Long Term Monitoring, 2013
FOX-C, Ekalugad Fjord, Nunavut

FINAL REPORT

Prepared for:

Aboriginal Affairs and Northern Development Canada
Nunavut Regional Office
P.O. Box 2200
Iqaluit, Nunavut
X0A 0H0

Prepared by:

Franz Environmental Inc.
329 Churchill Avenue, Suite 200
Ottawa, Ontario
K1Z 5B8
Tel. (613) 721-0555
Fax: (613) 721-0029

Project No. 1697-1301
January 20, 2014

EXECUTIVE SUMMARY

Franz Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada – Nunavut Regional Office (AANDC) to conduct long-term monitoring activities at the former Distant Early Warning (DEW) Line site FOX-C. This project was completed under AANDC Standing Offer Number 01-11-6001/5, Call-up Number 3, File Number 1632-11/01-11-6001/5.

The FOX-C Ekalugad Fjord site is located on the northeast coast of Baffin Island, Nunavut, on the southern shore of Ekalugad Fjord. A remediation project was conducted at the former intermediate DEW Line site between 2005 and 2008. After demolition, remediation consisted of disposal of non-hazardous waste and contaminated soils in on-site facilities.

Monitoring efforts were conducted on August 11, 2013 while based out of Clyde River, approximately 260 km to the north. The landfill monitoring program consisted of a visual inspection of the Non-Hazardous Waste Landfill (NHWL). The five monitoring wells on site could not be sampled as they were frozen. Physical and anecdotal evidence and other information collected during natural environment monitoring suggest that wildlife and local hunters continue to frequent the site.

Overall, physical observations suggest that the NHWL is in acceptable condition and performing as designed to contain the enclosed waste. One area of potential settlement was noted on the top of the landfill, running north to south; this area was also noted during the 2009 and 2011 monitoring events. This settlement appears to be the result of the techniques used to build the NHWL and is not considered to be an issue related to integrity. Minor (<0.2 m in depth) erosion channels were observed on the east, northwest, and southwest sides of the landfill, these erosion channels were also noted in the 2009 and 2011 monitoring event. Very minor changes to the length and depth of these channels were observed.

A noticeable depression of approximately 390 m^2 was observed adjacent to the northwest berm between monitoring well MW-North and the beach access road. This depression was dry during the 2013 site visit; however, it likely contains ponded water at times of high rainfall and spring melt as evident by the dry cracking soil conditions and moss growth. Four small (< 0.02 m^3) potholes were observed along the sides of the landfill that are likely the result of erosion. Some larger particles (cobbles) are exposed at the top of the berms on the southwest and south sides of the NHWL and one area at the toe of the berm on the northwest side. No evidence of burrowing animals, vegetation re-establishment, staining, seepage points or exposed debris was observed.

A visual aerial survey via helicopter of surrounding areas was conducted. Areas surrounding the landfill site were visually scarred from the remediation activities and mostly devoid of vegetation. At the Lake Area, two wooden platforms, one with a pile of 2 x 4 wood planks, were observed near the shoreline. At the Mid and Upper Station Area, two cement pads were observed. The decommissioned road, used to access the Upper Station area from the Beach area, was observed to be in fair condition.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 7.0.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Project Objectives 1
1.2 Scope of Work 1
2.0 BACKGROUND INFORMATION 3
2.1 Site Description 3
2.2 Baseline Soil and Groundwater Data 4
2.3 Previous Monitoring Programs 6
3.0 INVESTIGATIVE METHODOLOGY 8
3.1 Health and Safety Plan 8
3.2 Visual Inspections 8
3.3 Wildlife Survey 9
3.4 Groundwater Sampling 9
3.5 Soil Sampling 9
4.0 NON-HAZARDOUS WASTE LANDFILL (NHWL) 10
4.1 Area Summary 10
4.2 Photographic Record 10
4.3 Visual Inspection Report 10
5.0 SURROUNDING AREAS 16
6.0 NATURAL ENVIRONMENT 17
7.0 LIMITATIONS 18
8.0 REFERENCES 19
9.0 CLOSURE 20

LIST OF FIGURES (Appendix A)

Figure A-1 Non-Hazardous Waste Landfill

LIST OF TABLES

Table 2-1: Baseline Groundwater Analytical Data.....5
Table 2-2: Baseline Copper and Lead Soil Analytical Data.....5
Table 2-3: Baseline Soil Analytical Data – Remaining..... 6
Table 4-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill 10
Table 4-2: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill - Definitions ..11
Table 4-3: FOX-C – Ekalugad Fjord – Visual Monitoring Checklist 14

LIST OF APPENDICES

Appendix A Figures
Appendix B Site Photographs
Appendix C Field Notes

1.0 INTRODUCTION

Franz Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada – Nunavut Regional Office (AANDC) to conduct long-term monitoring activities at the former DEW Line site FOX-C. This project was completed under AANDC Standing Offer Number 01-11-6001/5, Call-up Number 3, File Number 1632-11/01-11-6001/5.

This report describes the monitoring activities completed for AANDC at FOX-C and was prepared in accordance with the FRANZ Proposal No. P-4612, dated June 13, 2013, the Call-up Details, dated July 8, 2013 and the Project Initiating Meeting Minutes, dated July 30, 2013.

Throughout this report the AANDC DEW Line site FOX-C will be referred to as "the site."

1.1 Project Objectives

The objective of the 2013 Long-Term Monitoring (LTM) program was to complete Year 5 monitoring activities as described in the *FOX-C Ekalugad Fjord Long-Term Monitoring Plan* (INAC, 2008a). The program included visual observations, chemical analyses (where warranted and possible) and interviews with members of the nearby community knowledgeable about local activities at the site. The purpose of the program was to determine the condition of the natural environment and whether the site infrastructure is performing as designed.

1.2 Scope of Work

Consistent with previous years monitoring activity, the scope of work undertaken at the site in 2013 was as described in the 2008 Long-Term Monitoring Plan was as follows:

1. Visual Monitoring of the Non-Hazardous Waste Landfill (NHWL), including

    - Visually checking the physical integrity of the NHWL and looking for evidence of settlement, erosion, frost action, animal burrows, vegetation, staining, vegetation stress, seepage points, exposed debris, and the condition of wells; and
    - Taking photographs to document the condition of the NHWL and substantiate the recorded observations.

2. Active Layer Water Monitoring, including

    - The collection of samples from the 5 monitoring wells installed around the NHWL; and
    - These samples were to be analysed and the results compared to those from background samples.

3. Soil Monitoring (as required)

    - Soil sampling was to be limited to locations where seepage or staining was identified as part of the visual inspection.

4. Natural Environment Monitoring, including

    - The collection of direct and indirect evidence of wildlife presence and activity; and
    - Making observations regarding the re-vegetation of disturbed areas.

5. Preparation of a 2013 monitoring program report.

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

a) Review of the FOX-C LTM Plan, previous LTM reports for FOX-C, and the AMSRP;
b) Preparation of a health and safety plan;
c) Preparation of a sampling plan for soil and groundwater;
d) Collection of water level data and observation of monitoring well condition at the site;
e) Visual inspection, measurement and photo documentation of the site;
f) Interviewing local residents and officials to understand land use and wildlife trends; and
g) Reporting.

