Long Term Monitoring, 2013, Cape Christian, Nunavut

FINAL REPORT

Prepared for:
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Project No. 1697-1301
January 20, 2014

EXECUTIVE SUMMARY

FRANZ Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada (AANDC) to conduct the second long-term monitoring event (Year 3) at the former Long Range Navigation (LORAN) communication station, Cape Christian. Monitoring of the site is to be delivered in three phases over the next 25 years, as prescribed by AANDC's Cape Christian Long-Term Monitoring Plan. 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 Cape Christian site is situated on a lowland costal bluff located on the northeast coast of Baffin Island about 16 km northeast of the Hamlet of Clyde River, Nunavut. The site was a former US Coast Guard Long Range Navigation communication station constructed and operated between 1954 and 1974 when it was abandoned. A remediation project led by AANDC was conducted between 2008 and 2011. Hazardous wastes were removed from the site, buildings were demolished and, site debris was collected. All non-hazardous debris, demolition waste and contaminated soils were placed in a non-hazardous waste landfill (NHWL) constructed on-site.

The Year 3 monitoring efforts were conducted on August 9, 2013 while based out of Clyde River. The landfill monitoring program consisted of a visual inspection of the NHWL. In addition, the natural environment was monitored; physical evidence and anecdotal evidence and information suggest that wildlife and local hunters continue at a lower level to frequent at this site, primarily due to its proximity to Clyde River. The road leading to the Cape Christian LORAN site was in a good condition and the site was accessible by an ATV during the site visit for the Year 3 monitoring activities.

Overall, physical observations suggest that the NHWL is in a good condition and performing as designed to contain the enclosed waste. There was significantly less standing water around the base of the landfill observed during the Year 3 long-term monitoring event in 2013 in comparison to observations made in the Year 1 long-term monitoring event conducted in 2011. The two significant seepage faces, one along the north side of the landfill and the other located 14 metres east of the southeast corner of the landfill observed in the first year monitoring event, as well as the saturated soil along the perimeter of the north, west, and southwest corners of the landfill, were not encountered during the Year 3 monitoring event.

Soil staining was observed on both north and west sides of the NHWL. Grading was poor and uneven on the entire extent of the top of the landfill that would generate the potential for significant water infiltration. Only minor depressions were observed in the landfill area. No new features indicating the deterioration of the performance of the landfill were identified during the Year 3 monitoring event.

In addition to physical observations, FRANZ collected soil samples to assess the performance of the NHWL. Analytical results for soil samples collected in the vicinity of the NHWL satisfy applicable guidelines for contaminants of potential concern at the site.

During remediation, four monitoring wells were installed at the site to allow for active layer water monitoring. During the 2013 monitoring program, FRANZ collected samples from three of the wells (MW1, MW2 and MW4); there was insufficient water for sample collection in the remaining. Since this is the second monitoring event for the long-term monitoring plan to be implemented within the first three years at Cape Christian, there is insufficient historical or baseline data to compare the results to the baseline mean as recommended by AANDC's long-term monitoring guidance. No significant changes for parameters were identified in the Year 3 monitoring event. More rounds of long-term monitoring are required to establish the long-term trend of such changes.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 8.0.

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1.0 INTRODUCTION

FRANZ Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada (AANDC) to conduct the second long-term monitoring event (Year 3) at the former Long Range Navigation (LORAN) communication station, Cape Christian. Monitoring of the site is to be delivered in three phases over the next 25 years, as prescribed by AANDC's Cape Christian Long-Term Monitoring Plan. 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 Cape Christian 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 LORAN site Cape Christian will be referred to as "the site."

1.1 Project Objectives

The objective of the 2013 Long-Term Monitoring (LTM) was to complete Year 3 monitoring activities at the Cape Christian site as described in the Cape Christian LTM plan. This included visual observations, chemical analyses (where warranted and possible) and interviews with members of the nearby community knowledgeable of local activities at the site to determine the condition of the natural environment and whether the site infrastructure is performing as designed.

1.2 Scope of Work

The scope of work as described in the 2009 Cape Christian LTM 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

    - If possible, the collection of samples from the 4 monitoring wells installed around the NHWL. These samples were to be analysed and the results compiled in table form for future comparison.

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 Year 3 long-term monitoring report.

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

a. Updating the health and safety plan for Year 3 monitoring event;
b. Preparation of a sampling plan for soil and groundwater;
c. Collection of water level data and observation of monitoring well conditions at the site;
d. Collection of groundwater samples;
e. Collection of soil samples;
f. Visual inspection, measurement, and photo documentation of the site;
g. Interviewing local residents and officials to understand land use and wildlife trends; and
h. Reporting.

2.0 BACKGROUND INFORMATION

2.1 Site Description

According to AANDC's Cape Christian LTM plan, from 1954 to 1974, the United States Coast Guard operated a Long Range Navigation (LORAN) communications station at the Cape Christian site. The station was comprised of five buildings: the main station, garage, hazmat building, terminal building, and the survival hut. Six aboveground storage tanks (ASTs), each with a capacity of 102,600 L, and associated piping for fuel transfer and storage were also part of the station infrastructure. Barrels containing petroleum, oils, lubricants (POL), and other chemicals were supplied to the station during its years of operation, and used barrels were fully or partially buried at the site.

The site was abandoned in 1975 without decommissioning. After some initial efforts by others at cleaning up the site, AANDC led the remediation of the site between 2008 and 2011. The remediation involved removal and off-site disposal of hazardous materials, demolition of buildings and structures, excavation of non-hazardous metals and petroleum hydrocarbon contaminated soils, and clean-up of other site debris. All of the non-hazardous wastes were placed in a non-hazardous waste landfill (NHWL) constructed on-site for that purpose.

Construction of the NHWL began 2009 and was completed in 2010. The landfill is situated at approximately 25 m asl. AMSRP (INAC, 2009) generic design plans for NHWLs describe construction on natural ground surface with the organic matter stripped, and consisting of four perimeter berms constructed of granular material. It is assumed that the non-hazardous waste at Cape Christian was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill, that the waste layers were compacted, and that a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill, as per the AMSRP (INAC, 2009). The cap of the NHWL at Cape Christian was armoured with large cobble and boulders to provide additional protection against weathering. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content up to 500 parts per million (ppm) and PCB content up to 5 ppm).
- Petroleum hydrocarbon fractions F3 and F4 contaminated soil.
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal.
- Non-hazardous site debris, such as scrap metal and wood.
- Non-hazardous debris/soil excavated from landfills
- Creosote timbers.
- Double-bagged asbestos.

The lack of inhabitants at the site and the shallow permafrost make it extremely unlikely that groundwater would ever be used for drinking water in the area. The area is reported to be used

by hunters and fishermen. Interviews with residents of the nearby hamlet of Clyde River suggest that hunting is still popular in the area. Fishing and whaling in the area are considered good.

2.2 Baseline Soil and Groundwater Data

During site remediation (site clean-up) activities at Cape Christian, EBA Engineering Consultants (EBA) collected baseline soil and groundwater data to use for comparison during future monitoring events.

Groundwater monitoring wells were installed on each of the four sides of the NHWL for the purpose of collecting baseline background water chemistry and in the long-term to monitor up gradient and downgradient water quality. Three monitoring wells, MW-1 (downgradient), MW-2 (downgradient), and MW-3 (upgradient), were installed in 2009. The final well, MW-4 (upgradient), was installed in 2010 after the final landfill footprint had been determined (EBA, 2011). All four wells were installed to an approximate depth of 3.3 metre below ground surface (m bgs). EBA conducted five rounds of baseline groundwater sampling (however one round was dry) between August 15, 2009 and September 12, 2010. Table 2-1, below, depicts the baseline groundwater analytical data for Cape Christian collected by EBA.

Table 2-1: Baseline Groundwater Analytical Data

Parameters (mg/L)	MW-1					MW-2				MW-3			MW-4		Avg. Conc.	Std. Dev.
	Aug-15-09	Sept-18-09		Aug-21-10	Sept-12-10	Sept-18-09		Aug-21-10	Sept-12-10	Aug-15-09	Sept-18-09		Aug-21-10	Sept-12-10		
		Filtered	*Unfiltered*			*Filtered*	*Unfiltered*				*Filtered*	*Unfiltered*				
pH	9.4	10.9	10.8	8.16	8.21	7.4	7.3	0.77	7.96	9.6	8.2	8.1	7.89	7.58	8.02	2.4
Na	464	813	782	436	210	156	159	123	108	75.2	78.9	77.6	19	25.7	251.96	267.3
K	36.2	42.7	41.8	31.6	20.6	16	15	16.2	14.7	0.31	7.8	15.8	2.46	2.22	18.81	14.2
Mg	6.64	0.6	2.5	40.9	40.8	45.5	45.5	62.3	69.6	3	4.9	6.4	4.5	5.26	24.17	25.1
Ca	10.3	46.9	41.9	43.4	40.7	80	82.2	103	108	7	6.7	7.6	15.6	11.7	43.21	36.6
Hardness	53	120	115	286	271	387	393	669	668	30	37	45.4	58	56	227.74	226.7
Fe	ND	ND	ND	0.416	ND	5.9	10	31.8	35.3	4.2	0.27	4.7	ND	0.479	10.34	13.6
Mn	ND	ND	ND	0.082	0.005	3.1	3.4	5.63	6.57	0.07	ND	0.07	0.012	0.055	1.90	2.6
Cl	704	1070	1050	678	350	427	440	439	527	44.5	53.6	53.3	25	35	421.17	361.4
Nitrate	0.26	ND	ND	ND	0.135	ND	ND	1380	0.603	0.38	0.28	ND	0.133	0.396	172.77	487.8
Nitrite	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Sulphate	9.3.4	178	189	211	135	25.9	24.6	19	29	38.2	48.9	49.1	20	24	76.28	73.2
F1	ND	-	-	ND	ND	-	-	ND	ND	ND	-	-	ND	ND	-	-
F2	ND	-	-	-	ND	-	-	-	ND	ND	-	-	-	ND	-	-
PCBs	ND	-	-	ND	ND	-	-	ND	ND	ND	-	-	ND	ND	-	-
Total Cu	-	-	0.0412	0.0201	0.0178	-	0.0185	0.0338	0.0125	-	-	0.111	0.016	0.0069	0.0309	0.0
Total Ni	-	-	0.291	0.197	0.122	-	0.226	0.106	0.459	-	-	0.898	0.222	0.0163	0.2819	0.3
Total Co	-	-	0.0042	ND	ND	-	0.0359	0.041	0.052	-	-	0.0222	ND	ND	0.0311	0.0
Total Cd	-	-	ND	ND	ND	-	0.00192	0.0038	ND	-	-	0.00121	ND	ND	0.0023	0.0
Total Pb	-	-	ND	0.0192	0.0447	-	ND	0.0109	0.262	-	-	0.034	0.0192	0.0011	0.0559	0.1
Total Zn	-	-	0.0128	0.0506	0.0298	-	1.74	0.855	0.395	-	-	0.375	0.0282	0.0225	0.3899	0.6
Total Cr	-	-	0.399	0.226	0.075	-	0.0442	0.071	0.013	-	-	0.938	0.071	ND	0.2297	0.3
Total As	-	-	0.0032	0.0089	0.0039	-	ND	0.0102	0.005	-	-	0.0132	0.0014	ND	0.0065	0.0
Dissolved Cu	0.05475	0.0166	-	0.003	ND	0.0122	-	0.012	0.0034	0.0462	0.00928	-	ND	ND	0.0197	0.0
Dissolved Ni	0.482	ND	-	0.0038	0.0055	0.114	-	0.044	0.11	0.146	0.00516	-	ND	0.002	0.1014	0.2
Dissolved Co	0.00794	ND	-	ND	ND	0.0241	-	0.034	0.048	0.00864	ND	-	ND	ND	0.0245	0.0
Dissolved Cd	ND	ND	-	ND	ND	0.00118	-	ND	ND	ND	ND	-	ND	ND	0.0012	-
Dissolved Pb	ND	ND	-	ND	ND		-	ND	ND	ND	ND	-	ND	ND	-	-
Dissolved Zn	0.0491	ND	-	ND	0.0035	0.903	-	ND	0.315	0.0694	ND	-	ND	0.0094	0.2249	0.4
Dissolved Cr	0.718	ND	-	ND	ND	ND	-	ND	ND	0.187	ND	-	ND	ND	0.4525	0.4
Dissolved As	ND	ND	-	0.0056	0.0031	ND	-	0.0035	0.0046	0.00501	0.004345	-	ND	ND	0.0044	0.0

Std. Dev. = Standard Deviation

Data collected from Figure 4 (EBA, 2011)

EBA also conducted baseline environmental soil sampling at the NHWL in order to gain an understanding of the background concentrations of organic and inorganic elements. In addition, EBA collected soils across the site to verify that the areas were not situated on a previously unknown historic spill, to confirm that borrow materials used in road-building and remedial activities were pristine, and to ensure that the contractor's activities did not adversely affect the environment at the end of remedial activities (EBA, 2011). Soils were tested for petroleum hydrocarbons (F1-F4), metals including arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel zinc and PCBs. Table 2-2 depicts the baseline soil analytical data for Cape Christian collected by EBA.

Table 2-2: Baseline Soil Analytical Data

Location	Sample	F1 (ug/g)	F2 (ug/g)	F3 (ug/g)	F4 (ug/g)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	Aroclor 1254 (ug/g)	Aroclor 1260 (ug/g)
NHWL	BTL-1	ND	ND	39	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BTL-2	ND	ND	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BTL-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BTL-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BTL-MW2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16	ND	ND
		ND	ND	19	ND	ND	ND	34	5.2	5.9	ND	ND	8.4	22	ND	ND
	BTL-MW3	ND	ND	19	ND	ND	ND	ND	6.1	8.8	ND	ND	8.9	22	ND	ND
		ND	ND	10	ND	ND	ND	ND	7.3	13.1	ND	ND	9.1	28	ND	ND
BL-2 Landfarm	BL2-A	ND	ND	18.4	46.7	-	-	-	-	-	-	-	-	-	-	-
	BL2-B	ND	ND	11.4	35.5	-	-	-	-	-	-	-	-	-	-	-
	BL2-C	ND	ND	54.6	108	-	-	-	-	-	-	-	-	-	-	-
	BL2-D	ND	ND	118.9	60.2	-	-	-	-	-	-	-	-	-	-	-
	BL2-E	ND	ND	ND	31.6	-	-	-	-	-	-	-	-	-	-	-
	BL2-F	ND	ND	19.5	48.6	-	-	-	-	-	-	-	-	-	-	-
	BL2-G	ND	ND	ND	18.5	-	-	-	-	-	-	-	-	-	-	-
	BL2-H	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-I	ND	ND	ND	10.2	-	-	-	-	-	-	-	-	-	-	-
	BL2-J	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-K	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-L	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-M	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-N	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-O	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-P	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	DUP1	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-A_POST	-	ND	56	78	-	-	-	-	-	-	-	-	-	-	-

Location	Sample	F1 (ug/g)	F2 (ug/g)	F3 (ug/g)	F4 (ug/g)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	Aroclor 1254 (ug/g)	Aroclor 1260 (ug/g)
	BL2-C_POST	-	ND	46	32	-	-	-	-	-	-	-	-	-	-	-
	BL2-E_POST	-	700	277	53	-	-	-	-	-	-	-	-	-	-	-
	BL2-E_POST #2	-	20	23	15	-	-	-	-	-	-	-	-	-	-	-
	BL2-K_POST	-	198	42	11	-	-	-	-	-	-	-	-	-	-	-
	BL2-K_POST#2	-	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-L_POST	-	ND	65	38	-	-	-	-	-	-	-	-	-	-	-
	BL2-M_POST	-	39	1650	875	-	-	-	-	-	-	-	-	-	-	-
	BL2-M_POST#2	-	ND	17	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-N_POST	-	ND	33	42	-	-	-	-	-	-	-	-	-	-	-
	BL2-O_POST	-	ND	15	ND	-	-	-	-	-	-	-	-	-	-	-
	BL2-P_POST	-	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-
BL-3 Barrel Processing Area	BL3-A	ND	ND	ND	ND	ND	2.9	58	7.7	ND	ND	0.007	7.5	166	ND	ND
	BL3-4	-	26	51	23	-	-	-	-	-	-	-	-	-	-	-
	BL3-B	ND	ND	ND	ND	ND	ND	44	6	ND	ND	ND	5.8	252	ND	ND
	BL3-3	-	27	49	25	-	-	-	-	-	-	-	-	-	-	-
	BL3-C	ND	ND	ND	ND	ND	1.2	49	6.2	55	55	0.0321	9	249	ND	ND
	BL3-2	-	32	207	110	-	-	-	-	-	-	-	-	-	-	-
	BL3-D	ND	ND	ND	ND	ND	ND	80	8.7	11	11	0.019	8.3	143	ND	ND
	BL3-1	-	37	174	65	-	-	-	-	-	-	-	-	-	-	-

