visual Inspection

At the time of the visual inspection of the NHWL, the temperature was approximately 8°C; skies were clear and sunny with a light wind of approximately 10 km/hr. The precipitation from earlier in the morning stopped by noon, giving way to clear skies.

Settlement

Settlement indications were noted at six areas, three previously identified (Features A, B and C), and three new observations (Features I, J and M). Feature A, a subtle depression on the south slope of the Landfill, has decreased in size since the 2010 monitoring program, potentially due to the relatively high rates of erosion and deposition on the south slope of the Facility. Feature B consists of two depressions on the side slope below the southwest corner of the Landfill. Depressions have remained relatively consistent since the 2010 observations and consequently, the 2009 monitoring program (as indicated by the 2010 monitoring report). Feature C, comprised of subtle depressions on the north side slope of the NHWL, observed small changes in size from the 2010 monitoring program and the addition of a third depression adjacent to the previously observed depressions. Feature I, on the northern slope at the northwest corner of the Landfill, consists of a small linear depression. Feature J, located along the northern toe at its approximate midpoint, consists of a minor depression and associated tension crack. Feature M, located on the southern slope of the Landfill, consists of a small depression associated with large cobble, which may have inhibited proper compaction at this location.

Previously observed indications of settlement have shown little change since the 2010 monitoring program. While the newly observed depressions are all minor, all areas of settlement have an acceptable severity rating.

Erosion

Erosion is most prominent on the southern slope of the NHWL, with five prominent erosion channels (Feature D), extending from the Landfill surface to the toe. The channels are self-armouring and have experienced relatively small increases in depth and width since 2010. A sixth relatively small erosion channel was observed on the southern slope of the Landfill which was not previously reported. Feature D has an acceptable severity rating.

Feature F, a minor erosion channel on the eastern slope of the Landfill, is barely discernible, only apparent due to the small deposit of sediment at the Landfill toe. Feature F has an acceptable severity rating. The minor erosion extending along the eastern toe of the Landfill, Feature E, remains consistent with previous observations and has an acceptable severity rating.

Frost Action

Evidence of frost action was not noted.

Evidence of Burrowing Animals

Indications of burrowing animals were not noted.

Re-establishment of Vegetation

Evidence of vegetation was not noted.

Staining

Areas of staining were not observed at the time of the monitoring program.

Seepage Points

There was no seepage observed at this Landfill.

Debris

Feature G (partially exposed metal rod) was removed by the Field Technician. Unfortunately, no picture was taken prior to removal.

Presence/Condition of Monitoring Instruments

All monitoring well installations were found to be in good condition at the Landfill.

Other Features of Note

At the time of the 2012 monitoring program, Feature H was no longer visible, while three new tension cracks were observed on the slopes of the Landfill, Feature J, K and L. Feature J, a small tension crack, is associated with a minor depression along the northern toe of the Landfill. Feature K, a discontinuous partially in-filled tension crack, extends for 6 m on the east slope of the Landfill. Feature L, a discontinuous tension crack on the south slope of the Landfill, extends the length of the slope at the approximate middle of the slope. All features are considered to have an acceptable severity rating.

Table XXVII: Visual Inspection Checklist / Report – NHWL

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

SITE NAME: CAM-2 Gladman Point
LANDFILL DESIGNATION: NHWL (New Landfill)
DATE OF INSPECTION: August 27, 2012
DATE OF PREVIOUS INSPECTION: August 13-14, 2010
INSPECTED BY: B. MacKay
REPORT PREPARED BY: B. MacKay
LANDFILL MONITORING EVENT #: 7
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	Severity Rating	Additional Comments
Settlement	Yes	Feature A See Figure CAM-2.6 (south west corner)	3	0.2	0.05	Occasional	Linear depressions (three locations)	47	Acceptable	Subtle depressions on south slope of landfill, has decreased in size since the 2010 inspection, potentially due to the relatively high rates of erosion and deposition on the south slope of the facility.
		Feature B See Figure CAM-2.6 (south east corner)	0.2 - 0.3	0.2	0.05		Isolated depressions	29, 30	Acceptable	Two depressions on the side slope below the south west corner of the landfill. Depressions have increased in length and width but decreased in depth, potentially due to erosion forces on the side slope.
		Feature C See Figure CAM-2.6 (north east and north west corners)	0.75 - 2	0.05 - 0.8	0.05 - 0.2		Linear depressions (three locations)	12, 13, 17	Acceptable	Subtle depressions on north side slope of NHWLF, observed small changes in size from the 2010 investigation and the addition of a third depression adjacent to the previously observed depressions.
		Feature I See Figure CAM-2.6 (north west corner)	1	0.3	0.1		Linear depressions (three locations)	11	Acceptable	New Observation: Subtle depressions located on the north side slope at the north west corner.
		Feature J See Figure CAM-2.6 (north slope middle)	1	0.75	0.05 - 0.2		Isolated depressions	15	Acceptable	New Observation: Subtle depressions located along the toe of the north slope at the approximate mid point. Small tension crack is associated with this feature.
		Feature M See Figure CAM-2.6 (south west corner)	0.3	0.2	0.15		Depressions	48, 49, 50	Acceptable	New Observation: Small depression associated with a large cobble on the south slope of the landfill at the south west corner, 1 m from the crest of the landfill.
Erosion	Yes	Feature D See Figure CAM-2.6 (6 areas on south slope)	10	Variable, 0.1 - 2.0	0.02 - 0.25	Occasional	Minor surficial erosion	31 - 39	Acceptable	Minor erosion noted on downgradient side slope of landfill. Cover appears stable with minor increases in depth and width from 2010 (and consequently 2009). However, 2012 has seen the addition of a very minor sixth erosion channel not previously observed.
		Feature E See Figure CAM-2.6 (extending along east toe)	25	0.1 - 0.2	0.05		Minor surficial erosion	22	Acceptable	Runoff channel along toe of landfill, appears relatively stable in size since the 2010 investigation. Self-armouring.
		Feature F See Figure CAM-2.6 (east slope)	10	0.1 - 0.2	0.05		Minor surficial erosion	23	Acceptable	Minor erosion noted on lower east side slope of landfill. Self-armouring.

Checklist Item	Present (Yes/No)	Location	Length (m)	Width (m)	Depth (m)	Extent	Description	Photographic Record	Severity Rating	Additional Comments
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	No	Feature G	N/A	N/A	Unknown	Isolated <1%	Partially exposed metal rod at toe of landfill	N/A	Acceptable	Removed by field assistants.
Presence/Condition of Monitoring Instruments	Yes	See Figure CAM-2.6 MW-5 to MW-8	N/A	N/A	N/A	None	Steel protective casings	52, 53, 54, 59	Acceptable	All monitoring wells in good condition.
Other Features of Note	Yes	Feature J See Figure CAM-2.6 (north slope middle)	1	2 mm	Unknown	Occasional	Small tension crack	16	Acceptable	New Observation: Small tension crack associated with depression on the north slope of the landfill.
		Feature K See Figure CAM-2.6 (east slope)	6	0.01 - 0.1			Tension crack	24, 25	Acceptable	New Observation: Discontinuous partially in filled tension crack on the east slope of the landfill.
		Feature L See Figure CAM-2.6 (south slope)	50	0 - 0.05			Tension crack	40-43	Acceptable	New Observation: Discontinuous tension crack that extends the length of the south slope of the landfill running parallel to the toe at the approximate middle of the slope.
Additional Photos	Yes	See Figure CAM-2.6 and Photographic Record	N/A	N/A	N/A	N/A	General Photographic Record	N/A	Not Observed	General photos for documentation, no features of note.
Overall Landfill Performance:	**Acceptable**									

7.3 PRELIMINARY STABILITY ASSESSMENT

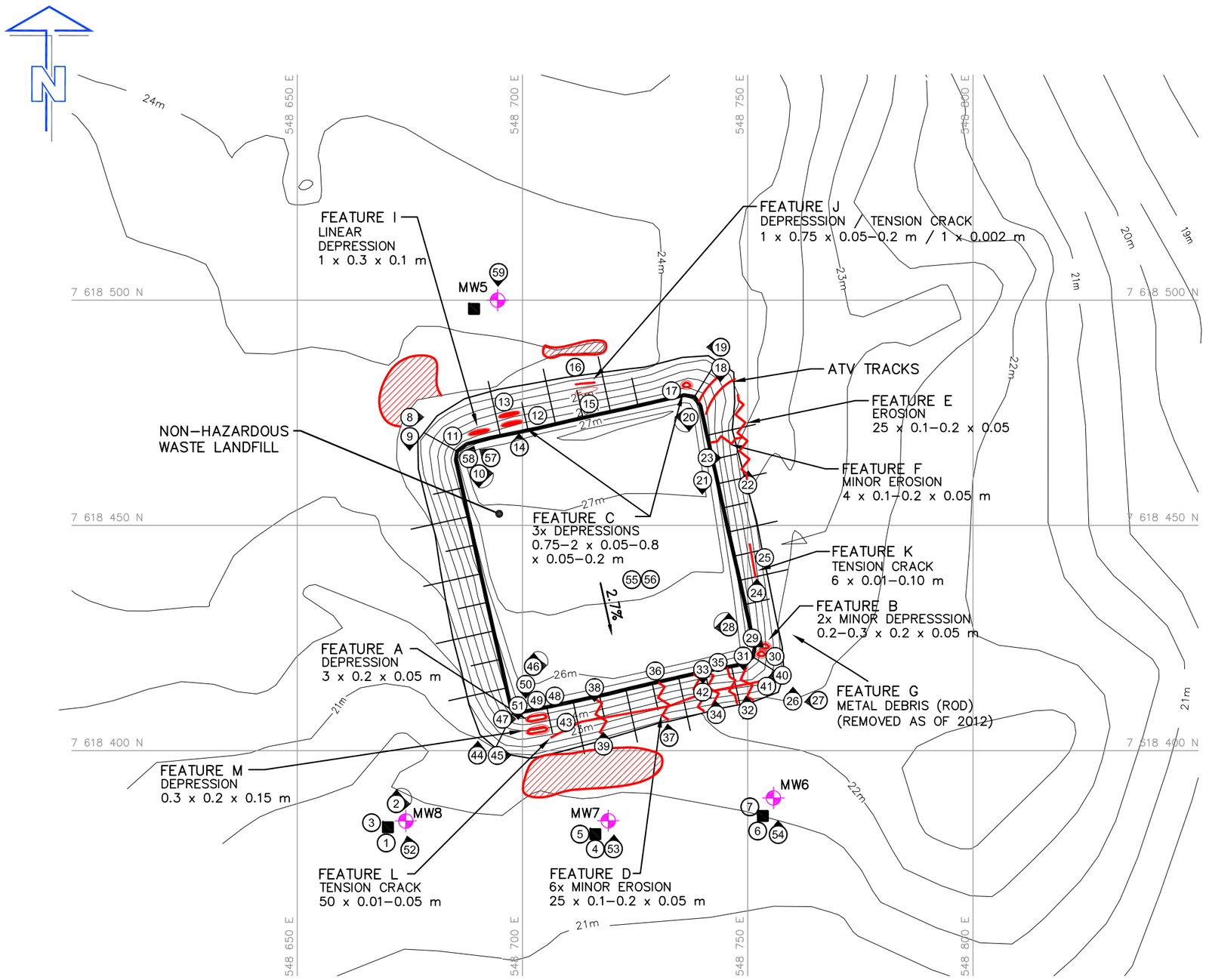
The Preliminary Stability Assessment for NHWL has been completed as per the TOR and is included as Table XXVIII hereafter.

Table XXVIII: Preliminary Stability Assessment – NHWL

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

7.4 LOCATION PLAN

The Location Plan for the NHWL has been completed as per the TOR and is included in the following page as Figure CAM-2.6 Gladman Point – NHWL.



LEGEND

- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- PHOTOGRAPH LOCATION
- EROSION (NTS)
- TENSION CRACK (NTS)
- SETTLEMENT (NTS)
- PONDING

0 10m 20m 30m 40m 50m

NO.	VERSION	DATE	PAR	VERIF.	APPR.
C	FINAL	13–04–19	D.L.	B.M.	A.L.
B	REVISION 1	13–02–14	A.L.	B.M.	A.L.
A	PRELIMINARY	12–11–30	P.L.	B.M.	A.L.

Construction de Défense Canada
Defence Construction Canada

FINAL REPORT
COLLECTION OF LANDFILL MONITORING DATA
CAM-2, GLADMAN POINT, NUNAVUT

NON-HAZARDOUS WASTE LANDFILL

SITE REMEDIATION SOLUTIONS

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MEASUREMENT UNIT	SCALE:	DATE (month–year):
Meter	1 : 1,000	FEBRUARY 2013
DRAWN BY:	VERIFIED BY:	APPROVED BY:
P. LÉGARÉ	B. MACKAY	A. LECLAIR P.ENG
PROJECT NO:	DRAWING NO:	PAGE
CD2656_200_203	CD2656_200_203-CAM-2_6	PL