2.0 BACKGROUND INFORMATION

2.1 Site Description

According to AANDC's FOX-C Ekalugad Fjord Long-Term Monitoring (LTM) plan, the Intermediate Distant Early Warning (DEW) Line Site was constructed in 1957 and abandoned in 1963. The site is located on the northeast coast of Baffin Island, a mountainous area characterized by deep fjords and glaciers. The site comprises three areas: the Upper Station, Mid Station, and Lower Station. The Lower Station is further divided into three sections: the Lake Area, the Beach Area, and the Landfill Area, now occupied by the non-hazardous waste landfill.

The Upper Station is so called because of its location, at 770 m above mean sea level. Before remediation was completed in 2008, the main site facilities were located in this area and included a module train, warehouse, garage, a former Quonset building, Inuit house, bulk fuel storage tanks, a radar tower as well as other site debris.

The Mid Station is located at the base of the summit approximately 500 m east of the Upper Station. A glacier located across from the Mid Station feeds a river that flows alongside the access road to an unnamed lake. Before remediation, the Mid Station area contained a dump area, barrel storage pad, four former Quonset buildings and numerous barrel and debris areas. A site access road travels east from the Upper Station, through the Mid Station to a junction in the Lake Area. The road, which was decommissioned after remediation, is approximately 5.9 kilometres long.

At the Lower Station near the Lake Area the site access road from the Upper Station splits into two parts. One section heads southwest to the Lake Area and is approximately 1.1 kilometres long. A river flows out of this lake and empties into the ocean at the Beach Area. The other section of the road heads north to the Beach Area and is approximately 2.2 kilometres long. Before remediation, there were two petroleum, oil and lubricants (POL) storage tanks at the beach area, barrel caches and abandoned construction equipment. The landing area at the beach was used to transfer equipment and supplies to the site, including bulk fuel transfers to the POL storage tanks. The remediation construction camp was located near this Beach Area.

A non-hazardous waste landfill (NHWL) was constructed at the site in 2006-2007 and closed in 2008. It was designed to contain non-hazardous materials only. It was constructed on natural ground surface with the organic matter stripped and consists of four perimeter berms constructed of granular material. The non-hazardous waste was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill. The waste layers were

compacted and a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content between 200 and 500 parts per million (ppm) and polychlorinated biphenyl (PCB) content between 1 and 5 ppm);
- Soil contaminated with petroleum hydrocarbon (PHC) fractions F3 and F4;
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal;
- Non-hazardous site debris, such as scrap metal and wood;
- Non-hazardous debris/soil excavated from landfills;
- Creosote timbers; and
- Double-bagged asbestos.

The site is not regularly inhabited and wells at the site would tend to freeze due to the presence of permafrost. As a result, groundwater is not considered to be used for water supply purposes. The area is known to be used by hunters and fishermen. Interviews in previous years of the LTM program with residents of the nearby community of Qikiqtarjuaq indicate that hunting does still take place in the area. Several local Qikiqtarjuaq residents are known have cabins in the area.

2.2 Baseline Soil and Groundwater Data

During site remediation (site clean-up) activities at FOX-C, UMA Engineering Ltd./AECOM (UMA) collected baseline soil and groundwater data to use for comparison during future monitoring events.

In 2006, UMA installed four monitoring wells (MW-A through MW-D) around the NHWL each to a depth of approximately 3.7 metres below ground surface (UMA, 2008a (CIDM# 261050)). Groundwater samples were collected from MW-A, MW-B and MW-C. A sample was not collected from MW-D as it was considered dry. No samples were collected from any wells in 2007 as they were either dry or frozen.

Three new monitoring wells were installed around the NHWL in 2008. During the 2008 construction season, the NHWL was redesigned and expanded to accommodate an additional 18,400 m^3 of waste (UMA, 2009 (CIDM# 360761)). Field adjustments were made to the east berm at this time and as a result, two of the wells installed in 2006 were removed (MWA and MWD) and replaced with two of the newly installed wells. UMA's (2008a, CIMD# 261050) Figure 3.0 (attached in Appendix A) depicts the original NHWL size and the location of the wells in 2006. UMA's (2009, CIMD# 360761) Figure 5.0 (attached in Appendix A) depicts the final layout of NHWL with the expansion to the east and the monitoring well locations as they remain today. No groundwater samples were collected in 2008 as the wells were dry. Table 2-1 depicts the baseline groundwater analytical data for FOX-C.

Table 2-1: Baseline Groundwater Analytical Data

Parameter (ug/L)	MW-A	MW-B (now MW-Northwest)	MW-C (now MW-Southwest)	Average Concentration	Standard Deviation
Year Installed	2006	2006	2006	---	---
pH	7.8	7.4	7	7.4	0.4
Total Oil & Grease	1.4	1	1.4	1.3	0.2
Benzene	ND	ND	ND	---	---
Toluene	ND	ND	ND	---	---
Ethylbenzene	ND	ND	ND	---	---
Total Xylenes	ND	ND	ND	---	---
F1 (C60-C10)	ND	ND	ND	---	---
F2 (C10-C16)	ND	ND	ND	---	---
F3 (C16-C34)	830	1100	480	803	310.9
F4 (C34-C50)	ND	140	ND	140	---
Total As	7	6	10	7.6	2.1
Dissolved Cd	ND	ND	0.3	0.3	---
Total Cr	63	78	98	80	17.5
Dissolved Co	1.1	8	11	6.7	5.1
Dissolved Cu	ND	ND	5	5	---
Dissolved Pb	ND	ND	ND	---	---
Dissolved Ni	5	25	1	10.3	12.8
Total Zn	370	180	1	243.6	184.5
Total PCB	ND	ND	ND	---	---

Data collected from Appendix C, Table C-7a (UMA, 2008a (CIDM# 261050))

In 2007, UMA collected eight soil samples around the NHWL and submitted them for copper and lead analysis (UMA, 2008b (CIDM# 261049)). The average concentration of copper in soil was reported at 16.4 mg/kg. Concentrations of lead in soil were reported as non-detectable. During the installation of the three new wells in 2008, UMA collected soil samples from the base of all five wells around the NHWL (UMA, 2009 (CIDM# 360761)). A total of 10 soils samples were collected. Table 2-2 depicts the copper and lead baseline soil analytical data for FOX-C collected in both 2007 and 2008. Table 2-3 depicts the baseline soil analytical data for FOX-C for the remaining analytical parameters collected in 2008.

Table 2-2: Baseline Copper and Lead Soil Analytical Data

Sample ID	Year Collected	Copper (mg/kg)	Lead (mg/kg)
FC-459	2007	18	ND
FC-460		13	ND
FC-461		14	ND
FC-462		17	ND
FC-463		22	ND
FC-464		17	ND
FC-465		15	ND

Sample ID	Year Collected	Copper (mg/kg)	Lead (mg/kg)
FC-466		15	ND
1178	2008	10.2	ND
1179		10.4	ND
1180		13.7	ND
1181		13.7	ND
1182		7.3	ND
1183		7.9	ND
1184		10.7	ND
1185		8.6	ND
1186		12.1	ND
1187		12.0	ND
1188		16.1	ND
Avg. Conc.	n/a	13.3	---
Std. Dev.	n/a	3.8	---

* average includes soils collected in 2007 and 2008.

