Indigenous and Northern Affairs Canada | Affaires autochtones et du Nord Canada

PIN-B Clifton Point
Long Term Monitoring Plan

Revised May 10, 2017

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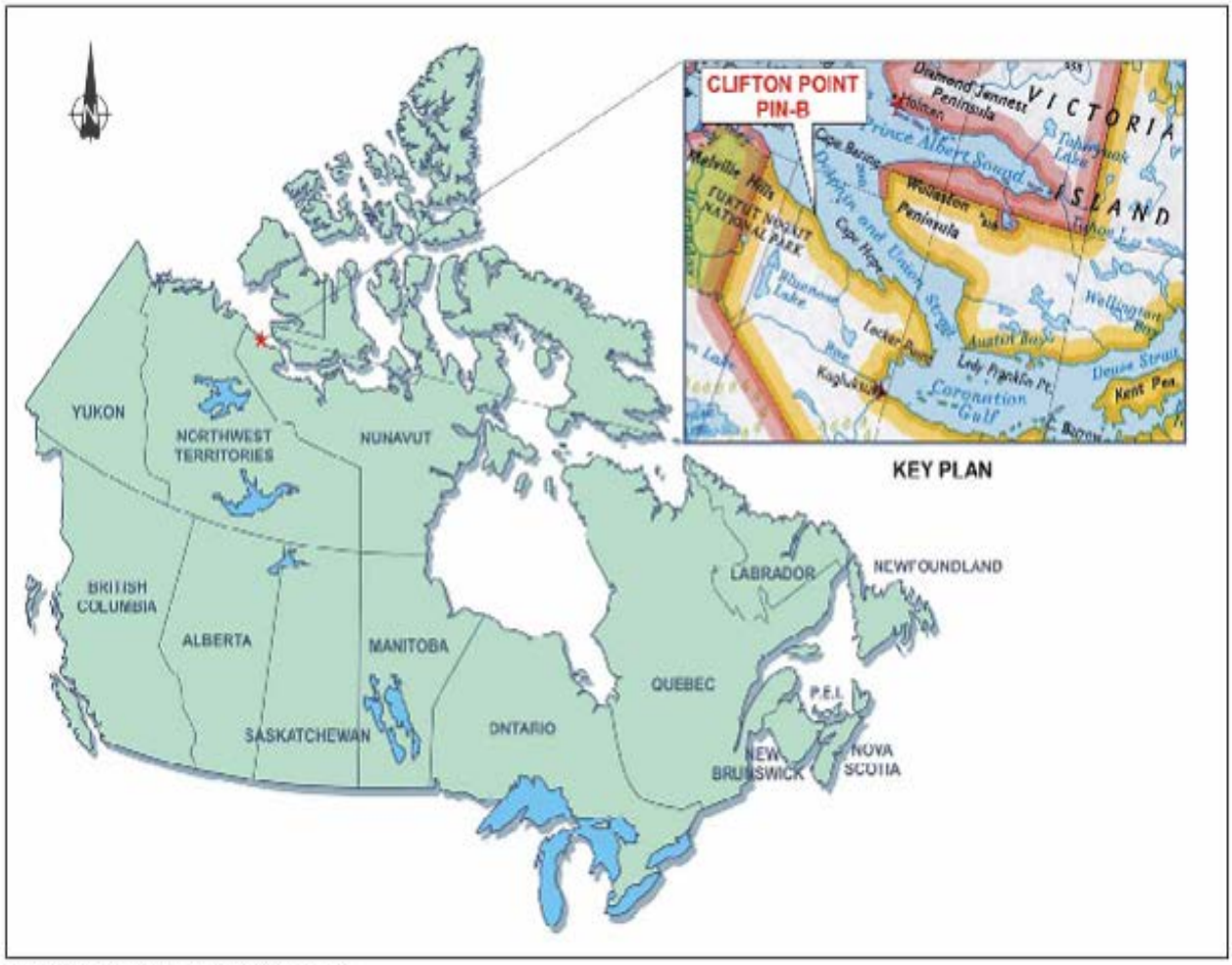
1.0 Introduction

1.1 Site Location

Clifton Point is located on the coast of Amundsen Gulf (Beaufort Sea) in Nunavut. The nearest communities are Paulatuk, NWT, about 220 km to the northwest, and Kugluktuk, Nunavut about 220 km to the southeast. The site is situated about 1 km inland from the coast (see Figure 1).



