III. SITE INVESTIGATIONS

A. Airstrip Dump

This dump was investigated as part of the environmental assessment conducted in 1993. Eight soil samples taken from the toe of the dump were collected. Analyses of these showed no levels above the DCC Tier I level of 1 ppm. Very low levels of PCBs were found with an average value of 0.046 ppm. As a result, the cleanup recommendation for this dump was to remove loose debris and cover with clean fill.

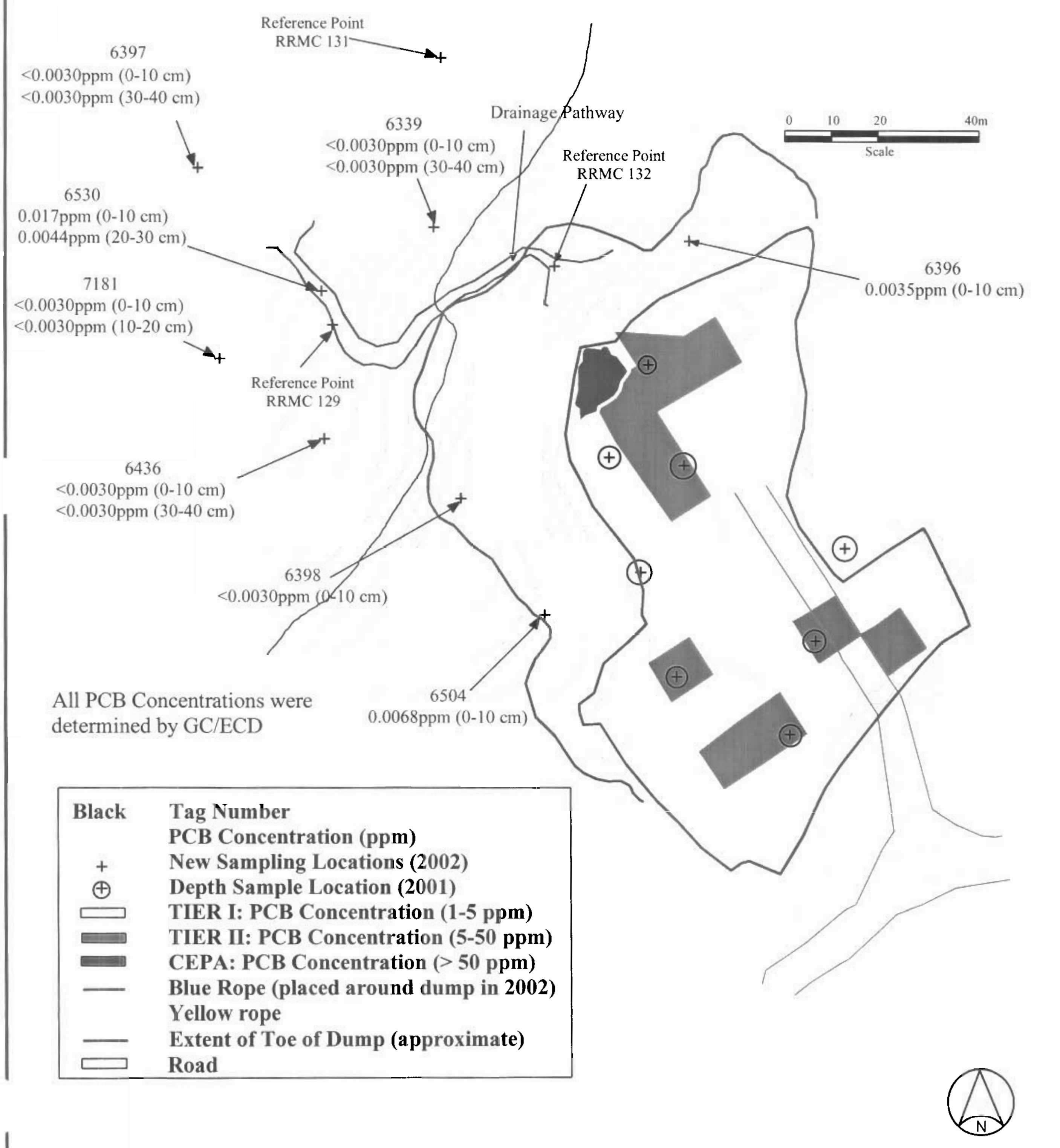
A complete delineation of the surface of the airstrip dump was conducted during the 2000 season at the request of INAC. Contamination with PCBs was found at the Tier I and Tier II levels with an average value of 6.4 ppm and a maximum of 33 ppm. PCB levels in drainage channels leading from the dump were found to be less than 0.5 ppm in all eight samples taken. However, on the final day of work at the site two trial pits were dug in the dump. One produced a hole, which filled with a black liquid and a small transformer was found in the other. These findings prompted further work in the following year.

In 2001, additional pits were excavated in the dump and sampling and analysis undertaken to determine the volume of PCB contaminated soils. The total amount of contaminated soil was estimated as 50 m^3 of CEPA, 600 m^3 of Tier II and 750 m^3 of Tier I. A significant proportion of this "soil" is likely in the form of metallic debris. These areas of various contamination levels presented in the 2001 ASU report were marked with rope on the ground this year and the position of the rope mapped with GPS. Map III-1 shows the various contaminated areas and the position of the ropes. Photographs III-1 shows the rope encircling the CEPA area and Photograph III-2 the area below the toe of the dump.

This year 24 soil samples were collected from below the dump (12 surface samples and 12 depth samples) in order to better ascertain the extent of contaminant migration. Thirteen of these were analysed for PCBs with a low detection limit to give the results shown in Table III-1 and on Map III-1. The results show that there is very low contamination at the toe of the dump. The average value of 0.064 ppm in 1993 is skewed by one value of 0.200 ppm right in the edge of the dump; the locations of the 1993 sampling points were marked with pegs but most of these were missing when the area was mapped by GPS this year. The main drainage pathway from the dump leads along the path encompassing RRMC 132 (0.200 ppm), 6547 (<0.5 ppm), RRMC 129 and 6530 (0.020 and 0.017; 0.0044 at 20-30 cm) and 6397 (<0.0030; <0.0030 at 30-40 cm). The levels drop and are below the detection limit at 30 m from the dump.