FIGURE CAM-2.6

7.5 PHOTOGRAPHIC RECORDS

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

Table XXIX: Landfill Visual Inspection Photo Log – NHWL

Photo (2012-C2-)	Thumbnail	Filename	Size (KB)	Date	Vantage Point		Caption
					Easting	Northing	
General Photos							
2		2012-C2-NHWL-2	0.544	Aug 27,2012	548672	7618384	Panoramic N - E of the SW corner of the landfill, taken from MW-8
8		2012-C2-NHWL-8	2.830	Aug 27,2012	548675	7618474	View E of N slope of landfill, taken from the NW corner.
9		2012-C2-NHWL-9	2.630	Aug 27,2012	548675	7618474	View S of the W slope of the landfill, taken from the NW corner
10		2012-C2-NHWL-10	15.200	Aug 27,2012	548691	7618464	Panoramic E - S of the landfill surface taken from the top NW corner.
11		2012-C2-NHWL-11	2.540	Aug 27,2012	548690	7618464	**Feature I:** Close-up of linear depression 1 m from the N crest at the NW corner. (1 m x 0.3 m x 0.10 m)
12		2012-C2-NHWL-12	2.540	Aug 27,2012	548695	7618467	**Feature C:** Close-up of depression on the N side slope of the NHWL (0.75 m x 0.75 m x 0.10 m)
13		2012-C2-NHWL-13	2.440	Aug 27,2012	548695	7618468	**Feature C:** Close-up of linear depression on the N side slope of the NHWL located 1 m below the depression in the previous photograph (2 m x 0.05 - 0.20 m x 0.05 m)
14		2012-C2-NHWL-14	2.460	Aug 27,2012	548695	7618468	**Feature C:** View N from landfill crest of linear depressions on the N side slope of the NWHL (1 - 2 m x 0.05 - 0.75 m x 0.05 - 0.1 m)
15		2012-C2-NHWL-15	2.530	Aug 27,2012	548712	7618478	**Feature J:** Close-up of depression 4 m from the N toe mid-way between the NW and NE corners. (1 m x 0.75 m x 0.05 - 0.20 m)
16		2012-C2-NHWL-16	2.820	Aug 27,2012	548712	7618478	**Feature J:** Small tension crack observed 0.10 m below the depression. (1 m x 0.002 m)
17		2012-C2-NHWL-17	2.400	Aug 27,2012	548734	7618475	**Feature C:** Depression located 2 m below the N crest at the NE corner, depression appears to have increased in size from 2010. (2 m x 0.8 m x 0.05 - 0.20 m).
18		2012-C2-NHWL-18	2.640	Aug 27,2012	548744	7618485	View S of the E slope of the landfill, taken from the NE corner
19		2012-C2-NHWL-19	2.640	Aug 27,2012	548744	7618485	View W of N slope of landfill, taken from the NE corner.
20		2012-C2-NHWL-20	8.610	Aug 27,2012	548737	7618474	Panoramic view S - W of the landfill surface taken from the NE corner.
21		2012-C2-NHWL-21	2.510	Aug 27,2012	548740	7618460	View S of the E landfill crest, Feature H a tension crack 0.4 m from the E crest, was not observed this year.
22		2012-C2-NHWL-22	2.570	Aug 27,2012	548750	7618459	**Feature E:** View N of minor erosion along the E toe of the landfill. (25 m x 0.1 - 0.2 m x 0.05 m)
23		2012-C2-NHWL-23	2.500	Aug 27,2012	548741	7618465	**Feature F:** View E of a minor erosion channel on the E slope, taken 11 m SSE of the NE corner. (10 m x 0.1 - 0.20 x 0.05 m)
24		2012-C2-NHWL-24	2.390	Aug 27,2012	548752	7618435	**Feature K:** View N of a tension crack on the E side slope of the landfill, located 25 m SSE of the NE corner. (6 m x 0.01 - 0.1).
25		2012-C2-NHWL-25	2.000	Aug 27,2012	548752	7618435	**Feature K:** Close-up of a tension crack on the E side slope of the landfill, located 25 m SSE of the NE corner. (6 m x 0.01 - 0.01 m).
26		2012-C2-NHWL-26	2.700	Aug 27,2012	548760	7618411	View N of E landfill slope/toe, taken from the SE corner of the landfill
27		2012-C2-NHWL-27	2.470	Aug 27,2012	548760	7618411	View W of S landfill slope/toe, several erosion channels are visible extending from the crest to the toe of the landfill. Taken from the SE corner of the landfill.
28		2012-C2-NHWL-28	7.750	Aug 27,2012	548749	7618426	Panoramic view W - N of the landfill surface taken from the SE corner.
29		2012-C2-NHWL-29	2.160	Aug 27,2012	548751	7618425	**Feature B:** View SE at two small depressions (potholes) noted below southeast top corner of landfill (0.20 - 0.30 m x 0.20 m x 0.05 m)
30		2012-C2-NHWL-30	2.520	Aug 27,2012	548750	7618422	**Feature B:** Close-up of small depressions (potholes) noted below southeast top corner of landfill (0.20 - 0.30 m x 0.20 m x 0.05 m)
31		2012-C2-NHWL-31	2.440	Aug 27,2012	548749	7618421	**Feature D:** View from the S from the top of the landfill of two erosion channels that extend to the landfill toe, approximately 1 m W of SE corner (10 m x 0.2 m x 0.05 - 0.15 m)

Photo (2012-C2-)	Thumbnail	Filename	Size (KB)	Date	Vantage Point		Caption
					Easting	Northing	
General Photos							
32		2012-C2-NHWL-32	2.590	Aug 27,2012	548750	7618409	**Feature D:** View from the S landfill toe of two erosion channels (10 m x 0.2 m x 0.05 - 0.15 m)
33		2012-C2-NHWL-33	2.520	Aug 27,2012	548740	7618418	**Feature D:** View S from the top of the landfill of erosion channel that extend to the landfill toe (10 m x 0.2 - 2 m x 0.1 - 0.25 m)
34		2012-C2-NHWL-34	2.640	Aug 27,2012	548743	7618408	**Feature D:** View from the S landfill toe erosion channel (10 m x 0.2 - 2 m x 0.1 - 0.25 m)
35		2012-C2-NHWL-35	2.520	Aug 27,2012	548740	7618418	**Feature D:** Close-up of erosion a the crest of the landfill.
36		2012-C2-NHWL-36	2.500	Aug 27,2012	548738	7618419	**Feature D:** Sixth channel not observed previously, view from the S crest of the landfill (10 m x 0.1 m x 0.02 - 0.05 m)
37		2012-C2-NHWL-37	2.520	Aug 27,2012	548739	7618406	**Feature D:** View from the S landfill toe erosion channels(10 m x 0.1 m x 0 - 0.05 m)
38		2012-C2-NHWL-38	2.460	Aug 27,2012	548716	7618414	**Feature D:** View from the S from the top of the landfill of erosion channel that extend to the landfill toe (10 m x 0.75 m x 0.05 m)
39		2012-C2-NHWL-39	2.420	Aug 27,2012	548718	7618401	**Feature D:** View from the S landfill toe erosion channel (10 m x 0.75 m x 0.05 m)
40		2012-C2-NHWL-40	2.430	Aug 27,2012	548750	7618416	**Feature L:** View W of discontinuous crack extending the length of the S side of the landfill. (60 m x 0 - 0.05 m)
41		2012-C2-NHWL-41	2.520	Aug 27,2012	548750	7618416	**Feature L:** Close-up of tension crack extending the length of the S slope of the landfill
42		2012-C2-NHWL-42	2.430	Aug 27,2012	548740	7618413	**Feature L:** Discontinuous crack extending the length of the S side of the landfill, taken 10 m W of photo 40 (60 m x 0 - 0.05 m)
43		2012-C2-NHWL-43	2.430	Aug 27,2012	548710	7618405	**Feature L:** Discontinuous crack extending the length of the S side of the landfill, taken 20 m W of photo 42 (60 m x 0 - 0.05 m)
44		2012-C2-NHWL-44	2.640	Aug 27,2012	548690	7618399	View N of the W landfill slope/toe, taken from the SW corner of the landfill
45		2012-C2-NHWL-45	2.540	Aug 27,2012	548690	7618399	View E of the S landfill slope/toe, taken from the SW corner of the landfill
46		2012-C2-NHWL-46	69.300	Aug 27,2012	548700	7618412	Panoramic view N - E
47		2012-C2-NHWL-47	2.470	Aug 27,2012	548700	7618412	**Feature A:** View E of depression, reduced in size since last observation, (3 m x 0.2 m x 0.05 m)
48		2012-C2-NHWL-48	2.520	Aug 27,2012	548699	7618411	**Feature M:** Small depression associated with large cobble 1 m from the crest of the SW corner on the S slope. (0.3 m x 0.2 m x 0.15 m)
49		2012-C2-NHWL-49	2.650	Aug 27,2012	548699	7618411	**Feature M:** Close-up of depression on the S slope.
50		2012-C2-NHWL-50	2.400	Aug 27,2012	548699	7618411	**Feature M:** View S from crest of landfill of depression.
51		2012-C2-NHWL-51	2.590	Aug 27,2012	548699	7618410	View S of ponded water along the S toe of the landfill.
52		2012-C2-NHWL-52	2.710	Aug 27,2012	548675	7618378	View NNW of MW-8
53		2012-C2-NHWL-53	2.650	Aug 27,2012	548726	7618378	View N of MW-7
54		2012-C2-NHWL-54	2.860	Aug 27,2012	548762	7618384	View N of MW-6, erosion visible on the S side slope of the landfill.
55		2012-C2-NHWL-55	2.400	Aug 27,2012	548723	7618438	Close-up of metal wire found compacted into the landfill cap.
56		2012-C2-NHWL-56	2.450	Aug 27,2012	548723	7618438	Close-up of removed metal wire found compacted into the landfill cap.
57		2012-C2-NHWL-57	2.900	Aug 27,2012	548693	7618465	View NW of ponded water along the NW landfill toe
58		2012-C2-NHWL-58	2.750	Aug 27,2012	548693	7618465	View NNE of ponded water between landfill toe and MW-5
59		2012-C2-NHWL-59	2.720	Aug 27,2012	548696	7618501	View S of MW-5

Photo (2012-C2-	Thumbnail	Filename	Size (KB)	Date	Vantage Point		Caption
					Easting	Northing	
Soil Sampling							
1		2012-C2-NHWL-1	2.430	24/08/2012	548672	7618384	**MW-6:** Close-up of open soil test pit
3		2012-C2-NHWL-3	2.340	24/08/2012	548672	7618384	**MW-6:** Close-up of closed soil test pit
4		2012-C2-NHWL-4	2.370	24/08/2012	548721	7618381	**MW-7:** Close-up of open soil test pit
5		2012-C2-NHWL-5	2.320	24/08/2012	548721	7618381	**MW-7:** Close-up of closed soil test pit
6		2012-C2-NHWL-6	2.380	24/08/2012	548756	7618383	**MW-8:** Close-up of open soil test pit
7		2012-C2-NHWL-7	2.370	24/08/2012	548756	7618383	**MW-8:** Close-up of closed soil test pit

7.6 SOIL SAMPLE ANALYTICAL DATA

The soil chemical analysis results and evaluation of analytical data for the 2012 Non-Hazardous Waste Landfill samples are presented in Tables XXX and XXXI below. Certificates of Analysis and results for field duplicates collected as part of the QA/QC program are presented in Appendix C at the end of this report.

Table XXX: Non-Hazardous Waste Landfill Summary Table of Soil Analytical Data

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																
C2-12-MW5-A	MW-5	0-15	12.2	8.7	2.3	<0.5	6.8	15	7.7	1.2	<0.5	<0.05	<10	<10	136.0	136.0
C2-12-MW5-A-D		0-15	11.4	8.5	2.2	<0.5	7.1	14	6.7	1.1	<0.5	<0.05	<10	<10	147.0	147.0
C2-12-MW5-B		40-50	8.0	9.7	3.9	<0.5	8.7	14	11.1	2.2	<0.5	123	<10	<10	<10	<10
Downgradient Samples																
C2-12-MW6-A	MW-6	0-15	3.6	3.1	0.7	<0.5	1.8	6	3.0	<0.5	<0.5	<0.05	<10	<10	133.0	133.0
C2-12-MW6-B		40-50	6.2	9.0	3.8	<0.5	9.9	21	10.0	1.8	<0.5	<0.05	<10	<10	<10	<10
C2-12-MW7-A	MW-7	0-15	11.1	18.4	3.8	0.7	4.6	11	8.1	2.2	<0.5	<0.05	<10	<10	306.0	306.0
C2-12-MW7-B		40-50	8.2	10.9	3.8	<0.5	8.9	16	11.9	2.6	<0.5	<0.05	<10	<10	195.0	195.0
C2-12-MW8-A	MW-8	0-15	8.1	11.3	1.6	<0.5	3.1	8	5.9	1.4	<0.5	<0.05	<10	46.0	1320.0	1366.0
C2-12-MW8-B		40-50	4.7	6.7	2.0	<0.5	5.0	9	6.9	1.5	<0.5	<0.05	<10	<10	25.0	25.0

Table XXXI: Evaluation of 2012 Soil Analytical Data – NHWL

Parameter	Evaluation
Copper (Cu)	Copper was detected at all sample locations. Concentrations ranged from 3.6 – 12.2 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of copper was detected at the surface of MW5, the upgradient location. All values were below CCME guidelines.
Nickel (Ni)	Nickel was detected at all sample locations. Results were consistent at upgradient and downgradient locations with concentrations ranging from 3.1 – 18.4 mg/kg. The highest concentration was detected at the surface of MW7, a downgradient sample. All values were below CCME guidelines.
Cobalt (Co)	Cobalt was detected at all sample locations. Concentrations ranged from 0.7 – 3.9 mg/kg. Concentrations were similar at upgradient and downgradient sample locations The highest concentration of cobalt was detected at the surface of MW5 the upgradient location. All values were below CCME guidelines.
Cadmium (Cd)	Cadmium was detected at MW7 at surface, at a concentration of 0.7 mg/kg. The concentration is below CCME guidelines.
Lead (Pb)	Lead was detected at all sample locations. Concentrations ranged from 1.8 – 9.9 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of lead was detected at depth at MW6, a downgradient location. All values were below CCME guidelines.
Zinc (Zn)	Zinc was detected at all sample locations. Concentrations ranged from 6 – 21 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of zinc was detected at depth MW6, a downgradient sample. All values were below CCME guidelines.
Chromium (Cr)	Chromium was detected at all sample locations. Concentrations ranged from 3.0 – 11.9 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of chromium was detected at depth at MW7, a downgradient sample. All values were below CCME guidelines.
Arsenic (As)	Arsenic was detected at all sample locations in all samples with the exception of the surface sample at MW6. Detected concentrations ranged from 1.1 – 2.6 mg/kg. Concentrations were similar at upgradient and downgradient sample locations. The highest concentration of arsenic was detected at depth at MW7. All values were below CCME guidelines.
Mercury (Hg)	Mercury was below the method detection limit at all sampling locations.
PCBs	PCBs were detected at depth at one sampling site, MW5 the upgradient location with a concentration of 123 mg/kg. PCBs are considered hazardous at this concentration in soil.
TPH	TPH was detected at all sampling locations at surface and depth with the exception of MW5 and MW6 m where TPH was not detected at depth. Detected TPH concentrations ranged from 25 – 1366 mg/kg with the highest concentration detected at the surface of MW8. Although relatively high at MW8, TPH concentrations are below standard DEW Line remediation criterion for TPH concentrations in soil.

7.7 GROUNDWATER SAMPLE ANALYTICAL DATA

The groundwater chemical analysis results and evaluation of analytical data for the 2012 Non-Hazardous Waste Landfill samples are presented in Tables XXXII and XXXIII. Certificates of Analysis and results of groundwater samples collected as part of the QA/QC program are presented in Appendix C, at the end of this report.

Table XXXII: Non-Hazardous Waste Landfill Summary Table for Groundwater Analytical Data

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																
C2-12-MW5	MW5	13.6	0.015	0.03	0.003	0.000096	0.002	0.313	0.029	0.003	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
Downgradient Samples																
C2-12-MW6	MW6	11.6	0.025	0.04	0.003	0.000116	0.005	0.262	0.204	0.008	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
C2-12-MW6-D			0.02	0.03	0.003	0.000075	0.003	0.225	0.103	0.008	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW7	MW7	9	0.052	0.34	0.006	<0.000160	0.003	0.292	1.02	0.015	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
FM12-MW8	MW8	12	0.021	0.07	0.008	0.000372	0.002	0.123	0.018	0.008	<0.000025	<0.01	<0.1	<0.1	1.7	1.7

*masl values are to be considered within +/- 3 m as elevations were not provided in the TOR and masl was measured with a handheld GPS

Table XXXIII: Evaluation of 2012 Groundwater Analytical Data – NHWL

Parameter	Evaluation
Copper (Cu)	Copper was detected all monitoring well locations, concentrations ranged from 0.015 – 0.052 mg/L with the highest concentration occurring at MW7. Results were consistent at upgradient and downgradient locations.
Nickel (Ni)	Nickel was detected at all monitoring well locations, concentrations ranged from 0.03 – 0.34 mg/L with the highest concentration occurring at MW7. Results are consistent at upgradient and downgradient locations.
Cobalt (Co)	Cobalt was detected at all monitoring locations, concentrations ranged from 0.003 – 0.08 mg/L with the highest concentration occurring at MW8. Results were consistent at upgradient and downgradient locations.
Cadmium (Cd)	Cadmium was detected at all monitoring well locations with the exception of MW7, concentrations ranging from 0.000096 – 0.000372 mg/L with the highest concentration occurring at MW8.
Lead (Pb)	Lead was detected at all monitoring well locations, concentrations ranged from 0.002 – 0.005 mg/L with the highest concentration occurring at MW6. Results were consistent at upgradient and downgradient locations.
Zinc (Zn)	Zinc was detected at all monitoring well locations, concentrations ranged from 0.123 – 0.313 mg/L, with the highest concentration occurring at MW5 the upgradient location. Results were consistent at upgradient and downgradient locations.
Chromium (Cr)	Chromium was detected at all monitoring well locations, concentrations ranged from 0.018 – 1.02 mg/L, with the highest concentration occurring at MW7. Results were consistent at upgradient and downgradient locations.
Arsenic (As)	Arsenic was detected at all monitoring well locations, concentrations ranged from 0.003 – 0.015 mg/L, with the highest concentration occurring at MW7. Results were consistent at upgradient and downgradient locations.
Mercury (Hg)	Mercury was not detected at any monitoring well locations
PCBs	Mercury was not detected at any monitoring well locations
TPH	TPH was detected at one location MW8 a downgradient location at a concentration of 1.7 mg/L. Free Phase was not detected at this location during sampling.