Source (inset): National Geographic (1999).

Figure 1: PIN-B (Clifton Point) site location

1.2 Background

PIN-B, Clifton Point, was reserved by the Department of National Defence (DND) in 1956 and the former PIN-B Intermediate Distant Early Warning (DEW) Line site was constructed in 1957 and subsequently closed and abandoned in 1963. In 1965, responsibility for the site reverted to INAC. The PIN-B station was comprised of a five-module building train (the "module train"), a warehouse, a garage, a small house for Inuit

staff (the "Inuit House"), a petroleum, oil and lubricants (POL) storage facility with associated distribution system, and a felled radar tower. In addition to the station facilities, a cargo beaching area was constructed at the beach area. A second POL storage facility was located at the beach, in the vicinity of the cargo beach area. Two airstrips were constructed at the site: the primary airstrip is approximately 1 km long, located south of the beach area, while the second airstrip is much shorter, with a length of 300 metres (m) and located northwest of the main strip. Gravel roads were built linking the airstrip, water supply lake, and beaching area to the station area. A small construction camp was erected during building of site facilities but was demolished once site construction was completed. The former camp of an Inuit family is located approximately 1.5 km southeast of the PIN-B site.

An environmental assessment of the PIN-B site was initiated in 1985 when DND and Environment Canada visited the site to remove surface contaminants such as PCBs and petroleum, oils and lubricants (POL) and to identify areas of buried materials which could pose environmental risks in the future. Various pieces of PCB-containing equipment were removed from electrical cabinets at the site (172 pieces). Two soil samples collected at the station area (upper site) adjacent to the module train indicated that no PCB residues were present. No other results were reported.

The site was revisited in 1994 by the Environmental Sciences Group (ESG) of Royal Roads Military College at which time a limited sampling program was completed[1]. Surface soil and vegetation samples were collected, in addition to wall swabs from the module train and warehouse, to investigate possible contamination. Floor tile and piping insulation samples were also taken from the module train in order to investigate possible asbestos content. Background samples were collected from locations that were considered to be unaffected by station activities. This investigation identified soil contamination exceeding Tier I and/or Tier II levels (based on the DND DEW Line Clean-up Criteria) around the module train, garage, sewage outfall, incinerator, warehouse, barrel/vehicle storage areas, and sewage outfall. The analyses from the swab samples indicate that there were high levels of PCBs in the paint of the module train, and the floor tiles and insulation were found to contain asbestos. One landfill was identified on site, 500 m west of the beach POL area and 40 m from the ocean. The majority of the debris in the beach landfill was buried, however some evidence of erosion on the ocean facing side was observed. These investigations did not include an assessment of hydrocarbon contamination.

Finally, a Phase III Environmental Site Assessment[2] was completed by UMA during the summer of 2007. A total of approximately 570 m^3, including 550 m^3 from dump excavations, of soils with concentrations of metals, PCBs, which exceeded the Tier I levels of the Abandoned Military Site Remediation Protocol (AMSRP)[3], were identified at the site. This soil was used as intermediate fill in the Non-Hazardous Waste Landfill

[1] Environmental Study of Abandoned DEW Line Sites – One Auxiliary and Eight Intermediate Sites in the Canadian Arctic (Mar, 95)
[2] Phase III Environmental Site Assessment, UMA Engineering (Mar, 08)
[3] Indian and Northern Affairs Canada, Abandoned Military Sites Remediation Protocol - March, 2009

(NHWL). An additional 1,210 m^3 of soils, including 880 m^3 from dump excavations, was identified in excess of Tier II levels and was shipped off site for disposal. In addition, 80 m^3 of Type A (F3-F4) and 1,360 m^3 of Type B (F1-F3) hydrocarbon impacted soils were identified. The Type A soil was used as intermediate fill in the NHWL and the Type B soil was treated onsite by alluing.

A total of 194 m^3 of hazardous materials were identified at the site. Materials coated with PCB amended paint (PAP) comprised the majority of the hazardous material volume. The remainder of the hazardous material included batteries, asbestos-containing materials, and drum contents. All hazardous material was shipped off site for disposal. Based on the combined results of the surface debris inventory, barrel assessment and demolition inventory, approximately 2,180 m^3 of non-hazardous waste was identified and placed in the constructed NHWL.

