Table 5.2

CAM-5, MACKAR INLET: ASBESTOS SAMPLE SITES AND ANALYTICAL RESULTS

Location	Area	Sample No.	Percent Asbestos Present	Type of Asbestos
Active Landfill	Refuse	C5A-001	70%	Chrysotile
Module Train	Laundry Room Floor Tile	C5A-002	Not Detected	
Module Train	Tank Room Floor Tile	C5A-003	Not Detected	
Module Train	Washroom Hot Water Pipe	C5A-004	Not Detected	
Warehouse	Mechanical Room	C5A-005	70%	Chrysotile

5.2 PAINT

5.2.1 FIELD SURVEY

Five paint samples were obtained from representative areas in the interior and on the exterior of the CAM-5 facilities in July of 1990. Sample locations included the interior and exterior of the emergency shelter hut, the exterior of a mogas tank, and the interior of the Module Train. The fifth sample was collected from a paint spill location. Specific areas are described in Table 5.3.

Table 5.3

CAM-5, MACKAR INLET: PAINT SAMPLE SITES AND ANALYTICAL RESULTS

Location	Emergency Shelter (FAC 3013)	Lake Shore POL	Lake Shore POL	Emergency Shelter (FAC 3009)	Module Train (FAC 01)
Sample Area	Interior	Paint Spill	Mogas Tank Exterior	Exterior	Storage Room Interior
Sample No.	C5P-001	C5P-002	C5P-003	C5P-004	C5P-005
Metals Present (mg/kg)					
Arsenic	170	1	0.5	0.7	38
Selenium	6.3	<0.5	<0.5	<0.5	2.2
Mercury	49	<0.5	0.22	2.9	14
Barium	120	13000	9900	55	48
Beryllium	<1	<1	<1	<1	<1
Cadmium	15	38	40	<1	11
Chromium	210	7	5	22	64
Lead	3300	210	40	52	1100
Nickel	42	<5	<5	<5	15
Silver	<5	<5	<5	<5	<5

5.2.2 ANALYTICAL RESULTS

The results of the metal analyses of the paint samples are presented in Table 5.3. All analyses determined the total concentration of specific metals. Test methods for the various chemicals are given in Appendix C.3.

Lead concentrations ranged from 40 to 3300 mg/kg in the specific samples tested, with the highest concentration detected in the sample taken from the exterior of the emergency shelter (C5P-001). Elevated concentrations of arsenic (170 mg/kg) and mercury (49 mg/kg) were also detected in this sample. Sample C5P-005, taken from the interior of the module train, showed moderately high levels of arsenic and mercury as well (38 mg/kg and 14 mg/kg, respectively).

High levels of barium were detected Samples C5P-002 and C5P-003 (13000 and 9900 mg/kg, respectively) taken from the lake shore POL facility. Generally, high metal concentrations are typical of industrial oil-based paints.

5.3 PCB

5.3.1 RECORD REVIEW

The most recent PCB inventory is dated January 25, 1990 (DEW Surveys 1990). A list of the equipment suspected of containing PCBs in use as of January 25, 1990 is summarized in Table 5.4.

5.3.2 FIELD SURVEY

A runway lighting regulator located at the airstrip, suspected of containing PCB oil, was sampled. The remaining units listed in the inventory were not tested as they were either sealed or in use at the time of the site visit.

Table 5.4

CAM-5, MACKAR INLET: PCB INVENTORY

Area	Transformer Units	Capacitor Units	Misc. Units	Suspected Total PCBs (kg)
Building 32	1	--	--	172.12
Airstrip	1	--	--	172.12
Receiver Room	556	38	506	131.6
Radar Room	86	574	328	94.08
Lateral Communication Room	12	24	--	36.56
Surveillance Room	20	68	13	36.56
Emergency Radio Room	1	1	1	2.50

5.3.3 ANALYTICAL RESULTS

The sample tested did not contain PCB oil above the detection limit. These results do not preclude the presence of PCBs in other units which were not available for sampling.

6.0 SITE ASSESSMENT

The study was designed to satisfy the requirements of the base line risk assessment and available environmental clean-up criteria (UMA 1990a). A full suite of chemical analyses of soil and water samples consisted of the following: metals by ICP scan EPA Method 6010; arsenic EPA Method 7061; lead and cadmium EPA Method 7420 and 7130; mercury EPA Method 7471; PCB and TPH EPA Method 8080; volatiles EPA Method 8270; and semi-volatiles EPA Method 8260.