In summary, the results on Map III-1 show that no PCBs (< 0.0030 ppm) have been detected further than 30 meters from the toe of the dump and no PCBs (<0.10 ppm) have been detected at all beyond the dump. Thus a minimal quantity of PCBs have leached from the dump in 30 years. The dump faces north and is therefore generally colder than much of the site. The following actions are therefore proposed in order to remediate the airstrip dump. Firstly the area contaminated at the CEPA level should be excavated and all material screened. The soil would be containerized and shipped off site while the material not passing through the screener will be returned to the hole created by the excavation when it is complete. The whole dump will then be compacted. Any barrels containing free product will initially be removed from the toe of the dump. The dump will then be covered with clean fill. Compaction of the toe of the dump will be done by the dozer but with some intermediate fill as required. Two monitoring wells should be installed beyond the toe of the dump and two soil sampling points identified for long term monitoring.

Map III-1: Sampling Locations and PCB Concentrations Below the Toe of the Airstrip Dump in 2002



Photograph III-1: The Roped off CEPA Area at the Airstrip Dump Showing the Hole From Which the Small Transformer was Removed

Photograph III-2: Toe of Airstrip Landfill

Table III-1: Sampling Locations and PCB Concentrations at the Airstrip Dump

Sample (prefix RI02-)	Tag #	Location	Depth (cm)	PCB Concentration by GC/ECD (ppm)
312	6396	near toe	0-10	0.0035
316	6398	near toe	0-10	<0.0030
318	6504	near toe	0-10	0.0068
320	6436	20 m from toe	0-10	<0.0030
321	6436	20 m from toe	30-40	<0.0030
302	7181	30 m from toe	0-10	<0.0030
303	7181	30 m from toe	10-20	<0.0030
300	6530	20 m from toe at RRMC tag 129 (0.020 ppm)	0-10	0.017
301	6530	20 m from toe at RRMC tag 129	20-30	0.0044
311	6339	20 m from toe	0-10	<0.0030
323	6339	20 m from toe	30-40	<0.0030
307	6397	15 m beyond 6530	0-10	<0.0030
308	6397	15 m beyond 6530	30-40	<0.0030

B. S1/S4 Beach Area

Delineation of the S1/S4 beach area was carried out in 1994. Additional samples were taken in 2000 in order to confirm the location of the line between the uncontaminated zone required for a road turnaround area at the base of the cliff and the Tier I area adjacent to it. The area was mapped by GPS in 2000 although not all the tags placed at the site in 1994 could be located.

This year limited additional sampling was conducted to better define the contaminant boundaries and these boundaries were marked on the ground with rope. The results of the analyses are given in Table III-2 and Map III-2 shows the various levels of PCB contamination, the position of the ropes and the sample locations. Map III-3 again shows the various levels of contamination but with a 20 m by 20 m grid superimposed upon it. This grid is to be used during remediation for demarcation during excavation and confirmatory testing.

In 1994, all samples were analysed by the GC/ECD method as test kits were found to give erroneous results. Five samples were taken and analysed by both analytical methods to give the results shown in Table III-3. The test kits again gave variable results. These were, however, restricted to oily samples or those containing a high organic content which is consistent with analytical results from other locations.

Table III-2: Sampling Locations and PCB Concentrations at the S1/S4 Beach Area

Sample (prefix RI02-)	Tag Number	PCB Concentration by GC/ECD (ppm)
122	6625	223
044	6626	<1.0
123	6699	<1.0
125	6627	12
121	6621	147
058	6322	205
029	6545	<1.0
124; 203	6698	178; 95
126	6619	200
031	6505	<1.0

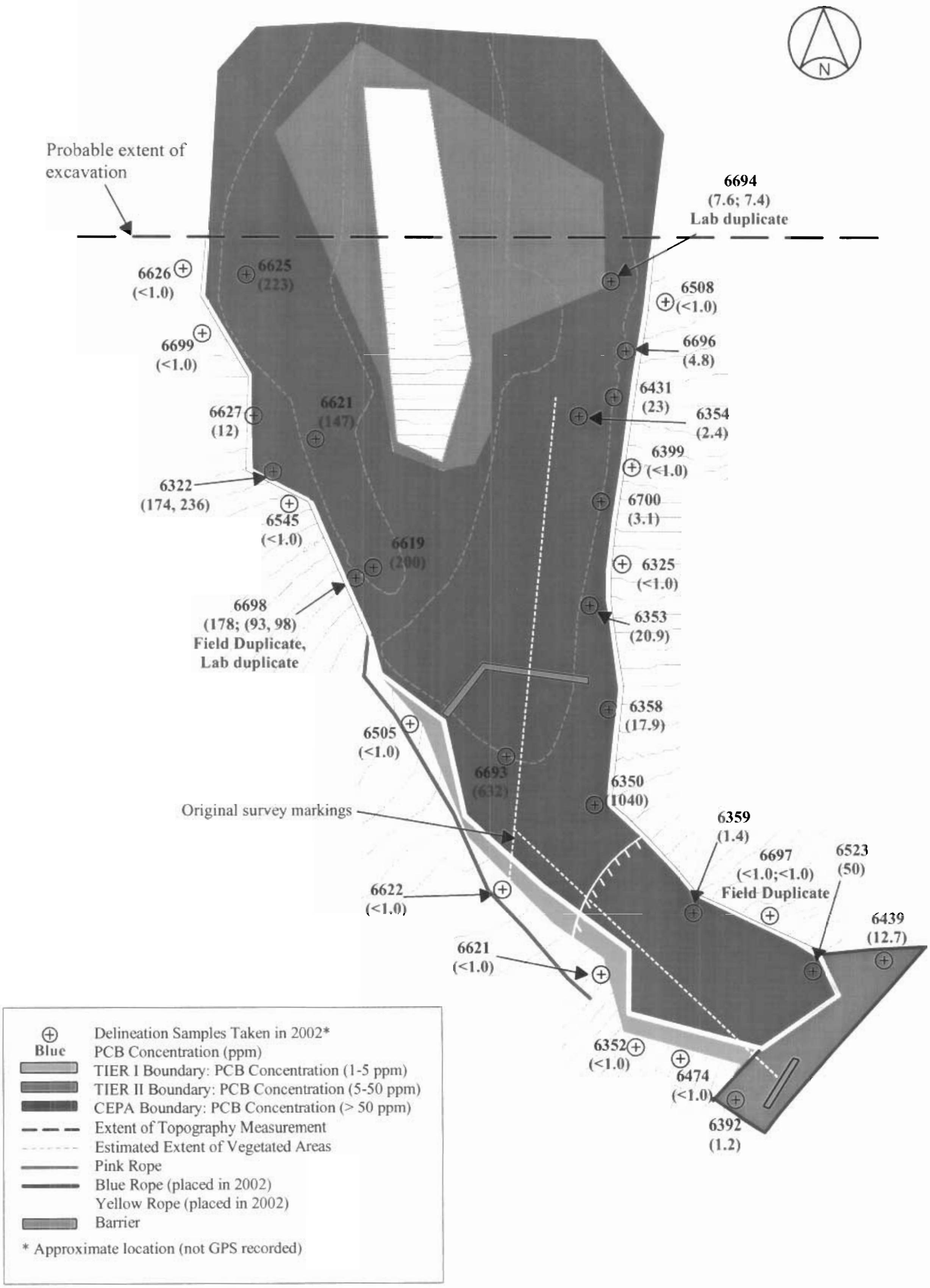
054	6693	632
057	6622	<1.0
055	6621	<1.0
056	6352	<1.0
200	6474	<1.0
199	6392	1.2
155	6523	50
158	6439	12.7
160, 160D	6697	<1.0; <1.0
196	6359	1.4
161	6350	1040
180	6358	17.9
195	6353	21
188	6325	<1.0
194	6700	3.1
189	6399	<1.0
162	6354	2.4
193	6431	22
191	6696	4.8
192	6508	<1.0
163	6694	7.5