Location	Sample	F1 (ug/g)	F2 (ug/g)	F3 (ug/g)	F4 (ug/g)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	Aroclor 1254 (ug/g)	Aroclor 1260 (ug/g)
	BL3-E	ND	ND	ND	ND	ND	ND	72	8.2	ND	ND	0.0083	7.7	299	ND	ND
	BL3-5	-	26	51	25	-	-	-	-	-	-	-	-	-	-	-
	BL3-F	ND	ND	ND	ND	ND	ND	26	ND	ND	ND	ND	ND	ND	ND	ND
BL-5 Site Road	BL5-1	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-2	ND	ND	231	95	ND	1.3	ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-3	ND	ND	62	39	ND	2.2	ND	ND	ND	ND	ND	ND	130	-	-
	BL5-4	ND	15	59	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-5	ND	12	50	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-6	ND	13	22	11	ND	1.3	ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-7	ND	ND	71	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL5-8	ND	10	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
*BL-6 Temporary Waste Storage**	BL6-3	-	27	47	22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BL6-4	-	67	48	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BL6-5	-	53	53	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BL6-6	-	ND	51	32	-	-	-	-	-	-	-	-	-	-	-
	BL6-7	-	ND	30	18	-	-	-	-	-	-	-	-	-	-	-
	BL6-9	-	ND	34	20	-	-	-	-	-	-	-	-	-	-	-
BL-7 Camp Area	BL7-A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL7-2		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	-	-
	BL7-B	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	16	-	-
	BL7-4		19	23	12	ND	ND	ND	ND	ND	ND	0.2	ND	ND	-	-
	BL7-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL7-1		ND	38	29	ND	ND	ND	ND	ND	ND	0.2	ND	ND	-	-
	BL7-D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008	ND	ND	-	-
	BL7-5		ND	27	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	-	-
	BL7-E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL7-3		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	-	-
	Garage 1	ND	ND	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	Garage 2	ND	ND	36	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-

Location	Sample	F1 (ug/g)	F2 (ug/g)	F3 (ug/g)	F4 (ug/g)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	Aroclor 1254 (ug/g)	Aroclor 1260 (ug/g)
	Garage 3	ND	ND	123	27	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	Garage 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	Garage 5	ND	ND	159	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	Garage 6	ND	ND	72	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	FB1	ND	39	53	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	FB2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	FB3	ND	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	FB4	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
BL-8 Borrow Sources	BL8-1	-	-	-	-	ND	ND	173	16.1	ND	ND	ND	15.6	21	-	-
	BL8-2	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	16	-	-
	BL8-3	-	-	-	-	ND	ND	197	18.7	ND	ND	ND	17.7	23	-	-
	BL8-4	-	-	-	-	ND	ND	41	ND	ND	ND	ND	5.1	ND	-	-
	BL8-5	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL8-7	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	BL8-8	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	DUP1	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
	Avg. Conc.	-	75.6	91.5	56.0	1.4	1.8	77.4	9.0	18.8	33.0	0.107	9.4	100.2	-	-
	Stand. Dev.	-	161.5	234.5	135.3	-	0.7	59.3	4.6	20.4	31.1	0.1	3.8	104.8	-	-

*

*Four samples removed from sample set as soils were removed off site
Std. Dev. = Standard Deviation
Data collected from Figure 5a through Figure 5g (EBA, 2011)

2.3 Previous Monitoring Programs

The first round of the long-term monitoring program (Year 1) was conducted in 2011.

The post construction landfill monitoring frequency will follow the schedule recommended in the INAC AMSRP (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 monitoring program will conclude if after Phase I monitoring (5 years post remediation) an evaluation of the program confirms that there are no stability or environmental issues. Otherwise, monitoring will continue into Phase II. (i.e., up to 25 years post remediation). Another evaluation will be conducted at the end of 25 years to determine if monitoring should be concluded or enter phase III. If required, the Phase III monitoring requirements will be determined based on results of the previous monitoring program evaluations.

3.0 REGULATORY AND OTHER GUIDELINES

3.1 Groundwater

There was no groundwater guideline provided in the Cape Christian LTM plan. In the absence of site-specific guidelines, the AMSRP (INAC, 2009) guidance on post-construction monitoring indicates that "comparison to background and baseline values is recommended." The AMSRP (INAC, 2009) provides the following table for the assessment of analytical data in groundwater.

Table 3-1: Groundwater Assessment

Geochemical Assessment	**Acceptable**	**Marginal**	**Significant**	**Unacceptable**
Groundwater concentrations within average ± three standard deviations or within analytical variability	Performing as expected			
Increasing trend in contaminant data over 2 or more successive monitoring events (variation in excess of average ± three standard deviations or analytical variability)		Low risk of failure		
Groundwater concentrations in excess of three times average baseline concentrations in more than one monitoring event			Moderate risk of failure	
Where applicable, surface water concentrations in excess of surface water quality guidelines for the protection of aquatic life				Failure
Required Actions	Monitor as per schedule	Increase monitoring frequency. Monitor surface water quality, if applicable, in downgradient water bodies within 300 m.	Assess causes of increasing contaminant concentrations. Evaluate whether remediation is required.	Assess cause of contaminant concentrations. Develop remedial plan. Implement remedial plan.

This table is reproduced from AMSRP (INAC, 2009) Chapter 11, Table 4.2

FRANZ has used historical baseline data collected by EBA and presented in Section 2.2 to obtain the mean and standard deviation of analytical results for comparison with results from the 2013 field program. FRANZ obtained acceptable values for groundwater results from these tables (calculated as mean plus or minus three standard deviations). The 2013 analytical results were compared to the upper limit of acceptability (ULA) equal to the average

concentration ± 3 times of standard deviation of each parameter. Maximum acceptable values from these ranges are presented in groundwater analytical tables in Appendix B.

For some parameters, specifically PHCs, BTEX and PCBs sufficient data to support calculations of mean and standard deviation were not available. This is primarily due to the high frequency of not detected (nd) results for BTEX, PCBs and PHC compounds in collected samples.

In May 2010, Environment Canada (EC) under Federal Contaminated Sites Action Plan (FCSAP) released the *Federal Interim Groundwater Quality Guidelines* (FIGQG) for Federal Contaminated Sites. The guidelines were released based on the observed need for federal custodians and others to apply appropriate groundwater guidelines at federal sites. Previously, a mixture of provincial standards, federal surface water guidelines, and drinking water quality guidelines were applied to groundwater at federal sites. The FIGQGs remove the need for this patchwork of regulations, which were not consistently applied at federal sites. The FIGQGs were updated in November, 2012.

The FIGQGs were not developed with the scientific rigour associated with the CEQGs. Instead, Environment Canada requested the development of guidelines based on a review and evaluation of existing approaches in other jurisdictions.

The FIGQGs follow a tiered framework, consistent with the Canadian Soil Quality Guidelines development through the CCME. The tiers are:

- Tier 1: direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway;
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site; and
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

The FIGQGs are based on the consideration of a number of potential receptors and exposure pathways, including:

- Groundwater transport to surface water at least 10 m from the contamination and subsequent exposure of freshwater and marine life;
- Direct contact of soil organisms with contaminated groundwater;
- Use of groundwater for irrigation water;
- Use of groundwater for livestock watering;
- Groundwater transport to surface water at least 10 m from the contamination and subsequent ingestion by wildlife;

- Migration of contaminant vapours to indoor air and subsequent inhalation by humans; and
- Use of groundwater for human consumption (i.e., drinking water).

The generic guidelines are point estimates of a chemical concentration in groundwater associated with an approximate no- to low-effects level based on toxicological information about the chemical, along with a screening-level evaluation and environmental fate and transport and estimated intake rates, or exposure, by potential receptors. As a result, the Table 1 *Federal Interim Groundwater Quality Guidelines*, *Generic Guidelines for Residential/Parkland Land Uses* Tier 1 Lowest Guideline *Values* for coarse grained soil (FIGQG Table 1 Tier 1) were referenced for comparison purposes.

3.2 Soil

Similar to groundwater, FRANZ has used historical baseline soil data collected by EBA and presented in Section 2.2 to obtain the mean and standard deviation of analytical results for comparison with results from the 2013 field program. FRANZ calculated the mean plus or minus three standard deviations to obtain acceptable values for soil results. The 2013 soil analytical results were compared to the upper limit of acceptability (ULA) equal to the average concentration ± 3 times of standard deviation of each parameter. Maximum acceptable values from these ranges are presented in soil analytical tables in Appendix B. Sufficient data to support calculations of mean and standard deviation were not available for F1, BTEX and PCBs.

The soil standards or guidelines referenced for this evaluation are inclusive of the following:

- Abandoned Military Sites Remediation Protocol (AMSRP), Volume I – Main Report (INAC, 2009).
- *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CCME, 1999, with updates) for residential/parkland use, including fact sheets for benzene, toluene, ethylbenzene, and xylenes. Non-potable groundwater is stipulated and coarse grain material is assumed based on a 2009 grain-size analysis, field observation (generally sandy material) as well as for conservative reasons – being that coarse grain criteria are more stringent than those applied to fine grain.
- *Canada-Wide Standards for Petroleum Hydrocarbons in Soil* (CCME, 2008a) - Tier 1 Residential/Parkland, coarse-grained soil, non-potable groundwater.

As a preliminary and conservative determination of protection of human health and the environment at the site, Tier 1 levels of the CWS are applied to all analytical results where site specific values are not specified. The appropriate levels are presented with the laboratory

analytical data in tables. The rationale for the selection of the appropriate criteria is discussed below.

BTEX Compounds

For the BTEX compounds specifically, the CSQGs were used to determine the appropriate pathway-specific guidelines. For benzene, for example, the 2004 update was used, with the following assumptions:

- Residential/Parkland land use
- Coarse-grained soils
- 10^{-5} acceptable incremental risk
- With applicable guidelines the most conservative of:
    - Soil dermal contact guideline
    - Soil ingestion guideline
    - Eco soil contact

The groundwater check (drinking water) pathway was excluded, as groundwater in the area of Cape Christian is not used as a source of potable water. With its exclusion, the most conservative guideline for benzene applicable at the site is related to the protection of the pathway for the inhalation of indoor air (slab on grade), at 0.095 mg/kg; however, there are no buildings at the NHWL. The most conservative remaining guideline is therefore the ecological soil contact guideline, at 31 mg/kg. A similar process was used to determine the most conservative applicable guideline value for toluene, ethylbenzene and xylenes.

Petroleum Hydrocarbons

For petroleum hydrocarbons, the CWS-PHC was used to determine the appropriate pathway-specific guidelines. Pathway-specific guidelines can be found in the CWS-PHC Technical Supplement (CCME, 2008c).

4.0 INVESTIGATIVE METHODOLOGY

The Year 3 monitoring event was carried out at the Cape Christian LORAN site on August 9, 2013 by field assessors Julie Dittburner and Kim Krug of Franz Environmental Inc. and Noah Sholiga of Nunatta Environmental, accompanied by AANDC representative Allison Dunn. The site was accessed via an ATV. The road leading to Cape Christian from Clyde River was in good condition. Wildlife monitoring services were provided by John Berry of Clyde River, NU. During the field investigations, weather conditions were overcast, drizzle and temperatures around 5 ^{o}C. 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;
- Collection of soil samples; 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.

4.1 Health and Safety Kickoff Meeting

Before commencing with site activities, the site-specific health and safety plan (HASP) developed for the site visit was reviewed and any necessary revisions were made to include any changes of site conditions. 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 distributed, discussed with 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 in the AANDC Nunavut Regional Office.

4.2 Visual Inspections

The physical integrity of the NHWL and surrounding areas were assessed using systematic visual observations and empirical measurements to record evidences 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. Please note that the site photographs from 2013 are of poor resolution and views of site details are limited.

A portion of this photographic record appears in Appendix C; and is presented in its entirety on the accompanying CD ROM.

The Year 3 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 native Trimble files and the data dictionary are included in the appended CD ROM for use in future site investigations.

4.3 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.

As part of the investigation, a FRANZ representative interviewed people knowledgeable about surrounding areas. 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.

4.4 Groundwater Sampling

No frost action was observed around or inside the casing of the wells. Groundwater levels at all the monitoring wells were measured upon arrival at the site. One well (MW-3) was dry during the site visit. In comparison to the Year 1 monitoring event conducted in 2011, the water level in the wells had dropped moderately.

Groundwater samples were collected from the three monitoring wells (MW1, MW2 and MW4) installed around the NHWL. A peristaltic pump was used to purge the monitoring wells prior to sample collection. Wells were purged of three well volumes except where poor recharge rates made it necessary to sample sooner. During purging, a YSI 556 water quality meter was calibrated and used to measure *in situ* field parameters including temperature, conductivity, dissolved oxygen, turbidity, pH and oxidation-reduction potential. Sampling took place when these parameters stabilized. Water samples submitted for dissolved metals analyses were field-filtered.

Groundwater samples were submitted for various analytical parameters: total and dissolved metals, polychlorinated biphenyls (PCBs); petroleum hydrocarbons (PHCs); benzene, toluene, ethylbenzene and total xylenes (BTEX); suspended and dissolved solids; major ions; hardness; pH and conductivity. Due to limited sample volume, one duplicate sample was collected for general inorganics (MW2) and one was collected for PHCs (MW1). MW3 was dry; as a result, no sample was collected from that location. MW4 had a very low recharge rate; therefore the sample was just collected for PHCs analysis.

A summary of the samples that were collected and submitted for laboratory analysis during the Year 3 monitoring event is provided in

Table 4-1 below. Groundwater sample logs are included in Appendix E.

Table 4-1: Summary of groundwater sample collection near the NHWL.

Sample	Analytical Parameters
MW-1	- total and dissolved metals - PCBs - PHCs F1-F4 and BTEX - inorganics (major ions, TDS, TSS, colour, pH, conductivity)
DUP*	- PHCs F1-F4 and BTEX - inorganics (major ions, TDS, TSS, colour, pH, conductivity)
MW-2	- total and dissolved metals - PCBs - PHCs F1-F4 and BTEX - inorganics (major ions, TDS, TSS, colour, pH, conductivity)
MW-3	- dry
MW-4	- PHCs F1-F4

Note: * indicates a blind field duplicate of the sample listed directly above (DUP for PHCs/BTEX was from MW-1 and DUP for general inorganics was from MW-2).

All samples were collected in laboratory prepared sample bottles appropriate for the specified analyses. Water samples for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Additional details on the groundwater sampling are presented in the groundwater sample records provided in Appendix E.

4.5 Test Pitting and Soil Sampling

Soil sampling was completed by manual test pitting. Three test pits, identified as CC-SS1 to CC-SS3 (plus one duplicate) were manually advanced in the vicinity of the NHWL in areas of suspected staining to confirm or refute the staining as natural occurrence or potential landfill leachate. The background sample, CC-BK was collected approximately 160 m northwest of the NHWL.

A summary of the soil samples that were collected and submitted for laboratory analysis during the Year 3 monitoring event is provided in Table4-2 below.

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

Sample	Sample Location and Soil Description	Analytical Parameters
CC-SS1	Soils collected at north end of NHWL near northeast corner, where an erosion channel meets Feature J. Soils were sand, some gravel, brown, heavily stained, no odours	- total metals - PCBs - PHCs F1-F4 and BTEX
CC-SS2	Soils collected at north end of NHWL near northwest corner where erosion channel meets Feature N. Soils were sand and gravel, brown, heavily stained, sheen, organic odours. DUP1 collected here.	- total metals - PCBs - PHCs F1-F4 and BTEX
CC-SS3	Soils collected on west side of NHWL at the northwest corner. Possible seepage point. Soils were sand and gravel, brown, moist, stained, slight organic odour, no sheen.	- total metals - PCBs - PHCs F1-F4 and BTEX
CC-BK	Background soil sample. Soils collected approximately 160 m northwest of NHWL. Sample collected in similar stained soils. Soils were sand, brown, moist, no odours.	- total metals - PCBs - PHCs F1-F4 and BTEX

Test pitting was performed using a shovel, which was decontaminated with Alconox between sample collections. Surface soil samples were collected at a maximum depth of 0.15 m. Soil samples were collected from each test pit and placed in laboratory prepared jars for chemical analyses. Discrete soil samples and blind duplicates were collected as grab samples using disposable nitrile gloves for each sample. Fresh, sterile gloves were used at each sample location. Soil stratigraphy was logged and photos taken before backfilling the test pits with excavated soil.

A total of four soil samples were submitted for laboratory analysis for petroleum hydrocarbons (PHCs) fractions F1-F4 and benzene, toluene, ethylbenzene and xylenes (BTEX) as well as metals and polychlorinated biphenyls (PCBs). One field duplicate sample (D1) was analyzed for QA/QC purposes. Professional judgment and visual observations were used to select the locations sampled and submitted for laboratory analysis. Samples submitted for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Test pit locations are indicated on Figure A-1; Appendix A.

4.6 Quality Assurance and Quality Control

Field personnel employed FRANZ's Quality Assurance/Quality Control (QA/QC) protocols, including appropriate techniques for soil sampling, sample storage, shipping and handling, as

well as collection of duplicates. Additional discussion of QA/QC methodology is provided below in Section 4.6.2.