The full suite of analyses was conducted on water and leachate samples. Representative soil samples from each of the facilities/features investigated, as well as the background samples were analyzed for all requested parameters. Analysis of additional samples were targeted at specific compounds based on the results of the full suite of analysis. The results of all soil and water analyses are presented in Appendix C.

The evaluation of the indicator chemical concentrations found at specific locations at this station is based on the site assessment strategy outlined in Volume 2. The strategy consisted of:

(1) Comparison of laboratory data to background soil and water and identification of results with values greater than 50 percent of Quebec Level A Guidelines or detection of organic chemicals.

(2) Comparison of laboratory data to Quebec Soil Guidelines and Guidelines for Canadian Drinking Water Quality.

(3) Assessment of risk to human health and the environment from specific locations (landfills, sewage outfalls and others).

The following subsections address each location and stain area on the site and present an evaluation of the risk assessment. Quality assurance and quality control of the analytical data appears in Appendix D. Risk assessment for the site is presented in detail in Appendix E, and summarized in Table 6.1.

6.1 SITE RISK ASSESSMENT SUMMARY

Results from the CAM-5 site exposure assessment were integrated in order to characterize the site-specific risk. As described in Volume 2, Section 3.0, the methods for characterizing non-carcinogenic risk are different from those used for carcinogenic risk. The quantification of CAM-5 site risk has therefore been segregated according to these categories.

Results have been summarized in Table E-6. and as may be seen the total carcinogenic risk was estimated at $\leq 2 \times 10^{-5}$. Based on the U.S. EPA site remediation goal of reducing cancer risks below 10^{-4}, the CAM-5 carcinogenic risk is less than criteria. The principal contributor was chromium intake from the Inhalation pathway. Although only a small area of significant chromium concentration was found, low level concentrations below background were distributed over a large area which resulted in greater potential exposures. The incremental risk above background is therefore much less than that estimated above. As discussed in Volume 2, a large slope factor is defined for the hexavelant form of chromium and therefore any portion of the chromium from CAM-5 site which is not in hexavelant form would reduce the estimated risk proportionately.

Table 6.1

CAM-5, MACKAR INLET: RISK ASSESSMENT SUMMARY

		Carcinogenic Risk	Non-Carcinogenic Risk
Site Worker		2×10^{-5}	6×10^{-1}
Northerner:	Adult	n/a	n/a
	Child	n/a	n/a
Standard		10^{-4}	1.0

n/a = Not Available

The CAM-5 site worker non-carcinogenic hazard index results are summarized in Table E-7. Ingestion of water contributed the largest amount to the risk index due to the chromium concentration in drinking water. The distribution of hazard quotients from other pathways is given in Figure E-2. The hazard index of 6×10^{-1} is less than the unity criteria however the reference dose was based on chromium VI. The reference dose for chromium III is 200 times greater than that for chromium VI, therefore the portion of chromium which is not in hexavelant form would reduce the estimated risk proportionately.

The uncertainty of the risk assessment is addressed in Section E.5.3.

The estimated contaminant intakes for caribou and grasses were compared to estimated safe values to characterize risk in a method similar to that used for human non-carcinogenic risk assessment. The sum of all hazard quotients in caribou was significantly smaller than the unity criterion and therefore caribou risks are considered small. Likewise, the hazard quotients for PCBs, lead and nickel in grasses were less than 1. The estimated intakes for the remaining contaminants were small, however, toxicity information was not available and therefore risks could not be quantified.

The estimated contaminant intakes for caribou and grasses were compared to estimated safe values to characterize risk in a method similar to that used for human non-carcinogenic risk assessment. The hazard quotients for lead, PCBs and TPH in caribou were significantly smaller than the unity criterion and therefore caribou risks are considered small. Likewise, the hazard quotients for PCBs in grasses was very small while that for lead in grasses was 0.15, still less than the unity criteria. The estimated intakes for the remaining contaminants were small however toxicity information was not available and therefore risks could not be qualified.

6.2 SITE BACKGROUND CONDITIONS

One water sample (C5-B) was taken to provide an indication of background water chemistry in the vicinity of the site. The sample was obtained from near the intake in the water supply lake located 100 m southwest of the Module Train.