Table III-3: Comparison of Test Kits with GC/ECD Data for the S1S4 Beach Area

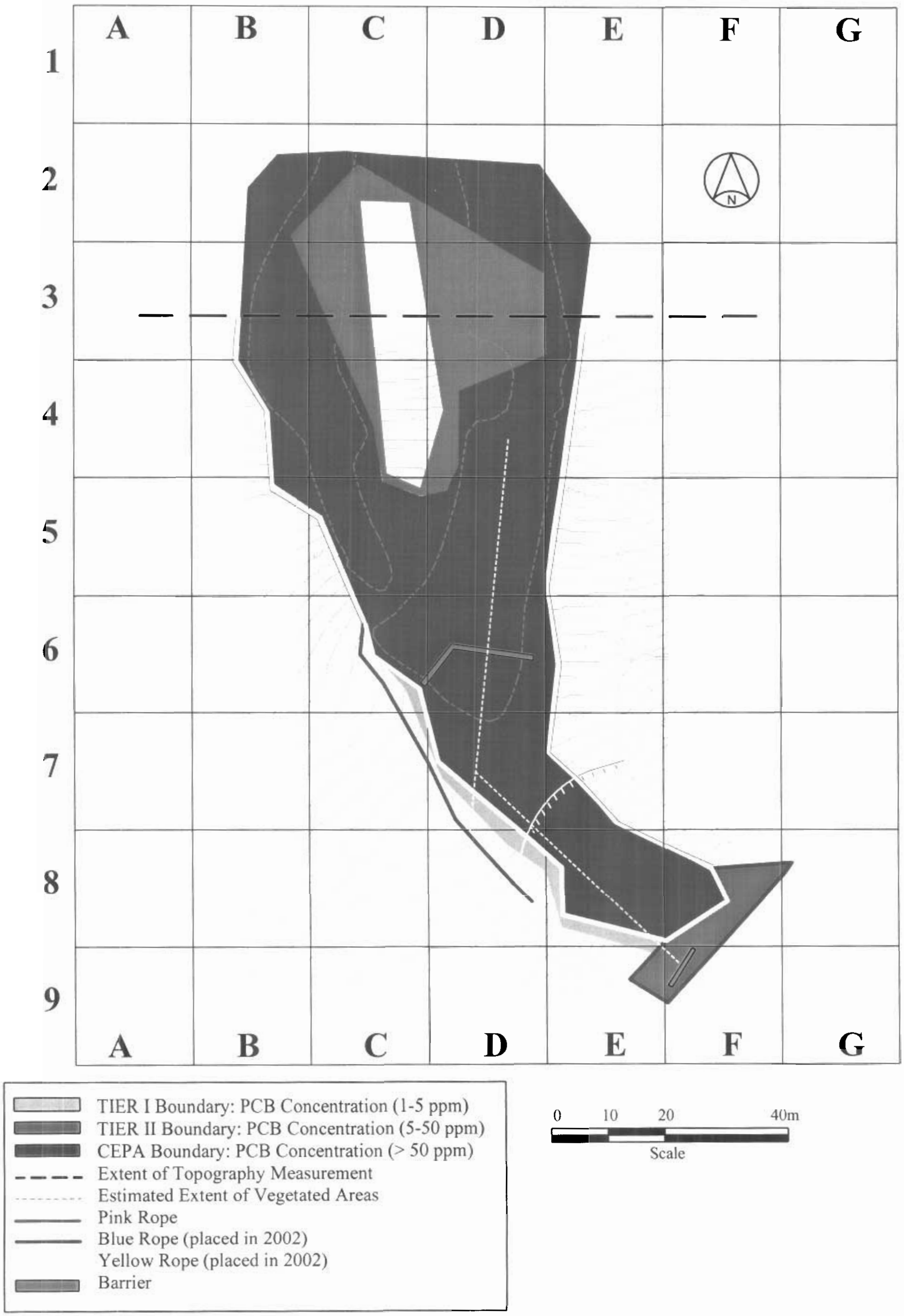
Sample (prefix RI02-)	PCB Concentration by GC/ECD (ppm)	PCB Concentration by Test Kit (ppm)
014	>1000[a]	>100
015	224[a]	>25
016	1.1	1.6
017[b]	140	8
018	<1.0	<1.0

[a] samples were very oily. GC/ECD samples were cleaned up using silica and florisil prior to analysis. [b] Sample contained a large quantity of plant material

Map III-2: Location of Various Levels of PCB Contamination at the S1/S4 Beach Area, Additional Sample Locations, and the Position of Ropes



Map III-3: The S1/S4 Beach Area Showing the Quadrants Set Up for the Excavation Work



C. Monitoring of Barrier Performance

In 1994, barriers were constructed in the drainage pathways where PCB-contaminated soils were found to be present. These pathways comprise the large contaminated area originating at the S1/S4 building complex and extending through the S1/S4 valley to the S1/S4 beach area and the smaller leachate pathway from the furniture dump. Both drainage pathways have been shown to contain PCBs at levels above 50 ppm.