4.6.1 Field

Soil samples collected for potential laboratory analysis were placed in polyethylene bags and laboratory prepared 125 mL glass jars fitted with screw-tight Teflon-lined lids. Groundwater samples were collected from monitoring wells and placed in a variety of appropriately sized and prepared laboratory vessels. Sample numbers were clearly marked on the containers. The soil jars and water bottles were filled to capacity with minimum headspace and stored in coolers with cold packs to moderate temperature fluctuations during transport to the laboratory. To prevent cross contamination, samples were collected with fresh nitrile gloves. Where soil samples were impossible to obtain by hand, a stainless steel trowel or shovel was used and decontaminated between samples.

As a quality control measure, one soil and one groundwater blind field duplicate samples were collected and analyzed for PHC fractions F1-F4, BTEX, metals and PCBs. The water samples were also analyzed for colour, pH, conductivity, total dissolved solids and major ions.

The samples were transported to the project laboratory accompanied by a Chain of Custody form. Copies of the Chain of Custody forms are provided in Appendix D.

4.6.2 Laboratory

To assess the reliability of the laboratory data, duplicate samples were taken for approximately every five samples collected by FRANZ. One blind field duplicates were collected in the soil sampling program, and one blind field duplicate was collected in the groundwater sampling program.

For soil duplicates, FRANZ personnel generated the duplicate samples by alternately placing approximately 50 percent of the sample volume into the primary sample container and then placing the same amount into the duplicate container. Similarly, for duplicated water samples, field staff placed aliquots of approximately 50 percent of the container volume into each container until both containers were filled.

Analytical data quality was assessed by submission of the following:

- Soil samples CC-SS2 (primary) and D1 (soil duplicate), were analyzed for petroleum hydrocarbons (PHCs), polychlorinated biphenyls (PCBs) and metals.
- Groundwater samples MW-1 and MW-2 (primary) and DUP (water duplicate) were analyzed for PHCs and general inorganics.

Sampling procedures and laboratory analytical precision are evaluated by calculating the relative percent difference (RPD) for a sample and duplicate pair according the following equation:

$$RPD = | X_1 - X_2 | / X_{avg} \times 100$$

where: X_1 and X_2 are the duplicate concentrations and X_{avg} is the mean of these two values. The duplicate results were evaluated using criteria developed by Zeiner (1994), which draws from several data validation guidelines developed by the United States Environmental Protection Agency (USEPA). According to these criteria, the RPD for duplicate samples should be less than 20% for aqueous samples, and less than 40% for solid samples. RPDs can only be calculated when the compound is detected in both the original and the duplicate sample at a concentration five times above the reportable detection limit (or method detection limit - MDL). Alternative criteria are used to evaluate duplicate pairs where one or both of the results are less than five times the MDL, or where one or both of the results is less than the MDL (i.e. nd or 'not-detected'). The alternative criteria used for the evaluation of the data, adapted from Zeiner (1994), are presented in Table 4-3 below. When both concentrations are less than the MDL, no calculation/evaluation criterion is required.

Table 4-3: Criteria for the Evaluation of Blind and Duplicate Sample Results

Scenario	Result A	Result B	Criteria for Acceptance	
			Aqueous (water)	Soil (Soil)
A	nd	nd	Acceptable precision; no evaluation required	
B	nd	positive	result B – 0.5 x MDL < MDL	result B – 0.5 x MDL < 2 x MDL
C	positive and > 5 x MDL	positive and > 5 x MDL	RPD < 20%	RPD < 40%
D	positive and < or = 5 x MDL	positive	|result B – result A| < MDL[1]	|result B – result A| < 2 x MDL[1]

Source: Zeiner, S.T., Realistic Criteria for the Evaluation of Field Duplicate Sample Results, Proceedings of Superfund XV, November 29-December 1, 1994, Sheraton Washington Hotel, Washington, D.C. – modified to use Method Detection Limit (MDL) or Reportable Detection Limit (RDL) in lieu of the Quantitation Limit (QL), the Instrument Detection Limit (IDL) and/or Laboratory Reporting Limit (LRL).

Notes:

nd – not detected
RPD – relative percent difference, |result A - result B| / |(result A + result B)/2|
1. When result reported was less than half the quantitation limit, half the limit was used in the equation.

The precision is considered acceptable when the evaluation criteria are met or when both results are below the MDL. When the evaluation criteria are not satisfied, the following apply:

- nd vs. positive – unacceptable precision: the positive result is considered an estimate and the nd result is considered inconclusive.
- Positive vs. positive – unacceptable precision: the results are considered an estimate.

Refer to Section 5.6 for a discussion on QA/QC results.

4.7 Laboratory Analytical Program

Soil and groundwater samples were sent to Maxxam Analytics in Ottawa, Ontario for chemical analyses of the target compounds previously identified. Maxxam is certified by the Canadian Association for Laboratory Accreditation, Inc. (CALA) and has an internal QA/QC protocol. The laboratory QA/QC documentation is provided with the analytical report and was reviewed by FRANZ as part of the QA/QC protocol. The laboratory Certificates of Analysis and Chain of Custody forms are presented in Appendix D.

5.0 NON-HAZARDOUS WASTE LANDFILL (NHWL)

5.1 Area Summary

The NHWL is located in the Lower Site Landfill Area, between the Beach and Lake Areas of the Cape Christian LORAN site. Monitoring of the landfill included visual observations to assess its physical integrity including evidence of erosion, ponding, frost action, settlement and lateral movement. Groundwater samples were collected at locations up- and downgradient (MW1, MW2 and MW4) of the NHWL. Soil samples were collected in areas of staining near the NHWL and one soil background sample was collected 160 m northwest of NHWL for comparison purposes. The visual inspection report, including supporting photos and drawing, is presented in the following pages.

5.2 Photographic Record

The photographic record of the NHWL has been completed as per the Statement of Work (Photographs 1 to 84; CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix C. The complete record of full-resolution photographs is provided in the attached CD-ROM.

5.3 Visual Inspection Report

Monitoring consisted of visual observations and empirical measurements of the NHWL to assess its physical integrity. Evidences of erosion, ponding, frost action, settlement and lateral movement were investigated. 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 Cape Christian LTM plan has been completed and is included in Table 5-3 of this report. Table 5-1 and associated Table 5-2 present the preliminary visual inspection results for the NHWL at Cape Christian.

Table 5-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill

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

Table 5-2: 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

There were six areas of minor settlement observed at the toe of the landfill in 2011 (see Features A, C, E, G, H, and K, Figure A-1; Appendix A). Three of these areas (A, G, and K) also had orange staining. Six areas of ponded water were observed near the NHWL: Two were adjacent to the toe of the NHWL (see Features J and O); three of these areas (see Features L, M, and N) appear to be the result of the equipment used to construct the NHWL. In 2011, wet conditions were encountered and water was pooled in what appeared to be tracks left by the heavy equipment; though these three features are not believed to be the result of settlement, they are noted for comparison to future observations. Much dryer site conditions were

encountered during the 2013 monitoring activities. Six features identified in 2011 as having ponded water were observed to be dry during the 2013 site visit.

Ponded water was observed in one area near the NHWL: Feature N (Figure A-1; Appendix A and Photographs 82 to 84; CD-ROM) is likely the result of the equipment used to construct the NHWL. These settlement and ponding areas do not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Two sinkholes were still observed near the toe of the NHWL (see Features D and F, Figure A-1; Appendix A and Photographs 55 and 59; CD-ROM) during the Year 3 monitoring event. Neither of the sinkholes contained water during the site visit. The size of one of the sinkhole slightly increased.

There were no areas of settlement and areas of ponded water and saturated soils observed on top of the landfill cap during the site visit.

Erosion

Evidence of newly developed minor erosion was observed on the north end of the NHWL (see Features N, M and J, Figure A-1; Appendix A). However, it does not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Frost Action

No cracking was observed surrounding the landfill on the native soils suggesting frost action in and outside of the landfill extents was not significant. 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 and the very course materials used to construct the landfill cap, reestablishment of vegetation is likely to take a significant amount of time. No vegetation growth was observed on the top or sides of the landfill.

Staining

Several areas of orange staining were observed surrounding the landfill. Soil was collected from three (3) locations around Features L, N, and A where the staining was observed. Two new areas of staining were observed on the west side of the landfill (Features P and Q, Photographs 80 and 81). These areas were dry and no ponded water was observed. They are not considered to be seepage points.

Seepage Points

One potential seepage point was observed at the southwest corner of the NHWL during the 2011 site visit. However, the area was dry during the 2013 site visit.

Exposed Debris

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

Discussion

The features discussed above are currently considered to be of little consequence to the physical integrity of the NHWL. All physical observations indicate that the NHWL is performing as designed and is containing the enclosed waste. Care should be taken during future monitoring events to observe the condition of Feature E identified during the 2011 site visit at the southwest corner of the NHWL for further evidence of settlement or potential seepage.

Although the overall performance of the landfill is presently considered acceptable, as it was observed during the Year 1 monitoring event and again in Year 3, the grading of the landfill cap is poor, inconsistent, and does not appear to maintain a consistent grade. It was also observed that the landfill cap consisted of many different particle sizes (i.e., small cobbles to fines). The inconsistent grading and particle size selection has led to many small undulations on the cap. A potential increase in water infiltration, over time, may cause excessive erosion, possible settlement issues, and potential seepage issues around the landfill perimeter in subsequent years.

Table 5-3 below summarizes the results of the visual inspection.

Table 5-3: Cape Christian – Visual Monitoring Checklist

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Settlement	A	8 m south of the northwest corner of the NHWL	22.7	0.8	0.02	<1%	A possible seepage area with small drain connected. Ponded water with staining at two locations. One of the locations had orange staining.	Soil sample CC-SS3 collected by the south end of the possible seepage area	51
Settlement	B	15 m south of the northwest corner of the NHWL	11.8	0.03	0	<1%	Minor settlement cracks. No noticeable change was observed in 2013 site visit		52-53
Settlement	C	23 m south of the northwest corner of the NHWL	8.9 m^2			<1%	Dry and stains at toe of NHWL		54
Settlement	D	22 m south of the northwest corner of the NHWL	0.3 m^3			<1%	Sinkhole	Volume calculated using the width of 1 m and the maximum depth of 0.3 m in 2013	55
Settlement	E	Southwest corner of the NHWL	66.4 m^3			<1%	Dry with staining	Dry in 2013, soils not saturated	56-58
Settlement	F	Southwest corner of the NHWL	0.5 m^3			<1%	Sinkhole	Volume calculated using the width of 1.0 m and the maximum depth of 0.5 m in 2013	59
Settlement	G	6 m east of the southwest corner of the NHWL	35.4 m^3			<1%	Dry, No staining	Dry in 2013, soils not saturated, moss growth	60-61
Settlement	H	Northeast corner of the NHWL	45.6 m^3			<1%	Dry. No staining	Standing water in the area during the 2011 site visit, dry in 2013	63
Settlement	I	11 m northeast of the northeast corner of the NHWL	14.6 m^3			<1%	Saturated soils, No ponding and staining	Was identified as a drainage area with vegetation during the 2011 site visit, area is saturated but not ponded in 2013	64
Settlement	J	20 m west of the northeast corner of the NHWL	4.9 m^2			<1%	Ponded water with staining	Remains unchanged	65
Settlement	K	13 m east of the northeast corner of the NHWL	7.2 m^2			<1%	Ponded water with staining	Remains unchanged	66
Settlement	L	22 m east of the northeast corner of the NHWL	18.2 m^2			<1%	Ponded water with staining may be due to equipment tracks	Soil sample CC-SS1 collected from this area	67-68
Settlement	M	32 m east of the northeast corner of the	38.4 m^2			<1%	Ponded water with staining may be due to equipment tracks		69-70

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
		NHWL							
Settlement	N	15 m east of the northwest corner of the NHWL	89 m^2			<1%	Ponded water with staining may be due to equipment tracks, size has increased	Soil sample CC-SS2 collected from this area	71, 82-84
Settlement	O	21 m east of the southeast corner of the NHWL	85.2 m^2			<1%	Dry with staining	Ponded water with staining in 2011, dry with staining in 2013	73-75
Staining	P	10 m west of toe of NHWL	56.5 m^2			<1%	Soil staining, soils are dry, no ponding of water	New feature in 2013	81
Staining	Q	12 m west of toe of NHWL	17.6 m^2			<1%	Stained soils, dry, no ponding or seepage	New feature in 2013	80

5.4 Analytical Results – Groundwater Samples

As described in Section 4.4, a total of four groundwater samples (three samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario. Two of the samples (MW1 and MW2) were submitted for analyses of petroleum hydrocarbons (PHCs), metals, PCBs and inorganic parameters and one sample (MW-4) was submitted from for analyses of PHCs only.

FRANZ obtained acceptable values for groundwater results from baseline groundwater data collected by EBA (see Section 2.2). The 2013 analytical results were compared to the upper limit of acceptability (ULA) equal to the average concentration ± 3 times of standard deviation of each parameter. Additionally, analytical results were compared to the FIGQGs. Analytical results are discussed below.

PHCs

Concentrations for all parameters were below laboratory reportable detection limits (see Table B-1; Appendix B).

Metals

Analytical results for dissolved and total metals in groundwater are shown in Table B-2 and Table B-3; Appendix B. Water sampled from MW1 and MW2 had concentrations of total and dissolved for multiple parameters above the laboratory detection limits. The following parameters reported concentrations above the FIGQGs for total metals: aluminum, cadmium, chromium, copper, iron, lead and zinc. Cadmium, copper, iron and zinc also reported concentrations for dissolved metals above the FIGQGs.

In addition to the metal parameters listed that exceeded the FIGQGs, a number of parameters for both total and dissolved metals were reported at concentrations above the limit of acceptability derived from the baseline data. These include: arsenic, calcium, cobalt, magnesium, manganese, nickel, potassium and sodium. The upper limit of acceptability is an indication of trends in groundwater concentration and is not a science-based guideline for human health or the environment. As a result, exceedances of the ULA only indicate that trends in groundwater may be changing. At Cape Christian, this may have been the result of samples collected from wells where limited groundwater was available for purging before sampling, which tends to elevate groundwater concentrations of contaminants.

Well MW3 was dry. Groundwater was insufficient for sampling at MW4. As such no groundwater samples were collected from MW3 and MW4 for the analyses of metal parameters.

Monitoring wells at the site have been constructed in an environment where permafrost is prevalent. Frost action can affect the bentonite seal at ground surface around the well itself and

well casing. This could potentially allow for transport of metals from the natural surface water environment to the groundwater environment via infiltration.

Although a number of metals were above the upper limit of acceptability calculated from the baseline data, many of them were below the FIGQGs. The remaining parameters marginally exceeded the FIGQGs. These concentrations are not of an immediate concern; however should be monitored during future sampling events.

PCBs

The PCBs concentrations for all samples were below the laboratory detection limit (see Table B-3; Appendix B).

Inorganics

Laboratory analytical results for inorganics are shown in Table B-5; Appendix B. Concentrations of orthophosphate (P) were reported below the laboratory detection limit in both MW1 and MW2.

Concentrations of nitrate (N) and nitrite (N) were reported below the laboratory detection limit in MW1 only. All other inorganics and calculated parameters reported concentrations above the laboratory detection limit. Concentrations of fluoride were reported above the FIGQGs and the pH was reported outside the range of 6.5 – 9.

Laboratory certificates of analyses for the 2013 groundwater samples are provided in Appendix D.

5.5 Analytical Results – Soil Samples

As described in section 4.5, a total of five soil samples (four samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of PHCs, metals and PCBs. Analytical results are discussed below.

PHCs

Laboratory analytical results and selected provincial standards and federal guidelines for PHCs are shown in Table B-6; Appendix B. As shown in the table, most soil PHCs concentrations were below the reportable detection limit in 2013. PHCs which were detected in one sample were limited to the F2 and F3 fractions, with concentrations well below the selected standards and guidelines applied to the site.

Metals

Laboratory analytical results and selected federal and site specific criteria for metals are shown in Table B-7; Appendix B. As shown in the table, concentrations satisfied the guideline criteria applied to the site in 2013.

PCBs

Laboratory analytical results and selected federal guidelines for PCBs are shown in Table B-8; Appendix B. Neither provincial nor site-specific guidelines exist for PCBs and federal guidelines provide a criterion for total PCBs only. As shown in the table, concentrations all satisfied the guideline criterion applied to the site in 2013.

Laboratory certificates of analyses for the 2013 soil samples are provided in Appendix D.

5.6 QA/QC Discussion

In order to obtain the required minimum of 20% duplicate samples, as stipulated in Cape Christian LTM Plan, one duplicate groundwater sample and one duplicate soil sample were collected during the 2013 monitoring activities. Analytical results for submitted samples and their duplicate pairs were compared to provide an indication of the precision of both the field sampling and laboratory analyzing methods. Results are presented along with chemical data in Tables B-1 through B-8, Appendix B.

The groundwater duplicate pairs analyzed for PHCs and inorganics fell within limits of QA/QC acceptability. The soil duplicate pair analyzed for PHCs and PCBs fell within the limits of acceptability. However, four metal parameters (sulphur, arsenic, copper and thallium) fell outside the RPD acceptability of 40 percent. The high RPDs highlight the difficulty in obtaining true soil duplicates. While every effort was made in the field to obtain good-quality duplicates, the nature of the contaminants the NHWL is expected to be very difficult to homogenize, such as small, discrete particles of metal materials might be present that could cause large differences in concentrations between primary and duplicate samples.