7.8 MONITORING WELL SAMPLING / INSPECTION LOGS

The monitoring well sampling logs for MW-5 to MW-8 are included in this section.

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	25-Aug-12	Time:	8:10 AM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	NHWL		
Monitoring Well ID:	MW5		
Sample Number:	12-C2-MW5		
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	20.0		
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)	56.0	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	36.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	151.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	95.0		
Static volume of water in well (mL) =	1865.3		
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 =	2500 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 =	7.21		
Final Conductivity (uS/cm) =	4040		
Final Temperature (°C) =	4.1		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	24-Aug-12	Time:	7:50 PM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	NHWL		
Monitoring Well ID:	MW6		
Sample Number:	12-C2-MW6	12-C2-MW6-D	
Condition of Well:	Good		
Measured Data			
Vell pipe height above ground (cm) =	38.0		
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)	76.0	Measurement method: (meter, tape, etc.)	Interface Meter
Static water level (cm) = (below ground surface)	38.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	171.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	95.0		
Static volume of water in well (mL) =	1865.3		
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 =	9.57		
Final Conductivity (uS/cm) =	3564		
Final Temperature (°C) =	3.8		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	24-Aug-12	Time:	7:26 PM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	NHWL		
Monitoring Well ID:	MW7		
Sample Number:	12-C2-MW7		
Condition of Well:	Good		
Measured Data			
Vell pipe height above ground (cm) =	42.0		
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)	52.0	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	10.0		
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) =	98.0		
Static volume of water in well (mL) =	1924.2		
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 =	9.52		
Final Conductivity (uS/cm) =	8377		
Final Temperature (°C) =	3.7		

Monitoring Well Sampling Record			
Site Name:	CAM-2	Gladman Point	Nunavut
Date of Sampling Event	24-Aug-12	Time:	7:11 PM
Names of Samplers:	Brandon MacKay	Dwayne Allukpik	Jay Evalik
Landfill Name:	NHWL		
Monitoring Well ID:	MW8		
Sample Number:	12-C2-MW8	12-C2-MW8 (Interlab)	
Condition of Well:	Good		
Measured Data			
Well pipe height above ground (cm) =	60.5		
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)	65.5	Measurement method: (meter, tape, etc.)	Interface meter
Static water level (cm) = (below ground surface)	5.0		
Measured well refusal depth (cm) = (i.e. depth to frozen ground)	127.0	Evidence of sludge or siltation:	No evidence of sludge or siltation, probable freezing at well bottom
Thickness of water column (cm) =	61.5		
Static volume of water in well (mL) =	1207.5		
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 =	1250 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 =	6.62		
Final Conductivity (uS/cm) =	7034		
Final Temperature (°C) =	4.5		

8 QUALITY ASSURANCE / QUALITY CONTROL

The Quality Assurance/Quality Control (QA/QC) program was implemented to monitor the quality of the analytical results. The main objective of this QA/QC program is to insure that sampling data and analysis results are complete, precise, exact, representative and comparable. The review consisted of evaluating sample collection/handling methodology, general laboratory comments, field (blind) duplicate samples, and inter-laboratory duplicate samples. Samples collected during the monitoring program were submitted to laboratories accredited by the Canadian Association for Environmental Analytical Laboratories (CAEAL).

All samples were collected following strict Biogénie sampling procedures. Samples were uniquely labelled and control was maintained through use of chain of custody forms. All samples were collected in laboratory supplied containers and preserved in insulated coolers. Appropriate QA/QC procedures were adhered to at all times.

Blind duplicate samples were submitted to AGAT for intra-laboratory analysis, with additional duplicate samples were sent to Maxxam for inter-laboratory comparison purposes.

The relative percent difference (RPD) is used to evaluate the sample result variability. Average RPD values of less than 100% for soil samples and 30% for groundwater samples are considered an indication of acceptable duplicate sample variability. For groundwater samples, an RPD of greater than 30% may reflect difference in sample turbidity or variance in the sample procedures. Individual RPD values greater than 50% are not considered to reflect acceptable variability. RPD values are not used to evaluate those compounds that are present at concentrations less than five times the method detection limit (MDL).

As discussed in Section 1.4, inter-laboratory samples were lost during transport and subsequently not analyzed.

8.1 SOIL SAMPLES

In case of soil samples, four blind duplicate samples were submitted for intra- and inter-laboratory comparisons. Review of blind duplicate results indicated very minor differences in the detected concentrations of the various parameters. All evaluated RPD values are within the acceptable ranges for metals, TPH and PCBs.

Overall, the soil sample results are coherent and within the same range of results for intra- laboratory samples; therefore the reliability of soil analytical results are considered as good.

Table XXXIV: Evaluation of 2012 Soil Analytical Data – QA/QC – Blind Duplicates

Soil Sample Blind Duplicate 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}
C2-12-2-A	C2-2	0-15	5.3	4.5	1.4	<0.5	3.9	12	7.6	1.3	<0.5	<0.05	<10	11	382	393
C2-12-2-A-D		0-15	5.9	3.6	1.2	<0.5	3.5	14	7.0	0.9	<0.5	<0.05	<10	<10	485	485
C2-12-MW11-A	C2-11	0-15	4.2	5.7	1.7	<0.5	3.6	10	6.8	0.6	<0.5	<0.05	<10	<10	130.0	130.0
C2-12-MW11-A-D		0-15	5.7	4.9	1.4	<0.5	3.0	12	6.6	0.7	<0.5	<0.05	<10	<10	210.0	210.0
C2-12-MW2-A	MW-2	0-15	5.7	6.5	2.1	<0.5	11.7	15.0	6.9	1.3	<0.5	<0.05	<10	<10	47.0	47.0
C2-12-MW2-A-D		0-15	5.4	6.6	2.0	<0.5	9.5	15.0	6.4	1.4	<0.5	<0.05	<10	<10	47.0	47.0
C2-12-MW5-A	MW-5	0-15	12.2	8.7	2.3	<0.5	6.8	15	7.7	1.2	<0.5	<0.05	<10	<10	136.0	136.0
C2-12-MW5-A-D		0-15	11.4	8.5	2.2	<0.5	7.1	14	6.7	1.1	<0.5	<0.05	<10	<10	<10	<10

8.2 GROUNDWATER SAMPLES

In case of groundwater samples, one blind duplicate sample was submitted for intra- and inter-laboratory comparisons. Review of results indicated relatively minor differences in concentrations within the blind duplicate results, with one parameter slightly outside the acceptable RPD range (Cadmium 49.5%). This difference may be attributed to variations in sample turbidity.

Overall, the soil sample results are coherent and within the same range of results for intra- laboratory samples; therefore the reliability of soil analytical results are considered as good.

Table XXXV: Evaluation of 2012 Groundwater Analytical Data – QA/QC

Groundwater Blind Duplicate Analytical Results															
Sample #	Location	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}
C2-12-MW6	MW-6	0.025	0.04	0.003	0.000116	0.005	0.262	0.204	0.008	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1
C2-12-MW6-D		0.02	0.03	0.003	0.000075	0.003	0.225	0.103	0.008	<0.000025	<0.01	<0.1	<0.1	<0.1	<0.1

SUMMARY

As of the 2012 monitoring program, all of the Landfills at CAM-2 Gladman Point are functioning as designed, with little change since the 2010 monitoring program. The Station Landfill has had slight increases in erosion and settlement from the 2010 monitoring program. The erosion channels on Lobe 2 are the largest observed at CAM-2 however, they appear to be self-armouring and remain at an acceptable severity rating. The West Landfill North and South have changed little in the way of erosional features since the 2010 monitoring program, with minor increases in settlement. The Tier II Disposal Facility saw a reduction in desiccation cracking (likely due to recent precipitation events at the time of monitoring), and little change in the stability of the Tier II Disposal Facility. All monitoring stations and equipment remain in good condition. The NHWL saw slight increases in settlement and erosion. Despite these increases, all features are of little impact to the Facility. As of 2012, plants have begun to colonize on Lobe 5 of the Station Landfill and the Tier II Disposal Facility.

APPENDIX A

Range of the Report and Limitation of Responsibilities

RANGE OF THE REPORT AND LIMITATION OF RESPONSIBILITIES

A – Recipient and Use

This report ("Report") was prepared by Biogénie, a division of EnGlobe Corp. ("Biogénie") at the request and for the sole benefit of the Client ("Client"), and is intended to be used exclusively by the Client.

B –Site Conditions

Any description of the target site ("Site"), soil and/or groundwater included in the Report is only provided as an indication to the Client, and unless otherwise specifically mentioned in the Report such description shall not at any time and under any circumstances be used for purposes other than to gain a better understanding of the Site and to fulfil the requirements of the mandate assigned to Biogénie by the Client ("Mandate").

All information, including but not limiting the comprehensiveness of the data, charts, descriptions, drawings, tables, analysis results, compilations, and any conclusion and recommendation included in the Report, shall arise from the direct observation of the Site during a specific period, namely the fulfilment of the Mandate, and from the interpretation of such information and data available during the same period.

The content of the Report shall not apply in any way or to any part of the Site or to any parameter, material or analysis excluded from the Mandate.

Biogénie shall not be held responsible for the presence of any substance or material of a different nature, or of a similar nature but with different concentrations, as those indicated in the Report, and this in any part or parts of the Site excluded from the Mandate.

The content of the Report, including its conclusions and recommendations, shall not apply to any period preceding or following the Mandate. The physiochemical conditions of the Site, and the type and degree of contamination identified on the Site, may vary within a given period depending on a number of factors, especially the current activities taking place on the Site and/or on lands adjacent to the Site.

A review of the Report and/or changes in the parameters, conclusions and/or recommendations may prove to be necessary in the event of a change in the Site conditions or the discovery of pertinent information subsequent to the production of the Report.

C - Legislation, Regulations, Guidelines and Policies

The interpretation of the data and observations concerning the Site, as well as the conclusions and recommendations resulting from these, shall take into account the laws, regulations, standards, policies and/or guidelines applicable to the Project and that are in effect at the time of the fulfilment of the Mandate. In the event no current law, regulation, policy, guideline or standard applies to the project, Biogénie shall take into account proven environmental and professional rules and practices when drawing up the Report.

Any change in the legislation, regulations, standards, policies and/or guidelines applicable to the project may result in the need to review the Report and/or modify its parameters, conclusions and/or recommendations.

D – Use of Report

The Report is intended for the exclusive use of the Client and shall only be used for the purpose it was meant for.

The content of the Report and its conclusions and recommendations only apply to the Site and may not, at any time and under any circumstances, apply to any land adjacent to the Site or to any other land located in the vicinity of the Site.

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No provision of the Report shall be construed as or considered to be a legal opinion of Biogénie’s.

APPENDIX B

Field Notes

No.....

Date.....Page.....

928-8026

No.....

Da.....Page.....

	Joe	Jay	Dwayne
Fri	10	7	7
Sat	12	12	12
Sun	12	12	12
Mon	12	12	12

Joe Sr. Korlon
867-983-3265
P.O Box 1075
W609 371 208
Cam. Bay

Dwayne Allokpik
867-983-3866
S.I.N
665 919 080
P.O 1080
Cam. Bay

Jay Victor Evalik
Cambridge Bay NU
P.O. Box 2152 X0B 0C0
SIN # 651 149 213
867 983 3899

No.....
Date.....Page.....

No. CAM-2 Gladman Point
Date. August 24th Page.....

Landed Plane 1:00 pm
Joe - 9.5 + 3 = 12.5
Jay - 9.5
- 9.5

Stopped work 20:50

Arrived CAM-2 @ 16:10
- Set-up camp + prepare samples

Weather: 5°C
No wind
Overcast

No. NHVL

Date August 24 th Page

Soil Samplings

Samplers: Jay

-

- Brandon

MW - 8 - 18:08

1) MW12 - 8A + ~~Replicate~~

Depth: 10cm

Soil: Organic rootlets present

Jars: 4 x 125 mL + 2x Bag

2) MW12 - 8B

Depth @ 45cm

Soil - Silt + Sand

Jars: 2 x 125mL + 1 Bag

* Ponded water at south Base of landfill

Test pits full of water

Photo ID: 2 - open 1

4 - covered 3

GPS Point: 39

2 - pano SW corner

No.

Date Page

MW-7 - 18:26

3) MW12 - 7A + ESG 4

Depth - 7cm

Soil: organic - rootlets

Jars: 2 x 125mL + ~~1~~ x Bag

1 x 250 mL

4) MW12 - 7B + Interlab

Depth - 50cm

Soil - Silt + Clay

Jars: 2x 125 mL + 1 Bag

1 x 250 mL Jar

* Ponded Water + water in Pit

Photo ID: 7 → open 4

8 → closed 5

GPS = 44

No.....
Date.....Page.....

Locke 11
Pic 24 - 393

Ranked units
Pic 25 (15)
GPS 242
* unchanged from 2010

Pano 26 (14)
Pics 395 - 400 SE → NW
GPS 243

Pano 27 (22)
Pics 400 - 404 S - NW
GPS 244

~~Feature B~~

Feature B exposed Geotextile
Pic 28 (405
GPS 245 closeup 0.5m² exposed
Pic 29/~~305~~ 405 → F
GPS ~~246~~ 246

No.....
Date.....Page.....

Pic 30
407 → E Drainage Feature
GPS 247

Pano 31 (21)
Pic 408 → W
GPS 247

Pano 32 (NW)
Pic 409 - 413 E → N
GPS 248

Pano ~~33~~ 35 (20)
Pic 414 - 416 E → NE

Pano 34 (18)
417 - 426
GPS 251

No.....
Date.....Page.....