Ten existing dumps were investigated, including six that were previously unidentified in past assessments at the PIN-B site. The total volume of buried debris within the sites was approximately 6,600 m^3. Based on the location and condition of the dumps and contaminant migration assessment results, each dump site was assigned as a Class A, B or C dump according to the INAC protocol. Five dumps were classified as Class C (one of which required excavation due to its proximity to a lake). Two dumps were classified as Class B and required excavation. Finally, three dumps were classified as Class A and required excavation. Therefore, five of the seven dumps were excavated due to stability or proximity to environmentally sensitive areas.

Water samples collected from Drinking Water Lake suggests that some chronic inputs of inorganic elements may have occurred, however, contaminant levels are all low, and no significant impacts were identified.

Final remediation activities were completed in the 2010 field season and final demobilization of all supplies, equipment and waste occurred on August 18, 2010.

The overall objectives for the PIN-B remediation project were:

- To minimize environmental impacts to humans and wildlife at the site;
- To ensure the project is completed complying with all legal obligations;
- To ensure the project is undertaken in accordance with all Federal and/or Departmental policies;
- To increase public perception and attitude toward remediation activities;
- To promote the social and economic benefits of the project for Inuit; and
- To reduce liabilities to the Crown.

2.0 Monitoring Plan

Monitoring was completed during remediation at the site, as required under Part K, Item 2 of water licence 1BR-CLI0914. Results were provided in Annual Reports as required under Part B, Item 1 of the same water licence.

Upon completion of remediation, the only structure that remains at the PIN-B site is the NHWL. The monitoring program for the PIN-B site is in accordance with the AMSRP (2009) and involves (i) natural environment monitoring and (ii) post-closure monitoring of the site.

2.1 Natural Environment Monitoring

Natural environment data has been collected during the environmental assessment and community meetings as well as during the remediation of the site. In addition, information was collected during previous site visits and will be collected during future site visits in the course of the long term monitoring process. This data includes local and Indigenous knowledge of the site and serves as a reference for post-construction monitoring. The purpose of collecting this new data is not to find correlations with the landfill monitoring data but rather to provide anecdotal data related to the presence of wildlife and changes over time. The information to be gathered is included in the Visual Monitoring Checklist (see Appendix B).

The data collected during the Long Term Monitoring site visits will include:

- Wildlife sightings (species, number, gender, juveniles);
- Other evidence of recent presence of wildlife (droppings, tracks, feathers/fur, carcass remains, etc.)
- Wildlife activity (summering/nesting/denning, migratory/passing through);
- Qualitative assessment of relative numbers versus previous years (more, same, less); and
- Revegetation of disturbed areas versus previous years (more, same, less).

Information regarding visits made to the site by local people may also be collected through consultations with local community members and/or local Hunter and Trapper Associations and/or the Kitikmeot Inuit Association. The type of information that may be collected includes:

- Wildlife sightings;
- Use by people for traditional activities;
- Season(s);
- Activities (hunting, fishing, trapping, camping, other harvesting);
- Relative frequency versus previous years (more, same, less);
- Wildlife species present (sightings or evidence);
- Wildlife presence versus previous years (more, same, less);
- Health of wildlife observed or harvested (good, average, poor); and
- Relative health of wildlife versus previous years (better, same, worse).

2.2 Post Construction Monitoring

- ***Design***

Construction of the NHWL was completed and closed in the summer of 2010 (see Appendix A). The NHWL was designed to contain non-hazardous materials only. It was constructed on native ground, with all organic matter removed, and consists of four perimeter berms constructed of granular material. The non-hazardous waste was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill. Once all the waste was placed, a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the NHWL.

- ***Contents***

The NHWL at PIN-B contains the following material:

- F3 and F4 fraction hydrocarbon 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; and
- Tier I contaminated soil (Lead concentration between 200 and 500ppm and PCB concentrations between 1 and 5 ppm).