A soil monitoring system was instituted at three of the six barriers in 1994 in order to assess their effectiveness. This consisted of a clean cell and a series of soil monitoring points on either side of the barrier. The clean cells were installed on the lower side of the barrier, using PCB-free sand and sphagsorb. As a result, any PCBs passing through the barriers could be detected. Soil monitoring points were positioned on either side of the barriers so that levels of PCBs could be monitored and compared to levels found in the previous years. The full details of barrier construction, clean cells and monitoring points are described elsewhere[1]. The barriers have been inspected and monitored each year since their installation.

The upper furniture dump barrier was removed in 2000 during the excavation of the furniture dump and its drainage pathway; the lower barrier was left in place. The lower barrier was not inspected or tested by ASU in 2002.

During the 2002 site visit, a full inspection was made of the S1/S4 barriers and drainage pathways. This included an assessment of physical damage, sampling at the soil monitoring points, sampling of barrier material and sampling of water. The barriers at the S1/S4 valley and beach were found to be in good condition with the exception of the brown sphagsorb booms. As observed in previous years, these booms were starting to show signs of rotting but since they are contained between the other booms this is not of great concern. The soil monitoring points, established in 1994, were re-sampled and soil samples submitted for analysis. Samples of barrier material from barriers were also collected and submitted for analyses as was water that was entering the ocean from the S1/S4 beach area and following the drainage pathway along the S1/S4 valley.

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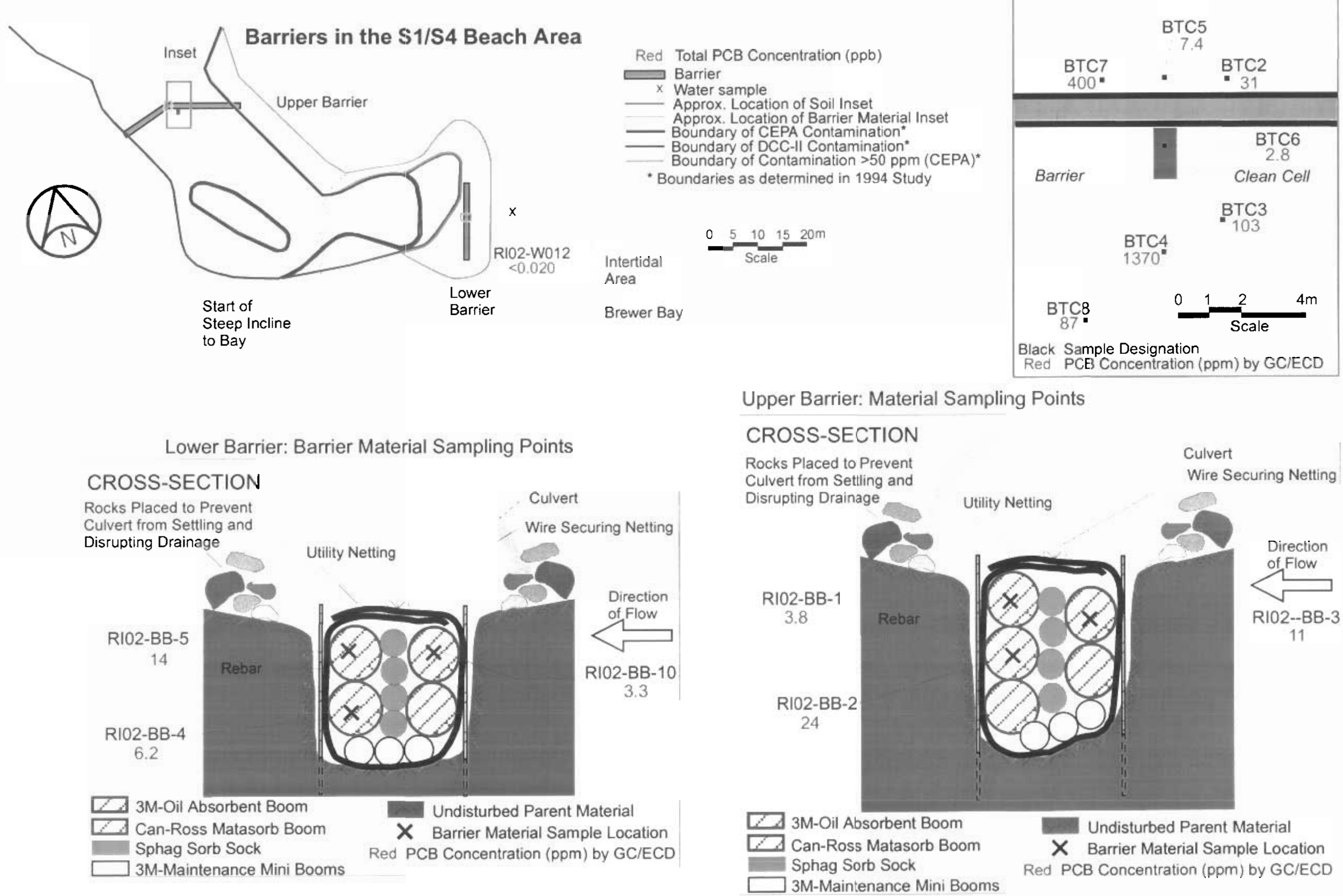
[1] Analytical Services Unit (1995) Environmental Study of a Military Installation at Resolution Island, BAF-5: Volume Two. Prepared for Indian and Northern Affairs Canada.