New obs
6 depressions East cum
4 in east cum
0-5 - 2m x 0-5 - 1m x 0-10 - 0-20
Pics 375 (377 E GPS 233
376 (14) close "

2 along SW arm
2m x 0.5 x 0.5
GPS 234 Pic 377 (15)

Pano 16 (B)
Pics 378 - 380
GPS 235

Lobe 9
New obs Seaping/ ponded obs
Pic 18 - 382 - SE GPS 236
Pic 19 - 383 - NW GPS 237

No.....
Date.....Page.....

Pic 19 (9) → SE
GPS 235
381

Pano 20 (8)
Pic 284 - 285 NW → N
GPS 230

Lobe 10
Pic 21 (9) 386
GPS 238

NW obs
Minor Depression on N toe
0.30 x 0.20 x 0.10
Pic 387 (22)
GPS 239

NW Pano (23)
Pic 388 - 392 NW → SE
GPS 240

No.....
Date.....Page.....

Lobe 6
Pano 37 (6)
Pics 340-342 SW-NW
GPS 227

Unclear
Pics 343 (38) → SE

New Pano (39)
Pic 344-345 NE-SE
GPS 224

Pano 40 (20)
Pic 346-348 NW → NE
GPS 225

Lobe 7
Pic 41 354 → N
GPS 226

No.....
Date.....Page.....

West landfill South
Aug 27 14:17 Partly cloudy

Lobe 8
Pic 9 (1)
#366 → SE
GPS 230

Pano 10 (2)
Pic 370-372 N → SE
GPS 231

Feature A
3x depressions
1) 0.5 x 0.5 x 0.15 (left)
2) " (middle)
3) 0.5 x 0.5 x 0.05 (right)
(41) (42)
Pic 373 → E 374 close-up
GPS 232

No.....
Date.....Page.....

Feature E - Curves Bump
1.5 m above Gondola
10m in radius
GPS 214 Pic 313 (25) → E

Pano 26 (11)
Pic 314 - 318
GPS 215

Pano 27 (12)
Pic 319 - 324 S→NW
GPS 217

Pano 28 (13)
Pics 325 - 327 S→NW
GPS 217

No.....
Date.....Page.....

Lobe 5
Pano 32 (17)
Pic 336 - 339 NE→SE
GPS 221

Pano 33 (21)
Pic 345 - 353 NW - SE
GPS 225

Pano 34 (20)
Pic 355 - 359 SW - NW
GPS 227
* Andrews GPS point is off.

Pic 35 (19)
Pic 360 → NW
GPS 228

Pano 36 (18)
Pic 361 - 367
GPS 229

No.
Date. Page.

Lobe 3
Pano 19 (6)
Pic 295-297 SE → S
GPS 208

Pano (20) (7)
Pic 298-299 SE → S
GPS 209

Pano 8 21
Pic 300-305 NW → E
GPS 210

Feature C 3x minor depressions
1) Pic 306 → E 2) 307 (224/13)
2-4 x 0.2-0.5 x 0.1
GPS 211/212

No.
Date. Page.

Lobe 4
~~Pano 23~~
Feature A Erosion channel
20 m x 0.40 x 0.05
Pic 23 NE - 320 GPS 218
Pic 24 SW - 329 219

Pano 25 (16)
Pic 330-335 W → NE
GPS 220

Pano 29 (9)
Pics 308-311 NE → E
GPS 213

Feature D - New obs
Animal Borrow - small rodent
Pic 312 GPS 213
(30)

F

No.....

Date.....Page.....

West landfill North

Weather: 20 km/h wind from South
2°C Overcast

Lobe 1
- No features of Note

Pano 11 (2)
Pics 270 - 272 N → E
GPS 200

Pano 12 (1)
Pics 273 - 276 N → W
GPS 201

Pic 13 → SW
Cap of lobe
GPS 202

No.....

Date.....Page.....

Lobe 2
Pano 14 (4)
Pics 278 - 280 (SW - S)
GPS 203

Pano 15 (New)
Pics (281 - 284) (NW → S)
GPS 2084

Pano 16 (NW)
Pics 285 - 287 (N → E)
GPS 205

Pano 17 (3)
Pics 291 - 293 N → SE
GPS 206

Feature B
Minor Depression (18)
~ 2m x 1m x 0.10
Pic 294 → NE
GPS 207

No.

Date. Page.

No. CAM-5

Date. August 28, 2012 Page.

Weather - 7:00 pm
- Overcast
- No wind
- 15 °C

Soil Sampling at Tier II

1) MW-08

ID: CS-12-MW-8-A 10cm
" -B 45cm

Soil - Sand + gravel

Time: 19:37

No.....
Date.....Page.....

MW ~~1, 2, 3~~

MW 8 : 262 (52) → N
: 194 "
" 7 : 263 (53) "
: 195 "
" 6 ~~8~~ : 264 (54) "
: 196 "
" 5 : ~~[illegible] [illegible] [illegible]~~ 269 → 5 (59)
~~[illegible]~~ ~~[illegible]~~ 199

Ponded water South West corner
Pic ~~[illegible]~~ 261 (51)
GPS 193
no evidence of Seepage Natural

No.....
Date.....Page.....

New Frame (55/56)
~~[illegible]~~ 266 Pic
197
metal wire → removed w
removed

Ponded water
North slope by MW5
NW corner
Pic 267 / 268 (57/58)
GPS 198

No.....
Date.....Page.....

New Feature (3) 40 - 43
Discontinuous crack
runs length of South
slope ½ from top
(length of crack) × 0.02 - 0.05 ×
0.02 - 0.05)

Pic from SE corner
246 → W close up : 247
GPS 186

248 → W midway
GPS 187

249 5m from SW corner
GPS 188

No.....
Date.....Page.....

SW corner
→ N
250 GPS 189 44
→ E
251 GPS " 45
Pano from top (N → E)
Pic : 252 - 256 46
GPS: 190

Feature A
1) Depression
- Barely visible
3m × 0.20 × 0.05
Pic 257 47
GPS 191
(Not even worth marking)

2) New ORBS 48 - 50
0.3 × 0.20 × 0.15
Pic 258 - 260
GPS 192
1m from SW corner
on South slope

No.....
Date.....Page.....

Feature B
Pothole

1) 0.20 x 0.20 x 0.10
GPS 175
Pic 235 29 ESE

2) 0.30 x 0.15 x 0.16
GPS ~~176~~ 177
Pic 236 30
- Both Feature are Minor

Feature D (3x)

1) 1m from top SE corn
~~2m~~ x
10m x ~~0~~2m x 0.05 = 0.15
Self among
Pic Top → S Pic Bottom → N
237 (31) # 245 (32)
GPS 178 GPS 185

No.....
Date.....Page.....

2) 1/4 way W from SE corn
10m x 0.20 = 2m x 0.25 = 0.10
Pic Top Pic Bottom
238 (33) # 244 (34)
GPS 179 GPS 184

Close up Top
239 (35)
GPS 179

3) 3m from #2 (West)
10m x 0.10 x 0 - 0.05
Top Pic 240 (36) Bottom 243 (37)
GPS # 180 183

4) 10m from SW corn (E)
10m x 0.75 x 0.05
Top Pic 241 (38) Bottom 242 (39)
GPS 181 182
- self armoured
- no longer appears [illegible]

No.
Date. Page.

Created During construction
- fines from slope collect
in The channel
Pic 225 → N (22)
GPS 170 or ~~[illegible]~~

Feature G
- Removed by techs

New Feature - (name?)
- crack - tension or desiccation?
Dim - 6m x 0.01 - 0.05 x 0.01 - 0.01
Pic 227 (24) → N Pic 228 (25) (Close-up)
GPS 172

Feature F
minor erosion East slope
~~10m from~~ 10m south from
NE corner
10m x 0.30 x 0.10
- Erosion feature is
barely discernable
- self armoring

No.
Date. Page.

- I suspect little will
change ~~at~~ This feature
Pic (23) looking E.
GPS 171 from ½ down
slope

South East corner
Pics from bottom
229 (26) → N
GPS 173
230 (27) → W
GPS 173
Panorama (N → W)
Pics 231-234 (28)
GPS 174

No.....
Date.....Page.....

4) minor Depression - New Obs
4m from toe, midway
between NW and NE corners
1m x 0.75m x 0.05-0.20

Pic 216 (15)
GPS: 165

Small crack 1m x 2mm x ?
visible 10cm below
Depression Pic 217 (16)

5) Previously observed — Feature C
Depression 2m from North East
corner just Below north
crest
- 2m x 4m x 0.05-0.20
- appears to be larger
Than 2010
Pic 217 - N (17)
GPS 166

No.....
Date.....Page.....

NE corner
Picture from Both
Looking West
222 GPS 168 (18)
Looking South
223 GPS 168 (19)
Pano at top (S→W)
Pics 218-221 (20)
GPS 167

Feature H - Tension Crack
- Not observed
Pic 22 on East crest → 5 (21)
GPS 169
- no visible crack

Feature E
Minor erosion along toe
- Same dimension as 2010
- minor
- appears to be caused
by a small rodent just
beyond toe potentially

No. NHWL
Date Aug 27 Page

Inspection of NHWL
Weather: Low Fog, light Drizzle
4°C
- Wind 10km/hr from SE
- Slowly going up to sun
- Fog burned off by 09:30

North West corner
Picture → East 8
#206 GPS 160
Picture → S 9)
205 GPS 160
Panorama 5" top NW corner
Pic: 206 - 208/209 10
GPS 161

No. Date Page

Feature C
minor Depression 2x
NW corner (3x Depression)
1) Just below crest at corner on north slope (1m from top)
1m x 0.30 x 0.10
Pic 212 → E 11
GPS 162

2) 10m from NW corner (new)
Just below crest
Previously Observed 0.75 x 0.75 x 0.10
Pic 213 close up 12
GPS 163

3) 1m below (2) (new)
2m x 0.5 - 0.20 x 0.05
Pic 214/215 13/14
GPS 164

No.....

Date.....Page.....

Pics 188 → N (1) 18
GPS = 149
189 - NW (2) 19
GPS, 150

Lob 3

Pano 190 - 192 - N from Both (50)
GPS 151

Feature C Mine Erosion
1) Pic 193-95 3m x 0.15, 0.03 (51-53)
GPS 152 = 54
5x

2x Erosion channels on North side

1) 196 | 155 } From (54)
2) 197 | 156 } Both (55)

Feature I
* Not visible at this time

Pano (General) (60)
GPS 157
Pic 198 - 202

Lobe 3
North end

Pic SE
H 203 (56)
GPS 158

Pic SE
204 (57)
159

No.....
Date.....Page.....

Feature N (1)

1) 15 - 3m x 15m x 0.1 x 0.1 (41)
Top: 172 GPS 139
Bottom: 173 GPS 140 (42)

4 x channels

Feature K
- Not visible

Feature O (2)
- 12m x 0.5-0.2 x 0.1-0.15
Top 174 GPS: 141 (43)
Bottom 173 GPS 142 (44)

Feature J - Tension crack
Pin. 4m
Pic: ~~177~~ 176/177 (45/46)
: 143
: NE

No.....
Date.....Page.....

Pano 8"
Pic 178-181 (47)
GPS 144

Additional Pics
182 GPS 145 48
183 GPS 146 49

Lake 1
Pic 184 (48) 14
GPS: 149
SE

New Feature (M)
2 Potholes
1m x .70 x 0.20
Pics 185/186 SE - 187 (3?)
GPS 147
(15/16) +17

No.....
Date.....Page.....

New Feature

- Minor erosion channel (27/28)
- 10m x 0.05 x 0.07
Picture = 149/150 150 (close up)
GPS : 124

Pano
22 as re-named Previously (32)
Pics: 154 - 159
GPS: 127

Feature L Not observed
- Potentially due to recent rain events

Pano 18" (33)
Pic 160 - 164
GPS: 128

No.....
Date.....Page.....

Feature F

Minor Erossion
7 Events

Feature O

1) 5m x 0.15 - 0.50 x 0.26
Top: Pic: 165 GPS ~~131~~ 132
Bottom: Pic: 166 GPS ~~130~~ 133

Feature F

2) 30m x 0.30 - 2m x 0.05 - 0.30
Top Pic 167 GPS 134 (36)
crest Pic 168 GPS 135 (37)
Bottom Pic 169 GPS 136 (38)

Self as many

Feature E

3) 3 major cracks
10m x 0.1 - 0.50 x 0.10 - 0.15
Pic top 170 GPS 137 (39)
Pic Bottom 171 GPS 138 (40)

No.....
Date.....Page.....

Lake 2

Feature G:
minor Erosion in Drainage channel
60 x 1 x 0.15

Picture (1) (138) GPS 118 NE (20)
Picture (2) (139) GPS 119 NE (21)
Picture (3) (140) GPS 120 NE (22)
Picture (4) (141) GPS 121 SW (23)

Feature H Seepage and stain
- Feature H is located in a natural depression, stain appears to be from natural oxidization as it is observed in other areas in the local tundra
- Area is 50 x 20m

No.....
Date.....Page.....

Pano Picture (Feature H
Pics (142-146) (24)
GPS 122

Sheen on water
- should be noted a visible sheen is on the water at Feature H
- The sheen is caused by "iron bacteria" not the TPH
Pic: (147/148) (25/26)
GPS (123

Feature B (2 new Depressions), minor Depress (3x) Inner
- 1.5 x 0.3 x 0.10 (Northern)
- 2 x 0.2 x 0.05 (middle)
- 3 x 0.4 x 0.10 (southern)

Pic North Pic 153 ~~SW~~ NE GPS 127 (31)
middle Pic 152 ~~SW~~ NE GPS 127 (30)
South Pic 151 ~~SW~~ NE GPS 125 (29)

No.
Date Stephan Aug 26 Page

light Rain overcast

Overhead shots from Tour 2
GPS 1076
Pic's : 116 - 118 (11 - 13)
Lobe 5
Feature A Lobe 5
Minor settlement
4 Areas (up from 2)
0.3 - 0.5 × 0.3 - 0.5 × 0.10
Pics 122 - 125 (East - West)
GPS 108 - 111
(63 - 66)
New Feature (Find name)
Minor Depression
0.5 × 0.3 × 0.10

Picture : 126 (67)
GPS : 112
Vegetation present in bottom of Depression

No.
Date Page

Panoramas (68)
46 as referenced previously
Pictures : 127 - 129 Stitch
GPS : 113

44 " (Stitch (69)
Pictures : ~~127~~ 130 - 132
GPS : 114

Lobe 4
New Feature (Name)
- Hydrocarbon stain
- Feature of note
0.60 × 0.50
GPS 115
Picture 133 (58)
No other Features of Note

Pano	59	61
	43" (59/60)	4" (61/62)
Pictures	134/135	136/137
GPS	116	117

No.....
Date.....Page.....

MW1 - Picture ~~100~~ F→N
GPS

Feature K
Vegetation South Slope
- Pic 101 close up (41)
GPS : 103

Pic : 105 → West (45)
GPS 105

Plant Density approx
1 plant per $3m^2$
on south slope
- few plants observed
on other sections

~~Pic~~

No.....
Date.....Page.....

Top Panoramas
North :
GPS :
East :
GPS : ~~105~~
South :
GPS ~~West~~ : 105

Top Pan (static)
T South : 107 - 109 (46)
E GPS : ~~105~~ 104

East : 110 - 112 (47)
N GPS : ~~105~~ 105

North : 113 - 115 (48)
W GPS : ~~106~~ ~~109~~ 106

West
~~South~~ : 119 - 121 (49)
GPS : 107

No.

