

## **Resolution Island Monitoring Program**

Following the clean up and remediation of the BAF-5 Resolution Island former military site a long-term monitoring program will be put into operation.

### **Monitoring Areas**

The monitoring plan will be concerned with the landfills, dumps and the permanent interceptor barriers. The remediation plan proposed below is based largely on the agreement between NTI and DND for the clean-up and restoration of DEW line sites within the Nunavut settlement area (environmental provisions 1998).

#### **Landfills**

##### **Non Hazardous Landfills**

Three (3) new landfills for non-hazardous (NH) wastes will be present at the end of the project: 1) the East Camp NH Landfill, 2) the West Camp NH Landfill, and 3) the Beach NH Landfill. The locations of these landfills are presented in figure 1.

These landfills will be inspected visually for stability only. This visibility inspection will look for any settling, ponding, erosion or frost action that may have occurred. If there are signs of instability at these landfills such that buried material becomes exposed, then remedial action will be required.

##### **Tier II Landfill**

For the Tier II landfill, visual inspection, water and soil monitoring as well as the recording of thermal measurements are proposed. The location of the Tier II landfill is presented in figures 1 and 2.

The landfill will be inspected visually for stability. Any signs of instability (*i.e.*, settling, ponding, erosion or frost action) that may affect the integrity of the landfill would potentially require remedial action.

Three (3) wells were installed down-gradient of the landfill in 2003, and one (1) well will be installed up-gradient of the site in 2004. If considered desirable, more monitoring wells may be installed in 2004. The locations of the installed and proposed MW are presented in figure 2. Monitoring of these locations should start in 2004. Water from the wells will be tested for the 8 elements of the DCC (As, Cd, Cr, Co, Cu, Pb, Ni, and Zn), PCBs, and TPH. Furthermore, the following parameters will be measured on site: pH, conductivity, and temperature.

Soil collected from four (4) locations close to the monitoring wells will be analysed for the same set of parameters. Remediation steps will be required if the analytical results show a significant increase in contamination over a period of three (3) or more years.

Three (3) thermister strings will be placed within the landfill so as to record temperature at 0.5 m intervals. Temperatures will be recorded during the annual site visit. This landfill is designed to ensure that all the buried Tier II material should remain frozen. This steady state should be reached within 3 to 4 years. Remedial action could be required if

all the buried material is not frozen permanently. The locations of the proposed thermistors are presented in figure 2.

### **Dumps**

The Airstrip and Maintenance dumps will be visually monitored for stability and have a water and soil sampling program. The locations of these dumps are presented in figures 1, 2, and 3. Water and soil monitoring points will be established down-gradient from each dump with one reference location up-gradient for each dump.

In the case of the Maintenance dump two (2) points will be established at 10 m and 30 m down-gradient from the dump and monitored for cobalt (Co) only.

For the Airstrip dump, three (3) monitoring points will be established at 5 m, 25 m, and 50 m from the toe of the dump in the drainage pathway and samples will be analysed for PCBs only. The up-gradient well and one down-gradient (25 m) well were installed in 2003.

The locations of the installed and proposed MW are presented in figures 2 and 3.

### **Interceptor Barriers**

The two (2) permanent interceptor barriers (*i.e.*, S1/S4 Valley barrier, S1/S4 Beach barrier) will be inspected and repaired, if necessary at each monitoring visit. The locations of these barriers are presented in figure 2.

Any silt collected by the barriers will be excavated and/or any used filters that need to be replaced will be discharged and placed into plastic drums and sub-samples collected for PCB analysis. These drums will be temporarily stored in building B2 at the beach area. The drum contents will be managed according to the PCB level in the soil. In addition soil samples should be collected from the clean cells which will be established beyond the barriers.

The GPS coordinates of all sampling points will be measured during the 2004 season and subsequent seasons and will be reported starting in 2004 or 2005 for landfills and barriers not completed in 2004. Tables 1 and 2 summarize the monitoring requirements of all identified areas.

Table 1: General Monitoring Requirements

Area	Visual	Water	Soil	Thermal
East Camp NH Landfill	X			
West Camp NH Landfill	X			
Beach NH Landfill	X			
Tier II Landfill	X	X	X	X
Maintenance Dump		X	X	
Airstrip Dump		X	X	
S1/S4 Valley Barrier	X		X	
S1/S4 Beach Barrier	X		X	

Table 2: Specific Monitoring Requirements

Sampling Points		Water and Soil			Thermal		
Area	ID	Description	Installation	GPS coordinates	ID	Installation	GPS coordinates
Tier II Landfill	MW-01	Up-gradient monitoring well	2004	TBD	TH-1	2005	TBD
	MW-02	Down-gradient monitoring well	2003	TBD	TH-2	2005	TBD
	MW-03	Down-gradient monitoring well	2003	TBD	TH-3	2005	TBD
	MW-04	Down-gradient monitoring well	2003	TBD			
Maintenance Dump	MW-11	Down-gradient monitoring well	2004	TBD			
	MW-12	Down-gradient monitoring well	2004	TBD			
Airstrip Dump	MW-21	Up-gradient monitoring well	2003	TBD			
	MW-22	Down-gradient monitoring well	2003	TBD			
	MW-23	Down-gradient monitoring well	2004	TBD			
S1/S4 Valley Barrier	STV	Up-gradient sampling point - soil	2003	TBD			
	BWV	Down-gradient sampling point - water	2003	TBD			
	CCV	Down-gradient sampling point - soil	2003	TBD			
S1/S4 Beach Barrier	STB	Up-gradient sampling point - soil	2005	TBD			
	BWB	Down-gradient sampling point - water	2005	TBD			
	CCB	Down-gradient sampling point - soil	2005	TBD			

ID: Identification number

TBD: To be determined starting in 2004

## Monitoring Schedule

Initially, a baseline study will be conducted in 2006 during demobilization of equipment and infrastructure. Monitoring will then be conducted once a year in approximately mid-August. The frequency of the program will be on a yearly basis for the first 5 years. Then year 7, 10, 15 and 25 if no problems are encountered. A full review of all data will be undertaken in the fifth year. The proposed monitoring schedule is presented in figure 5.

Figure 4: Proposed Monitoring Schedule

Year nb years	2006 0	2007 1	2008 2	2009 3	2010 4	2011 5	2012 6	2013 7	2014 8	2015 9	2016 10	2017 11	2018 12	2019 13	2020 14	2021 15	2022 16	2023 17	2024 18	2025 19	2026 20	2027 21	2028 22	2029 23	2030 24	2031 25
baseline study																										
monitoring																										
full review																										

## **Sampling and Analysis**

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” published by AWWA.

All analyses will be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Accredited Laboratory.

## **Quality Assurance/Quality Control (QA/QC) Plan**

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