Maps III-4 and III-5 show the sampling locations and analytical results which are also given in Tables III-4, III-5 and III-6. QA/QC data is compiled in Section K

The PCB levels in the booms ranged from 3.3 to 41 ppm. The PCB levels in the booms from the beach area were less than those in the S1/S4 valley. Comparison of these results with those from previous years shows that this is a continuing trend indicating that there is more PCB migration in the S1/S4 valley. The results of analyses of soil from the clean cells show that the barriers are still functioning well; the clean cell PCB concentrations found were 2.8 ppm at the beach and <1.0 ppm at the Northern barrier in the S1/S4 valley. Soil samples collected at the same monitoring points as in the previous years continued to show significant variation.

Two water samples were collected this year. Both PCBs at concentrations less than the method detection limit (Table III-4). One of these samples was taken at the cliff below the lower barrier at the S1/S4 beach area where drainage enters the sea and the other from water flowing over the top of the cliff.

Map III-4: Sampling Points and PCB Concentrations at the Barriers in the S1/S4 Beach Area



Map III-5: Sampling Points and PCB Concentrations at the Northern Barrier in the S1/S4 Valley

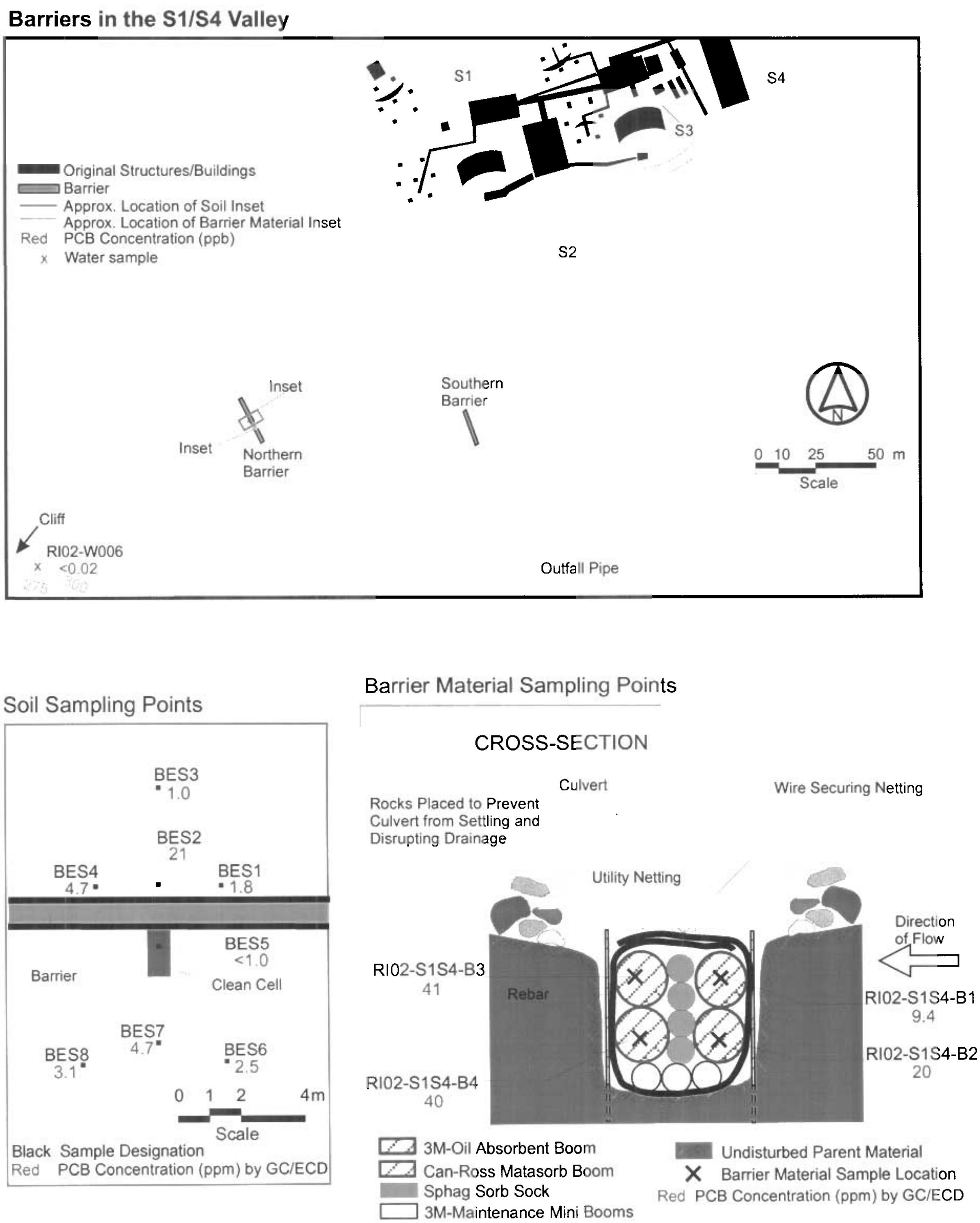


Table III-4: PCB Concentrations in Water Taken in the S1/S4 Drainage Pathway

Location	Sample	PCB Concentration (ppb)
In valley at top of cliff	RI02-W006	<0.020
Beach as drainage enters sea	RI02-W012	<0.020

Table III-5: PCB Concentrations in Barrier Material Samples

Location of Sample	Material	Sample	PCB Concentration (ppm)
S1/S4 Valley – southern barrier	3M absorbent	RI02-S1/S4-B1	9.4
S1/S4 Valley – southern barrier	3M absorbent	RI02-S1/S4-B2	20
S1/S4 Valley – southern barrier	Matasorb	RI02-S1/S4-B3	41
S1/S4 Valley – northern barrier	Matasorb	RI02-S1/S4-B4	40
S1/S4 Beach – upper barrier	Matasorb	RI02-BB1	3.8
S1/S4 Beach – upper barrier	Matasorb	RI02-BB2	24
S1/S4 Beach – upper barrier	3M absorbent	RI02-BB3	11
S1/S4 Beach – lower barrier	Matasorb	RI02-BB4	6.2
S1/S4 Beach – lower barrier	Matasorb	RI02-BB5	14
S1/S4 Beach – lower barrier	3M absorbent	RI02-BB10	3.3