Date. Page.

Feature D

- Minor Depress
  1m x 0.20 x 0.15
- has not increased in size

Picture ! 97 (P) 37

GPS 96

Feature E

- Minor Erosion
  15m x 1 - 1.25m x 0.15
- self armoring

Pic 98 → looks down 38

99 looks up 39

GPS - ~~98/99~~ (check

97/98

40 - 99

No.

Date. Page.

Feature C

102 → N East (42)

GPS → 101

- 103 → SW (43)

GPS . 102

increased in size

10 m x 0.10 - 0.50 x 0.10

also includes several other D[illegible] at SE corner

Picture

104 (44)

GPS 103

No.....

Date.....Page.....

Panoramas

From Bottom
- North: 84 (24)
- GPS: 84
- East 85 (25)
- GPS ~~86~~ use old
- South 86 (29)
- GPS 85
- West 90 (30)
- GPS ~~88~~ use old

Picture 91 → metal Debris removed from Tier II area (31)

Pic 92 - Ponded water off north slope (32)
GPS 89

Pic 94 - (33)
- ~~GPS~~ East
- GPS 91 (34)

No.....

Date.....Page.....

Feature F
- minor erosion
- ~~0.50~~ 15m × 0.50 × 0.05
- Picture = 93 (34)
- GPS 90

Feature B (35)
- Minor Depression
- 2m × 0.75 × 0.10
- Pic: 95 → E
- GPS: 92 or 93?

Additional Depression (36)
- minor
- 0.75 × 0.20 × 0.05
- Pic 96 → N
- GPS ~~95~~ 94

No.....
Date.....Page.....

MWI Picture 81 → N (21)
GPS 82

Feature J Tension cracks
North Slope
Picture: 82 → W (22)
83 → close up (23)
Approx 10m x 0.05 x 0.05
West
- Tension cracks no longer visible

East Picture 87 → N (27)
88 → 84 2nd crack (29)
GPS: 86 (28)
GPS 87

3- 5m x 0.01 - 0.05 ~ 0.02

Tension cracks no longer as prevalent
(Wetting of soil?)

No.....
Date.....Page.....

N

no longer visible

GPS 83

not visible

Pic 100
GPS 100

(40)

No.....
Date.....Page.....

Feature 8
Vetting
- larger area
- May be due to precipitation events over past week
- ~~North~~ side
  - Approx 60% of slopes
  Picture 73 looks east from NW corner (13)
  74 looking south " (14)
  GPS: 79

~~larger Area due to High rains~~

Unable to properly assess vetting due to rain experienced during sampling

No.....
Date.....Page.....

Feature G
Minor erosion
10 m x 0.5 x 0.05

Picture 75 - looking west (15)
76 - close up (16)
GPS 80
- Feature G has changed little in size
- minor erosion at base of toe

Feature I.
"metal Debris"
- ~~Piece of wood Removed~~
~~Picture = 77/78 close up and~~
GPS 81
Picture 77 - 80
shows removal process

(17 - 20)

No.
Date. Aug 26/2012 Page.

5°C light Rain in morning
8°C Sunshine Afternoon

~~F~~

Morning - Afternoon
- Boys collected 2 full bags of Debris and Garbage from landfills
- More Garbage on-site around Rangers Camp
- Changed Battery and DL Thermistor Data
- Re installed UT-3

No. Tier 11
Date. Aug 26/2012 Page.

Inspection

Feature A
- 2x linear Depressions on North East and South ~~east~~ W sides (crest of slope)

North east
- 35 m x 20-50 cm x 5+10 cm
  - stable

Picture reference:
→ S~~E~~ South end ↓ GPS: 75
→ close up GPS: 76
→ SE middle GPS: 7
→ NW west End GPS: 7

South slope

No.....
Date.....Page.....

41) C2-12-10-A
Depth: 10cm
Soil: Sand + roots
Time: 17:04
Jars: 2 x 120 + Bag

42) C2-12-10-B
Depth: 40cm
Soil: Sand + cobble
Time: 11
Jars: 11

Photo: 58 (9)
: 59 (10)
GPS: 73

No.....
Date.....Page.....

43) C2-12-14
Depth: 10
Soil: Sand + roots (some) + pebbles (
Time: 17:25
Jars: 2 x 120 + Bag

44) C2-12-14
Depth: 50cm
Soil: Sand + Sand Gravel
Time: 17:25
Jars: 2 x 120 + Bag

Photo: 60 (7)
: 61 (8)
GPS 74

No.....
Date.....Page.....

37) C2-12-7-A
Depth: 10 cms
Soil: Organics + Rootlets
Time: 16:38
Jars: 2 x 120 + Bag

38) C2-12-7-B
Depth: 35cm
Soil: Gravel + Sand
Time: 11
Jars: 2 x 120 + Bag

Photo: 54 (3)
: 55 (4)
GPS: 71

No.....
Date.....Page.....

39) C2-12-6-A
Depth: 7
Soil: Sand + roots (some)
Time: 16:53
Jars: 2 x 120 + Bag

40) C2-12-6-B
Depth: 50
Soil: Sand
Jars: 2 x 120 + Bag

Photo: 56 (1)
: 57 (2)

GPS: 72

No.....
Date.....Page.....

33) CZ-12-9-A + ESG
Depth: 10cm
Soil: Sand + organic
small pebbles
Time: 16:13
Jars: 2x120 + Bag + 250

34) CZ-12-9-F3 + marsh
Depth: 45cm
Soil: Sand + fines
* starting to Freez

Picture: 50 (7)
: 51 (8)
GPS: 69

No.....
Date.....Page.....

35) CZ-12-8-A
Depth
Soil: Clay Frozen organic +
Time: 16:22
Jars: 2x120 + Bag

36) CZ-12-8-F3
Depth: 50cm
Soil: Mud (Clay Frozen
Time: 16:22
Jars: 11

Picture: 52 (5)
: 53 (6)
GPS: 70

No.....

Date.....Page.....

29) C2-12-12-A
Depth : 10cm
Soil = Sand
Jars : 2 x 120 + Bag
Time = 15:43

30) C2-12-12-B
Depth = 50cm
Soil = Sand
Jars = 2 x 120 + Bag
Time = "

Photo : 46 (3) (3)
: 47 (4) (4)
GPS 67

No.....

Date.....Page.....

31) C2-12-11-A + Dup
Depth = 10cm
Soil organic + Sand + rootlets
Jars : 4 + 120mL + 2 x Bag
Time : 15:55

32) C2-12-11-B
Depth : 50cm
Soil : Gravel + Sand
Jars : 2 x 120 + Bag
Time : "

Photo : 48 (1)
49 (2)
GPS : 68

water in testpit

No.....
Date.....Page.....

25) C2-12-5-A
Depth: 5cm
Soil: Sand + Gravel
Inv: 2×120 + Bag
Time: 13:16

26) C2-12-5-B
Depth: 50 cm
Soil: Sand

Piche: 42 9
: 43 10
GPS: 65

Soil is Dry

No.....
Date West Landfill Page.....

27) C2-12-13-A
Depth 10cm
Inv 2×120 + Bag
Time: 15:30
Soil: Sand + organic

28) C2-12-13-B
Depth: 50
Soil: Sand + Gravel
Some clay

Piche: 44
: 45
GPS: 66

No.....

Date.....Page.....

21) C2-12-2-A + Bag
Depth 5cm
Soil - Organic + Rootlets
Jar - 4x 120 + 2x Bag
Time - 12:34

22) C2-12-2-B
Depth: 30cm
Soil - Sand + Silt
Jar 2x 120 + 1 Bag
Water in Bottles

Photos: 38 (3)
: 39 (4)
GPS: 62

No.....

Date.....Page.....

23) C2-12-1-A + ESG
Depth: 10cm
Soil: Organic
Jar - 2x120 + Bag + 250
Time: 12:55

24) C2-12-1-B + Marron
Depth: 40cm
Soil: Sand few cobbly
Time "

Photos: 40 (1)
: 41 (2)
GPS: 63

No. Stephen Landfill

Date Page

17) C2-12-4-A
Depth = 10
Soil - Sand + organic
5cm organic layer
Jar = 2 x 120 + Bag
Time = 12:04

18) C2-12-4-B
Depth = 45
Soil = Sand + Silt
Time = 12:08
Picture = ~~Deleted Error 64~~ (7)
= 35 (8)
GPS 60
☆ Water in both

No.

Date Page

19) C2-12-3-A
Depth 5
Soil = Sand
Jar 2 x 120 + Bag
Time = 12:23

20) C2-12-3-B
Depth = 50cm
Jar = 2 x 120 + Bag
Time "
Picture 36 (5)
37 (6)
GPS = 61

No.....

Date.....Page.....

11) C2 - 12 - MW2 - A + ~~E56~~ Duplicate

Depth: 5-10

Soil: Sand

Jars: 4x120 + 2 x Bag

Time: 11:30

Notes

Picture 27

3

12) C2 - 12 - MW2 - B ~~+ Matrix~~

Depth: 45

Soil: Sand + Some Gravel

Jar: 2x120 + Bag

Time: 11:30

Notes

Picture 26 GPS: 57

4

13) C2 - 12 - MW3 - A + E56

Depth 10cm

Soil: Gravel, organic + fine

Jar: " + 250mL

Time: 11:19

Notes

Picture:

GPS ± 3m

No.....

Date.....Page.....

14) C2 - 12 - MW3 - B + Matrix

Depth: 40cm

Soil: Some ~~Cobble~~ Gravel + fines

Jar: 2x120 + Bag + 250

Time: 11:19

Notes: Some Undes

Picture: E25 F26 GPS ~~E56~~ 56

1/2

15) C2 - 12 - MW4 - A

Depth 10

Soil: Sand/ Gravel/ organic

Jar:

Time: 11:55

Notes:

Picture E:32 F GPS 59

7

16) C2 - 12 - MW4 - B

Depth 45

Soil:

Jar:

Time: 11:55

Notes:

Picture 33

8

No.....
Date August 25 Page.....

Weather
8°C
Fog in morning
light wind from West
Fog cleared by 11
Grey skies

No.....
Date August 25 | 2012 Page.....

Soil Sandy
Started work @ 7:30 am

Tier 2

~~CZ-12-MW1~~ ~~CZ-12-MW~~

9) CZ-12-MW1-A
Depth: 5-10 cm
Soil: Sand/organics some rubble
Jars: 11
Time: 11:45
Notes:
Picture 29/30 GPS 58

5/6

10) CZ-12-MW1-B + ~~Field Dup~~
Depth: 50 cm
Soil:
Jars: 2x 120mL
Time: 11:50
Notes:
Picture: 31/32

7/8

No. Tier II
Date August 25, 2012 Page

MW - 1

9) MW12-1A
Depth
Soil
Jars
Notes

10) MW12-1B
Depth
Soil
Jars
Notes

Photo
GPS

No.
Date Page

MW - 2

11) MW12-2A + Duplicate
Depth
Soil
Jars
Notes

12) MW12-2B
Depth
Soil
Jars
Notes

Photo -
-

GPS

667-985-2569

No.....
Date.....Page.....

MW-6 18:40

5) MW12-6A
Depth: 10cm
Soil: Organic
Jars: 2x 125mL + Bag

6) MW12-6B
Depth: 45 cm upper
Soil: silt + Sand
Jars: 2x 125mL + Bag
* Water in test Pit

Photo: 8-0pm 6
9-closed 7

GPS: 45

No.....
Date.....Page.....

MW-5 + Duplicate 19:00

7) MW12-5A
Depth:
Soil
Jars: 2x 125mL + Bag

8) MW12-5B
Depth:
Soil:
Jars: 2x 125mL + Bag

* MW notes are in prepared filed log

APPENDIX C

AGAT QA/QC Reports and Certificates of Analysis

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.
1140, RUE LEVIS
TERREBONNE, QC J6W5S6
(450) 961-3535

ATTENTION TO: Brandon Mac Kay

PROJECT NO: Soil and Water Sample

AGAT WORK ORDER: 12E638576

SOIL ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

TRACE ORGANICS REVIEWED BY: Larissa Poryadina, Senior Analyst

WATER ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

DATE REPORTED: Sep 13, 2012

PAGES (INCLUDING COVER): 30

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES
VERSION 2:With added results (2012-11-05)

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

CCME / Alberta Tier 1 Metals (soil) + Hg

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-1-A	C2-12-1-B	C2-12-2-A	C2-12-2-A-D	C2-12-2-B	C2-12-3-A	C2-12-3-B	C2-12-4-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	Unit	G / S	RDL	3678251	3678268	3678269	3678270	3678271	3678272	3678273	3678277
Arsenic	mg/kg	17	0.5	13.9	0.7	1.3	0.9	<0.5	0.6	1.0	<0.5
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	4.7	4.1	7.6	7.0	3.4	3.1	4.3	4.5
Cobalt	mg/kg	20	0.5	1.3	1.2	1.4	1.2	0.9	1.0	1.3	1.1
Lead	mg/kg	70	0.5	4.0	3.1	3.9	3.5	2.7	2.2	3.3	2.7
Nickel	mg/kg	50	0.5	4.5	3.3	4.5	3.6	2.8	2.9	4.0	3.7
Zinc	mg/kg	200	1	11	6	12	14	8	5	6	7
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

		SAMPLE DESCRIPTION:		C2-12-4-B	C2-12-5-A	C2-12-5-B	C2-12-6-A	C2-12-6-B	C2-12-7-A	C2-12-7-B	C2-12-8-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	Unit	G / S	RDL	3678282	3678283	3678286	3678288	3678289	3678290	3678292	3678293
Arsenic	mg/kg	17	0.5	<0.5	1.0	0.6	<0.5	<0.5	1.4	0.6	2.2
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	3.4	6.3	4.2	2.9	2.6	5.4	4.5	4.6
Cobalt	mg/kg	20	0.5	0.9	2.1	1.1	0.7	0.7	1.4	1.0	2.4
Lead	mg/kg	70	0.5	2.1	3.6	2.5	1.2	1.3	3.0	2.2	2.3
Nickel	mg/kg	50	0.5	3.1	5.7	3.3	1.9	2.9	6.6	3.9	4.3
Zinc	mg/kg	200	1	4	14	4	6	3	6	5	6
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Certified By:

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

CCME / Alberta Tier 1 Metals (soil) + Hg

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: C2-12-8-B SAMPLE TYPE: Soil DATE SAMPLED: 2012-08-25 3678294	C2-12-9-A Soil 2012-08-25 3678295	C2-12-9-B Soil 2012-08-25 3678296	C2-12-10-A Soil 2012-08-25 3678297	C2-12-10-B Soil 2012-08-25 3678298	C2-12-11-A Soil 2012-08-25 3678299	C2-12-11-A-D Soil 2012-08-25 3678301	C2-12-11-B Soil 2012-08-25 3678302
Arsenic	mg/kg	17	0.5	2.9	1.9	2.9	1.1	1.2	0.6	0.7	0.8
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	24.6	8.8	21.9	6.8	6.4	6.8	6.6	7.7
Cobalt	mg/kg	20	0.5	6.9	3.4	5.5	2.0	2.1	1.7	1.4	2.2
Lead	mg/kg	70	0.5	14.7	2.8	10.4	3.9	3.4	3.6	3.0	3.1
Nickel	mg/kg	50	0.5	15.4	7.6	12.6	6.0	5.4	5.7	4.9	6.3
Zinc	mg/kg	200	1	37	18	32	11	11	10	9	12
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: C2-12-12-A SAMPLE TYPE: Soil DATE SAMPLED: 2012-08-25 3678304	C2-12-12-B Soil 2012-08-25 3678305	C2-12-13-A Soil 2012-08-25 3678306	C2-12-13-B Soil 2012-08-25 3678307	C2-12-14-A Soil 2012-08-25 3678321	C2-12-14-B Soil 2012-08-25 3678322	C2-12-MW1-A Soil 2012-08-25 3678323	C2-12-MW1-B Soil 2012-08-25 3678325
Arsenic	mg/kg	17	0.5	0.6	<0.5	<0.5	0.7	0.8	0.8	0.7	1.0
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	7.0	6.3	3.0	3.3	4.9	4.3	3.1	4.8
Cobalt	mg/kg	20	0.5	2.1	1.9	1.2	0.9	1.6	1.3	0.9	1.6
Lead	mg/kg	70	0.5	2.1	1.3	2.0	2.1	2.9	2.3	2.5	4.3
Nickel	mg/kg	50	0.5	4.7	4.2	3.4	3.5	4.5	3.5	2.9	5.2
Zinc	mg/kg	200	1	14	11	5	4	16	6	6	13
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

CCME / Alberta Tier 1 Metals (soil) + Hg

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: C2-12-MW2-A SAMPLE TYPE: Soil DATE SAMPLED: 2012-08-25 3678326	C2-12-MW2-A-D Soil 2012-08-25 3678328	C2-12-MW3-A Soil 2012-08-25 3678329	C2-12-MW3-B Soil 2012-08-25 3678331	C2-12-MW4-A Soil 2012-08-25 3678332	C2-12-MW4-B Soil 2012-08-25 3678333	C2-12-MW5-A Soil 2012-08-24 3678334	C2-12-MW5-A-D Soil 2012-08-24 3678335
Arsenic	mg/kg	17	0.5	1.3	1.4	1.4	1.8	1.3	1.8	1.2	1.1
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	6.9	6.4	8.4	7.8	5.9	11.1	7.7	6.7
Cobalt	mg/kg	20	0.5	2.1	2.0	2.5	3.2	2.0	4.3	2.3	2.2
Lead	mg/kg	70	0.5	11.7	9.5	10.9	6.2	7.1	7.0	6.8	7.1
Nickel	mg/kg	50	0.5	6.5	6.6	8.2	10.9	5.9	10.1	8.7	8.5
Zinc	mg/kg	200	1	15	15	16	13	20	21	15	14
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: C2-12-MW5-B SAMPLE TYPE: Soil DATE SAMPLED: 2012-08-24 3678336	C2-12-MW6-A Soil 2012-08-24 3678337	C2-12-MW6-B Soil 2012-08-24 3678338	C2-12-MW7-A Soil 2012-08-24 3678339	C2-12-MW7-B Soil 2012-08-24 3678341	C2-12-MW8-A Soil 2012-08-24 3678343	C2-12-MW8-B Soil 2012-08-24 3678346
Arsenic	mg/kg	17	0.5	2.2	<0.5	1.8	2.2	2.6	1.4	1.5
Cadmium	mg/kg	1.4	0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5
Chromium	mg/kg	64	0.5	11.1	3.0	10.0	8.1	11.9	5.9	6.9
Cobalt	mg/kg	20	0.5	3.9	0.7	3.8	3.8	3.8	1.6	2.0
Lead	mg/kg	70	0.5	8.7	1.8	9.9	4.6	8.9	3.1	5.0
Nickel	mg/kg	50	0.5	9.7	3.1	9.0	18.4	10.9	11.3	6.7
Zinc	mg/kg	200	1	14	6	21	11	16	8	9
Mercury	mg/kg	6.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 Soil (Ag, F)

Certified By:

AGAT Laboratories

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CALGARY, ALBERTA
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Soil Analysis - Copper

DATE RECEIVED: 2012-09-04 **DATE REPORTED: 2012-09-13**

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-1-A	C2-12-1-B	C2-12-2-A	C2-12-2-A-D	C2-12-2-B	C2-12-3-A	C2-12-3-B	C2-12-4-A
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
					3678251	3678268	3678269	3678270	3678271	3678272	3678273	3678277
Copper	mg/kg		0.5		7.8	1.7	5.3	5.9	1.8	2.0	3.9	2.3

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-4-B	C2-12-5-A	C2-12-5-B	C2-12-6-A	C2-12-6-B	C2-12-7-A	C2-12-7-B	C2-12-8-A
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
					3678282	3678283	3678286	3678288	3678289	3678290	3678292	3678293
Copper	mg/kg		0.5		1.8	5.5	1.8	2.2	1.3	20.8	3.9	5.7

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-8-B	C2-12-9-A	C2-12-9-B	C2-12-10-A	C2-12-10-B	C2-12-11-A	C2-12-11-A-D	C2-12-11-B
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
					3678294	3678295	3678296	3678297	3678298	3678299	3678301	3678302
Copper	mg/kg		0.5		16.2	3.3	11.5	3.3	3.0	4.2	5.7	5.3

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-12-A	C2-12-12-B	C2-12-13-A	C2-12-13-B	C2-12-14-A	C2-12-14-B	C2-12-MW1-A	C2-12-MW1-B
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
					3678304	3678305	3678306	3678307	3678321	3678322	3678323	3678325
Copper	mg/kg		0.5		2.0	4.0	1.3	1.6	3.3	2.8	2.5	5.7

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-MW2-A	C2-12-MW2-A-D	C2-12-MW3-A	C2-12-MW3-B	C2-12-MW4-A	C2-12-MW4-B	C2-12-MW5-A	C2-12-MW5-A-D
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-24	2012-08-24
					3678326	3678328	3678329	3678331	3678332	3678333	3678334	3678335
Copper	mg/kg		0.5		5.7	5.4	9.3	13.1	16.7	8.3	12.2	11.4

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	C2-12-MW5-B	C2-12-MW6-A	C2-12-MW6-B	C2-12-MW7-A	C2-12-MW7-B	C2-12-MW8-A	C2-12-MW8-B
				SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				DATE SAMPLED:	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24
					3678336	3678337	3678338	3678339	3678341	3678343	3678346
Copper	mg/kg		0.5		8.0	3.6	6.2	11.1	8.2	8.1	4.7

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Soil Analysis - Copper

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-1-A	C2-12-1-B	C2-12-2-A	C2-12-2-A-D	C2-12-2-B	C2-12-3-A	C2-12-3-B	C2-12-4-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678251**	**3678268**	**3678269**	**3678270**	**3678271**	**3678272**	**3678273**	**3678277**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	11	<10	<10	<10	<10	<10
C16 - C34 (F3)	mg/kg		10	438	20	382	485	<10	13	21	44
C34 - C50 (F4)	mg/kg		10	279	18	243	283	<10	20	12	44
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	60	16	51	71	13	12	13	18
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		101	102	100	100	101	99	94	101
Ethylbenzene-d10 (BTEX)	%	50-150		89	108	96	82	105	96	100	94
o-Terphenyl (F2-F4)	%	50-150		112	103	105	105	100	101	103	101

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-4-B	C2-12-5-A	C2-12-5-B	C2-12-6-A	C2-12-6-B	C2-12-7-A	C2-12-7-B	C2-12-8-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678282**	**3678283**	**3678286**	**3678288**	**3678289**	**3678290**	**3678292**	**3678293**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10	<10	11	<10	<10
C16 - C34 (F3)	mg/kg		10	12	101	<10	<10	31	435	115	106
C34 - C50 (F4)	mg/kg		10	19	78	11	<10	28	288	87	89
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	16	16	5.8	5.9	5.9	51	25	19
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		98	100	100	100	100	100	99	101
Ethylbenzene-d10 (BTEX)	%	50-150		85	92	97	96	86	85	80	80
o-Terphenyl (F2-F4)	%	50-150		102	103	103	101	104	106	100	106

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-8-B	C2-12-9-A	C2-12-9-B	C2-12-10-A	C2-12-10-B	C2-12-11-A	C2-12-11-A-D	C2-12-11-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678294**	**3678295**	**3678296**	**3678297**	**3678298**	**3678299**	**3678301**	**3678302**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C16 - C34 (F3)	mg/kg		10	59	24	42	32	14	130	210	12
C34 - C50 (F4)	mg/kg		10	58	35	51	34	<10	109	183	21
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	15	12	17	9.6	8.8	29	27	16
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		100	100	100	100	104	102	103	100
Ethylbenzene-d10 (BTEX)	%	50-150		90	102	93	91	100	88	91	85
o-Terphenyl (F2-F4)	%	50-150		114	102	102	105	112	102	104	99

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-12-A	C2-12-12-B	C2-12-13-A	C2-12-13-B	C2-12-14-A	C2-12-14-B	C2-12-MW1-A	C2-12-MW1-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678304**	**3678305**	**3678306**	**3678307**	**3678321**	**3678322**	**3678323**	**3678325**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	17
C16 - C34 (F3)	mg/kg		10	32	<10	14	<10	58	<10	29	52
C34 - C50 (F4)	mg/kg		10	27	<10	16	<10	51	12	22	34
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	16	3.6	18	15	13	6.6	6.1	11
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		104	103	103	104	103	98	94	102
Ethylbenzene-d10 (BTEX)	%	50-150		99	94	86	91	106	84	76	91
o-Terphenyl (F2-F4)	%	50-150		100	96	98	99	98	96	99	99

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW2-A	C2-12-MW2-A-D	C2-12-MW3-A	C2-12-MW3-B	C2-12-MW4-A	C2-12-MW4-B	C2-12-MW5-A	C2-12-MW5-A-D
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678326**	**3678328**	**3678329**	**3678331**	**3678332**	**3678333**	**3678334**	**3678335**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
C16 - C34 (F3)	mg/kg		10	47	47	162	11	119	<10	136	147
C34 - C50 (F4)	mg/kg		10	26	25	132	14	82	<10	109	117
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	9.1	9.9	23	14	16	3.9	23	25
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		98	101	99	103	99	100	97	98
Ethylbenzene-d10 (BTEX)	%	50-150		72	89	84	93	77	90	84	82
o-Terphenyl (F2-F4)	%	50-150		103	99	104	95	100	97	98	98

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW5-B	C2-12-MW6-A	C2-12-MW6-B	C2-12-MW7-A	C2-12-MW7-B	C2-12-MW8-A	C2-12-MW8-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678336**	**3678337**	**3678338**	**3678339**	**3678341**	**3678343**	**3678346**
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 (F1 minus BTEX)	mg/kg		10	<10	<10	<10	<10	<10	<10	<10
C10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10	<10	46	<10
C16 - C34 (F3)	mg/kg		10	<10	133	<10	306	195	1320	25
C34 - C50 (F4)	mg/kg		10	<10	106	<10	213	125	951	29
Gravimetric Heavy Hydrocarbons	mg/kg		1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moisture Content	%		1	8.7	28	12	22	13	64	10
Surrogate	**Unit**	**Acceptable Limits**								
Toluene-d8 (BTEX)	%	50-150		101	98	100	95	100	103	101
Ethylbenzene-d10 (BTEX)	%	50-150		87	85	99	85	92	77	92
o-Terphenyl (F2-F4)	%	50-150		98	96	97	100	97	100	96

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)

3678251-3678346 Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Sample holding time exceeded.

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Water

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW1	C2-12-MW2	C2-12-MW3	C2-12-MW4	C2-12-MW5	C2-12-MW6	C2-12-MW6-D	C2-12-MW7
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678347**	**3678348**	**3678349**	**3678350**	**3678351**	**3678352**	**3678353**	**3678354**
Benzene	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ethylbenzene	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylenes	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
C6 - C10 (F1)	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C6 - C10 (F1 minus BTEX)	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C>10 - C16	mg/L		0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C>16 - C34	mg/L		0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
C>34 - C50	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		106	106	106	104	106	106	106	107
o-Terphenyl (F2-F4)	%	50-150		104	103	104	103	102	101	102	103

		SAMPLE DESCRIPTION:		C2-12-MW8	Method Blank
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2012-08-25	2012-08-28
Parameter	**Unit**	**G / S**	**RDL**	**3678355**	**3678359**
Benzene	mg/L		0.0005	<0.0005	<0.0005
Toluene	mg/L		0.0005	<0.0005	<0.0005
Ethylbenzene	mg/L		0.0005	<0.0005	<0.0005
Xylenes	mg/L		0.0005	<0.0005	<0.0005
C6 - C10 (F1)	mg/L		0.1	<0.1	<0.1
C6 - C10 (F1 minus BTEX)	mg/L		0.1	<0.1	<0.1
C>10 - C16	mg/L		0.1	<0.1	<0.1
C>16 - C34	mg/L		0.1	1.7	<0.1
C>34 - C50	mg/L		0.1	<0.1	<0.1
Surrogate	**Unit**	**Acceptable Limits**			
Toluene-d8 (BTEX)	%	50-150		105	106
o-Terphenyl (F2-F4)	%	50-150		103	102

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Petroleum Hydrocarbons (BTEX/F1-F4) in Water

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3678347-3678359 The C>6 - C10 fraction is calculated using the toluene response factor.
The C10 - C16 fraction is calculated using the average response factor for nC10, nC16 and nC34.
BTEX has NOT been subtracted from Fraction 1.
Sample is blank corrected.

Sample holding time exceeded.

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Polychlorinated Biphenyls Analysis - Soil

DATE RECEIVED: 2012-09-04 **DATE REPORTED: 2012-09-13**

		SAMPLE DESCRIPTION:		C2-12-1-A	C2-12-1-B	C2-12-2-A	C2-12-2-A-D	C2-12-2-B	C2-12-3-A	C2-12-3-B	C2-12-4-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678251**	**3678268**	**3678269**	**3678270**	**3678271**	**3678272**	**3678273**	**3678277**
Aroclor 1242	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		80	76	68	66	79	65	79	65

		SAMPLE DESCRIPTION:		C2-12-4-B	C2-12-5-A	C2-12-5-B	C2-12-6-A	C2-12-6-B	C2-12-7-A	C2-12-7-B	C2-12-8-A
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678282**	**3678283**	**3678286**	**3678288**	**3678289**	**3678290**	**3678292**	**3678293**
Aroclor 1242	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		63	61	64	60	76	81	77	82

		SAMPLE DESCRIPTION:		C2-12-8-B	C2-12-9-A	C2-12-9-B	C2-12-10-A	C2-12-10-B	C2-12-11-A	C2-12-11-A-D	C2-12-11-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678294**	**3678295**	**3678296**	**3678297**	**3678298**	**3678299**	**3678301**	**3678302**
Aroclor 1242	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		84	81	79	86	81	84	81	76

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Polychlorinated Biphenyls Analysis - Soil

DATE RECEIVED: 2012-09-04 **DATE REPORTED: 2012-09-13**

		SAMPLE DESCRIPTION:		C2-12-12-A	C2-12-12-B	C2-12-13-A	C2-12-13-B	C2-12-14-A	C2-12-14-B	C2-12-MW1-A	C2-12-MW1-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678304**	**3678305**	**3678306**	**3678307**	**3678321**	**3678322**	**3678323**	**3678325**
Aroclor 1242	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		82	82	84	84	85	86	84	85

		SAMPLE DESCRIPTION:		C2-12-MW2-A	C2-12-MW2-A-D	C2-12-MW3-A	C2-12-MW3-B	C2-12-MW4-A	C2-12-MW4-B	C2-12-MW5-A	C2-12-MW5-A-D
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678326**	**3678328**	**3678329**	**3678331**	**3678332**	**3678333**	**3678334**	**3678335**
Aroclor 1242	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		88	88	94	87	90.8	82	85	80

		SAMPLE DESCRIPTION:		C2-12-MW5-B	C2-12-MW6-A	C2-12-MW6-B	C2-12-MW7-A	C2-12-MW7-B	C2-12-MW8-A	C2-12-MW8-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678336**	**3678337**	**3678338**	**3678339**	**3678341**	**3678343**	**3678346**
Aroclor 1242	mg/kg		0.05	115	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	mg/kg		0.05	146	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	mg/kg		0.05	107	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Polychlorinated Biphenyls	mg/kg		0.05	123	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**								
Decachlorobiphenyl	%	50-150		90	83	83	84	84	87	84

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3678251-3678346 Results are based on the dry weight of the sample.