- ***Monitoring Requirements***

The NHWL is monitored by:

- **Visual Monitoring**
  - This checks the physical integrity of the NHWL and looks for evidence of erosion, ponding, frost action, settlement and lateral movement through the use of a Visual Monitoring Checklist (see Appendix B).
  - Photographs are taken to document the condition of the NHWL and to substantiate the recorded observations.

- **Water (Active Layer) Monitoring**
  - Samples are taken from the four (4) monitoring wells installed around the NHWL (see Appendix A). These samples are analyzed and the results are compared to those collected from previous monitoring events. The parameters that are analyzed include:
    - Petroleum Hydrocarbons;
    - Total and Dissolved Metals;
    - Major Ions, Hardness, Total Dissolved Solids, Total Suspended Solids;
    - pH, Conductivity; and
    - Polychlorinated biphenyls (PCBs).

- **Soil Monitoring (as necessary)**
  - Soil sampling is limited to locations where seepage or staining has been identified as part of the visual inspection. When required, soil samples are collected over the interval of 0 to 0.15 m and 0.35 to 0.50 m depth. The parameters that are analyzed include:
    - PCBs;
    - Petroleum Hydrocarbons; and
    - Arsenic, Cadmium, Cobalt, Chromium, Lead, Nickel, and Zinc.

2.3 Monitoring Schedule

The post construction monitoring frequency follows the schedule identified in the AMSRP (2009). The three phases recommended by the protocol are:

- Phase I: years 1, 3 and 5;
- Phase II: years 7, 10, 15 and 25; and
- Phase III: beyond year 25 (if required).

Monitoring at the PIN-B site began in 2011 and will continue until 2035. Each of the four monitoring requirements discussed above (i.e., natural environment, water, visual and soil) are conducted during each site visit. Phase I monitoring took place in years 2011, 2013 and 2015 during the summer months (between July-September). An evaluation of Phase I monitoring data was carried out at the end of the 2015 program and additional monitoring (Phase II) was recommended. Future monitoring events will be carried out during the years 2017, 2020, 2025 and 2035. At the completion of the 25-year monitoring program, a review will take place and the need for continued monitoring (Phase III) will be assessed.

Table 1: Monitoring Schedule

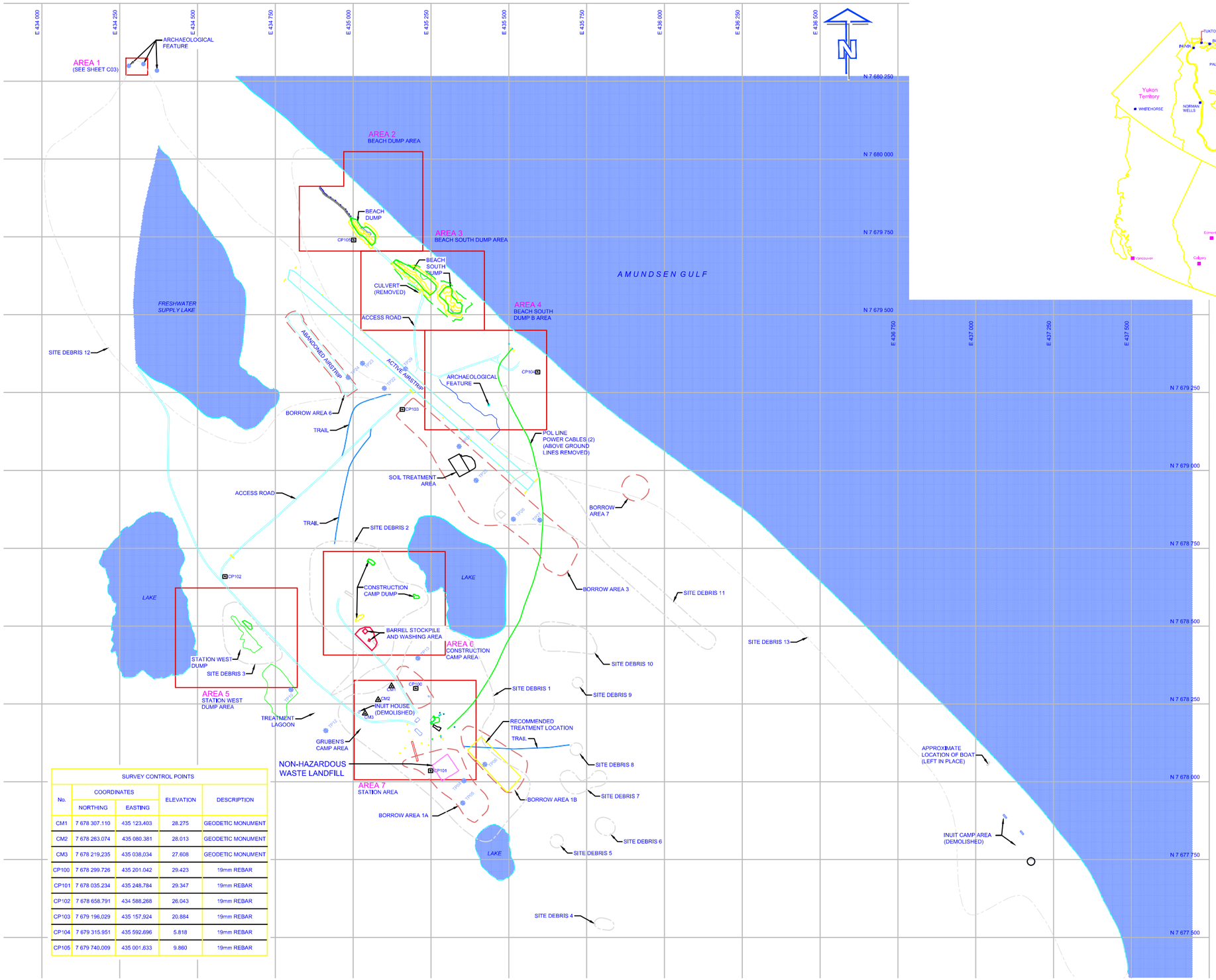
Year	Site Monitoring Scheduled (X)	Year	Site Monitoring Scheduled (X)
2011	X	**2024**	
2012		**2025**	X
2013	X	**2026**	
2014		**2027**	
2015	X	**2028**	
2016		**2029**	
2017	X	**2030**	
2018		**2031**	
2019		**2032**	
2020	X	**2033**	
2021		**2034**	
2022		**2035**	X
2023			