Std. Dev. = Standard Deviation

Data collected from Appendix C, Table C-2 (UMA, 2008b (CIDM# 261049)) and Appendix B, Table 7.0 (UMA, 2009 (CIDM# 360761)).

Table 2-3: Baseline Soil Analytical Data – Remaining Parameters

Parameter (mg/kg)	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	Avg. Conc.	Std. Dev.
Depth (cm)	0	30	0	0	30	0	30	0	30	0	33	---	---
Cd	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Cr	21	ND	28	26	ND	ND	21	ND	24	30	29	25.6	3.7
Co	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Ni	7.6	5.8	9.0	9.1	ND	ND	7.5	6.1	7.0	8.9	8.9	7.8	1.3
Zn	20	18	24	23	ND	ND	19	17	21	25	26	21.4	3.2
As	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Total PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
F1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
F2	20	235	28	18	11	ND	18	ND	20	ND	ND	50	81.7
F3	ND	ND	61	ND	ND	112	90	303	36	149	ND	125	95.8
F4	ND	ND	ND	ND	ND	ND	73	ND	ND	ND	ND	73	---

Std. Dev. = Standard Deviation

Data collected from Appendix B, Table 7.0 (UMA, 2009 (CIDM# 360761)).

2.3 Previous Monitoring Programs

The post construction landfill monitoring frequency will follow the schedule recommended in the *Abandoned Military Site Remediation Protocol* (INAC, 2009). The three phases recommended by the protocol are:

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

- Phase III (*if required*): beyond 25 years

The 2013 monitoring program was the third (Year 5) of a proposed eight that are scheduled over a 25 year period. To become familiar with the site, FRANZ reviewed the following reports pertaining to DEW Lines sites:

- *Long Term Monitoring, 2011, FOX-C, Ekalugad Fjord, Nunavut,* January 17, 2012 by Franz Environmental Inc.;
- *Long Term Monitoring, 2009, FOX-C, Ekalugad Fjord, Nunavut*, dated March 27, 2009 by Franz Environmental Inc.;
- *FOX-C Ekalugad Fjord Long-Term Monitoring Plan*, dated March 23, 2008 by Indian and Northern Affairs Canada; and
- *Abandoned Military Site Remediation Protocol*, dated March 2009 by Indian and Northern Affairs Canada, Contaminated Sites Program.

3.0 INVESTIGATIVE METHODOLOGY

The monitoring program was carried out at the FOX-C DEW Line site on August 11, 2013 by Julie Dittburner and Kim Krug, accompanied by AANDC representative Allison Dunn. During the field investigations, weather conditions were clear and sunny with temperatures around 10 to 12 degrees Celsius. The program consisted of the following:

- Completing a health and safety kick-off meeting;
- Visually observing and photographically documenting the physical integrity of the landfill;
- Collection of ground water samples from existing wells (if possible);
- Collection of soil samples (if necessary, as per the LTM plan); and
- Gathering information through first hand observation as well as through knowledgeable persons regarding local wildlife and human activity.

The field investigation procedures are described below.

3.1 Health and Safety Plan

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

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

3.2 Visual Inspections

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

Similar to 2011, the 2013 visual inspection was conducted with the aid of a Trimble Pro XRT GPS unit to locate features of note and to collect GIS information to be used in report preparation. A detailed data dictionary (Trimble file) was created prior to the site visit to capture all required information as outlined in the long-term monitoring plan. The SSF file from 2011

was updated with any changes to previous features and addition of any new features. The Trimble files are included in the appended CD ROM to be used in future site investigations.

3.3 Wildlife Survey

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

As part of the investigation, a FRANZ representative interviewed a member of the Hunters and Trappers Association in Clyde River, as well as other community members knowledgeable about surrounding areas. In previous LTM programs, several members of the Hunters and Trappers Association and community members in Qikiqtarjuaq were interviewed. Land uses by humans and wildlife, as well as changes in use over previous years by each, were discussed and pertinent information is documented in this report.

3.4 Groundwater Sampling

Upon arrival at the FOX-C site, the FRANZ field assessors made an attempt to measure water levels at each of the wells. Using a water level tape, the field assessors found that none of the monitoring wells contained groundwater; all of the water in the wells was frozen. The level of the frozen water and the casing heights of each well were recorded, but no water samples could be obtained. General well conditions were also recorded, and the wells were re-locked using keyed-alike padlocks.

3.5 Soil Sampling

Because there were no indications of seepage or staining as part of the visual inspection, no soil samples were collected during the 2013 monitoring activities, as per the 2008 Long-term Monitoring Plan for the site.

4.0 NON-HAZARDOUS WASTE LANDFILL (NHWL)

4.1 Area Summary

The NHWL is located in the Lower Site Landfill Area, between the Beach and Lake Areas of the site. The monitoring of the landfill included visual observations to assess its physical integrity, including evidence for erosion, ponding, frost action, settlement and lateral movement. Groundwater and soil samples were to be collected at locations up- and downgradient of the NHWL. Due to completely frozen wells during the site visit, groundwater samples could not be taken. As there was no apparent signs of facility malfunction (areas of seepage or staining), soil samples were deemed unnecessary by both the FRANZ and AANDC personnel on site. The visual inspection report, including supporting photos and figure, is presented in Section 4.3.

4.2 Photographic Record

The photographic record of the NHWL has been completed as per the Terms of Reference (Photographs 1 to 81, attached CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix B. The complete photographic record, of full-resolution photographs, is provided in the attached CD-ROM.

4.3 Visual Inspection Report

Monitoring consisted, in part, of visual observations of the NHWL to assess its physical integrity, by collecting evidence of erosion, ponding, frost action, settlement and lateral movement. A plan view of the NHWL indicating photographic viewpoints, observed salient features, and locations of ground water monitoring wells is presented in Figure A-1, Appendix A. The visual monitoring checklist provided in the FOX-C LTM plan has been completed and is included in Table 4-3 of this report. Table 4-1 and associated Table 4-2 present the preliminary visual inspection results for 2013 monitoring of the NHWL at FOX-C.

Table 4-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill

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

Table 4-2: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill - Definitions

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

Settlement

A linear area of settlement was noted running from north to south on the entire top of the landfill (Figure A-1; Appendix A), in the central area along the apex of the NHWL. This settlement appears to be the result of the techniques used to build the NHWL and may not be a settlement issue as was noted in the 2009 report. Based on the photographic evidence from 2009 and 2011, the extent of the depression has not changed significantly since previously noted and, if anything, has decreased in importance. As noted in Figure A-1, Appendix A, the landfill surface appears to be traversed by a ridge in a north-south direction. The landfill gently slopes westward and eastward to the west and east sides of the ridge, respectively.

An area of noticeable depression was observed directly north of the NHWL in 2011 (Feature H, Figure A-1; Appendix A and Photographs 10, 62 to 65, and, 80 on CD-ROM). This 390 m^2 depression was dry during the 2013 site visit; however, it likely contains ponded water at times of high rainfall and spring melt as evident by the dry cracking soil conditions and moss growth. On the south side of the NHWL, at the top of the berm at both features Q and S, minor

settlement was observed. The depression and minor settlement area do not currently appear to impact the structure of the landfill.