Table III-6 : PCB Concentrations in Soil at the Barrier Monitoring Points

Location	Sample (prefix: RI02-)	PCB Concentration (ppm)
S1/S4 Valley – above northern barrier	RI02-BES1	1.8
S1/S4 Valley – above northern barrier	RI02-BES2	21
S1/S4 Valley –above northern barrier	RI02-BES3	1.0
S1/S4 Valley – above northern barrier	RI02-BES4	4.7
S1/S4 Valley – below northern barrier	RI02-BES5	<1.0
S1/S4 Valley – below northern barrier	RI02-BES6	2.5
S1/S4 Valley – below northern barrier	RI02-BES7	4.7
S1/S4 Valley –below northern barrier	RI02-BES8	3.1
S1/S4 Beach – above upper barrier	RI02-BTC1	27
S1/S4 Beach – above upper barrier	RI02-BTC2	31
S1/S4 Beach – below upper barrier	RI02-BTC3	103
S1/S4 Beach – below upper barrier	RI02-BTC4	1370
S1/S4 Beach – above upper barrier	RI02-BTC5	7.4
S1/S4 Beach – below upper barrier	RI02-BTC6	2.8
S1/S4 Beach – above upper barrier	RI02-BTC7	400
S1/S4 Beach – below upper barrier	RI02-BTC8	87

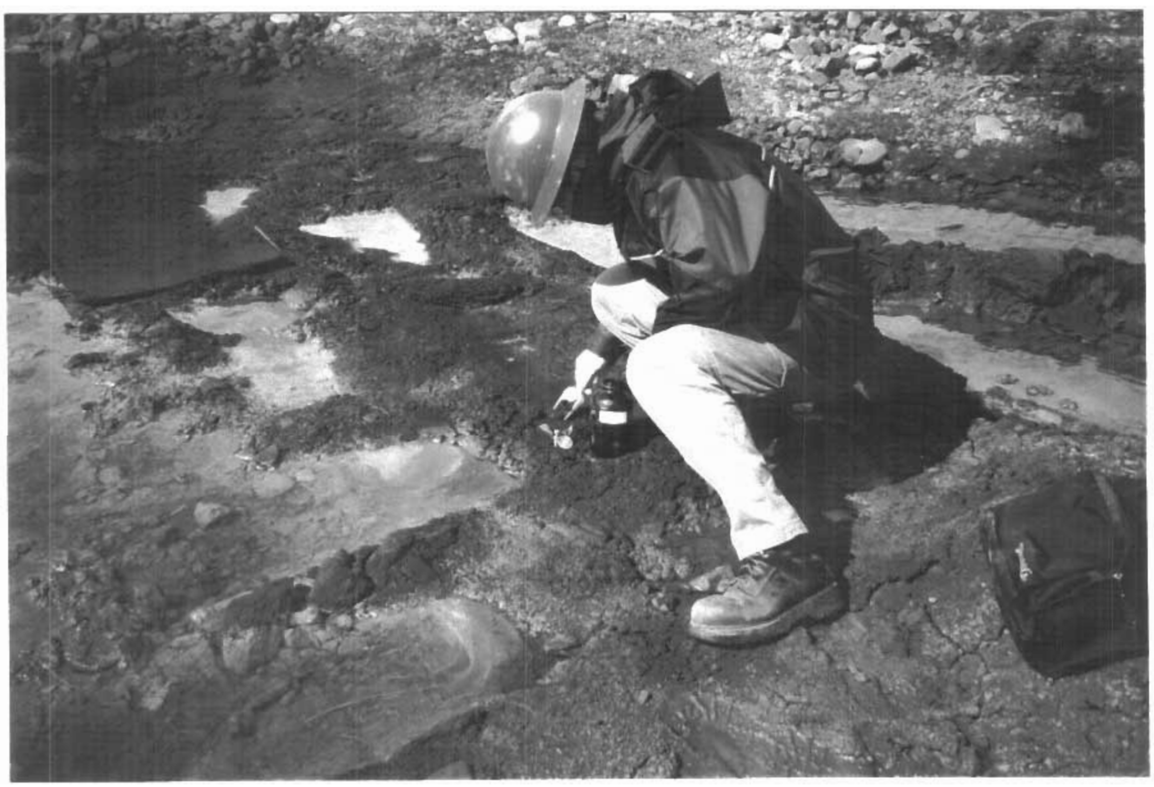
D. Testing for Degreasers

There are several areas at the site where soils are contaminated with heavy oils and lubricants. The remediation strategy for soils such as these is often to bury in a non-hazardous landfill. There are reasons for not doing this at Resolution Island. Because PCBs are the main concern at the site, there is a reluctance to add anything to the landfills that might increase the mobility of the PCBs. Also in 1993 and 1997 analysis for PAHs of the heavily contaminated soils showed that some contained PAHs at levels above the CCME parkland criteria; levels did not in fact greatly exceed the criteria. Chlorinated hydrocarbons have been found in many barrels at the site and there was concern that these might be present in these oily soils.

Six oily soil samples were collected from three locations at the site: the barrel cache valley, the cotton grass area and the near the imploded tank (Photographs III-3 and III-4). One from each site was analysed for volatile organic compounds which includes chlorinated degreasers such as trichloroethylene and dichloromethane. Results are shown in Table III-7.

Sample RI02-211 was collected at the imploded tank area where barrels were previously stored. The results show the presence of aromatic hydrocarbons but no chlorinated compounds. Analytical results for volatile organic compounds from samples RI02-213 and RI02-217 from the barrel cache valley and cotton grass areas respectively, gave no detectable results. These results could well reflect the fact that the oily materials spilled on the ground have been in place for several years and any volatile components would have evaporated.