3.0 Quality Assurance / Quality Control Measures

All sampling, sample preservation and analyses will be conducted in accordance with methods prescribed in the current edition of “Standard Methods for the Examination of Water and Wastewater”. All analysis will be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Accredited Laboratory.

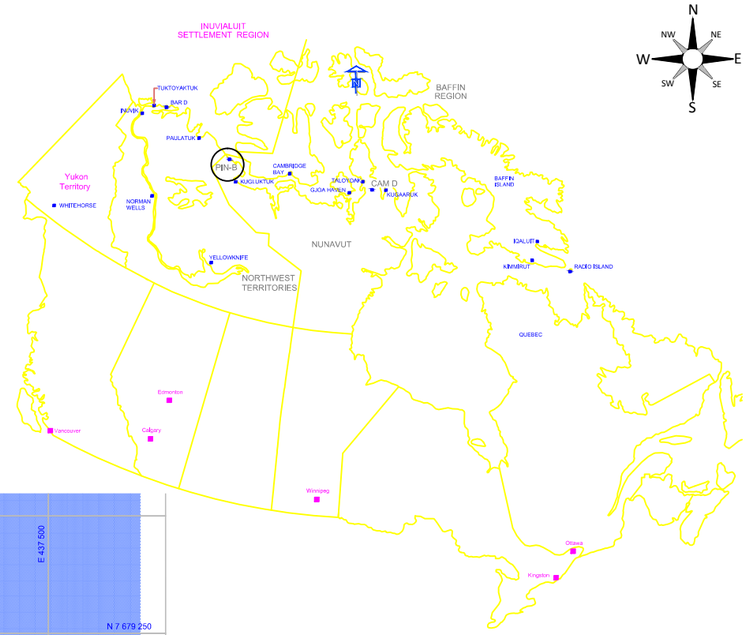
Quality Assurance/Quality Control (QA/QC) will be consistent with CAEAL regulations and guidelines. At least 20% of samples will be taken and analyzed in duplicate and all appropriate QA/QC data will be generated and reported.