Several potholes were noted in 2011 ranging in volume from 0.006 m^3 to 0.016 m^3 (Feature B, I, R, and T, Figure A-1; Appendix A and Photographs 51, 66, 77, and 79, Attached CD-ROM). These features remain unchanged in 2013. These features are likely a result of erosion and not settlement as most of the potholes contained one or more large cobbles at the downgradient extent. The presence of large cobbles embedded in the landfill berms cause eddy currents to form in the run-off water and therefore mechanically erode away some of the fine soil particles. This action is contributing to the pothole development.

Erosion

Minor erosion channels were observed running down the berms of the landfill on the east, northwest, and southwest sides (Feature A, E, F, G, K, M, N, O, and P, Figure A-1; Appendix A and see Tale 4-3 for photograph references); and to a lesser extent the south side. Additional erosion channels were observed at the toe of the landfill on the east side (Feature C and D, Figure A-1; Appendix A and Photographs 53 to 55; CD-ROM) running down towards MW-East, as well as on the northwest toe (Feature J, Figure A-1; Appendix A and Photographs 19, 67 and 68; CD-ROM) and southwest side (Features Q and S, Figure A-1; Appendix A and Photographs 76 to 78; CD-ROM). The maximum depth of the erosion channels noted was less than 0.2 m and on average less than 0.1 m.

Some larger particles (cobbles) are exposed at the top of the berms on the southwest and south sides of the NHWL. These features appear to be a result of water washing the finer grained soils away down the slope of the berm. An area of exposed cobbles was observed at the toe of the berm on the northwest side (Feature U, Figure A-1; Appendix A and Photograph 81; CD-ROM). This feature was not previously identified.

Several potholes (see settlement above) were noted along the berms of the NHWL. These features may be a result of water run-off and erosion based on the presence of cobbles which appear to be collecting run-off water and causing loss of finer grained material.

Frost Action

Some upwelling of bentonite inside well stickups was observed. This may be evidence of frost action at the site; however, limited movement of the well casing inside the stickups was observed.

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

Evidence of Burrowing Animals

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

Re-establishment of Vegetation

Based on the regional setting of this landfill, reestablishment of vegetation is likely to take a significant amount of time. No growth was observed on the top or sides of the landfill.

Staining

No staining was observed in the area of the NHWL.

Seepage Points

One potential seepage point was observed to the northeast of the NHWL. This feature was identified as feature D and did not contain any evidence of staining or product seepage from the landfill. This feature appeared to be caused only by melt water. Feature D may also be a result of erosion and not seepage; however, it is noted here to track progress in future monitoring programs. Feature D has increased in width and depth since 2011.

Exposed Debris

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

Discussion

All physical observations suggest that the NHWL is performing as designed and is containing the enclosed waste. Groundwater samples were not taken due to the frozen state of all the monitoring wells. Soil samples were not collected given the lack of evidence (e.g. seepage and staining) of any anomalies. The facility appears in acceptable condition.

Table 4-3 below summarizes the results of the visual inspection.

Table 4-3: FOX-C – Ekalugad Fjord – Visual Monitoring Checklist

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Erosion	A	20m northwest of the NHWLs southeast corner	10	0.2	0.02	<1%	Minor erosion channel	Measurements of worst case	50
Settlement	B	40 m northwest of the NHWLs southeast corner	0.25	0.3	0.1	<1%	Small pothole, may be result of erosion and not settlement	Measurements of worst case	51
Erosion	C	Northeast of NHWL running down and to the southeast of MW-East	50	3	0.1	<1%	Minor erosion channel developing starting at the southeast corner of the NHWL, running north towards MW-East. The length has decreased since 2011.	Measurements of width are worst case and measurements of depth are average	53-57
Erosion	D	6 m northeast of the toe of NHWL at edge of access road	16	1.5	0.5	<1%	Channel carved into the edge of the road. May be caused by either erosion or potential seepage point. The width and depth has increased since 2011.	Measurements of worst case. No staining or evidence of landfill seepage was observed.	58
Erosion	E	Center of northeast berm	13	0.3	0.02	<1%	Minor erosion channel	Measurements of worst case	59
Erosion	F	20 m southeast of northeast corner of NHWL	12	0.35	0.02	<1%	Minor erosion channel	Measurements of worst case	49 and 60
Erosion	G	8 m southeast of northeast corner of NHWL	13	0.2	0.01	<1%	Minor erosion channel	Measurements of worst case	61
Settlement/Erosion	H	North corner of the NHWL, just beyond the berm	390 m^2			<1%	Area of settlement and erosion. Appears to contain ponded water during rain and melt events from evidence of moss growth.	Does not affect the landfill integrity	62-65, 77, 80
Settlement/Erosion	I	46 m southwest of the northeast corner of the NHWL	0.3	0.2	0.1	<1%	Small pothole, may be result of erosion and not settlement		66
Erosion	J	At toe of northwest corner of the NHWL	45	2	0.1	<1%	Erosion channel at the base of the NHWL	Does not affect the landfill integrity	67 and 68
Erosion	K	2 m north of MW-northwest	12	0.3	0.1	<1%	Erosion channel	Measurements of worst case	69 and 70
Erosion	L	14 m southeast of northwest corner of NHWL	15.8 m^2			<1%	Exposed cobbles at top of berm		46
Erosion	M	14 m southeast of northwest corner of NHWL	18	0.05	0.05	<1%	Two minor erosion channels stemming from feature L	Measurements of worst case	72
			10	0.05	0.05	<1%			
Erosion	N	18 m southeast of northwest corner of NHWL	10	0.05	0.05	<1%	Three grouped minor erosion channel	Measurements of worst case	73
		20 m southeast of northwest corner of NHWL	11	0.1	0.05	<1%			
		21 m southeast of northwest corner of NHWL	22	0.25	0.1	<1%			

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Erosion	O	11 m northwest of southwest corner of NHWL	10	0.05	0.03	<1%	Four grouped minor erosion channels	Measurements of worst case. Measurement of location to center of erosion channel grouping	74
			11	0.25	0.05	<1%			
			18	0.5	0.05	<1%			
			12	0.15	0.05	<1%			
Erosion	P	5 m northwest of southwest corner of NHWL	14	0.35	0.05	<1%	Minor erosion channel	Measurements of worst case	75
Settlement/Erosion	Q	19 m east of southwest corner of NHWL	22.1 m^2			<1%	Exposed cobbles at top of berm, minor settlement at top of berm	Measurements of worst case	76 – photo not available
			8	0.05	0.01	<1%	Eastern minor erosion channel stemming from exposed cobbles		
Settlement/Erosion	R	30 m east of southwest corner of NHWL	0.3	0.35	0.15	<1%	Small pothole, may be result of erosion and not settlement		77 – photo not available
Erosion	S	35 m east of southwest corner of NHWL	30.2 m^2			<1%	Exposed cobbles at top of berm, minor settlement at top of berm		78 – photo not available
Settlement/Erosion	T	50 m east of southwest corner of NHWL	0.2	0.2	0.1	<1%	Small depression area, pothole		79 – photo not available
Erosion	U	8 m southeast of northwest corner of NHWL	12 m^2			<1%	Exposed cobbles at toe of berm	New feature identified during the 2013 site visit	81

5.0 SURROUNDING AREAS

A visual aerial survey of surrounding areas via helicopter was conducted during the 2013 monitoring event. Areas surrounding the landfill site were visually scarred from the remediation activities. The areas directly surrounding the landfill site were mostly devoid of vegetation due to remediation activities.