Photograph III-3: Collecting a Soil Sample for the Analysis of Degreasers at the Barrel Cache Valley



Photograph III-4: Collecting a Soil Sample for the Analysis of Degreasers at the Cotton Grass Area

Table III-7: Concentration of Volatile Organic Compounds in Oily Soil (ng/g)

Compound	RI02-211	RI02-213	RI02-217
Dichlorodifluoromethane	< 100	< 100	< 100
Chloromethane	< 100	< 100	< 100
Vinyl chloride	< 100	< 100	< 100
Bromomethane	< 100	< 100	< 100
Chloroethane	< 100	< 100	< 100
Trichlorofluoromethane	< 100	< 100	< 100
1,1-Dichloroethene	< 100	< 100	< 100
Methylene chloride	< 100	< 100	< 100
trans-1,2-Dichloroethene	< 20	< 20	< 100
1,1-Dichloroethane	< 20	< 20	< 100
2,2-Dichloropropane	< 20	< 20	< 100
cis-1,2-Dichloroethene	< 20	< 20	< 100
Bromochloromethane	< 20	< 20	< 100
Chloroform	< 20	< 20	< 100
1,1,1-Trichloroethane	< 20	< 20	< 100
Carbon Tetrachloride	< 20	< 20	< 100
1,1-Dichloropropene	< 20	< 20	< 100
Benzene	< 20	< 20	< 100
1,2-Dichloroethane	< 20	< 20	< 100
Trichloroethene	< 20	< 20	< 100
1,2-Dichloropropane	< 20	< 20	< 100
Bromodichloromethane	< 20	< 20	< 100
Dibromomethane	< 20	< 20	< 100
cis-1,3-Dicholorpropene	< 20	< 20	< 100
Toluene	< 20	< 20	< 100
trans-1,3-Dichloropropene	< 20	< 20	< 100
1,1,2-Trichloroethane	< 20	< 20	< 100
Tetrachloroethane	< 20	< 20	< 100
1,3-Dichloropropane	< 20	< 20	< 100
Dibromochloromethane	< 20	< 20	< 100

Compound	RI02-211	RI02-213	RI02-217
1,2-Dibromoethane	< 20	< 20	< 100
Chlorobenzene	< 20	< 20	< 100
1,1,1,2-Tetrachloroethane	< 20	< 20	< 100
Ethylbenzene	28	< 20	< 100
m+p-Xylene	70	< 20	< 100
o-Xylene	22	< 20	< 100
Styrene	< 20	< 20	< 100
Bromoform	< 20	< 20	< 100
Isopropylbenzene	32	< 20	< 100
Bromobenzene	< 20	< 20	< 100
1,2,3-Trichloropropane	< 20	< 20	< 100
1,1,2,2-Tetrachloroethane	< 20	< 20	< 100
n-Propylbenzene	< 20	< 20	< 100
2-Chlorotoluene	< 20	< 20	< 100
4-Chlorotoluene	< 20	< 20	< 100
1,3,5-Trimethylbenzene	720	< 20	< 100
tert-Butylbenzene	42	< 20	< 100
1,2,4-Trimethylbenzene	650	< 20	< 100
sec-ButylBenzene	61	< 20	< 100
1,3-Dichlorobenzene	< 20	< 20	< 100
1,4-Dichlorobenzene	< 20	< 20	< 100
p-Isopropyltoluene	110	< 20	< 100
1,2-Dichlorobenzene	< 50	< 20	< 100
n-butylbenzene	< 20	< 20	< 100
1,2-Dibromo-3-chloropropane	< 20	< 20	< 100
1,2,4-Trichlorobenzene	< 50	< 20	< 100
1,2,3-Trichlorobenzene	< 20	< 20	< 100
Naphthalene	650	< 20	< 100
Hexachlorobutadiene	< 20	< 20	< 100

E. Characterisation of CEPA Soil

In September 2000, an Environmental Impact Statement (EIS) was submitted by INAC to the Nunavut Impact Review Board (NIRB). Following hearings in Iqaluit and Kimmirut, the proposal to ship CEPA soils for destruction by Bennett Environmental Inc. St. Amboise, Quebec was approved. In order for Bennett Environmental to receive the soil they required that a waste profile questionnaire be completed. As part of their operating procedure, this questionnaire is submitted by them to Environment Quebec for approval of the project including the transportation of these soils to Quebec and their destruction and disposal of the remediated soils. The Waste Profile Questionnaire requires that for 1500 m^3 of soil, a total of 14 samples should be analysed. Sixteen samples were collected (Photographs III-5, III-6) and fourteen analysed. A summary of results is presented in Tables III-8a-k; detailed results are given in Chapter 7: Appendix.

1. Methods

Generally standard methods were used for this work. Sample numbers BRI02-011 and BRI02-016 were of material not screened through a 2 inch screener. This material, which represents about 5-10 % of the total and generally contains higher PCB concentrations, will be indicated on the steel containers for the convenience of plant operation. Samples BRI02-003 and BRI02-009 were not analysed at this time but could be used if the volume of soil shipped was to increase to 2000 m^3 of CEPA soil.

Particle Size Distribution: ASTM method D 422 was used with minor modifications. Hydrometer analysis was not performed as differentiation of material below 0.075 mm was not required. Separation of material > 50 mm was performed on-site. Most of the material for this project is screened on site to 50 mm. Concrete, steel, wood and debris were estimated visually (all < 1 %).

Moisture content: This was determined by weighing representative samples before and after drying at 110 C.

pH: This was measured by mixing equal quantities of water and soil and measuring the pH with a standard pH electrode.

PCBs: Soil was extracted with dichloromethane, using a soxhlet apparatus prior to analysis by GC/ECD. Extracts were concentrated using a rotoevaporator and the solvent was exchanged to hexane before cleanup of the sample using a Florisil column.

Total C_{10} - C_{50} Hydrocarbons: These were analysed by extracting soil samples with hexane using ultrasonic agitation. Resulting extracts were analysed by GC/FID.

Total Chlorobenzenes: These were determined by extracting the soil samples with dichloromethane in a soxhlet extractor and running concentrates of the extracts by GC/MS.