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Polychlorinated Biphenyls Analysis - Water

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW1	C2-12-MW2	C2-12-MW3	C2-12-MW4	C2-12-MW5	C2-12-MW6	C2-12-MW6-D	C2-12-MW7
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678347**	**3678348**	**3678349**	**3678350**	**3678351**	**3678352**	**3678353**	**3678354**
Aroclor 1242	µg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1254	µg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1260	µg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polychlorinated Biphenyls	µg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	50-150		83	82	83	76	84	92	90	88

		SAMPLE DESCRIPTION:		C2-12-MW8	Method Blank
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2012-08-25	2012-08-28
Parameter	**Unit**	**G / S**	**RDL**	**3678355**	**3678359**
Aroclor 1242	µg/L		0.01	<0.01	<0.01
Aroclor 1254	µg/L		0.01	<0.01	<0.01
Aroclor 1260	µg/L		0.01	<0.01	<0.01
Polychlorinated Biphenyls	µg/L		0.01	<0.01	<0.01
Surrogate	**Unit**	**Acceptable Limits**			
Decachlorobiphenyl	%	50-150		90	94

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Total Petroleum Hydrocarbon Analysis - Soil

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

Parameter	Unit	G / S	RDL	C2-12-1-A Soil 2012-08-25 3678251	C2-12-1-B Soil 2012-08-25 3678268	C2-12-2-A Soil 2012-08-25 3678269	C2-12-2-A-D Soil 2012-08-25 3678270	C2-12-2-B Soil 2012-08-25 3678271	C2-12-3-A Soil 2012-08-25 3678272	C2-12-3-B Soil 2012-08-25 3678273	C2-12-4-A Soil 2012-08-25 3678277
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	280	11	261	351	11	<10	<10	26
Total Petroleum Hydrocarbons	mg/kg		10	280	11	261	351	11	<10	<10	26

Parameter	Unit	G / S	RDL	C2-12-4-B Soil 2012-08-25 3678282	C2-12-5-A Soil 2012-08-25 3678283	C2-12-5-B Soil 2012-08-25 3678286	C2-12-6-A Soil 2012-08-25 3678288	C2-12-6-B Soil 2012-08-25 3678289	C2-12-7-A Soil 2012-08-25 3678290	C2-12-7-B Soil 2012-08-25 3678292	C2-12-8-A Soil 2012-08-25 3678293
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	<10	60	<10	<10	18	300	77	59
Total Petroleum Hydrocarbons	mg/kg		10	<10	60	<10	<10	18	300	77	59

Parameter	Unit	G / S	RDL	C2-12-8-B Soil 2012-08-25 3678294	C2-12-9-A Soil 2012-08-25 3678295	C2-12-9-B Soil 2012-08-25 3678296	C2-12-10-A Soil 2012-08-25 3678297	C2-12-10-B Soil 2012-08-25 3678298	C2-12-11-A Soil 2012-08-25 3678299	C2-12-11-A-D Soil 2012-08-25 3678301	C2-12-11-B Soil 2012-08-25 3678302
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	35	15	28	20	<10	130	160	<10
Total Petroleum Hydrocarbons	mg/kg		10	35	15	28	20	<10	130	160	<10

Parameter	Unit	G / S	RDL	C2-12-12-A Soil 2012-08-25 3678304	C2-12-12-B Soil 2012-08-25 3678305	C2-12-13-A Soil 2012-08-25 3678306	C2-12-13-B Soil 2012-08-25 3678307	C2-12-14-A Soil 2012-08-25 3678321	C2-12-14-B Soil 2012-08-25 3678322	C2-12-MW1-A Soil 2012-08-25 3678323	C2-12-MW1-B Soil 2012-08-25 3678325
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	20	<10	<10	<10	40	<10	20	50
Total Petroleum Hydrocarbons	mg/kg		10	20	<10	<10	<10	40	<10	20	50

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AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Total Petroleum Hydrocarbon Analysis - Soil

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW2-A	C2-12-MW2-A-D	C2-12-MW3-A	C2-12-MW3-B	C2-12-MW4-A	C2-12-MW4-B	C2-12-MW5-A	C2-12-MW5-A-D
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-25	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678326**	**3678328**	**3678329**	**3678331**	**3678332**	**3678333**	**3678334**	**3678335**
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	40	40	130	<10	90	<10	100	120
Total Petroleum Hydrocarbons	mg/kg		10	40	40	130	<10	90	<10	100	120

		SAMPLE DESCRIPTION:		C2-12-MW5-B	C2-12-MW6-A	C2-12-MW6-B	C2-12-MW7-A	C2-12-MW7-B	C2-12-MW8-A	C2-12-MW8-B
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-24
Parameter	**Unit**	**G / S**	**RDL**	**3678336**	**3678337**	**3678338**	**3678339**	**3678341**	**3678343**	**3678346**
Total Purgeable Hydrocarbons	mg/kg		10	<10	<10	<10	<10	<10	<10	<10
Total Extractable Hydrocarbons	mg/kg		10	<10	90	<10	240	140	1100	20
Total Petroleum Hydrocarbons	mg/kg		10	<10	90	<10	240	140	1100	20

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3678251-3678346 Results are based on the dry weight of the sample.
Recovery of toluene-d8 surrogate added to sample prior to TPGH analysis: %
Total Petroleum Hydrocarbons (TPH, n-C5 - n-C32); Calculated based on addition of n-C5 to n-C10 fraction (purgeable method) and n-C10 to n-C32 fraction (TEH extraction).
Total Extractable Hydrocarbons (TEH, n-C10 - n-C32); Calculated based on all extractable compounds using n-eicosane response.
Total Purgeable Hydrocarbons (TPGH, n- C5 - n-C10); Calculated based on all purgeable compounds using toluene response.
Sample is blank corrected.

Sample holding time exceeded.

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

Total Petroleum Hydrocarbon Analysis - Water

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW1	C2-12-MW2	C2-12-MW3	C2-12-MW4	C2-12-MW5	C2-12-MW6	C2-12-MW6-D	C2-12-MW7
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-25	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678347**	**3678348**	**3678349**	**3678350**	**3678351**	**3678352**	**3678353**	**3678354**
Total Purgeable Hydrocarbons	mg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Extractable Hydrocarbons	mg/L		0.1	0.3	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Total Petroleum Hydrocarbons	mg/L		0.1	0.3	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8 (BTEX)	%	50-150		106	106	106	104	106	106	106	107
o-Terphenyl (TEH)	%	50-150		101	100	101	100	99	98	99	100

		SAMPLE DESCRIPTION:		C2-12-MW8	Method Blank
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2012-08-25	2012-08-28
Parameter	**Unit**	**G / S**	**RDL**	**3678355**	**3678359**
Total Purgeable Hydrocarbons	mg/L		0.1	<0.1	<0.1
Total Extractable Hydrocarbons	mg/L		0.1	1.5	<0.1
Total Petroleum Hydrocarbons	mg/L		0.1	1.5	<0.1
Surrogate	**Unit**	**Acceptable Limits**			
Toluene-d8 (BTEX)	%	50-150		105	106
o-Terphenyl (TEH)	%	50-150		100	99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3678347-3678359 Recovery of toluene-d8 surrogate added to sample prior to TPGH analysis: %
Total Petroleum Hydrocarbons (TPH, n-C5 - n-C32); Calculated based on addition of n-C5 to n-C10 fraction (purgeable method) and n-C10 to n-C32 fraction (TEH extraction).
Total Extractable Hydrocarbons (TEH, n-C10 - n-C32); Calculated based on all extractable compounds using n-eicosane response.
Total Purgeable Hydrocarbons (TPGH, n- C5 - n-C10); Calculated based on all purgeable compounds using toluene response.
Sample is blank corrected.

Sample holding time exceeded.

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

CCME / Alberta Tier 1 Metals (Total) + Hg

DATE RECEIVED: 2012-09-04

DATE REPORTED: 2012-09-13

		SAMPLE DESCRIPTION:		C2-12-MW1	C2-12-MW2	C2-12-MW3	C2-12-MW4	C2-12-MW5	C2-12-MW6	C2-12-MW6-D
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2012-08-24	2012-08-24	2012-08-24	2012-08-24	2012-08-25	2012-08-25	2012-08-25
Parameter	**Unit**	**G / S**	**RDL**	**3678347**	**3678348**	**3678349**	**3678350**	**3678351**	**3678352**	**3678353**
Total Arsenic	mg/L	0.005	0.001	0.005	**0.006**	**0.007**	0.005	0.003	**0.008**	**0.008**
Total Cadmium	mg/L	0.000017	0.000016	**0.000102**	**0.000071**	**0.000043**	**0.000104**	**0.000096**	**0.000116**	**0.000075**
Total Chromium	mg/L		0.001	0.007	0.165	0.020	0.348	0.029	0.204	0.103
Total Copper	mg/L	0.002	0.002	**0.011**	**0.019**	**0.018**	**0.015**	**0.015**	**0.025**	**0.020**
Total Lead	mg/L	0.001	0.001	**0.003**	**0.004**	**0.004**	0.001	**0.002**	**0.005**	**0.003**
Total Nickel	mg/L	0.025	0.01	**0.05**	**0.14**	**0.06**	**0.03**	**0.03**	**0.04**	**0.03**
Total Zinc	mg/L	0.03	0.001	**18.4**	**10.3**	**0.978**	**26.0**	**0.313**	**0.262**	**0.225**
Total Mercury	mg/L	0.000026	0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025	<0.000025

		SAMPLE DESCRIPTION:		C2-12-MW7		C2-12-MW8	Method Blank
		SAMPLE TYPE:		Water		Water	Water
		DATE SAMPLED:		2012-08-25		2012-08-25	2012-08-28
Parameter	**Unit**	**G / S**	**RDL**	**3678354**	**RDL**	**3678355**	**3678359**
Total Arsenic	mg/L	0.005	0.001	**0.015**	0.001	**0.008**	<0.001
Total Cadmium	mg/L	0.000017	0.000160	<0.000160	0.000016	**0.000372**	<0.000016
Total Chromium	mg/L		0.001	1.02	0.001	0.018	0.001
Total Copper	mg/L	0.002	0.002	**0.052**	0.002	**0.021**	<0.002
Total Lead	mg/L	0.001	0.001	**0.003**	0.001	**0.002**	<0.001
Total Nickel	mg/L	0.025	0.01	**0.34**	0.01	**0.07**	<0.01
Total Zinc	mg/L	0.03	0.001	**0.292**	0.001	**0.123**	0.002
Total Mercury	mg/L	0.000026	0.000025	<0.000025	0.000025	<0.000025	<0.000025

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 GW (Ag, F)
3678347-3678359 < - Values refer to Report Detection Limit.

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Guideline Violation

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
3678347	C2-12-MW1	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000102
3678347	C2-12-MW1	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.011
3678347	C2-12-MW1	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.003
3678347	C2-12-MW1	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.05
3678347	C2-12-MW1	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	18.4
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.006
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000071
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.019
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.004
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.14
3678348	C2-12-MW2	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	10.3
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.007
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000043
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.018
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.004
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.06
3678349	C2-12-MW3	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.978
3678350	C2-12-MW4	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000104
3678350	C2-12-MW4	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.015
3678350	C2-12-MW4	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.03
3678350	C2-12-MW4	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	26.0
3678351	C2-12-MW5	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000096
3678351	C2-12-MW5	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.015
3678351	C2-12-MW5	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.002
3678351	C2-12-MW5	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.03
3678351	C2-12-MW5	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.313
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.008
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000116
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.025
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.005
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.04
3678352	C2-12-MW6	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.262
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.008
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000075
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.020
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.003
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.03
3678353	C2-12-MW6-D	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.225
3678354	C2-12-MW7	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.015
3678354	C2-12-MW7	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.052
3678354	C2-12-MW7	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.003
3678354	C2-12-MW7	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.34
3678354	C2-12-MW7	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.292

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Guideline Violation

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

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CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

ATTENTION TO: Brandon Mac Kay

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Arsenic	0.005	0.008
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Cadmium	0.000017	0.000372
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Copper	0.002	0.021
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Lead	0.001	0.002
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Nickel	0.025	0.07
3678355	C2-12-MW8	ABTier1 GW (Ag, F)	CCME / Alberta Tier 1 Metals (Total) + Hg	Total Zinc	0.03	0.123

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Quality Assurance

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

ATTENTION TO: Brandon Mac Kay

Soil Analysis

RPT Date: Sep 13, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME / Alberta Tier 1 Metals (soil) + Hg															
Arsenic	733	3678273	0.9	1.0	10.5%	< 0.5	93%	80%	120%				93%	80%	120%
Cadmium	733	3678273	< 0.5	< 0.5	0.0%	< 0.5	95%	80%	120%				94%	80%	120%
Chromium	733	3678273	4.7	4.5	4.3%	< 0.5	100%	80%	120%				98%	80%	120%
Cobalt	733	3678273	1.3	1.3	0.0%	< 0.5	101%	80%	120%				92%	80%	120%
Lead	733	3678273	2.92	3.31	12.5%	< 0.5	102%	80%	120%				96%	80%	120%
Nickel	733	3678273	3.84	4.04	5.1%	< 0.5	100%	80%	120%				93%	80%	120%
Zinc	733	3678273	6	6	0.0%	< 1	105%	80%	120%				98%	80%	120%
Mercury	733	3678273	< 0.5	< 0.5	0.0%	< 0.5	99%	80%	120%		90%	110%	95%	80%	120%
Soil Analysis - Copper															
Copper	733	3678273	4.0	3.9	2.5%	< 0.5	102%	80%	120%		80%	120%	91%	80%	120%

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Quality Assurance

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP. **AGAT WORK ORDER: 12E638576**