The internal laboratory quality control for analyses meets acceptability criteria. Therefore based on both laboratory and field QA/QC results, the data is reliable for its intended use. Laboratory QA/QC results are included in the laboratory certificates of analyses provided in Appendix D.

6.0 SURROUNDING AREAS

As proposed, an inspection of outlying areas on site was completed during Year 3 monitoring event.

The road from Clyde River to Cape Christian was in a good condition and the team arrived at the site by an ATV.

Areas surrounding the landfill site were visually scarred from the remediation activities of previous years and activity in the area this past summer. The areas directly surrounding the landfill site were mostly void of vegetation due to the aforementioned remediation activities. A low drainage area was present directly south of the landfill site and contained some ponding water, which eventually terminated at the ocean shoreline.

One building remained intact to the southeast of the landfill site. The building was left intact, at the request of the Hamlet of Clyde River, for the purpose of serving as a storm shelter for hunters and trappers frequenting the area. This building is now the responsibility of the Hamlet of Clyde River to maintain. Evidence of terrain vehicle traffic was observed in the form of tracks on the roadways and tundra on-site, as well as on surrounding lands.

7.0 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 in human and wildlife use of the site. The Cape Christian 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
- Re-vegetation of disturbed areas versus previous years

Wildlife and Human Activity

FRANZ interviewed Mr. John Barry, the wildlife monitor, who has lived in Clyde River for his whole life. According to Mr. Barry, the following wildlife frequent the area on a regular basis:

- Ptarmigans;
- Foxes;
- Polar bears;
- Canada geese;
- Canada goose (white);
- Ringed seals;
- Arctic Char;
- Bowhead Whales;
- Small birds (i.e bunting birds);
- Seagulls;
- Loons;
- Ravens; and
- Arctic hare.

Mr. Barry indicated that there are fewer animals than used to be in the area. The area is often used for hunting and fishing. However, more data are required to establish the long-term trend of animal activities at the site.

Re-establishment of Vegetation

Based on the regional setting of this site and material used on the site, reestablishment of vegetation is likely to take a significant amount of time. Only berries (Kunaliks) were observed in the re-graded areas.

8.0 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 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 9, 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.

9.0 REFERENCES

EBA Engineering Consultants, March 2011, Remediation Closure Report for Cape Christian Long-Range Navigation (LORAN) Station near Clyde River, Nunavut.

Indian and Northern Affairs Canada, February 10, 2009. *Cape Christian Long-Term Monitoring Plan*

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

Franz Environmental Inc., 2012. *Long Term Monitoring, 2011, Cape Christian, Nunavut.*

10.0 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.

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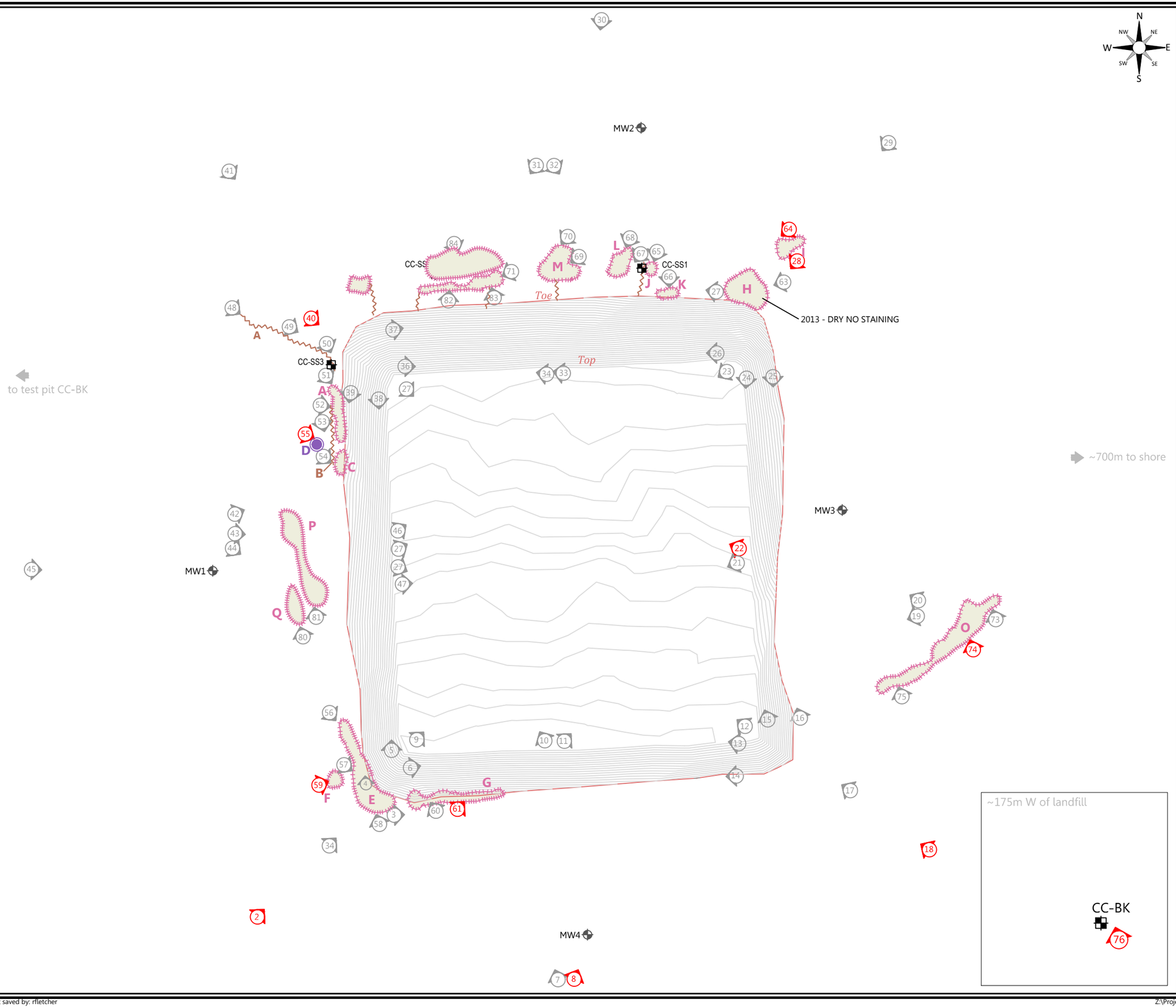
APPENDIX A

Figures



Legend

- MW — Monitoring Well Locations
- TP — Test Pit Locations
- 25 — Picture Viewpoint Number
- 8 — Viewpoint Photograph Included in Appendix F
- A — Staining or Seepage
- Sinkhole
- Settlement
- A — Feature Reference Letter

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: Cape Christian 1697-1301

Date: October 2013

Client: Aboriginal Affairs and Northern Development Canada

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metres

Figure A-1

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APPENDIX B

Tables

Table B-1
Ground Water Chemical Concentrations - PHCs

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MW-1	DUP	Duplicate Evaluation		MW-2	MW-4
				09/08/2013	09/08/2013	RPD (%)	Acceptable	09/08/2013	09/08/2013
BTEX & F1 Hydrocarbons (ug/L)									
Benzene	140	NA	0.20	<0.20	<0.20	N/A	Y	<0.20	<0.20
Toluene	83	NA	0.20	0.26	0.27	4	Y	<0.20	<0.20
Ethylbenzene	1100	NA	0.20	<0.20	<0.20	N/A	Y	<0.20	<0.20
o-Xylene	NC	NA	0.20	<0.20	<0.20	N/A	Y	<0.20	<0.20
p+m-Xylene	NC	NA	0.40	<0.40	<0.40	N/A	Y	<0.40	<0.40
Total Xylenes	3900	NA	0.40	<0.40	<0.40	N/A	Y	<0.40	<0.40
F1 (C6-C10)	810	NA	25	<25	<25	N/A	Y	<25	<25
F1 (C6-C10) - BTEX	NC	NA	25	<25	<25	N/A	Y	<25	<25
F2-F4 Hydrocarbons (ug/L)									
F2 (C10-C16 Hydrocarbons)	1300	NA	100	<100	<100	N/A	Y	<100	<100
F3 (C16-C34 Hydrocarbons)	NC	NA	100	<200	<200	N/A	Y	<200	<200
F4 (C34-C50 Hydrocarbons)	NC	NA	100	<200	<200	N/A	Y	<200	<200
Reached Baseline at C50	NA	NA	NA	Yes	Yes	NC	NC	Yes	Yes

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NA = Not Applicable
NC = No Criteria
RDL= Reportable Detection Limit
RPD= Relative Percent Difference
20 = Exceeds FIGQGs.

Table B-2
Ground Water Chemical Concentrations - Total Metals

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MW-1	MW-2
				09/08/2013	09/08/2013
Metals (µg/L)					
Total Aluminum (Al)	100	NA	3.0	1900	180
Total Antimony (Sb)	2000	NA	0.60	<0.60	<0.60
Total Arsenic (As)	5	0.0065	0.20	1.8	0.91
Total Barium (Ba)	500	NA	10	13	45
Total Beryllium (Be)	5.3	NA	1.0	<1.0	<1.0
Total Boron (B)	5000	NA	20	130	30
Total Cadmium (Cd)	0.017	0.0023	0.005	0.037	0.16
Total Calcium (Ca)	NA	153	300	56000	110000
Total Chromium (Cr)	8.9	1.1	1.0	36	1.7
Total Cobalt (Co)	NA	0.031	0.30	0.74	31
Total Copper (Cu)	2	0.031	0.20	11	8.4
Total Iron (Fe)	300	51	60	840	29000
Total Lead (Pb)	2	0.356	0.20	38	0.40
Total Lithium (Li)	NA	NA	20	<20	<20
Total Magnesium (Mg)	NA	99.5	200	53000	60000
Total Manganese (Mn)	NA	9.7	4.0	120	5900
Total Molybdenum (Mo)	73	NA	0.20	9.5	2.1
Total Nickel (Ni)	83	1.18	0.50	32	47
Total Phosphorus (P)	NA	NA	100	<100	<100
Total Potassium (K)	NA	267	300	15000	12000
Total Selenium (Se)	1	NA	0.20	0.31	0.35
Total Silicon (Si)	NA	NA	100	4100	5600
Total Silver (Ag)	0.1	NA	0.10	<0.10	<0.10
Total Sodium (Na)	NA	1054	500	120000	90000
Total Strontium (Sr)	NA	NA	20	330	540
Total Sulphur (S)	NA	NA	200	13000	12000
Total Thallium (Tl)	0.8	NA	0.20	<0.20	<0.20
Total Tin (Sn)	NA	NA	1.0	<1.0	<1.0
Total Titanium (Ti)	100	NA	1.0	19	9.8
Total Uranium (U)	15	NA	0.10	5.4	0.39
Total Vanadium (V)	NA	NA	1.0	2.7	1.7
Total Zinc (Zn)	10	2.19	3.0	8.6	71

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NA = Not Available
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds FIGQGs.

Table B-3
Ground Water Chemical Concentrations - Dissolved Metals

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MW-1	MW-2
				09/08/2013	09/08/2013
Metals (µg/L)					
Dissolved Aluminum (Al)	100	NA	3.0	28	32
Dissolved Antimony (Sb)	2000	NA	0.60	<0.60	<0.60
Dissolved Arsenic (As)	5	0.0044	0.20	1.4	0.72
Dissolved Barium (Ba)	500	NA	10	12	47
Dissolved Beryllium (Be)	5.3	NA	1.0	<1.0	<1.0
Dissolved Boron (B)	5000	NA	20	95	<20
Dissolved Cadmium (Cd)	0.017	0.0012	0.005	0.031	0.21
Dissolved Calcium (Ca)	NA	NA	300	54000	110000
Dissolved Chromium (Cr)	8.9	1.653	1.0	<1.0	<1.0
Dissolved Cobalt (Co)	NA	0.025	0.30	<0.30	32
Dissolved Copper (Cu)	2	0.02	0.20	1.3	6.1
Dissolved Iron (Fe)	300	NA	60	190	28000
Dissolved Lead (Pb)	2	NA	0.20	<0.20	<0.20
Dissolved Lithium (Li)	NA	NA	20	<20	<20
Dissolved Magnesium (Mg)	NA	NA	200	53000	63000
Dissolved Manganese (Mn)	NA	NA	4.0	81	6100
Dissolved Molybdenum (Mo)	73	NA	0.20	8.7	2.0
Dissolved Nickel (Ni)	83	0.7	0.50	2.0	44
Dissolved Phosphorus (P)	NA	NA	100	<100	<100
Dissolved Potassium (K)	NA	NA	300	15000	12000
Dissolved Selenium (Se)	1	NA	0.20	0.31	0.33
Dissolved Silicon (Si)	NA	NA	100	3400	5700
Dissolved Silver (Ag)	0.1	NA	0.10	<0.10	<0.10
Dissolved Sodium (Na)	NA	NA	500	120000	94000
Dissolved Strontium (Sr)	NA	NA	20	320	570
Dissolved Sulphur (S)	NA	NA	200	13000	12000
Dissolved Thallium (Tl)	0.8	NA	0.20	<0.20	<0.20
Dissolved Tin (Sn)	NA	NA	1.0	<1.0	<1.0
Dissolved Titanium (Ti)	100	NA	1.0	<1.0	<1.0
Dissolved Uranium (U)	15	NA	0.10	2.7	0.38
Dissolved Vanadium (V)	NA	NA	1.0	<1.0	<1.0
Dissolved Zinc (Zn)	10	1.425	3.0	<3.0	84

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NA = Not Available
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds FIGQGs.

Table B-4
Ground Water Chemical Concentrations - PCBs

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	Upper Limit of Acceptability[2]	RDL	MW-1	MW-2
				09/08/2013	09/08/2013
PCBs (ug/L)					
Aroclor 1016	NC	NA	0.010	<0.010	<0.010
Aroclor 1221	NC	NA	0.010	<0.010	<0.010
Aroclor 1232	NC	NA	0.010	<0.010	<0.010
Aroclor 1242	NC	NA	0.010	<0.010	<0.010
Aroclor 1248	NC	NA	0.010	<0.010	<0.010
Aroclor 1254	NC	NA	0.010	<0.010	<0.010
Aroclor 1260	NC	NA	0.010	<0.010	<0.010
Aroclor 1262	NC	NA	0.010	<0.010	<0.010
Aroclor 1268	NC	NA	0.010	<0.010	<0.010
Total PCB	NC	NA	0.010	<0.010	<0.010

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds FIGQGs.

Table B-5
Ground Water Chemical Concentrations - Inorganics

PARAMETER		**CCME FIGQGs**[1]	**Upper Limit of Acceptability**[2]	**RDL**	**MW-1**	**MW-2**	**DUP**	**Duplicate Evaluation**	
Sample ID									
Date					09/08/2013	09/08/2013	09/08/2013	RPD (%)	Acceptable
Inorganics	**Units**								
Colour	TCU	NC	NA	20	5.0	610	930	43	Y
Conductivity	umho/cm	NC	NA	1.0	1300	1600	1800	11	Y
Total Dissolved Solids	mg/L	3000	NA	10	780	1520	1550	2	Y
Fluoride (F-)	mg/L	0.12	NA	0.10	0.34	0.22	<0.10	---	Y
Orthophosphate (P)	mg/L	NC	NA	0.010	<0.010	<0.050	<0.050	---	Y
pH	pH	6.5-9	NA	NC	8.08	5.26	6.56	22	Y
Total Suspended Solids	mg/L	NC	NA	3.0	10	81	76	6	Y
Dissolved Sulphate (SO4)	mg/L	100	296	1.0	37	28	26	7	Y
Dissolved Chloride (Cl)	mg/L	NC	1505	6.0	250	450	480	6	Y
Nitrite (N)	mg/L	0.060	NA	0.010	<0.010	0.035	0.036	3	Y
Nitrate (N)	mg/L	13.0	1636	0.10	<0.10	0.30	0.24	22	Y
Nitrate + Nitrite	mg/L	NC	NA	0.10	<0.10	0.34	0.28	20	Y
Hardness (CaCO3)	mg/L	NC	908	0.50	350	540	NA	---	Y

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.1. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NA = Not Available
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds FIGQGs.
RPD = Relative Percent Difference

Table B-6
Soil Chemical Concentrations - PHCs

PARAMETER	Federal		Upper Limit of Acceptability[3]	RDL							
Sample ID					**CC-SS1**	**CC-SS2**	**CC-DUP1**	**Duplicate Evaluation**		**CC-SS3**	**CC-BK**
Date	**CCME [1] Residential/ Parkland**	**CWS for PHC in Soil (<1.5m)[2]**			09/08/2013	09/08/2013	09/08/2013	RPD (%)	Acceptable	09/08/2013	09/08/2013
Depth (m)					0 - 0.15	0 - 0.15	0 - 0.15			0 - 0.15	0 - 0.15
BTEX & F1 Hydrocarbons (ug/g)											
Benzene	**31**	NC	NC	0.005	<0.005	<0.005	<0.005	N/A	Y	<0.005	<0.005
Toluene	**75**	NC	NC	0.02	<0.02	<0.02	<0.02	N/A	Y	<0.02	<0.02
Ethylbenzene	**55**	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
o-Xylene	NC	NC	NC	0.02	<0.02	<0.02	<0.02	N/A	Y	<0.02	<0.02
p+m-Xylene	NC	NC	NC	0.04	<0.04	<0.04	<0.04	N/A	Y	<0.04	<0.04
Total Xylenes	**95**	NC	NC	0.04	<0.04	<0.04	<0.04	N/A	Y	<0.04	<0.04
F1 (C6-C10)	NC	NC	NC	10	<10	<10	<10	N/A	Y	<10	<10
F1 (C6-C10) - BTEX	NC	**30**	NC	10	<10	<10	<10	N/A	Y	<10	<10
F2-F4 Hydrocarbons (ug/g)											
F2 (C10-C16 Hydrocarbons)	NC	**150**	560	10	<10	<10	<10	N/A	Y	86	<10
F3 (C16-C34 Hydrocarbons)	NC	**300**	795	50	<50	<50	<50	N/A	Y	68	<50
F4 (C34-C50 Hydrocarbons)	NC	**2800**	461	50	<50	<50	<50	N/A	Y	<50	<50
Reached Baseline at C50	N/A	N/A	N/A	N/A	Yes	Yes	Yes	N/A	Y	Yes	Yes

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in coarse-grained surface soils. Protection of Eco Soil Contact from Table 1 - Technical Supplement.