Lake Area

To the southwest of the NHWL (Lower Site Landfill Area) lies the Lake Area, including Borrow Areas 5 and 6 and the *in-situ* treatment area. This area was observed during the 2013 field program by the AANDC representative. Two wood platforms, one with a pile of 2 x 4 wood planks, were observed near the shore of the lake. These wood platforms were in good condition and were assumed to have been left after site remedial works, and not from time of site operations.

Beach Area

To the north of the NHWL lies the Beach Area, containing Borrow Area 4, the former camp and the decommissioned sewage lagoon. All areas appeared to be devoid of vegetation and graded level.

Mid- and Upper Station Areas

The Upper Station Area is located on the nearest peak to the east of the NHWL, at over 700 metres above mean sea level. The Mid Station Area is slightly to east of this, roughly 100 vertical metres lower than the Upper Station. Both areas were observed during the 2013 monitoring activities. Two cement pads were observed - one on the edge of an embankment. The cement pad noted on the edge of the embankment was a tower anchor block. This was verified by the FOX-C final as-bulit drawings (CIDM#: 360774). The decommissioned road, used to access the Upper Station area from the Beach area, was observed to be in fair condition.

6.0 NATURAL ENVIRONMENT

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

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

Wildlife and Human Activity

According information collected during 2011, Harry Alookie from the Qikiqtarjuaq Hunters and Trappers Association stated the area around FOX-C is used during the winter and summer for harvesting narwhal, char, caribou, and goose. Hunting for polar bear occurs from October to March and can occur in the area around FOX-C. Wolves are rare and it has been around eight years since the last sighting. Beluga whales are also rare in the FOX-C area. There has been an increase in Killer Whale sightings in the past couple of years with pods numbering 100 to 150 whales observed.

During the 2013 site visit, the FRANZ field assessors observed evidence (e.g. scat, tracks or visual observation) that Canada geese, Canada goose and polar bears are present on the site. The bear monitor for the 2013 site visit was from Clyde River and was not familiar with the hunting and wildlife in the area.

Re-establishment of Vegetation

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

7.0 LIMITATIONS

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

Any use, which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Franz Environmental Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Some of the information presented in this report was provided through existing documents and interviews. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, Franz Environmental Inc., in certain instances, has been required to assume that the information provided is accurate.

The conclusions presented represent the best judgment of the assessors based on current environmental standards and on the site conditions observed on August 11, 2013. Due to the nature of the investigation and the limited data available, the assessors cannot warrant against undiscovered environmental liabilities.

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

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

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

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

8.0 REFERENCES

Franz Environmental Inc., January 17, 2012. *Long Term Monitoring, 2011 FOX-C, Ekalugad Fjord, Nunavut.*

Franz Environmental Inc., March 27, 2009. *Long Term Monitoring, 2009 FOX-C, Ekalugad Fjord, Nunavut.*

Indian and Northern Affairs Canada, March 23, 2008a. *FOX-C Ekaluguad Fjord Long-Term Monitoring Plan.*

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

UMA Engineering Ltd. May, 2008a. FOX-C Ekalugad Fjord, 2006 Construction Clean-up Summary (CIDM# 261050).

UMA Engineering Ltd. June, 2008b. FOX-C Ekalugad Fjord, 2007 Construction Clean-up Summary (CIDM# 261049).

AECOM Canada Ltd. (formerly UMA Engineering Ltd.). April, 2009. FOX-C Ekalugad Fjord, 2008 Construction Clean-up Summary (CIDM# 360761).

9.0 CLOSURE

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

Yours truly,

Franz Environmental Inc.

Julie Dittburner, B.Sc., EPt
Field Assessor and Report Author

Kim Krug, B.Sc.
Field Assessor

Andrew Henderson, B.A.Sc.
Project Manager

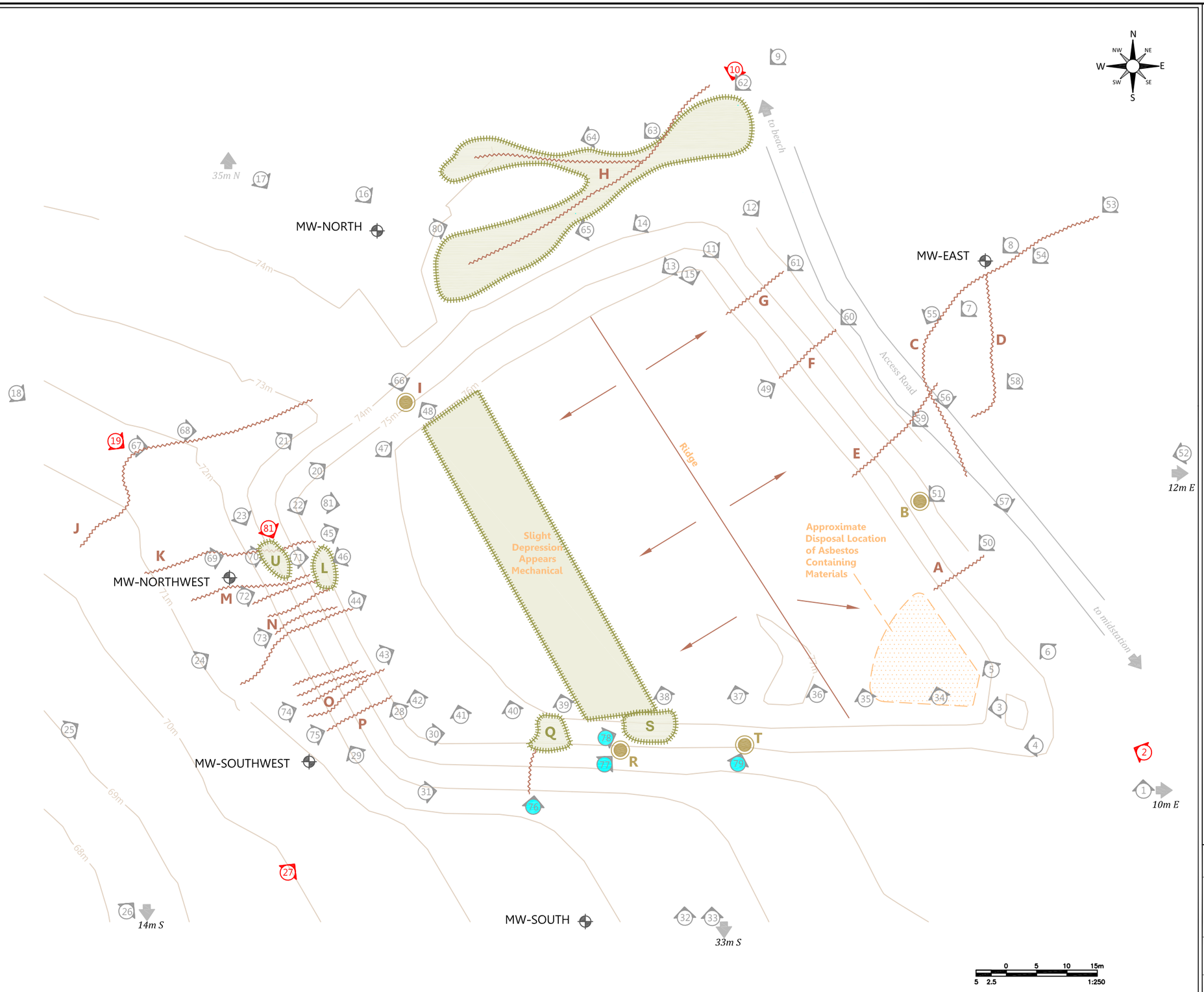
Steve Livingstone, M.Sc., P.Geol.
Principal/Senior Reviewer