APPENDIX A:
PIN-B NHWL As-Builts



SURVEY CONTROL POINTS

No.	COORDINATES		ELEVATION	DESCRIPTION
	NORTHING	EASTING		
CM1	7 678 307.110	435 123.403	28.275	GEODETIC MONUMENT
CM2	7 678 263.074	435 080.381	28.013	GEODETIC MONUMENT
CM3	7 678 219.235	435 038.034	27.608	GEODETIC MONUMENT
CP100	7 678 299.726	435 201.042	29.423	19mm REBAR
CP101	7 678 035.234	435 248.784	29.347	19mm REBAR
CP102	7 678 658.791	434 588.268	26.043	19mm REBAR
CP103	7 679 196.029	435 157.924	20.884	19mm REBAR
CP104	7 679 315.951	435 592.696	5.818	19mm REBAR
CP105	7 679 740.009	435 001.633	9.860	19mm REBAR



LEGEND:

- APPROXIMATE EXTENT OF BORROW AREA
- APPROXIMATE EXTENT OF SHORELINE
- ACCESS ROAD
- TRAIL
- EXTENT OF SITE DEBRIS AREAS
- CULVERT
- BODY OF WATER
- TP01 TESTPIT LOCATIONS
- CM1 SURVEY CONTROL MONUMENT
- CP100 SURVEY CONTROL POINTS

Reference:
Figure adopted from SENES Consultants drawing C02, dated February 2011

Title: Overall Site Plan

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: PIN-B Clifton Point 1697-1101

Date: January 2012

Client: Aboriginal Affairs and Northern Development Canada

1:12,500

Figure A-1

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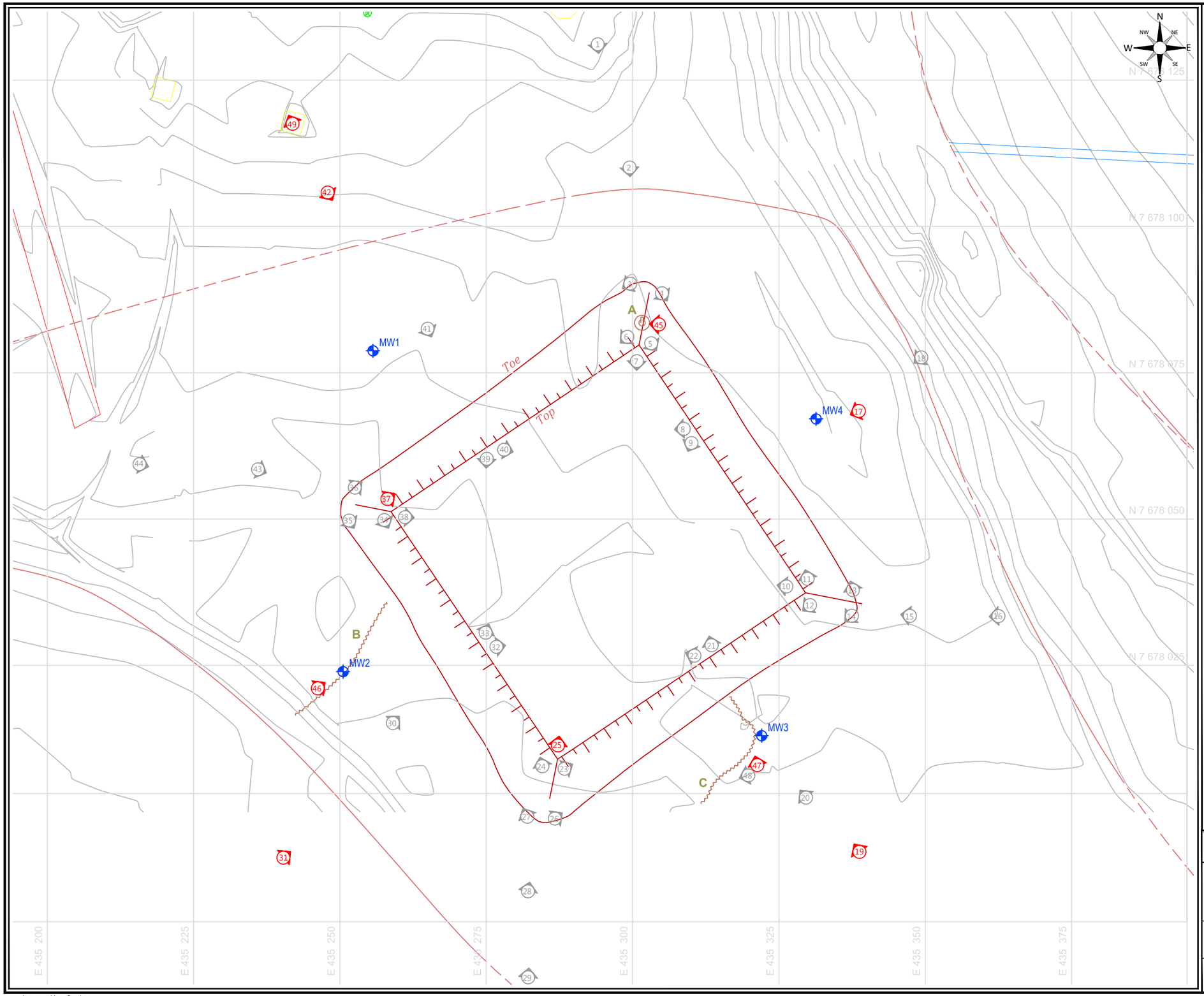