3 = Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

N/A = Not applicable
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds selected guideline.

Table B-7
Soil Chemical Concentrations - Metals

PARAMETER	Federal											
Sample ID	**CCME[1] Residential/ Parkland**	**CCME[2] Human Health Ingestion (H) / Eco Soil Contact (E)**	**INAC DEW Line Cleanup Criteria, Tier II**	**Upper Limit of Acceptability[3]**	**RDL**	**CC-SS1**	**CC-SS2**	**CC-DUP1**	**Duplicate Evaluation**		**CC-SS3**	**CC-BK**
Date						09/08/2013	09/08/2013	09/08/2013	RPD (%)	Acceptable	09/08/2013	09/08/2013
Depth (m)						0 - 0.15	0 - 0.15	0 - 0.15			0 - 0.15	0 - 0.15
Metals (ug/g)												
Sulphur (S)	NC	NC	NC	NC	50	74	150	81	60	N	<50	150
Antimony (Sb)	**20**	NC	NC	NC	0.20	<0.20	<0.20	<0.20	N/A	Y	<0.20	<0.20
Arsenic (As)	**12**	12H 17E	30	1.4	1.0	<1.0	2.3	1.4	47	N	<1.0	1.3
Barium (Ba)	**500**	NC	NC	NC	0.50	9.5	44	29	40	Y	6.2	29
Beryllium (Be)	**4.0**	NC	NC	NC	0.20	<0.20	0.21	<0.20	0.05	Y	<0.20	<0.20
Boron (B)	NC	NC	NC	NC	5.0	<5.0	<5.0	<5.0	N/A	Y	<5.0	<5.0
Cadmium (Cd)	10	NC	**5.0**	3.9	0.10	<0.10	<0.10	<0.10	N/A	Y	<0.10	<0.10
Chromium (Cr)	**64**	220H 64E	250	952	1.0	7.4	16	13	20	Y	36	11
Cobalt (Co)	50	NC	**50**	23	0.10	1.4	5.6	3.9	33	Y	3.3	3.6
Copper (Cu)	**63**	1100H 63E	100	80	0.50	2.0	11	6.7	48	N	1.5	4.7
Lead (Pb)	**140**	140H 300E	500	126	1.0	1.8	4.9	3.7	18.0	Y	2.6	3.2
Molybdenum (Mo)	**10**	NC	NC	NC	0.50	<0.50	<0.50	<0.50	N/A	Y	<0.50	<0.50
Nickel (Ni)	**50**	50E	100	21	0.50	2.4	9.0	6.2	36.0	Y	4.7	5.6
Selenium (Se)	**1.0**	80H 1E	NC	NC	0.50	<0.50	<0.50	<0.50	N/A	Y	<0.50	<0.50
Silver (Ag)	**20**	NC	NC	NC	0.20	<0.20	<0.20	<0.20	N/A	Y	<0.20	<0.20
Thallium (Tl)	**1.0**	1.0H 1.4E	NC	NC	0.05	<0.050	0.26	0.16	43	N	<0.050	0.15
Tin (Sn)	**50**	NC	NC	NC	5.0	<5.0	<5.0	<5.0	N/A	Y	<5.0	<5.0
Uranium (U)	**23**	23H 500E	NC	NC	0.05	0.33	0.86	0.62	28		0.29	0.53
Vanadium (V)	**130**	130E	NC	NC	5.0	19	34	31	9	Y	100	24
Zinc (Zn)	**200**	200E	500	415	5.0	7.7	34	26	26.0	Y	11	27
Mercury (Hg)	6.6	6.6H 12E	**2.0**	0.4	0.05	<0.050	<0.050	<0.050	N/A	Y	<0.050	<0.050
Physical Properties												
Moisture (%)	NC	NC	NC		1.0	16	12	10	N/A	Y	13	14

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

2 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Human health soil ingestion and Eco Soil Contact.

3 = Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

N/A = Not applicable
NC = No Criteria
RPD= Relative Percent Difference
RDL= Reportable Detection Limit
20 = Exceeds selected guideline.

Table B-8
Soil Chemical Concentrations - PCBs

PARAMETER	Federal	INAC DEW Line Cleanup Criteria, Tier II	Upper Limit of Acceptability[2]	RDL	CC-SS1	CC-SS2	CC-DUP1	Duplicate Evaluation		CC-SS3	CC-BK1
Sample ID											
Date	CCME[1] Residential/ Parkland				09/08/2013	09/08/2013	09/08/2013	RPD (%)	Acceptable	09/08/2013	09/08/2013
Depth (m)					0 - 0.15	0 - 0.15	0 - 0.15			0 - 0.15	0 - 0.15
Polychlorinated Biphenyls (ug/g)											
Aroclor 1262	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1016	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1221	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1232	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1242	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1248	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1254	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1260	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Aroclor 1268	NC	NC	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01
Total PCB	**1.3**	50	NC	0.01	<0.01	<0.01	<0.01	N/A	Y	<0.01	<0.01

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

2 = Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated using mean of baseline data +3 standard deviations.

NC = No Criteria
RPD= Relative Percent Difference
RDL= Reportable Detection Limit
20 = Exceeds selected guideline.

APPENDIX C

Site Photographs

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

Southeast corner of the NHWL. Viewpoint 17 (Figure A-1; Appendix A). Photograph reference 17 (CD-ROM). Direction photo taken: NW

Northeast corner of the NHWL. Viewpoint 28 (Figure A-1; Appendix A). Photograph reference 28 (CD-ROM). Direction photo taken: SW

Northwest corner of the NHWL. Soil sample CC-SS3 collected from stained area. Viewpoint 40 (Figure A-1; Appendix A). Photograph reference 40 (CD-ROM). Direction photo taken: SE

Top of the NHWL. Note the undulations of the cap. Viewpoint 22 (Figure A-1; Appendix A). Photograph reference 22 (CD-ROM). Direction photo taken: W

Sinkhole near the northwest corner of the NHWL. Not as pronounced as depicted in 2011. Viewpoint 55 (Figure A-1; Appendix A). Photograph reference 55 (CD-ROM). Direction photo taken: E

Soil staining at Feature Q and P on west side of the NHWL. Viewpoint 81 (Figure A-1; Appendix A). Photograph reference 81 (CD-ROM). Direction photo taken: N

In 2011, this area was ponded water with staining along the toe of NHWL near the southwest corner. Dry in 2013. Viewpoint 61 (Figure A-1; Appendix A). Photograph reference 61 (CD-ROM). Direction photo taken: NE

Drainage area with staining and vegetation near the northeast corner of the NHWL. Area is dry in 2013. Viewpoint 64 (Figure A-1; Appendix A). Photograph reference 64 (CD-ROM). Direction photo taken: SW

Ponded water with staining near the north side of the NHWL at Feature J. Soil sample CC-SS1 collected from this area. Viewpoint 67 (Figure A-1; Appendix A). Photograph reference 67 (CD-ROM). Direction photo taken: S

Small erosion channel and staining near the north side of the NHWL. Soil sample CC-SS2/DUP1 collected from this area. Viewpoint 83 (Figure A-1; Appendix A). Photograph reference 83 (CD-ROM). Direction photo taken: SE

Background soil sampling location. Soil sample CC-BK collected from this area. Similar stained soils. Viewpoint 74 (Figure A-1; Appendix A). Photograph reference 74 (CD-ROM). Direction photo taken: W

Polar Bear paw print. Photograph reference 85 (CD-ROM). Direction photo taken: NE

Canada Goose tracks. Photograph reference 86 (CD-ROM). Direction photo taken: N/A

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

Note:

Numbers in **bold** appear in Appendix C.

APPENDIX D

Laboratory Reports and Chain of Custody Forms

Your Project #: 1697-1301
Site#: Clyde River, NU
Your C.O.C. #: 42769701, 427697-01-01

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

Report Date: 2013/08/22

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3D3673
Received: 2013/08/13, 10:55

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Petroleum Hydro. CCME F1 & BTEX in Soil (1)	5	2013/08/15	2013/08/16	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Soil (1)	5	2013/08/16	2013/08/17	CAM SOP-00316	CCME CWS
Total Metals Analysis by ICP (1)	5	2013/08/16	2013/08/16	CAM SOP-00408	SW-846 6010C
Acid Extr. Metals (aqua regia) by ICPMS (1)	5	2013/08/16	2013/08/19	CAM SOP-00447	EPA 6020
Moisture (1)	5	N/A	2013/08/16	CAM SOP-00445	R.Carter,1993
Polychlorinated Biphenyl in Soil (1)	5	2013/08/15	2013/08/16	CAM SOP-00309	SW846 8082

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Chloride by Automated Colourimetry (1)	3	N/A	2013/08/19	CAM SOP-00463	EPA 325.2
Colour (1)	3	N/A	2013/08/19	CAM SOP-00412	APHA 2120
Conductivity (1)	3	N/A	2013/08/19	CAM SOP-00448	SM 2510
Petroleum Hydro. CCME F1 & BTEX in Water (1)	4	N/A	2013/08/16	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water (1)	4	2013/08/16	2013/08/17	CAM SOP-00316	CCME Hydrocarbons
Fluoride (1)	3	2013/08/16	2013/08/19	CAM SOP-00449	APHA 4500FC
Nitrate (NO3) and Nitrite (NO2) in Water (1,2)	3	N/A	2013/08/20	CAM SOP-00440	SM 4500 NO3I/NO2B
Polychlorinated Biphenyl (PCB) (1)	2	2013/08/15	2013/08/19	CAM SOP-00309	SW846 8082
pH (1)	3	N/A	2013/08/19	CAM SOP-00448	SM 4500H+ B
Orthophosphate (1)	3	N/A	2013/08/19	CAM SOP-00461	EPA 365.1
Sulphate by Automated Colourimetry (1)	3	N/A	2013/08/19	CAM SOP-00464	EPA 375.4
Total Dissolved Solids (1)	3	N/A	2013/08/16	CAM SOP-00428	APHA 2540C
Low Level Total Suspended Solids (1)	3	N/A	2013/08/16	CAM SOP-00428	SM 2540D

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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

(1) This test was performed by Maxxam Analytics Mississauga
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

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

Parnian Baber, Project Manager
Email: pbaber@maxxam.ca
Phone# (613) 274-0573

==========

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

Total cover pages: 2

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

CCME ICPMS/ICP METALS & MERCURY (SOIL)

Maxxam ID		SQ3087	SQ3088	SQ3089	SQ3090	SQ3091		
Sampling Date		2013/08/09	2013/08/09	2013/08/09	2013/08/09	2013/08/09		
	Units	**CC-SS1**	**CC-SS2**	**CC-SS3**	**CC-DUP1**	**CC-BK**	**RDL**	**QC Batch**
Metals								
Acid Extractable Sulphur (S)	ug/g	74	150	<50	81	150	50	3317201
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3317233
Acid Extractable Arsenic (As)	ug/g	<1.0	2.3	<1.0	1.4	1.3	1.0	3317233
Acid Extractable Barium (Ba)	ug/g	9.5	44	6.2	29	29	0.50	3317233
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.21	<0.20	<0.20	<0.20	0.20	3317233
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	3317233
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	3317233
Acid Extractable Chromium (Cr)	ug/g	7.4	16	36	13	11	1.0	3317233
Acid Extractable Cobalt (Co)	ug/g	1.4	5.6	3.3	3.9	3.6	0.10	3317233
Acid Extractable Copper (Cu)	ug/g	2.0	11	1.5	6.7	4.7	0.50	3317233
Acid Extractable Lead (Pb)	ug/g	1.8	4.9	2.6	3.7	3.2	1.0	3317233
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3317233
Acid Extractable Nickel (Ni)	ug/g	2.4	9.0	4.7	6.2	5.6	0.50	3317233
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3317233
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3317233
Acid Extractable Thallium (Tl)	ug/g	<0.050	0.26	<0.050	0.16	0.15	0.050	3317233
Acid Extractable Tin (Sn)	ug/g	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	3317233
Acid Extractable Uranium (U)	ug/g	0.33	0.86	0.29	0.62	0.53	0.050	3317233
Acid Extractable Vanadium (V)	ug/g	19	34	100	31	24	5.0	3317233
Acid Extractable Zinc (Zn)	ug/g	7.7	34	11	26	27	5.0	3317233
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	3317233

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

CCME PETROLEUM HYDROCARBONS (SOIL)

Maxxam ID		SQ3087	SQ3087		SQ3088	SQ3089	SQ3090	SQ3091	SQ3091		
Sampling Date		2013/08/09	2013/08/09		2013/08/09	2013/08/09	2013/08/09	2013/08/09	2013/08/09		
	Units	**CC-SS1**	**CC-SS1 Lab-Dup**	**QC Batch**	**CC-SS2**	**CC-SS3**	**CC-DUP1**	**CC-BK**	**CC-BK Lab-Dup**	**RDL**	**QC Batch**
Inorganics											
Moisture	%	16	16	3317234	12	13	10	14	14	1.0	3317170
BTEX & F1 Hydrocarbons											
Benzene	ug/g	<0.005	<0.005	3316867	<0.005	<0.005	<0.005	<0.005		0.005	3316867
Toluene	ug/g	<0.02	<0.02	3316867	<0.02	<0.02	<0.02	<0.02		0.02	3316867
Ethylbenzene	ug/g	<0.01	<0.01	3316867	<0.01	<0.01	<0.01	<0.01		0.01	3316867
o-Xylene	ug/g	<0.02	<0.02	3316867	<0.02	<0.02	<0.02	<0.02		0.02	3316867
p+m-Xylene	ug/g	<0.04	<0.04	3316867	<0.04	<0.04	<0.04	<0.04		0.04	3316867
Total Xylenes	ug/g	<0.04	<0.04	3316867	<0.04	<0.04	<0.04	<0.04		0.04	3316867
F1 (C6-C10)	ug/g	<10	<10	3316867	<10	<10	<10	<10		10	3316867
F1 (C6-C10) - BTEX	ug/g	<10	<10	3316867	<10	<10	<10	<10		10	3316867
F2-F4 Hydrocarbons											
F2 (C10-C16 Hydrocarbons)	ug/g	<10		3316918	<10	86	<10	<10		10	3316918
F3 (C16-C34 Hydrocarbons)	ug/g	<50		3316918	<50	68	<50	<50		50	3316918
F4 (C34-C50 Hydrocarbons)	ug/g	<50		3316918	<50	<50	<50	<50		50	3316918
Reached Baseline at C50	ug/g	YES		3316918	YES	YES	YES	YES			3316918
Surrogate Recovery (%)											
1,4-Difluorobenzene	%	92	92	3316867	91	91	92	91			3316867
4-Bromofluorobenzene	%	103	102	3316867	102	104	103	102			3316867
D10-Ethylbenzene	%	102	109	3316867	106	104	103	103			3316867
D4-1,2-Dichloroethane	%	91	89	3316867	90	89	90	90			3316867
o-Terphenyl	%	102		3316918	104	99	96	93			3316918

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxamanalytics.com

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

CCME PETROLEUM HYDROCARBONS (WATER)