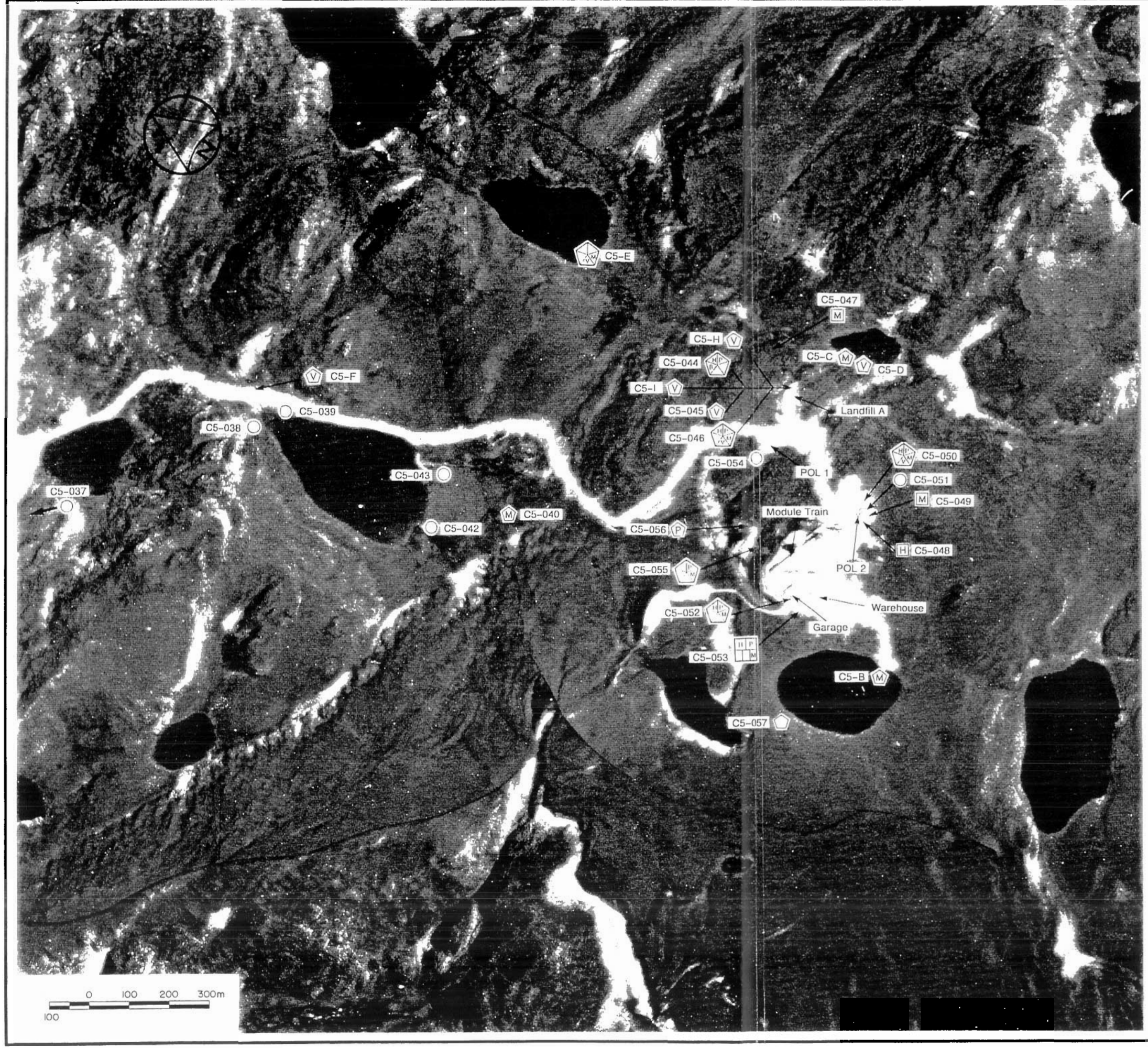
Two soil samples, C5-057 and C5-058, were taken to provide an indication of background soil chemistry. The former sample was taken at a point 40 m from the northwest end of the water supply lake. The latter was collected north of the west end of the Airstrip.

Sample site locations are presented in Figures 6.1 and 6.2.

Water sample C5-B was tested for the complete set of indicator chemicals.

Concentrations in the background water sample (C5-B) were below detection limits for all indicator chemicals analyzed with the exception of chromium (Appendix B). At 0.13 mg/l, the chromium concentration is above Guidelines for Canadian Drinking Water Quality (1987). It is not clear whether this relatively high chromium level represents background conditions or is a result of pollution from some source on the site.