Distribution: Addressee (2 hardcopies, 1 electronic)
FRANZ (1 hard copy, 1 electronic)

Z:\Projects\2130\1697-1301 AANDC Dewlines\Individual Sites\FOX-C\Reporting/Final

APPENDIX A

Figures



Legend

- MW — Monitoring Well Locations
- 25 — Picture Viewpoint Number
- 8 — Viewpoint Photograph Included in Appendix B
- A — Settlement or Depression
- Pothole
- Erosion
- A — Feature Reference Letter
- Slope Direction
- 25 — Photo Not Available

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

Title:
Non-Hazardous Waste Landfill

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project:
FOX-C Ekalugad Fiord 1697-1301

Date:
December 2013

Client:
Aboriginal Affairs and Northern Development Canada

Scale as shown

Figure A-1

513 900 E
513 975 E
514 050 E
514 125 E
7 624 725 N
7 624 650 N
7 624 575 N
7 624 500 N
7 624 425 N
7 624 350 N
7 624 275 N
7 624 725 I
7 624 650 I
7 624 575 I
7 624 500 I
7 624 425 I
7 624 350 I
7 624 275 I

MW 1
MW 2
MW 3
MW 4
MW A
MW B
MW C
MW D

LANDFARM
ACCESS ROAD
BORROW AREA 3
TEMPORARY PCB STORAGE AREA
LOWER SITE NON-HAZARDOUS WASTE LANDFILL

46m 47m 48m 49m 50m 51m 52m 53m 54m 55m 56m
62m 63m 64m 65m 66m 67m 68m 69m 70m 71m 72m 73m 74m 75m 76m

SCALE 1:150

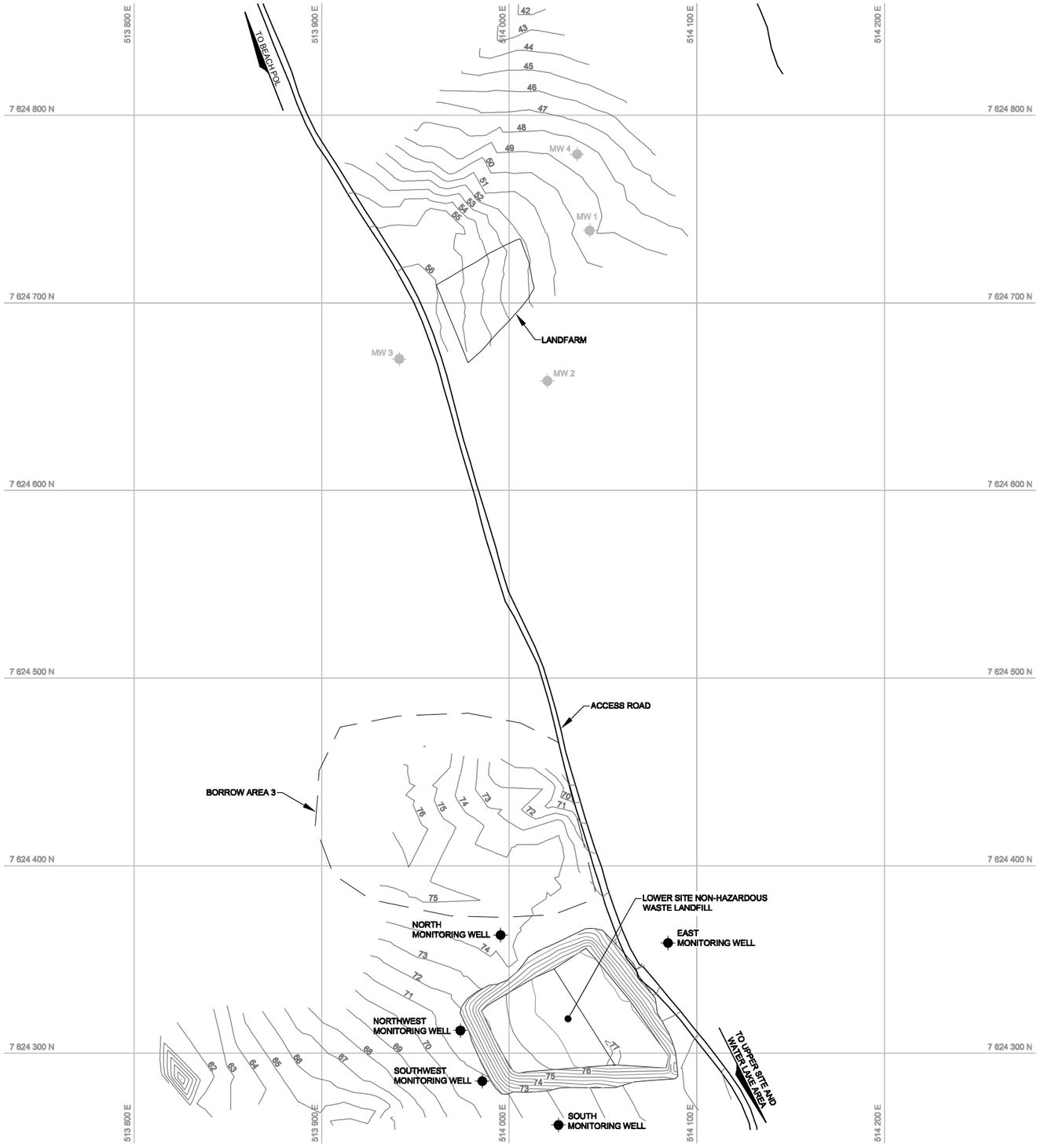
LEGEND:

MW 2 MONITORING WELL

Public Works and Government Services Canada
FOX - C Ekalugad Fiord - Monitoring Services

Landfarm and Landfill
2006 Field Season
Figure - 3.0

UMA | AECOM



GENERAL NOTES:

1. GROUND CONTOURS ARE SHOWN AT AN INTERVAL OF 1m.
2. LANDFILL CONTOURS ARE SHOWN AT AN INTERVAL OF 0.5m.

LEGEND:

- 71 — GROUND CONTOURS
- 71 — LANDFILL CONTOURS
- MONITORING WELL LOCATION
- MW 2 — FORMER MONITORING WELL LOCATION

0 25 50 m SCALE 1:2500

AECOM

Public Works and Government Services Canada
FOX - C Ekalugad Fiord - Monitoring
FOX-C 2008 Services

Lower Site Landfill Area
Site Plan
Figure 5.0

APPENDIX B

Site Photographs

East corner of the NHWL. Viewpoint 2 (Figure A-1; Appendix A). Photograph reference 2 (CD-ROM). Direction photo taken: NW

North corner of the NHWL. Note the damp depression area. Viewpoint 10 (Figure A-1; Appendix A). Photograph reference 10 (CD-ROM). Direction photo taken: SW. Feature H in foreground – depression is dry with moss growth.