Maxxam ID		SQ3083	SQ3084	SQ3085	SQ3086		
Sampling Date		2013/08/09	2013/08/09	2013/08/09	2013/08/09		
	Units	**MW1**	**MW2**	**MW4**	**DUP**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons							
Benzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	3317514
Toluene	ug/L	0.26	<0.20	<0.20	0.27	0.20	3317514
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	3317514
o-Xylene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	3317514
p+m-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	3317514
Total Xylenes	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	3317514
F1 (C6-C10)	ug/L	<25	<25	<25	<25	25	3317514
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	<25	25	3317514
F2-F4 Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	100	3317151
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	3317151
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	3317151
Reached Baseline at C50	ug/L	YES	YES	YES	YES		3317151
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	99	100	100	101		3317514
4-Bromofluorobenzene	%	101	100	103	98		3317514
D10-Ethylbenzene	%	103	103	102	101		3317514
D4-1,2-Dichloroethane	%	90	90	89	91		3317514
o-Terphenyl	%	107	106	104	107		3317151

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		SQ3087	SQ3088	SQ3089	SQ3090	SQ3091		
Sampling Date		2013/08/09	2013/08/09	2013/08/09	2013/08/09	2013/08/09		
	Units	**CC-SS1**	**CC-SS2**	**CC-SS3**	**CC-DUP1**	**CC-BK**	**RDL**	**QC Batch**
PCBs								
Aroclor 1016	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1221	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1232	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1242	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1248	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1254	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1260	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1262	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Aroclor 1268	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Total PCB	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	3315999
Surrogate Recovery (%)								
Decachlorobiphenyl	%	89	95	82	100	90		3315999

RESULTS OF ANALYSES OF WATER

Maxxam ID		SQ3083		SQ3084		SQ3086		
Sampling Date		2013/08/09		2013/08/09		2013/08/09		
	Units	**MW1**	**RDL**	**MW2**	**RDL**	**DUP**	**RDL**	**QC Batch**
Inorganics								
Colour	TCU	5	2	610	10	930	20	3318787
Conductivity	umho/cm	1300	1.0	1600	1.0	1800	1.0	3318156
Total Dissolved Solids	mg/L	780	10	1520	10	1550	10	3316953
Fluoride (F-)	mg/L	0.34	0.10	0.22	0.10	<0.10	0.10	3318157
Orthophosphate (P)	mg/L	<0.010	0.010	<0.050(1)	0.050	<0.050(1)	0.050	3317887
pH	pH	8.08		5.26		6.56		3318159
Total Suspended Solids	mg/L	10	1	81	3	76	3	3316933
Dissolved Sulphate (SO4)	mg/L	37	1	28	1	26	1	3317884
Dissolved Chloride (Cl)	mg/L	250	3	450	5	480	6	3317883
Nitrite (N)	mg/L	<0.010	0.010	0.035	0.010	0.036	0.010	3317867
Nitrate (N)	mg/L	<0.10	0.10	0.30	0.10	0.24	0.10	3317867
Nitrate + Nitrite	mg/L	<0.10	0.10	0.34	0.10	0.28	0.10	3317867

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		SQ3083	SQ3084		
Sampling Date		2013/08/09	2013/08/09		
	Units	**MW1**	**MW2**	**RDL**	**QC Batch**
PCBs					
Aroclor 1016	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1221	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1232	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1262	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1268	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1242	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1248	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1254	ug/L	<0.01	<0.01	0.01	3315385
Aroclor 1260	ug/L	<0.01	<0.01	0.01	3315385
Total PCB	ug/L	<0.01	<0.01	0.01	3315385
Surrogate Recovery (%)					
Decachlorobiphenyl	%	87	78		3315385

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

Test Summary

Maxxam ID SQ3083
Sample ID MW1
Matrix Water

Collected 2013/08/09
Shipped
Received 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	3317883	N/A	2013/08/19	Alina Dobreanu
Colour	SPEC	3318787	N/A	2013/08/19	Christine Pham
Conductivity	COND	3318156	N/A	2013/08/19	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	3317514	N/A	2013/08/16	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	3317151	2013/08/16	2013/08/17	Barbara Wowk
Fluoride	F	3318157	2013/08/16	2013/08/19	Surinder Rai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3317867	N/A	2013/08/20	Sandeep Singh
Polychlorinated Biphenyl (PCB)	GC/ECD	3315385	2013/08/15	2013/08/19	Sarah Huang
pH	PH	3318159	N/A	2013/08/19	Surinder Rai
Orthophosphate	AC	3317887	N/A	2013/08/19	Alina Dobreanu
Sulphate by Automated Colourimetry	AC	3317884	N/A	2013/08/19	Alina Dobreanu
Total Dissolved Solids	SLDS	3316953	N/A	2013/08/16	Gurpreet Kaur
Low Level Total Suspended Solids	SLDS	3316933	N/A	2013/08/16	Malik Kai Morgan John

Maxxam ID SQ3084
Sample ID MW2
Matrix Water

Collected 2013/08/09
Shipped
Received 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	3317883	N/A	2013/08/19	Alina Dobreanu
Colour	SPEC	3318787	N/A	2013/08/19	Christine Pham
Conductivity	COND	3318156	N/A	2013/08/19	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	3317514	N/A	2013/08/16	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	3317151	2013/08/16	2013/08/17	Barbara Wowk
Fluoride	F	3318157	2013/08/16	2013/08/19	Surinder Rai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3317867	N/A	2013/08/20	Sandeep Singh
Polychlorinated Biphenyl (PCB)	GC/ECD	3315385	2013/08/15	2013/08/19	Sarah Huang
pH	PH	3318159	N/A	2013/08/19	Surinder Rai
Orthophosphate	AC	3317887	N/A	2013/08/19	Alina Dobreanu
Sulphate by Automated Colourimetry	AC	3317884	N/A	2013/08/19	Alina Dobreanu
Total Dissolved Solids	SLDS	3316953	N/A	2013/08/16	Gurpreet Kaur
Low Level Total Suspended Solids	SLDS	3316933	N/A	2013/08/16	Malik Kai Morgan John

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Test Summary

Maxxam ID SQ3085 **Collected** 2013/08/09
Sample ID MW4 **Shipped**
Matrix Water **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	3317514	N/A	2013/08/16	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	3317151	2013/08/16	2013/08/17	Barbara Wowk

Maxxam ID SQ3086 **Collected** 2013/08/09
Sample ID DUP **Shipped**
Matrix Water **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Chloride by Automated Colourimetry	AC	3317883	N/A	2013/08/19	Alina Dobreanu
Colour	SPEC	3318787	N/A	2013/08/19	Christine Pham
Conductivity	COND	3318156	N/A	2013/08/19	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	3317514	N/A	2013/08/16	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	3317151	2013/08/16	2013/08/17	Barbara Wowk
Fluoride	F	3318157	2013/08/16	2013/08/19	Surinder Rai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	3317867	N/A	2013/08/20	Sandeep Singh
pH	PH	3318159	N/A	2013/08/19	Surinder Rai
Orthophosphate	AC	3317887	N/A	2013/08/19	Alina Dobreanu
Sulphate by Automated Colourimetry	AC	3317884	N/A	2013/08/19	Alina Dobreanu
Total Dissolved Solids	SLDS	3316953	N/A	2013/08/16	Gurpreet Kaur
Low Level Total Suspended Solids	SLDS	3316933	N/A	2013/08/16	Malik Kai Morgan John

Maxxam ID SQ3087 **Collected** 2013/08/09
Sample ID CC-SS1 **Shipped**
Matrix Soil **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3316918	2013/08/16	2013/08/17	Nicoleta Ciublea
Total Metals Analysis by ICP	ICP	3317201	2013/08/16	2013/08/16	Jolly John
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3317233	2013/08/16	2013/08/19	Viviana Canzonieri
Moisture	BAL	3317234	N/A	2013/08/16	Chamika Deeyagaha
Polychlorinated Biphenyl in Soil	GC/ECD	3315999	2013/08/15	2013/08/16	Sarah Huang

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Test Summary

Maxxam ID SQ3087 Dup
Sample ID CC-SS1
Matrix Soil

Collected 2013/08/09
Shipped
Received 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Moisture	BAL	3317234	N/A	2013/08/16	Chamika Deeyagaha

Maxxam ID SQ3088
Sample ID CC-SS2
Matrix Soil

Collected 2013/08/09
Shipped
Received 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3316918	2013/08/16	2013/08/17	Nicoleta Ciublea
Total Metals Analysis by ICP	ICP	3317201	2013/08/16	2013/08/16	Jolly John
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3317233	2013/08/16	2013/08/19	Viviana Canzonieri
Moisture	BAL	3317170	N/A	2013/08/16	Chamika Deeyagaha
Polychlorinated Biphenyl in Soil	GC/ECD	3315999	2013/08/15	2013/08/16	Sarah Huang

Maxxam ID SQ3089
Sample ID CC-SS3
Matrix Soil

Collected 2013/08/09
Shipped
Received 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3316918	2013/08/16	2013/08/17	Nicoleta Ciublea
Total Metals Analysis by ICP	ICP	3317201	2013/08/16	2013/08/16	Jolly John
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3317233	2013/08/16	2013/08/19	Viviana Canzonieri
Moisture	BAL	3317170	N/A	2013/08/16	Chamika Deeyagaha
Polychlorinated Biphenyl in Soil	GC/ECD	3315999	2013/08/15	2013/08/16	Sarah Huang

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Test Summary

Maxxam ID SQ3090 **Collected** 2013/08/09
Sample ID CC-DUP1 **Shipped**
Matrix Soil **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3316918	2013/08/16	2013/08/17	Nicoleta Ciublea
Total Metals Analysis by ICP	ICP	3317201	2013/08/16	2013/08/16	Jolly John
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3317233	2013/08/16	2013/08/19	Viviana Canzonieri
Moisture	BAL	3317170	N/A	2013/08/16	Chamika Deeyagaha
Polychlorinated Biphenyl in Soil	GC/ECD	3315999	2013/08/15	2013/08/16	Sarah Huang

Maxxam ID SQ3091 **Collected** 2013/08/09
Sample ID CC-BK **Shipped**
Matrix Soil **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3316867	2013/08/15	2013/08/16	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3316918	2013/08/16	2013/08/17	Nicoleta Ciublea
Total Metals Analysis by ICP	ICP	3317201	2013/08/16	2013/08/16	Jolly John
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3317233	2013/08/16	2013/08/19	Viviana Canzonieri
Moisture	BAL	3317170	N/A	2013/08/16	Chamika Deeyagaha
Polychlorinated Biphenyl in Soil	GC/ECD	3315999	2013/08/15	2013/08/16	Sarah Huang

Maxxam ID SQ3091 Dup **Collected** 2013/08/09
Sample ID CC-BK **Shipped**
Matrix Soil **Received** 2013/08/13

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Moisture	BAL	3317170	N/A	2013/08/16	Chamika Deeyagaha

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Package 1	4.3°C

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

GENERAL COMMENTS

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3315385	Decachlorobiphenyl	2013/08/19	86	60 - 130	76	60 - 130	87	%				
3315385	Aroclor 1260	2013/08/19	77	60 - 130	76	60 - 130	<0.01	ug/L	NC	40		
3315385	Total PCB	2013/08/19	77	60 - 130	76	60 - 130	<0.01	ug/L	NC	40		
3315385	Aroclor 1016	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1221	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1232	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1262	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1268	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1242	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1248	2013/08/19					<0.01	ug/L	NC	40		
3315385	Aroclor 1254	2013/08/19					<0.01	ug/L	NC	40		
3315999	Decachlorobiphenyl	2013/08/16	111	60 - 130	101	60 - 130	99	%				
3315999	Aroclor 1260	2013/08/16	112	60 - 130	115	60 - 130	<0.010	ug/g	NC	50		
3315999	Total PCB	2013/08/16	112	60 - 130	115	60 - 130	<0.010	ug/g	NC	50		
3315999	Aroclor 1016	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1221	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1232	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1242	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1248	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1254	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1262	2013/08/16					<0.010	ug/g	NC	50		
3315999	Aroclor 1268	2013/08/16					<0.010	ug/g	NC	50		
3316867	1,4-Difluorobenzene	2013/08/16	89	60 - 140	88	60 - 140	92	%				
3316867	4-Bromofluorobenzene	2013/08/16	110	60 - 140	110	60 - 140	104	%				
3316867	D10-Ethylbenzene	2013/08/16	100	60 - 140	97	60 - 140	99	%				
3316867	D4-1,2-Dichloroethane	2013/08/16	88	60 - 140	86	60 - 140	90	%				
3316867	Benzene	2013/08/16	83	60 - 140	88	60 - 130	<0.005	ug/g	NC	50		
3316867	Toluene	2013/08/16	91	60 - 140	96	60 - 130	<0.02	ug/g	NC	50		
3316867	Ethylbenzene	2013/08/16	97	60 - 140	104	60 - 130	<0.01	ug/g	NC	50		
3316867	o-Xylene	2013/08/16	98	60 - 140	106	60 - 130	<0.02	ug/g	NC	50		
3316867	p+m-Xylene	2013/08/16	90	60 - 140	97	60 - 130	<0.04	ug/g	NC	50		
3316867	F1 (C6-C10)	2013/08/16	77	60 - 140	92	80 - 120	<10	ug/g	NC	50		
3316867	Total Xylenes	2013/08/16					<0.04	ug/g	NC	50		
3316867	F1 (C6-C10) - BTEX	2013/08/16					<10	ug/g	NC	50		
3316918	o-Terphenyl	2013/08/16	84	50 - 130	84	50 - 130	88	%				
3316918	F2 (C10-C16 Hydrocarbons)	2013/08/17	93	50 - 130	94	80 - 120	<10	ug/g	NC	30		
3316918	F3 (C16-C34 Hydrocarbons)	2013/08/17	87	50 - 130	88	80 - 120	<50	ug/g	NC	30		
3316918	F4 (C34-C50 Hydrocarbons)	2013/08/17	88	50 - 130	88	80 - 120	<50	ug/g	NC	30		
3316933	Total Suspended Solids	2013/08/16					<1	mg/L	NC	25	98	85 - 115
3316953	Total Dissolved Solids	2013/08/16					<10	mg/L	4.3	25	98	90 - 110

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Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3317151	o-Terphenyl	2013/08/16	104	50 - 130	106	50 - 130	104	%				
3317151	F2 (C10-C16 Hydrocarbons)	2013/08/16	100	50 - 130	104	70 - 130	<100	ug/L				
3317151	F3 (C16-C34 Hydrocarbons)	2013/08/16	116	50 - 130	118	70 - 130	<200	ug/L				
3317151	F4 (C34-C50 Hydrocarbons)	2013/08/16	108	50 - 130	111	70 - 130	<200	ug/L				
3317170	Moisture	2013/08/16							1.4	20		
3317201	Acid Extractable Sulphur (S)	2013/08/16	99	75 - 125	101	80 - 120	<50	ug/g				
3317233	Acid Extractable Antimony (Sb)	2013/08/19	90	75 - 125	106	80 - 120	<0.20	ug/g	NC	30		
3317233	Acid Extractable Arsenic (As)	2013/08/19	96	75 - 125	102	80 - 120	<1.0	ug/g	5.2	30		
3317233	Acid Extractable Barium (Ba)	2013/08/19	NC	75 - 125	98	80 - 120	<0.50	ug/g	1.9	30		
3317233	Acid Extractable Beryllium (Be)	2013/08/19	100	75 - 125	105	80 - 120	<0.20	ug/g	NC	30		
3317233	Acid Extractable Boron (B)	2013/08/19	85	75 - 125	98	80 - 120	<5.0	ug/g	NC	30		
3317233	Acid Extractable Cadmium (Cd)	2013/08/19	99	75 - 125	104	80 - 120	<0.10	ug/g	NC	30		
3317233	Acid Extractable Chromium (Cr)	2013/08/19	92	75 - 125	99	80 - 120	<1.0	ug/g	1.5	30		
3317233	Acid Extractable Cobalt (Co)	2013/08/19	93	75 - 125	99	80 - 120	<0.10	ug/g	1.2	30		
3317233	Acid Extractable Copper (Cu)	2013/08/19	89	75 - 125	96	80 - 120	<0.50	ug/g	2.9	30		
3317233	Acid Extractable Lead (Pb)	2013/08/19	95	75 - 125	102	80 - 120	<1.0	ug/g	29.5	30		
3317233	Acid Extractable Molybdenum (Mo)	2013/08/19	94	75 - 125	99	80 - 120	<0.50	ug/g	NC	30		
3317233	Acid Extractable Nickel (Ni)	2013/08/19	NC	75 - 125	102	80 - 120	<0.50	ug/g	2.6	30		
3317233	Acid Extractable Selenium (Se)	2013/08/19	97	75 - 125	104	80 - 120	<0.50	ug/g	NC	30		
3317233	Acid Extractable Silver (Ag)	2013/08/19	96	75 - 125	100	80 - 120	<0.20	ug/g	NC	30		
3317233	Acid Extractable Thallium (Tl)	2013/08/19	88	75 - 125	97	80 - 120	<0.050	ug/g	NC	30		
3317233	Acid Extractable Tin (Sn)	2013/08/19	97	75 - 125	102	80 - 120	<5.0	ug/g				
3317233	Acid Extractable Uranium (U)	2013/08/19	95	75 - 125	102	80 - 120	<0.050	ug/g	0.5	30		
3317233	Acid Extractable Vanadium (V)	2013/08/19	NC	75 - 125	99	80 - 120	<5.0	ug/g	1.4	30		
3317233	Acid Extractable Zinc (Zn)	2013/08/19	NC	75 - 125	103	80 - 120	<5.0	ug/g	2.7	30		
3317233	Acid Extractable Mercury (Hg)	2013/08/19	109	75 - 125	120	80 - 120	<0.050	ug/g	NC	30		
3317234	Moisture	2013/08/16							4.4	20		
3317514	1,4-Difluorobenzene	2013/08/16	100	70 - 130	100	70 - 130	101	%				
3317514	4-Bromofluorobenzene	2013/08/16	114	70 - 130	109	70 - 130	100	%				
3317514	D10-Ethylbenzene	2013/08/16	99	70 - 130	97	70 - 130	98	%				
3317514	D4-1,2-Dichloroethane	2013/08/16	90	70 - 130	91	70 - 130	92	%				
3317514	Benzene	2013/08/16	NC(1)	70 - 130	91	60 - 130	<0.20	ug/L				
3317514	Toluene	2013/08/16	93	70 - 130	93	60 - 130	<0.20	ug/L				
3317514	Ethylbenzene	2013/08/16	NC(1)	70 - 130	103	60 - 130	<0.20	ug/L				
3317514	o-Xylene	2013/08/16	102	70 - 130	103	60 - 130	<0.20	ug/L				
3317514	p+m-Xylene	2013/08/16	95	70 - 130	97	60 - 130	<0.40	ug/L				
3317514	F1 (C6-C10)	2013/08/16	72	70 - 130	90	60 - 140	<25	ug/L	3.0	30		
3317514	Total Xylenes	2013/08/16					<0.40	ug/L				
3317514	F1 (C6-C10) - BTEX	2013/08/16					<25	ug/L	3.7	30		
3317867	Nitrite (N)	2013/08/20	109	80 - 120	105	85 - 115	<0.010	mg/L				