Data for selected soil indicator chemicals for the two background soil samples are shown in Table 6.2. Concentrations of all analyzed indicator chemicals with the exception of silver were less than 50 percent of Level A. Silver was present at the method detection limit (5 mg/kg) which exceeds the study criterion of 1 mg/kg.



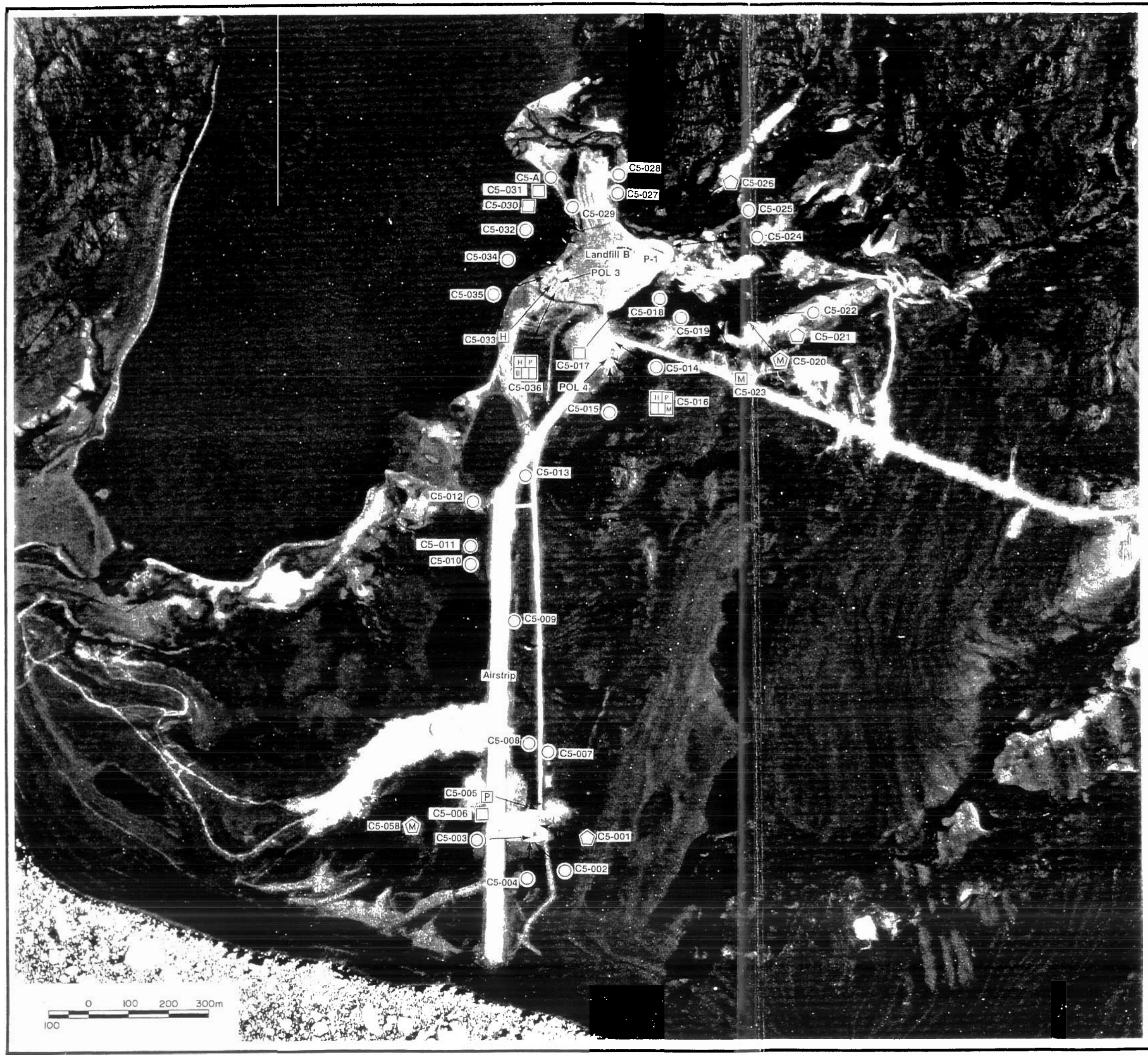
LEGEND

1ST ROUND TESTS RESULTS	2ND ROUND TESTS RESULTS	
		MULTIPLE PARAMETERS DETECTED
M	M	METALS DETECTED
B	B	BNA - BASE, NEUTRAL, ACID EXTRACTABLES DETECTED
H	H	HYDROCARBONS DETECTED
V	V	VOLATILES DETECTED
P	P	PCB DETECTED
		SAMPLE TESTED AND NO PARAMETERS DETECTED
○		SAMPLE TAKEN BUT NOT ANALYZED
C5 - 037		SOIL SAMPLE NUMBER
C5 - B		WATER SAMPLE NUMBER