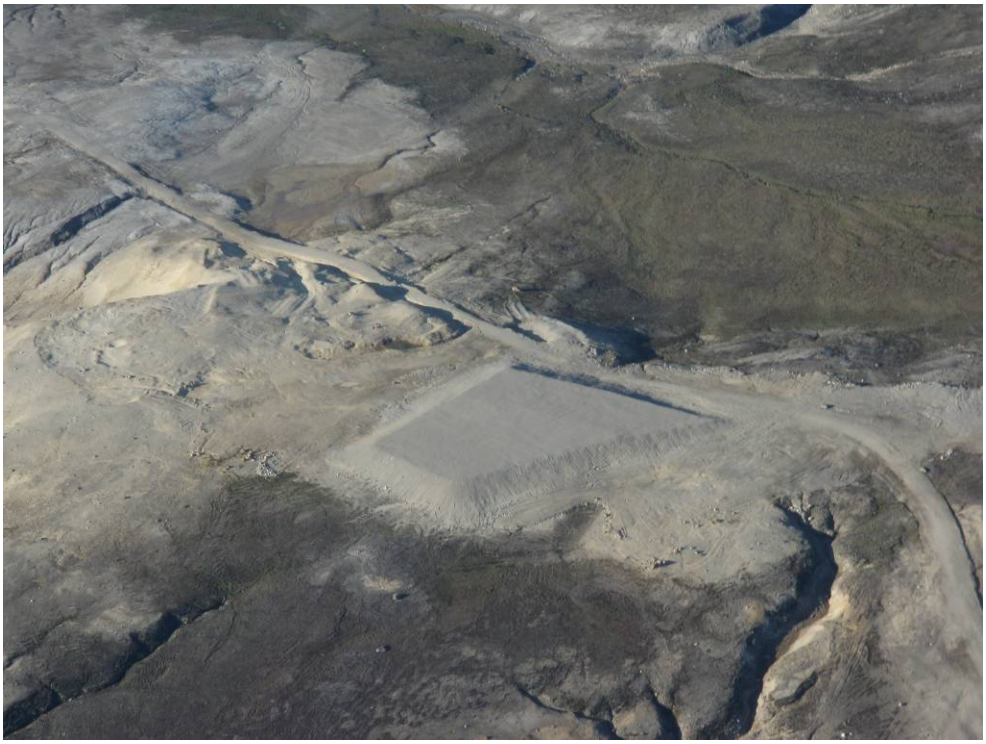
West corner of the NHWL. Note the erosion channel at the toe of the NHWL. Viewpoint 19 (Figure A-1; Appendix A). Photograph reference 19 (CD-ROM). Direction photo taken: SE

South corner of the NHWL. Viewpoint 27 (Figure A-1; Appendix A). Photograph reference 27 (CD-ROM). Direction photo taken: NE

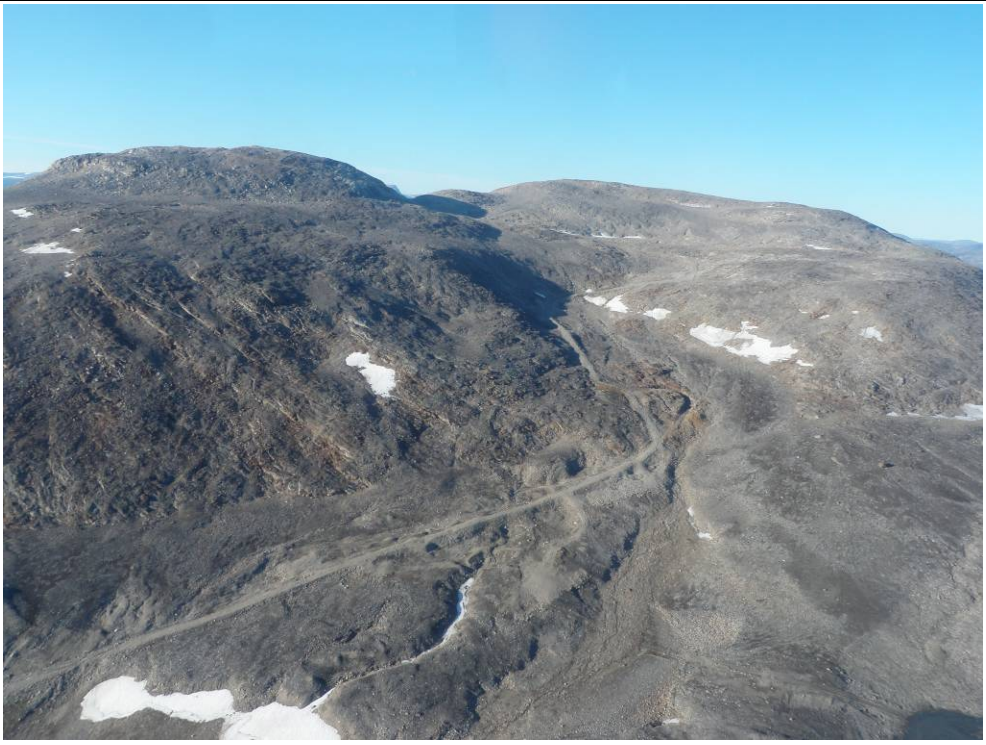
Exposed cobbles at NW corner of landfill at toe of berm. Note the erosion channels in background (Features M & N). Viewpoint 81 (Figure A-1; Appendix A). Photograph reference 81 (CD-ROM). Direction photo taken: S

View of Geese tracks near NHWL. Photograph reference 82 (CD-ROM). Direction photo taken: NA

Wood platforms at Lake Area. Photograph reference 83 (CD-ROM). Direction photo taken: NW



Aerial shot of NHWL. Roadway towards Beach Area in top corner and towards Upper Station in bottom corner. Photograph reference 84 (CD-ROM). Direction photo taken: NE



Aerial view of roadway to Upper Station. Photograph reference 85 (CD-ROM). Direction photo taken: E

Aerial view of Upper Station. A cement pad and tower anchor block. Photograph reference 86 (CD-ROM). Direction photo taken: SW

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

Viewpoint #	Picture #	Viewpoint #	Picture #	Viewpoint #	Picture #
1	1	30	30	59	59
2	**2**	31	31	60	60
3	3	32	32	61	61
4	4	33	33	62	62
5	5	34	34	63	63
6	6	35	35	64	64
7	7	36	36	65	65
8	8	37	37	66	66
9	9	38	38	67	67
10	**10**	39	39	68	68
11	11	40	40	69	69
12	12	41	41	70	70
13	13	42	42	71	71
14	14	43	43	72	72
15	15	44	44	73	73
16	16	45	45	74	74
17	17	46	46	75	75
18	18	47	47	76	N/A
19	**19**	48	48	77	N/A
20	20	49	49	78	N/A
21	21	50	50	79	N/A
22	22	51	51	80	80
23	23	52	52	**81**	**81**
24	24	53	53	N/A	82
25	25	54	54	N/A	83
26	26	55	55	N/A	84
27	**27**	56	56	N/A	85
28	28	57	57	N/A	86
29	29	58	58	--	--