PROJECT NO: Soil and Water Sample **ATTENTION TO: Brandon Mac Kay**

Trace Organics Analysis

RPT Date: Sep 13, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Polychlorinated Biphenyls Analysis - Soil															
Aroclor 1242	117	3678273	< 0.05	< 0.05	NA	< 0.05	96%	80%	120%	98%	70%	130%	100%	50%	150%
Aroclor 1254	117	3678273	< 0.05	< 0.05	NA	< 0.05	97%	80%	120%	120%	70%	130%	105%	50%	150%
Aroclor 1260	117	3678273	< 0.05	< 0.05	NA	< 0.05	88%	80%	120%	86%	70%	130%	110%	50%	150%
Total Polychlorinated Biphenyls	117	3678273	< 0.05	< 0.05	NA	< 0.05	94%	80%	120%	101%	70%	130%	105%	50%	150%
Polychlorinated Biphenyls Analysis - Soil															
Aroclor 1242	118	3678307	<0.05	<0.05	NA	< 0.05	120%	80%	120%	101%	70%	130%	116%	50%	150%
Aroclor 1254	118	3678307	<0.05	<0.05	NA	< 0.05	111%	80%	120%	104%	70%	130%	119%	50%	150%
Aroclor 1260	118	3678307	<0.05	<0.05	NA	< 0.05	97%	80%	120%	95%	70%	130%	102%	50%	150%
Total Polychlorinated Biphenyls	118	3678307	<0.05	<0.05	NA	< 0.05	111%	80%	120%	109%	70%	130%	122%	50%	150%
Polychlorinated Biphenyls Analysis - Soil															
Aroclor 1242	120	3678332	<0.05	<0.05	0.0%	< 0.05	120%	80%	120%	105%	70%	130%	115%	50%	150%
Aroclor 1254	120	3678332	<0.05	<0.05	0.0%	< 0.05	116%	80%	120%	103%	70%	130%	146%	50%	150%
Aroclor 1260	120	3678332	<0.05	<0.05	0.0%	< 0.05	108%	80%	120%	98%	70%	130%	107%	50%	150%
Total Polychlorinated Biphenyls	120	3678332	<0.05	<0.05	0.0%	< 0.05	116%	80%	120%	112%	70%	130%	123%	50%	150%
Total Petroleum Hydrocarbon Analysis - Soil															
Total Purgeable Hydrocarbons	331	3678273	<10	<10	NA	< 10	107%	80%	120%	83%	80%	120%	84%	60%	140%
Total Extractable Hydrocarbons	1538	3678273	< 10	< 10	NA	< 10	99%	80%	120%	103%	80%	120%	104%	60%	140%
Total Petroleum Hydrocarbon Analysis - Soil															
Total Purgeable Hydrocarbons	332	3678307	<10	<10	NA	< 10	106%	80%	120%	85%	80%	120%	88%	60%	140%
Total Extractable Hydrocarbons	1538	3678307	<10	<10	NA	< 10	101%	80%	120%	100%	80%	120%	103%	60%	140%
Total Petroleum Hydrocarbon Analysis - Soil															
Total Purgeable Hydrocarbons	1577	3678332	<10	<10	NA	< 10	91%	80%	120%	92%	80%	120%	78%	60%	140%
Total Petroleum Hydrocarbon Analysis - Soil															
Total Extractable Hydrocarbons	1538	3678332	90	83	8.1%	< 10	97%	80%	120%	101%	80%	120%	99%	60%	140%
Polychlorinated Biphenyls Analysis - Water															
Aroclor 1242	117	3678349	< 0.01	< 0.01	NA	< 0.01	102%	80%	120%	89%	70%	130%	81%	50%	150%
Aroclor 1254	117	3678349	< 0.01	< 0.01	NA	< 0.01	99%	80%	120%	98%	70%	130%	84%	50%	150%
Aroclor 1260	117	3678349	< 0.01	< 0.01	NA	< 0.01	100%	80%	120%	78%	70%	130%	69%	50%	150%
Polychlorinated Biphenyls	117	3678349	< 0.01	< 0.01	NA	< 0.01	100%	80%	120%	88%	70%	130%	78%	50%	150%
Total Petroleum Hydrocarbon Analysis - Water															
Total Purgeable Hydrocarbons	3618	3678851	<0.1	<0.1	NA	< 0.1	112%	80%	120%	114%	80%	120%	124%	70%	130%
Total Extractable Hydrocarbons	168	3678349	0.2	<0.1	NA	< 0.1	96%	80%	120%	89%	80%	120%	92%	70%	130%
Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)															
Benzene	331	3678273	<0.005	<0.005	NA	< 0.005	90%	80%	120%	84%	80%	120%	81%	60%	140%
Toluene	331	3678273	<0.05	<0.05	NA	< 0.05	91%	80%	120%	80%	80%	120%	79%	60%	140%
Ethylbenzene	331	3678273	<0.01	<0.01	NA	< 0.01	95%	80%	120%	91%	80%	120%	90%	60%	140%

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Quality Assurance

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

ATTENTION TO: Brandon Mac Kay

Trace Organics Analysis (Continued)

RPT Date: Sep 13, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Xylenes	331	3678273	<0.05	<0.05	NA	< 0.05	90%	80%	120%	84%	80%	120%	80%	60%	140%
C6 - C10 (F1)	331	3678273	<10	<10	NA	< 10	107%	80%	120%	83%	80%	120%	84%	60%	140%
C10 - C16 (F2)	1538	3678273	<10	<10	NA	< 10	99%	80%	120%	93%	80%	120%	103%	60%	140%
C16 - C34 (F3)	1538	3678273	21	12	NA	< 10	99%	80%	120%	92%	80%	120%	102%	60%	140%
C34 - C50 (F4)	1538	3678273	12	17	NA	< 10	99%	80%	120%	89%	80%	120%	101%	60%	140%
Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)															
Benzene	332	3678307	<0.005	<0.005	NA	< 0.005	101%	80%	120%	83%	80%	120%	84%	60%	140%
Toluene	332	3678307	<0.05	<0.05	NA	< 0.05	81%	80%	120%	80%	80%	120%	78%	60%	140%
Ethylbenzene	332	3678307	<0.01	<0.01	NA	< 0.01	102%	80%	120%	91%	80%	120%	90%	60%	140%
Xylenes	332	3678307	<0.05	<0.05	NA	< 0.05	109%	80%	120%	84%	80%	120%	80%	60%	140%
C6 - C10 (F1)	332	3678307	<10	<10	NA	< 10	106%	80%	120%	85%	80%	120%	88%	60%	140%
C10 - C16 (F2)	1538	3678307	<10	<10	NA	< 10	99%	80%	120%	91%	80%	120%	102%	60%	140%
C16 - C34 (F3)	1538	3678307	<10	<10	NA	< 10	99%	80%	120%	86%	80%	120%	105%	60%	140%
C34 - C50 (F4)	1538	3678307	<10	<10	NA	< 10	99%	80%	120%	87%	80%	120%	103%	60%	140%
Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)															
Benzene	1577	3678332	<0.005	<0.005	NA	< 0.005	99%	80%	120%	88%	80%	120%	92%	60%	140%
Toluene	1577	3678332	<0.05	<0.05	NA	< 0.05	92%	80%	120%	88%	80%	120%	88%	60%	140%
Ethylbenzene	1577	3678332	<0.01	<0.01	NA	< 0.01	91%	80%	120%	97%	80%	120%	88%	60%	140%
Xylenes	1577	3678332	<0.05	<0.05	NA	< 0.05	88%	80%	120%	95%	80%	120%	87%	60%	140%
C6 - C10 (F1)	1577	3678332	<10	<10	NA	< 10	91%	80%	120%	92%	80%	120%	78%	60%	140%
Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)															
C10 - C16 (F2)	1538	3678332	<10	<10	NA	< 10	99%	80%	120%	92%	80%	120%	97%	60%	140%
C16 - C34 (F3)	1538	3678332	119	112	6.0%	< 10	99%	80%	120%	89%	80%	120%	98%	60%	140%
C34 - C50 (F4)	1538	3678332	82	82	0.0%	< 10	99%	80%	120%	90%	80%	120%	98%	60%	140%
Petroleum Hydrocarbons (BTEX/F1-F4) in Water															
Benzene	3618	3678851	<0.0005	<0.0005	NA	< 0.0005	99%	80%	120%	103%	80%	120%	101%	70%	130%
Toluene	3618	3678851	<0.0005	<0.0005	NA	< 0.0005	96%	80%	120%	97%	80%	120%	93%	70%	130%
Ethylbenzene	3618	3678851	<0.0005	<0.0005	NA	< 0.0005	96%	80%	120%	100%	80%	120%	94%	70%	130%
Xylenes	3618	3678851	<0.0005	<0.0005	NA	< 0.0005	93%	80%	120%	95%	80%	120%	93%	70%	130%
C6 - C10 (F1)	3618	3678851	<0.1	<0.1	NA	< 0.1	112%	80%	120%	114%	80%	120%	124%	70%	130%
C>10 - C16	168	3678349	<0.1	<0.1	NA	< 0.1	104%	80%	120%	90%	80%	120%	102%	70%	130%
C>16 - C34	168	3678349	0.2	0.1	NA	< 0.1	104%	80%	120%	99%	80%	120%	105%	70%	130%
C>34 - C50	168	3678349	<0.1	<0.1	NA	< 0.1	104%	80%	120%						

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Quality Assurance

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP.

AGAT WORK ORDER: 12E638576

PROJECT NO: Soil and Water Sample

ATTENTION TO: Brandon Mac Kay

Water Analysis

RPT Date: Sep 13, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME / Alberta Tier 1 Metals (Total) + Hg															
Total Arsenic	774	854	0.003	0.003	0.0%	< 0.001	90%	80%	120%				92%	80%	120%
Total Cadmium	774	854	<0.	<0.	0.0%	< 0.000016	94%	80%	120%				94%	80%	120%
Total Chromium	774	854	0.001	0.001	0.0%	< 0.001	106%	80%	120%				102%	80%	120%
Total Copper	774	854	0.002	0.002	0.0%	< 0.002	108%	80%	120%				103%	80%	120%
Total Lead	774	854	<0.001	<0.001	0.0%	< 0.001	103%	80%	120%				103%	80%	120%
Total Nickel	774	854	0.007	0.007	0.0%	< 0.01	105%	80%	120%				104%	80%	120%
Total Zinc	774	854	0.005	0.005	0.0%	< 0.001	98%	80%	120%				97%	80%	120%
Total Mercury	1242	8347	<0.	<0.	0.0%	< 0.000025	103%	90%	110%	101%	90%	110%	101%	80%	120%

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Method Summary

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP. **AGAT WORK ORDER: 12E638576**

PROJECT NO: Soil and Water Sample **ATTENTION TO: Brandon Mac Kay**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Cadmium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Chromium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Cobalt	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Lead	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Nickel	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Zinc	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Mercury	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP-MS
Copper	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP-MS

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Method Summary

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP. **AGAT WORK ORDER: 12E638576**

PROJECT NO: Soil and Water Sample **ATTENTION TO: Brandon Mac Kay**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	TO 0570	EPA SW-846 8260	GC/MS
Toluene	TO 0570	EPA SW-846 8260	GC/MS
Ethylbenzene	TO 0570	EPA SW-846 8260	GC/MS
Xylenes	TO 0570	EPA SW-846 8260	GC/MS
C6 - C10 (F1)	TO 0570	CCME Tier 1 Method	GC/FID
C6 - C10 (F1 minus BTEX)	TO 0570	CCME Tier 1 Method	GC/FID
C10 - C16 (F2)	TO-0560	CCME Tier 1 Method	GC/FID
C16 - C34 (F3)	TO-0560	CCME Tier 1 Method	GC/FID
C34 - C50 (F4)	TO 0560	CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	TO 0560	CCME Tier 1 Method	GC/FID
Moisture Content	TO 0560	CCME Tier 1 Method	GRAVIMETRIC
Toluene-d8 (BTEX)	TO 0570	EPA SW-846 8260	GC/MS
Ethylbenzene-d10 (BTEX)	TO 0570	EPA SW-846 8260	GC/MS
o-Terphenyl (F2-F4)	TO 0560	CCME Tier 1 Method	GC/FID
Benzene	TO 0540	EPA SW846 8260	GC/MS
Toluene	TO 0540	EPA SW846 8260	GC/MS
Ethylbenzene	TO 0540	EPA SW846 8260	GC/MS
Xylenes	TO 0540	EPA SW846 8260	GC/MS
C6 - C10 (F1)	TO 0540	CCME Tier 1 Method	GC/FID
C6 - C10 (F1 minus BTEX)	TO 0540	CCME Tier 1 Method	GC/FID
C>10 - C16	TO 0511	CCME Tier 1 Method	GC/FID
C>16 - C34	TO 0511	CCME Tier 1 Method	GC/FID
C>34 - C50	TO 0511	CCME Tier 1 Method	GC/FID
Toluene-d8 (BTEX)	TO 0340	EPA SW846 8260	GC/FID
o-Terphenyl (F2-F4)	TO 0511	CCME Tier 1 Method	GC/FID
Aroclor 1242	TO 0410	EPA 8082	GC/ECD
Aroclor 1254	TO 0410	EPA 8082	GC/ECD
Aroclor 1260	TO 0410	EPA 8082	GC/ECD
Total Polychlorinated Biphenyls	TO 0410	EPA 8082	GC/ECD
Decachlorobiphenyl	TO 0410	EPA 8082	GC/ECD
Aroclor 1242	TO 0400	EPA 8082, AEC A106.0	GC/ECD
Aroclor 1254	TO 0400	EPA 8082, AEC A106.0	GC/ECD
Aroclor 1260	TO 0400	EPA 8082, AEC A106.0	GC/ECD
Polychlorinated Biphenyls	TO 0400	EPA 8082, AEC A106.0	GC/ECD
Decachlorobiphenyl	TO 0400	EPA 8082, AEC A106.0	GC/ECD
Total Purgeable Hydrocarbons	TO 0530	EPA SW-846 5035/8015	GC/FID
Total Extractable Hydrocarbons	TO 0510	AEC G108.0	GC/FID
Total Petroleum Hydrocarbons	TO 0510/0530	EPA SW-846 5035/8015, AEC G108.0	GC/FID
Total Purgeable Hydrocarbons	TO 0530	EPA 624 & SW-846 3810	GC/MS
Total Extractable Hydrocarbons	TO 0511	AEC A108.0, EPA SW-846 3510	GC/FID
Total Petroleum Hydrocarbons	TO 0530	EPA 624 & SW-846 3810/3510, AEC A108.0	GC/MS & GC/FID
Toluene-d8 (BTEX)			GC/MS
o-Terphenyl (TEH)			GC/FID

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Method Summary

CLIENT NAME: BIOGENIE, DIVISION D'ENGLOBE CORP. **AGAT WORK ORDER: 12E638576**

PROJECT NO: Soil and Water Sample **ATTENTION TO: Brandon Mac Kay**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Cadmium	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Chromium	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Copper	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Lead	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Nickel	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Zinc	WATR 0200; INST 0141	SM 3030 E; SM 3125 B	ICP/MS
Total Mercury	WATR 0200; INST 0160	SM 3030 E; SM 3112 B	CV/AA