Legend

- MW — Monitoring Well Locations
- 25 — Picture Viewpoint Number
- 25 — Veiwpoint Photograph Included in Appendix B
- A — Erosion/Drainage
- Animal Burrow

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

Reference:
Figure adopted from SENES Consultants drawing C08, dated February 2011

Title: Non-hazardous Waste Landfill

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: PIN-B Clifton Point 1697-1101

Date: January 2012

Client: Aboriginal Affairs and Northern Development Canada

1:650

Figure A-2

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Project: **Pin-B Environmental Site Remediation** Contract No: **34965**

Boring date: **18/09/2009** Supervised by: **Kurt Kure**

Borehole Location: **Pin-B, Nunavut**

Driller: **EGT**

Drilling Method: **Excavator Auger Attachment**

Borehole: **MW-101 (East)**

Monitoring Well: **Installed**

Sheet 1 of 1

Scale (m)	Stratigraphy: Elev. (m) Depth (m)	Stratigraphy: Description (Ground Surface Elevation: m)	Stratigraphy: Symbol	Samples: Well Details	Samples: Water Level	Samples: Sample Type and Number	Samples: Conditon	Samples: Blows/ 150mm	Samples: % Recovery	Samples: RQD	Odour	Headspace TOV ⊕ (ppm) 100 200 300 400 / Headspace TOV □ (%LEL) 20 40 60 80	Remarks and Sample Analyses
		- top of well housing @ 0.77 m a.g.s.				Top of Housing							
		Gravel Ground Surface											
	0.00	**Sand and Gravel**- brown, damp											
	0.40	**Permafrost Sand and Gravel**- greyish, frozen											
		- bottom of well housing @ 0.73 m.				Bot of Housing							
-1													
-2													
-3													
	3.49	End of Hole at Depth.											

ODOUR:
N - None
T - Trace
M - Moderate
S - Strong
VS- Very Strong

Prepared by: **H.H.Wong**

Checked by: **H.H.Wong**

Date: **21/09/09**

DCS
DECOMMISSIONING CONSULTING SERVICES LIMITED

Project: **Pin-B Environmental Site Remediation** Contract No: **34965**

Boring date: **19/09/2009** Supervised by: **Kurt Kure**

Borehole Location: **Pin-B, Nunavut**

Driller: **EGT**

Drilling Method: **Excavator Auger Attachment**

Borehole: **MW-102 (North)**

Monitoring Well: **Installed**

Sheet 1 of 1

Scale (m)	Stratigraphy: Elev. (m) Depth (m)	Stratigraphy: Description (Ground Surface Elevation: m)	Stratigraphy: Symbol	Samples: Well Details	Samples: Water Level	Samples: Sample Type and Number	Samples: Conditon	Samples: Blows/ 150mm	Samples: % Recovery	Samples: RQD	Odour	Headspace TOV ⊕ (ppm) 100 200 300 400 / Headspace TOV □ (%LEL) 20 40 60 80	Remarks and Sample Analyses
		- top of well housing @ 0.72 m a.g.s.					Top of Housing						
		Gravel Ground Surface											
	0.00	**Sand and Gravel**- brown, damp											
		- bottom of well housing @ 0.78 m.					Bot of Housing						
-1													
-2													
-3													
	3.55	End of Hole at Depth.											