CAM-5 MACKAR INLET

STATION AREA SAMPLE SITES AND PARAMETERS IDENTIFIED

FIGURE 6.1



LEGEND

1ST ROUND TESTS RESULTS	2ND ROUND TESTS RESULTS	
HPBVM	HPBVM	MULTIPLE PARAMETERS DETECTED
M	M	METALS DETECTED
B	B	BNA - BASE, NEUTRAL, ACID EXTRACTABLES DETECTED
H	H	HYDROCARBONS DETECTED
V	V	VOLATILES DETECTED
P	P	PCB DETECTED
⬠	□	SAMPLE TESTED AND NO PARAMETERS DETECTED
	○	SAMPLE TAKEN BUT NOT ANALYZED
C5 - 001		SOIL SAMPLE NUMBER
C5 - A		WATER SAMPLE NUMBER

CAM-5 MACKAR INLET

AIRSTRIP SAMPLE SITES AND PARAMETERS IDENTIFIED

FIGURE 6.2

Table 6.2

CAM 5, MACKAR INLET: SOIL ANALYTICAL RESULTS – BACKGROUND

Indicator Chemical (mg/kg)	Background Concentrations		Typical Ranges**
	C5-057	C5-058	
Arsenic	<0.1	0.8	0.7 - 15
Selenium	<0.5	<0.5	<0.1 - 1.2
Mercury	<0.05	<0.05	0.01 - 0.14
Barium	43	29	300-1500
Beryllium	<1	<1	1-2
Cadmium	<1	<1	-
Chromium	37	22	10 - 100
Lead	<10	<10	10-50
Nickel	21	11	-
Silver	<5	<5	0.2 - 3.2

** = Kabata - Pendias and Pendias (1984)

- = Data Not Available

6.3 LANDFILLS

There are three landfills; A, B and C at CAM-5.

6.3.1 LANDFILL A

6.3.1.1 Visual Observations and Sample Locations

Landfill A is an active landfill located along a steeply sloping bank 350 m northeast of the Module Train. Refuse including drums and barrels, as well as domestic tin and aluminum cans have been dumped over the valley wall.

Primary drainage from the landfill is to the east, toward a north-flowing stream adjacent to the toe of the landfill. Flow also occurs to the north from the landfill to this stream as well as to a small lake 100 m southeast which is drained by the same north-flowing stream.

Soil in the area was silty sand and much of the area was covered with cobbles and boulders. Some staining was evident east of the toe of the landfill.

A sample of landfill leachate was obtained 8 m east of the toe of the landfill (C5-H). Water sample C5-I was taken 50 m northeast, and downslope from the toe of the landfill. Two water samples were also taken at the point where drainage from the vicinity of the landfill flows into the small lake to the southeast (C5-C), 50 m downstream to the northeast, and at an inflow to another small lake to the north (C5-E).

Four soil samples were collected near the landfill. Sample C5-045 was taken 8 m east of the toe of the landfill. Sample C5-044 was taken on a steep slope farther east. The two remaining samples were taken to the north adjacent to streams draining the landfill (C5-046 and C5-047).

The sample locations are provided on Figure 6.1.

6.3.1.2 Analytical Results

Water samples C5-C, C5-D, C5-E, C5-H, and C5-I were submitted for the first round of analyses and tested for the full or partial set of indicator chemicals as shown in Appendix C.

Chromium was detected in water sample C5-E but was comparable to background levels. Nickel was present in samples C5-C and C5-E above the Guidelines for Canadian Drinking Water Quality (1987).

Soil samples C5-044, C5-045, and C5-046 were tested for the complete set of indicator chemicals. Based on the results of these analyses, sample C5-047 was tested for the complete set of indicator chemicals except volatile organics.

Soil sample results are presented in Table 6.3.

Several indicator chemicals were present in soils taken from the landfill vicinity. Barium was present in concentrations above 50 percent of Level A in C5-046 and C5-047. C5-047 also contained chromium and nickel above 50 percent of Level A, but within the range expected for background.

TPH was above Level B in C5-044 and above 50 percent of Level A in C5-046. Concentrations of PCBs exceeded Level A in C5-044 and C5-046.