Maxxam Job #: B3D3673
Report Date: 2013/08/22

Franz Environmental Inc
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3317867	Nitrate (N)	2013/08/20	103	80 - 120	97	85 - 115	<0.10	mg/L	NC	25		
3317883	Dissolved Chloride (Cl)	2013/08/19	NC	80 - 120	101	80 - 120	<1	mg/L	1.0	20		
3317884	Dissolved Sulphate (SO4)	2013/08/19	NC	75 - 125	101	80 - 120	<1	mg/L	0.6	20		
3317887	Orthophosphate (P)	2013/08/19	106	75 - 125	100	80 - 120	<0.010	mg/L	NC	25		
3318156	Conductivity	2013/08/19					<1.0	umho/cm	0.1	25	101	85 - 115
3318157	Fluoride (F-)	2013/08/19	104	80 - 120	101	80 - 120	<0.10	mg/L	NC	20		
3318787	Colour	2013/08/19			99	85 - 115	<2	TCU	NC	25		

N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - F1-BTEX analysis:The recovery in the matrix spiked is not calculated (NC) due to high concentration of this compound in the parent sample. The relative difference between the spiked and un-spiked concentrations is not sufficiently significant to permit a reliable recovery.

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxamanalytics.com

Validation Signature Page

Maxxam Job #: B3D3673

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

Charles Ancker, B.Sc., M.Sc., C.Chem, Senior Analyst

Cristina Carriere, Scientific Services

Medhat Riskallah, Manager, Hydrocarbon Department

Mamdouh Salib, Analyst, Hydrocarbons

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxamanalytics.com

Validation Signature Page

Maxxam Job #: B3D3673

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

Suzana Popovic, Supervisor, Hydrocarbons

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

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxamanalytics.com

Your Project #: MB3D3673
Site Location: 1697-1301

Attention: SUB CONTRACTOR
MAXXAM ANALYTICS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2013/08/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B372603
Received: 2013/08/17, 10:15

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cadmium - low level CCME - Dissolved	2	N/A	2013/08/21	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2013/08/17	2013/08/21	AB SOP-00043	EPA 200.8
Hardness	2	N/A	2013/08/21	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	2	N/A	2013/08/21	AB SOP-00042	EPA 200.7
Elements by ICP - Total	2	2013/08/19	2013/08/20	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	2	N/A	2013/08/21	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2013/08/19	2013/08/21	AB SOP-00043	EPA 200.8

* Results relate only to the items tested.

Encryption Key

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

Carmen McKay, Project Manager Assistant
Email: CMcKay@maxxam.ca
Phone# (403) 291-3077

==========

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

Total cover pages: 1

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HF5449	HF5450		
Sampling Date		2013/08/09	2013/08/09		
	UNITS	**MW1 (SQ3083)**	**MW2 (SQ3084)**	**RDL**	**QC Batch**
Calculated Parameters					
Hardness (CaCO3)	mg/L	350	540	0.50	7088428
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.031	0.21	0.0050	7088665
Total Cadmium (Cd)	ug/L	0.037	0.16	0.0050	7088614

RDL = Reportable Detection Limit

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HF5449	HF5450		
Sampling Date		2013/08/09	2013/08/09		
	UNITS	**MW1 (SQ3083)**	**MW2 (SQ3084)**	**RDL**	**QC Batch**
Elements					
Dissolved Aluminum (Al)	mg/L	0.028	0.032	0.0030	7093719
Total Aluminum (Al)	mg/L	1.9	0.18	0.0030	7092700
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	7093719
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	7092700
Dissolved Arsenic (As)	mg/L	0.0014	0.00072	0.00020	7093719
Total Arsenic (As)	mg/L	0.0018	0.00091	0.00020	7092700
Dissolved Barium (Ba)	mg/L	0.012	0.047	0.010	7094540
Total Barium (Ba)	mg/L	0.013	0.045	0.010	7092703
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	7093719
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	7092700
Dissolved Boron (B)	mg/L	0.095	<0.020	0.020	7094540
Total Boron (B)	mg/L	0.13	0.030	0.020	7092703
Dissolved Calcium (Ca)	mg/L	54	110	0.30	7094540
Total Calcium (Ca)	mg/L	56	110	0.30	7092703
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	7093719
Total Chromium (Cr)	mg/L	0.036	0.0017	0.0010	7092700
Dissolved Cobalt (Co)	mg/L	<0.00030	0.032(1)	0.00030	7093719
Total Cobalt (Co)	mg/L	0.00074	0.031	0.00030	7092700
Dissolved Copper (Cu)	mg/L	0.0013	0.0061	0.00020	7093719
Total Copper (Cu)	mg/L	0.011	0.0084	0.00020	7092700
Dissolved Iron (Fe)	mg/L	0.19	28	0.060	7094540
Total Iron (Fe)	mg/L	0.84	29	0.060	7092703
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	7093719
Total Lead (Pb)	mg/L	0.0038	0.00040	0.00020	7092700
Dissolved Lithium (Li)	mg/L	<0.020	<0.020	0.020	7094540
Total Lithium (Li)	mg/L	<0.020	<0.020	0.020	7092703
Dissolved Magnesium (Mg)	mg/L	53	63(1)	0.20	7094540
Total Magnesium (Mg)	mg/L	53	60	0.20	7092703
Dissolved Manganese (Mn)	mg/L	0.081	6.1(1)	0.0040	7094540
Total Manganese (Mn)	mg/L	0.12	5.9	0.0040	7092703
Dissolved Molybdenum (Mo)	mg/L	0.0087	0.0020	0.00020	7093719
Total Molybdenum (Mo)	mg/L	0.0095	0.0021	0.00020	7092700
Dissolved Nickel (Ni)	mg/L	0.0020	0.044	0.00050	7093719
Total Nickel (Ni)	mg/L	0.032	0.047	0.00050	7092700
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	7094540

RDL = Reportable Detection Limit
(1) - Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HF5449	HF5450		
Sampling Date		2013/08/09	2013/08/09		
	UNITS	**MW1 (SQ3083)**	**MW2 (SQ3084)**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	<0.10	<0.10	0.10	7092703
Dissolved Potassium (K)	mg/L	15	12	0.30	7094540
Total Potassium (K)	mg/L	15	12	0.30	7092703
Dissolved Selenium (Se)	mg/L	0.00031	0.00033	0.00020	7093719
Total Selenium (Se)	mg/L	0.00031	0.00035	0.00020	7092700
Dissolved Silicon (Si)	mg/L	3.4	5.7(1)	0.10	7094540
Total Silicon (Si)	mg/L	4.1	5.6	0.10	7092703
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	7093719
Total Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	7092700
Dissolved Sodium (Na)	mg/L	120	94(1)	0.50	7094540
Total Sodium (Na)	mg/L	120	90	0.50	7092703
Dissolved Strontium (Sr)	mg/L	0.32	0.57(1)	0.020	7094540
Total Strontium (Sr)	mg/L	0.33	0.54	0.020	7092703
Dissolved Sulphur (S)	mg/L	13	12	0.20	7094540
Total Sulphur (S)	mg/L	13	12	0.20	7092703
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	7093719
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	7092700
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	7093719
Total Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	7092700
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.0010	7093719
Total Titanium (Ti)	mg/L	0.019	0.0098	0.0010	7092700
Dissolved Uranium (U)	mg/L	0.0027	0.00038	0.00010	7093719
Total Uranium (U)	mg/L	0.0054	0.00039	0.00010	7092700
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	0.0010	7093719
Total Vanadium (V)	mg/L	0.0027	0.0017	0.0010	7092700
Dissolved Zinc (Zn)	mg/L	<0.0030	0.084(1)	0.0030	7093719
Total Zinc (Zn)	mg/L	0.0086	0.071	0.0030	7092700

RDL = Reportable Detection Limit
(1) - Dissolved greater than total. Results within acceptable limits of precision.

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

General Comments

Sample HF5450-01: Dissolved greater than total for Cd. Reanalysis yields similar results.

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7092700	Total Aluminum (Al)	2013/08/20	NC	80 - 120	116	80 - 120	<0.0030	mg/L	5.4	20
7092700	Total Antimony (Sb)	2013/08/20	98	80 - 120	108	80 - 120	<0.00060	mg/L	NC	20
7092700	Total Arsenic (As)	2013/08/20	95	80 - 120	102	80 - 120	<0.00020	mg/L	NC	20
7092700	Total Beryllium (Be)	2013/08/20	98	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
7092700	Total Chromium (Cr)	2013/08/20	100	80 - 120	108	80 - 120	<0.0010	mg/L	NC	20
7092700	Total Cobalt (Co)	2013/08/20	103	80 - 120	113	80 - 120	<0.00030	mg/L	NC	20
7092700	Total Copper (Cu)	2013/08/20	101	80 - 120	111	80 - 120	<0.00020	mg/L	0.8	20
7092700	Total Lead (Pb)	2013/08/20	98	80 - 120	105	80 - 120	<0.00020	mg/L	NC	20
7092700	Total Molybdenum (Mo)	2013/08/20	105	80 - 120	107	80 - 120	<0.00020	mg/L	NC	20
7092700	Total Nickel (Ni)	2013/08/20	100	80 - 120	111	80 - 120	<0.00050	mg/L	NC	20
7092700	Total Selenium (Se)	2013/08/20	90	80 - 120	93	80 - 120	<0.00020	mg/L	NC	20
7092700	Total Silver (Ag)	2013/08/20	100	80 - 120	106	80 - 120	<0.00010	mg/L	NC	20
7092700	Total Thallium (Tl)	2013/08/20	84	80 - 120	100	80 - 120	<0.00020	mg/L	NC	20
7092700	Total Tin (Sn)	2013/08/20	96	80 - 120	103	80 - 120	<0.0010	mg/L	NC	20
7092700	Total Titanium (Ti)	2013/08/20	90	80 - 120	95	80 - 120	0.0016, RDL=0.0010	mg/L	12.1	20
7092700	Total Uranium (U)	2013/08/20	100	80 - 120	106	80 - 120	<0.00010	mg/L	NC	20
7092700	Total Vanadium (V)	2013/08/20	100	80 - 120	109	80 - 120	<0.0010	mg/L	NC	20
7092700	Total Zinc (Zn)	2013/08/20	NC	80 - 120	106	80 - 120	0.0030, RDL=0.0030	mg/L	2.6	20
7092703	Total Barium (Ba)	2013/08/20	93	80 - 120	94	80 - 120	<0.010	mg/L	NC	20
7092703	Total Boron (B)	2013/08/20	113	80 - 120	113	80 - 120	<0.020	mg/L	NC	20
7092703	Total Calcium (Ca)	2013/08/20	NC	80 - 120	102	80 - 120	<0.30	mg/L	5.0	20
7092703	Total Iron (Fe)	2013/08/20	NC	80 - 120	101	80 - 120	<0.060	mg/L	3.6	20
7092703	Total Lithium (Li)	2013/08/20	96	80 - 120	98	80 - 120	<0.020	mg/L	NC	20
7092703	Total Magnesium (Mg)	2013/08/20	100	80 - 120	100	80 - 120	<0.20	mg/L	5.2	20
7092703	Total Manganese (Mn)	2013/08/20	98	80 - 120	98	80 - 120	<0.0040	mg/L	4.8	20
7092703	Total Phosphorus (P)	2013/08/20	101	80 - 120	100	80 - 120	<0.10	mg/L	NC	20
7092703	Total Potassium (K)	2013/08/20	102	80 - 120	105	80 - 120	<0.30	mg/L	NC	20
7092703	Total Silicon (Si)	2013/08/20	NC	80 - 120	115	80 - 120	<0.10	mg/L	5.5	20
7092703	Total Sodium (Na)	2013/08/20	101	80 - 120	103	80 - 120	<0.50	mg/L	5.9	20
7092703	Total Strontium (Sr)	2013/08/20	95	80 - 120	96	80 - 120	<0.020	mg/L	NC	20
7092703	Total Sulphur (S)	2013/08/20					<0.20	mg/L	1.2	20
7093719	Dissolved Aluminum (Al)	2013/08/21	NC	80 - 120	96	80 - 120	<0.0030	mg/L	1.8	20
7093719	Dissolved Antimony (Sb)	2013/08/21	90	80 - 120	85	80 - 120	<0.00060	mg/L	NC	20
7093719	Dissolved Arsenic (As)	2013/08/21	103	80 - 120	101	80 - 120	<0.00020	mg/L	NC	20
7093719	Dissolved Beryllium (Be)	2013/08/21	106	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
7093719	Dissolved Chromium (Cr)	2013/08/21	98	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
7093719	Dissolved Cobalt (Co)	2013/08/21	96	80 - 120	101	80 - 120	<0.00030	mg/L	NC	20
7093719	Dissolved Copper (Cu)	2013/08/21	96	80 - 120	103	80 - 120	<0.00020	mg/L	3.3	20
7093719	Dissolved Lead (Pb)	2013/08/21	96	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20
7093719	Dissolved Molybdenum (Mo)	2013/08/21	93	80 - 120	95	80 - 120	<0.00020	mg/L	NC	20

Maxxam Job #: B372603
Report Date: 2013/08/21

MAXXAM ANALYTICS
Client Project #: MB3D3673
Site Location: 1697-1301

QUALITY ASSURANCE REPORT

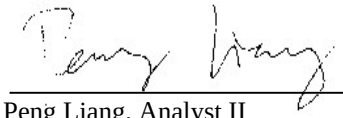
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7093719	Dissolved Nickel (Ni)	2013/08/21	96	80 - 120	103	80 - 120	<0.00050	mg/L	NC	20
7093719	Dissolved Selenium (Se)	2013/08/21	108	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
7093719	Dissolved Silver (Ag)	2013/08/21	92	80 - 120	95	80 - 120	<0.00010	mg/L	NC	20
7093719	Dissolved Thallium (Tl)	2013/08/21	97	80 - 120	96	80 - 120	<0.00020	mg/L	NC	20
7093719	Dissolved Tin (Sn)	2013/08/21	85	80 - 120	92	80 - 120	<0.0010	mg/L	NC	20
7093719	Dissolved Titanium (Ti)	2013/08/21	146(1)	80 - 120	99	80 - 120	<0.0010	mg/L	3.3	20
7093719	Dissolved Uranium (U)	2013/08/21	96	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20
7093719	Dissolved Vanadium (V)	2013/08/21	100	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
7093719	Dissolved Zinc (Zn)	2013/08/21	NC	80 - 120	101	80 - 120	<0.0030	mg/L	0.5	20
7094540	Dissolved Barium (Ba)	2013/08/21	94	80 - 120	95	80 - 120	<0.010	mg/L	NC	20
7094540	Dissolved Boron (B)	2013/08/21	97	80 - 120	98	80 - 120	<0.020	mg/L	NC	20
7094540	Dissolved Calcium (Ca)	2013/08/21	104	80 - 120	102	80 - 120	<0.30	mg/L	0.2	20
7094540	Dissolved Iron (Fe)	2013/08/21	95	80 - 120	96	80 - 120	<0.060	mg/L	0.6	20
7094540	Dissolved Lithium (Li)	2013/08/21	98	80 - 120	100	80 - 120	<0.020	mg/L	NC	20
7094540	Dissolved Magnesium (Mg)	2013/08/21	100	80 - 120	100	80 - 120	<0.20	mg/L	0.04	20
7094540	Dissolved Manganese (Mn)	2013/08/21	99	80 - 120	98	80 - 120	<0.0040	mg/L	0.3	20
7094540	Dissolved Phosphorus (P)	2013/08/21	102	80 - 120	100	80 - 120	<0.10	mg/L	NC	20
7094540	Dissolved Potassium (K)	2013/08/21	102	80 - 120	105	80 - 120	<0.30	mg/L	NC	20
7094540	Dissolved Silicon (Si)	2013/08/21	100	80 - 120	101	80 - 120	<0.10	mg/L	1.2	20
7094540	Dissolved Sodium (Na)	2013/08/21	99	80 - 120	100	80 - 120	0.79, RDL=0.50	mg/L	NC	20
7094540	Dissolved Strontium (Sr)	2013/08/21	98	80 - 120	99	80 - 120	<0.020	mg/L	NC	20
7094540	Dissolved Sulphur (S)	2013/08/21					<0.20	mg/L	NC	20