ODOUR:
N - None
T - Trace
M - Moderate
S - Strong
VS- Very Strong

Prepared by: **H.H.Wong**

Checked by: **H.H.Wong**

Date: **21/09/09**

DCS
DECOMMISSIONING CONSULTING SERVICES LIMITED

Project: **Pin-B Environmental Site Remediation** Contract No: **34965**

Boring date: **19/09/2009** Supervised by: **Kurt Kure**

Borehole Location: **Pin-B, Nunavut**

Driller: **EGT**

Drilling Method: **Excavator Auger Attachment**

Borehole: **MW-103 (West)**

Monitoring Well: **Installed**

Sheet 1 of 1

Scale (m)	Stratigraphy: Elev. (m) Depth (m)	Stratigraphy: Description (Ground Surface Elevation: m)	Stratigraphy: Symbol	Samples: Well Details	Samples: Water Level	Samples: Sample Type and Number	Samples: Conditon	Samples: Blows/ 150mm	Samples: % Recovery	Samples: RQD	Odour	Headspace TOV ⊕ (ppm) 100 200 300 400 / Headspace TOV □ (%LEL) 20 40 60 80	Remarks and Sample Analyses
		- top of well housing @ 0.67 m a.g.s. housing cut to fit					Top of Housing						
		Gravel Ground Surface											
	0.00	**Sand and Gravel**- brown, damp											
		- bottom of well housing @ 0.5 m.					Bot of Housing						
-1		- water table during drilling.											
-2													
-3													
	3.45	End of Hole at Depth.											

ODOUR:
N - None
T - Trace
M - Moderate
S - Strong
VS- Very Strong

Prepared by: **H.H.Wong**

Checked by: **H.H.Wong**

Date: **21/09/09**

DCS
DECOMMISSIONING CONSULTING SERVICES LIMITED

Project: **Pin-B Environmental Site Remediation** Contract No: **34965**

Boring date: **20/09/2009** Supervised by: **Kurt Kure**

Borehole Location: **Pin-B, Nunavut**

Driller: **EGT**

Drilling Method: **Excavator Auger Attachment**

Borehole: **MW-104 (South)**

Monitoring Well: **Installed**

Sheet 1 of 1

Scale (m)	Stratigraphy: Elev. (m) Depth (m)	Stratigraphy: Description (Ground Surface Elevation: m)	Stratigraphy: Symbol	Samples: Well Details	Samples: Water Level	Samples: Sample Type and Number	Samples: Conditon	Samples: Blows/ 150mm	Samples: % Recovery	Samples: RQD	Odour	Headspace TOV ⊕ (ppm) 100 200 300 400 / Headspace TOV □ (%LEL) 20 40 60 80	Remarks and Sample Analyses
		- top of well housing @ 0.8 m a.g.s.					Top of Housing						
		Gravel Ground Surface											
	0.00	**Sand and Gravel**- brown, damp											
		- bottom of well housing @ 0.7 m.					Bot of Housing						
-1		- water table during drilling.											
-2													
-3													
	3.57	End of Hole at Depth.											

ODOUR:
N - None
T - Trace
M - Moderate
S - Strong
VS- Very Strong

Prepared by: **H.H.Wong**

Checked by: **H.H.Wong**

Date: **21/09/09**

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APPENDIX B:
Visual Monitoring Checklist

Date:			
Site:			
Note	**Response**	**Extent**	**Description**
	Yes/No	*Provide information as applicable (i.e. length/width/depth/type)*	*Features of note, photographic reference with scale, point of view anddirection*
Natural Environmental Monitoring			
Wildlife Sightings			
Evidence of Wildlife			
Wildlife Activity			
Relative Number			
Evidence of Revegetation			
Landfill Location:			
Post-Closure Landfill Monitoring			
Evidence of Settlement			
Evidence of Erosion			
Evidence of Frost Action			
Animal Burrows			
Vegetation Present			
Vegetation Stresses			
Staining Present			
Seepage Points			
Exposed Debris			
Condition of Instruments			
Other Features			