APPENDIX C

Field Notes

Groundwater Sampling

Project: 1697-1301

Franz Personnel: KK
Weather: Sunny, 11°C

Development of Monitoring Wells

Name of Area:	FOX-C		Sector:
Date of Sampling:	Day: 11	Month: 08	Year: 2013
Monitoring Well ID:	MW-SOUTHWEST		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):			
Sampling Equipment:			

Measured Data

Well Depth (m):	1.626m
Water Depth (m):	— dry
Stick Up (m):	0.514m

Field Chemistry

Name and # unit:	Readings *	
pH:	1	
	2	
	3	
	4	
	5	
	6	
Temperature (°C):	1	
	2	
	3	
	4	
	5	
	6	
Conductivity (mS/cm):	1	
	2	
	3	
	4	
	5	
	6	
DO:	1	
	2	
	3	
	4	
	5	
	6	
ORP:	1	
	2	
	3	
	4	
	5	
	6	
Turbidity:	1	
	2	
	3	
	4	
	5	
	6	

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

KK bottom of well did not sound like frozen

Comments/ Notes:

- loose ice at bottom pulled up by water level meter

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

Groundwater Sampling

Project: 1697-1301

Franz Personnel: KK
Weather: Sunny, 11°C

Development of Monitoring Wells

Name of Area:	FOX-C		Sector:
Date of Sampling:	Day: 11	Month: 08	Year: 2013
Monitoring Well ID:	MW-SOUTH		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	(Stick Up)	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):			
Sampling Equipment:			

Measured Data

Well Depth (m):	1.511 m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	— dry					
Stick Up (m):	0.548m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1		PHC			
	2					
	3					
	4					
	5					
	6					
Temperature (°C):	1		PCB Total			
	2					
	3					
	4					
	5					
	6					
Conductivity (mS/cm):	1		VOC			
	2					
	3					
	4					
	5					
	6					
DO:	1		PAH			
	2					
	3					
	4					
	5					
	6					
ORP:	1		Hardness			
	2					
	3					
	4					
	5					
	6					
Turbidity:	1		Other			
	2					
	3					
	4					
	5					
	6					

KK
Bottom of well did not sound like ice

Comments/ Notes:

- loose ice at bottom of well - some came up on water level meter

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

Groundwater Sampling

Project: 1697-1301

Franz Personnel: KK
Weather: sunny, 14°C

Development of Monitoring Wells

Name of Area: FOX-C			Sector:
Date of Sampling:	Day: 11	Month: 09	Year: 2013
Monitoring Well ID:	MW-NORTH		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):			
Sampling Equipment:			

Measured Data

Well Depth (m):	1.710m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	— dry					
Stick Up (m):	0.581m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1		PHC			
	2					
	3					
	4					
	5		PCB Total			
	6					
Temperature (°C):	1					
	2					
	3					
	4		VOC			
	5					
	6					
Conductivity (mS/cm):	1					
	2					
	3		PAH			
	4					
	5					
	6					
DO:	1					
	2					
	3		Hardness			
	4					
	5					
	6					
ORP:	1					
	2					
	3					
	4		Other			
	5					
	6					
Turbidity:	1					
	2					
	3					
	4					
	5					
	6					

Comments/ Notes:

- ice at bottom - when put water level meter down there was broken up ice on the bottom mixed with sand + silt

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

Groundwater Sampling

Project: 1697-301

Franz Personnel: KK
Weather: sunny, 18°C

Development of Monitoring Wells

Name of Area: FOX-C			Sector:
Date of Sampling:	Day: 11	Month: 08	Year: 2013
Monitoring Well ID:	MW-NORTHWEST		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):			
Sampling Equipment:			

Measured Data

Well Depth (m):	1.641 m
Water Depth (m):	/ dry
Stick Up (m):	0.544 m

Field Chemistry		
Name and # unit:	Readings *	
pH:	1	
	2	
	3	
	4	
	5	
	6	
Temperature (°C):	1	
	2	
	3	
	4	
	5	
	6	
Conductivity (mS/cm):	1	
	2	
	3	
	4	
	5	
	6	
DO:	1	
	2	
	3	
	4	
	5	
	6	
ORP:	1	
	2	
	3	
	4	
	5	
	6	
Turbidity:	1	
	2	
	3	
	4	
	5	
	6	

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

KK
Unable to get sand from bottom

Comments/ Notes:

- icey sand at bottom of well (pulled up from water level meter

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

Groundwater Sampling

Project: 1697-1301

Franz Personnel: KK
Weather:

Development of Monitoring Wells

Name of Area: FOX-C			Sector:
Date of Sampling:	Day: 11	Month: 08	Year: 2013
Monitoring Well ID:	MW-EAST		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	
Condition of Well:	Good	Broken Casing	Bailer stuck in well
	Waterra tubing stuck in well		Missing Cap
Volume Purged (L):			
Sampling Equipment:			

Measured Data

Well Depth (m):	1.808 m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	dry					
Stick Up (m):	0.734m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1		PHC			
	2					
	3					
	4					
	5		PCB Total			
	6					
Temperature (°C):	1					
	2					
	3					
	4		VOC			
	5					
	6					
Conductivity (mS/cm):	1					
	2					
	3		PAH			
	4					
	5					
	6					
DO:	1					
	2					
	3		Hardness			
	4					
	5					
	6					
ORP:	1					
	2					
	3					
	4					
	5		Other			
	6					
Turbidity:	1					
	2					
	3					
	4					
	5					
	6					

Comments/ Notes:

- frozen silty sand at bottom of well

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

1697-1301 FOX-C Aug 11/13

8:30 - Pilot (Jim) contacted 'Polar Shelf' and weather is too bad to go this morning. Will wait & see if it clears.

12:00pm - weather has cleared & Jim says we can go now

3:00pm: Arrive on-site at FOX-C
Franz (J. Dittburner & K. Krug)
AWDC (A. Dunn)
Pilot (Jim)
B.M (Teema Quilliq)

- completed health & safety & everyone signed off.

- Kim and Allison began the Monitoring well check
→ See Kim's field sheets.
- all well's were frozen
- no water, therefor no samples collected

1697-1301 FOX-C Aug 11/13

- Julie completed the photographic assessment using the DGPS.
- all previous photo locations were collected w/ viewpoints same as 2011

- Julie and Kim complete the NWWL visual checklist
- observed and recorded all changes noted since 2011 in the features,

- majority remained the same, slight change to a couple

- 2 new features added - no impacted to landfill integrity.

1697-1301 Fox-C Aug 11/13

Wildlife

tracks – goose tracks
- possible polar bear

animals that frequent the area - Canada goose
Canada geese

Teema (B.M) does not generally hunt in the area
- was not aware of the hunting in the area.
- ~~fish are present in the fresh water~~

- Did a walk around w/ Allison to make sure no features were missed.

- did an aerial inspection of the middle & upper stations
- not much present other than

1697-1301 Fox-C Aug 11/13

a cement pad & ~~cement~~ cement brace at the upper station, roadways were present & appeared in good shape.

6:30 pm : off-site.