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

Maxxam Job #: B372603

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



Peng Liang, Analyst II

==========

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

MAXXAM ANALYTICS
6740 Campobello Road
Mississauga, Ontario, L5N 2L8
Phone: (905) 817-5700
Fax: (905) 817-5777

Maxxam

SUBCONTRACTING REQUEST FORM

Franz Environmental Inc - Ottawa
Maxxam PM Parnian Baber

To: Campo to Calgary Subcontract

Job# B3D3673

☐ Yes ☑ No International Sample/BioHazard (if yes, add copy of Movement Cert., heat treat is required prior to disposal)
☐ Yes ☑ No Special Protocol (if yes, Protocol _____)

Sample ID	Matrix	Test(s) Required	Container	Date Sampled	Date Required
SQ3083-05R \ MW1	W	CCME Metals (low Level), total	1(M)	2013/08/09	2013/08/19
SQ3083-06R \ MW1	W	CCME Metals (low Level), dissolved	1(DM)	2013/08/09	2013/08/19
SQ3083-06R \ MW1	W	Subcontracted Analysis	1(DM)	2013/08/09	2013/08/19
SQ3084-05R \ MW2	W	CCME Metals (low Level), total	1(M)	2013/08/09	2013/08/19
SQ3084-06R \ MW2	W	CCME Metals (low Level), dissolved	1(DM)	2013/08/09	2013/08/19
SQ3084-06R \ MW2	W	Subcontracted Analysis	1(DM)	2013/08/09	2013/08/19

	Temp. 1	Temp. 2	Temp. 3			
Cooler #1	15	15	15	Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO
Cooler #2	-			Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO
Cooler #3				Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO

Receiving Maxxam Location: Campo to Calgary Subcontract JOB # B372603

Relinquished by (Sign) _____ (Print) DAVID CHAN Date and Time 2013/08/16 16:00

Received by (Sign) _____ (Print) Jenelle Feller Date and Time 2013/08/17 10:15

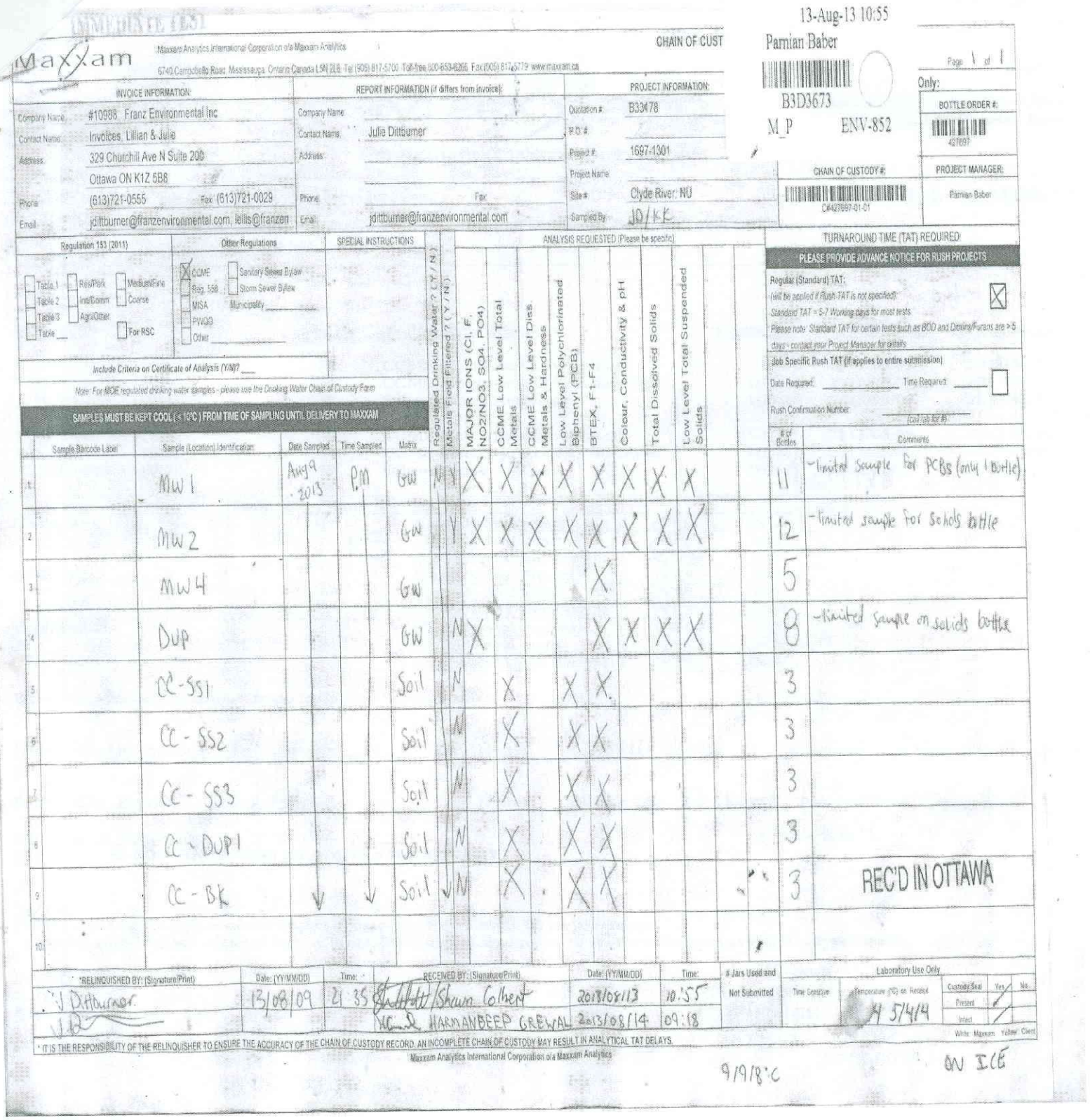
Subcontract Comments
SUB-MISC IS FOR HARDNESS AT MAXXAM CALGARY.

08-669

NOTES:
1) Please call us if due date cannot be met. Please reference Sample ID on your report.
2) Include copy of this completed form, Client COC & signed final report to **scontractor@maxxamanalytics.com**

Reporting Requirements:
National:
Regional:

17-Aug-13 10:15
Carmen McKay
B372603
ACI INS-0078



Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario, Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5779 www.maxxam.ca

CHAIN OF CUST

13-Aug-13 10:55
Parmian Baber
B3D3673
M_P ENV-852

Page 1 of 1

Only:

BOTTLE ORDER #: 427697

CHAIN OF CUSTODY #: C#427697-01-01

PROJECT MANAGER: Parmian Baber

INVOICE INFORMATION:
Company Name: #10988 Franz Environmental Inc
Contact Name: Invoices, Lillian & Julie
Address: 329 Churchill Ave N Suite 209, Ottawa ON K1Z 5B8
Phone: (613)721-0555 Fax: (613)721-0029
Email: jdittburner@franzenvironmental.com, lellis@franzen

REPORT INFORMATION (if differs from invoice):
Company Name:
Contact Name: Julie Dittburner
Address:
Phone: Fax:
Email: jdittburner@franzenvironmental.com

PROJECT INFORMATION:
Quotation #: B33478
P.O. #:
Project #: 1697-1301
Project Name:
Site #: Clyde River, NU
Sampled By: JD/KK

Regulation 153 (2011): Table 1, Table 2, Table 3, Table ___, Res/Park, Ind/Comm, Agri/Other, Medium/Fine, Coarse, For RSC
Other Regulations: CCME, Reg. 558, MISA, PWQO, Other ___, Sanitary Sewer Bylaw, Storm Sewer Bylaw, Municipality ___
SPECIAL INSTRUCTIONS
Include Criteria on Certificate of Analysis (Y/N)? ___
Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

ANALYSIS REQUESTED (Please be specific):
Regulated Drinking Water? (Y / N)
Metals Field Filtered? (Y / N)
MAJOR IONS (Cl, F, NO2/NO3, SO4, PO4)
CCME Low Level Total Metals
CCME Low Level Diss Metals & Hardness
Low Level Polychlorinated Biphenyl (PCB)
BTEX, F1-F4
Colour, Conductivity & pH
Total Dissolved Solids
Low Level Total Suspended Solids

TURNAROUND TIME (TAT) REQUIRED:
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Regular (Standard) TAT: (will be applied if Rush TAT is not specified) ☒
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	MAJOR IONS (Cl, F, NO2/NO3, SO4, PO4)	CCME Low Level Total Metals	CCME Low Level Diss Metals & Hardness	Low Level Polychlorinated Biphenyl (PCB)	BTEX, F1-F4	Colour, Conductivity & pH	Total Dissolved Solids	Low Level Total Suspended Solids	# of Bottles	Comments
1		MW1	Aug 9 2013	PM	GW	N	N	X	X	X	X	X	X	X	X	11	-limited sample for PCBs (only 1 bottle)
2		MW2			GW		Y	X	X	X	X	X	X	X	X	12	-limited sample for Solids bottle
3		MW4			GW							X				5	
4		DUP			GW		N	X				X	X	X	X	8	-limited sample on solids bottle
5		CC-SS1			Soil		N		X		X	X				3	
6		CC-SS2			Soil		N		X		X	X				3	
7		CC-SS3			Soil		N		X		X	X				3	
8		CC-DUP1			Soil		N		X		X	X				3	
9		CC-BK	↓	↓	Soil	↓	N		X		X	X				3	REC'D IN OTTAWA
10																	

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present / Intact	Yes	No
J Dittburner	13/08/09	21 35	Shawn Colbert	2013/08/13	10:55			4 5/4/4			
			HARMANBEET GREWAL	2013/08/14	09:18						

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

Maxxam Analytics International Corporation o/a Maxxam Analytics

White: Maxxam Yellow: Client

9/9/18 °C

ON ICE

APPENDIX E

Field Notes

Groundwater Sampling

Project: 1697-1301

Franz Personnel: Kim Krug
Weather:

Development of Monitoring Wells

Name of Area	Cape Chignecto		Sector:
Date of Sampling:	Day: 09	Month: 08	Year: 2013
Monitoring Well ID:	MW3		
Coordinates of Well	Easting:		Northing:
	GPS unit:		WP #:
Type of Well:	Stick Up	Drive Point	stickup = 0.575m
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):	1.624m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	— well dry					
Stick Up (m):	0.575m					
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					

Comments/ Notes:

DRY - NO SAMPLE

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

Groundwater Sampling

Project: 1697-1301

Franz Personnel: KAC
Weather:

Development of Monitoring Wells

Name of Area:	Cape Christian		Sector:
Date of Sampling:	Day: 09	Month: 09	Year: 2013
Monitoring Well ID:	MW2		
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):	1.394m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	0.909m					
Stick Up (m):	0.628m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1 13:01	5.44	PHC	y	5 bottles	
	2 13:05	4.75				
	3 13:10	4.79				
	4 13:15	4.90				
	5 Sample	5.04				
	6					
Temperature (°C):	1	3.18	PCB Total	y	2 bottles	
	2	3.46				
	3	3.45				
	4	3.38				
	5	3.37				
	6					
Conductivity (mS/cm):	1	1.043	VOC	N		
	2	1.010				
	3	0.977				
	4	0.951				
	5	0.938				
	6					
DO:	1	73.7	PAH	N		
	2	48.9				
	3	5.74				
	4	5.26				
	5	4.98				
	6					
ORP:	1	120.9	metals Hardness total + dissolved	y	2 bottles	
	2	149.6				
	3	152.1				
	4	149.1				
	5	140.7				
	6					
Turbidity:	1	124.7	Other			
	2	1.115				
	3	1.077	gen chem solids		3 bottles	
	4	1.058				
	5	1.040				
	6					

- turned off pump for 10 minutes before sampling
- well dried at 13:35 while sampling

* DUP for gen chem. & solids (3 bottles)

Comments/ Notes:

(*) 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: Cape Christian			Sector:
Date of Sampling:	Day: 09	Month: 08	Year: 2013
Monitoring Well ID:	MW1		
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):	1.592 m
Water Depth (m):	1.402m
Stick Up (m):	

Field Chemistry

Name and # unit:		Readings *
pH:	1	14:42 7.01
	2	
	3	
	4	
	5	
	6	
Temperature (°C):	1	3.34
	2	
	3	
	4	
	5	
	6	
Conductivity (mS/cm):	1	0.393
	2	
	3	
	4	
	5	
	6	
DO:	1	14/0.0
	2	
	3	
	4	
	5	
	6	
ORP:	1	53.5
	2	
	3	
	4	
	5	
	6	
Turbidity:	1	0.430
	2	
	3	
	4	
	5	
	6	

Sample Analysis	Y/N	# of Bottles	Duplicate Information
PHC	Y	5 bottles	
PCB Total	Y	1 Ebottles	
VOC	N		
PAH	N		
metals Hardness	Y	5 bottles.	
gen chem solids			
Other		* DUP for PHCs/BTEX (5 bottles)	

- stopped to see if well would recharge after bail first measurement (14:42)

Comments/ Notes:

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

Groundwater Sampling

Project: 1Ce97-1301

Franz Personnel: KK
Weather:

Development of Monitoring Wells

Name of Area: Cape Christian			Sector:
Date of Sampling:	Day: 09	Month: 08	Year: 2015
Monitoring Well ID:	MW4		
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):	1.508m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	1.453m					
Stick Up (m):	0.585m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1		PHC	Y	6 bottles	
	2					
	3					
	4					
	5					
	6					
Temperature (°C):	1		PCB Total	N		
	2					
	3					
	4					
	5					
	6					
Conductivity (mS/cm):	1		VOC	N		
	2					
	3					
	4					
	5					
	6					
DO:	1		PAH	N		
	2					
	3					
	4					
	5					
	6					
ORP:	1		Hardness	N		
	2					
	3					
	4					
	5					
	6					
Turbidity:	1		Other			
	2					
	3					
	4					
	5					
	6					

Comments/ Notes:

-> not much water in well, purged 1 well volume (650mL) & and then started sampling
- well goes dry after on well volume

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

1697-1701 Cape Christian Aug 9/13

Wildlife Survey

berries - Kunaliks - edible & grasses

- ptarmigans
- fox
- polar bear
- Canada Geese
- Canada Goose (white)
- ring seals
- Arctic Char
- Bowhead whales (do not hunt)
- small birds (buntings?)
- seagulls (tracks)
- loons
- Ravens
- Arctic Hare's
- less animals than used to be

Spoke w/ John Barry - our Bear Monitor - has lived in Clyde his whole life.

Rite in the Rain

1697-1301 Cape Christian Aug 9/13

- Arrived at site @ 11:30am
- ATV ride approx ½ hour from Clyde
- road in good condition

On-Site

Franz: Julie Dithburner + Kim Krug
MANDC: Allison Dunn
Nunatta: Noah
B.M: John Barry a local from Clyde

- Groundwater monitoring completed using peristaltic geopump, WL meter & YSI 556.
- See notes (field sheets) for well info.

- completed photographic survey * using DGPS.
- completed landfill ~~integr~~ survey using DGPS - new features added
  - see landfill map for locations

- completed soil samples where staining + ponded water →

1697-1301 Cape Christian Aug 9/13

Soils - see map for locations.

CC-SS1
- collecting soils on north side of the landfill at end of erosion channel
- heavy staining.
- at NE SI corner.
- sand, some gravel, no odours.
- 3 jars for PHCs, PCBs & metals

CC-SS2
- on north side of landfill at end of erosion channel at NW corner. ~~heavy~~ Heavy staining, sheen observed.
- soils - brown, sand, ground, fine to medium
- organic odours

*DUP 1 here.
3 jars each for PHCs, PCBs & metals.

Rite in the Rain

1697-1301 Cape Christian Aug 9/13

CC-SS3
- collected at NW corner of landfill at large stained area, last time (2012) was very wet here, possible seepage point
- soils are brown, moist, sand & gravel, medium ~~no odours, no (slight~~ slight organic odours.

CC-BK
- background sample
- ~ 160m NW of landfill
- collected in stained soil, no odours
- Sand, brown, moist.

~~once completed~~ did a walk around

1697-1301 Cape Christian Aug 9/13

- once soils & GW sampling completed, did a walk around with Franz & AANDC to make sure no features were missed.

- cleaned up site
- off-site at 6:30pm and back to Clyde River.

Rite in the Rain