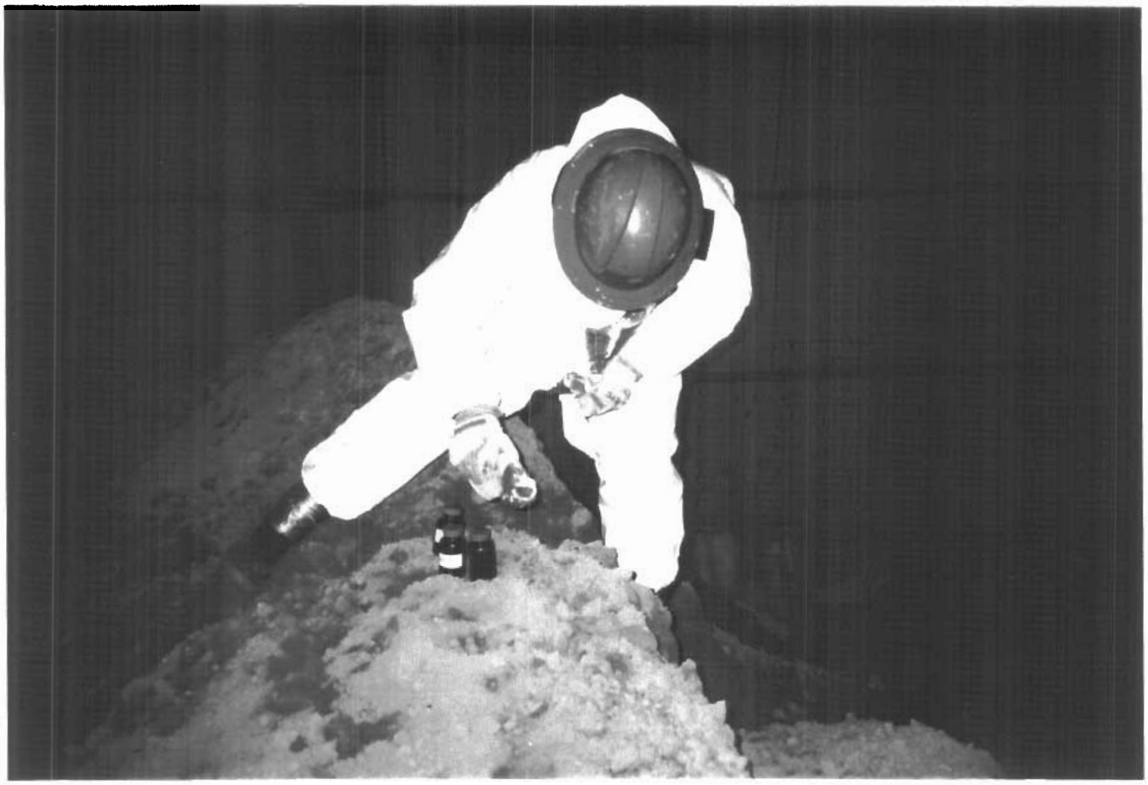
Total Toxic Equivalent Dioxins and Furans: EPA method 1613 was used with modifications. Sample clean-up was carried out according to Ontario Environment Ministry method DFPCB-E3418. Analyses were performed using ion-trap GC-MS. The reported Toxic Equivalents were calculated using the value of half the detection limit when concentrations were below the detection limit.

Elemental Analyses: Metals and other elements were determined by digestion of air dried soil with aqua regia followed by ICP/OES analysis.

2. Results

The results show that the soil has generally low amounts of materials finer than 0.075 mm which is generally associated with clay material. Only the two samples from the >2000 ppm material contained rocks and stones over 2 inches in diameter since all the other soils were screened on site. Metals were low and well below the Quebec Ministry of the Environment (MENV) heavy metal and sulphur Level C criteria. Therefore, as a result, no additional charge should be attached to disposal of these soils.

As expected organic contaminants were high. The dioxin and furan results were consistent with the PCB values. The results for chlorobenzenes also followed the same trend. There were surprisingly high levels of tetrachlorobenzenes. Most PCB mixtures used such as Askarels contained chlorobenzenes in the range 20-50 % and most were tricholobenzenes. However, some mixtures, notably Type B Askarels contained up to 55 % of a mixture of trichloro- and tetra-chlorobenzenes. Analysis of the lower chlorobenzenes was determined by the purge and trap technique. This showed that mono- and dichloro- benzenes were absent. As a result, a solvent extraction method was developed using GS/MS detection to determine all the tri-, tetra-, penta- and hexa-chlorobenzenes.



Photograph III-5: Collecting Representative CEPA Soil Samples from the Main PCB Storage Facility

Photograph III-6: Collecting Representative CEPA Soil Samples from the S1/S4 Valley

Table III-8a: Results of Characterisation of CEPA Soils

	Units	BRI 02-001	BRI 02-002	BRI 02-004	BRI 02-005	BRI 02-006
Clay Content (est)	%	6	8	6	3	8
Concrete and steel (est)	%	<1	<1	<1	<1	<1
Wood and debris (est)	%	<1	<1	<1	<1	<1
Moisture	%	6.2	5.5	3.5	2.0	4.2
pH		7.1	6.7	6.8	6.3	5.7
Total Sulphur	%	0.027	0.049	0.040	0.032	0.065

Table III-8b: Results of Characterisation of CEPA Soils

	Units	BRI 02-007	BRI 02-008	BRI 02-010	BRI 02-011	BRI 02-012
Clay Content (est)	%	3	6	2	2	5
Concrete and steel (est)	%	<1	<1	<1	<1	<1
Wood and debris (est)	%	<1	<1	<1	<1	<1
Moisture	%	4.4	4.0	6.0	12.8	4.6
pH		7.1	7.2	7.3	6.6	4.7
Total Sulphur	%	0.025	0.036	0.035	0.048	0.042

Table III-8c: Results of Characterisation of CEPA Soils

	Units	BRI 02-013	BRI 02-014	BRI 02-015	BRI 02-016
Clay Content (est)	%	3	<1	4	7
Concrete and steel (est)	%	<1	<1	<1	<1
Wood and debris (est)	%	<1	<1	<1	<1
Moisture	%	5.8	13.4	3.4	10.6
pH		4.7	4.6	6.7	5.9
Total Sulphur	%	0.018	0.052	0.026	0.031

Table III-8d: Results of Characterisation of CEPA Soils

	Units	BRI 02-001	BRI 02-002	BRI 02-004	BRI 02-005	BRI 02-006
<0.075 mm	%	6	8	6	3	8
>0.075 to <0.50 mm	%	34	35	27	24	32
>0.50 to <1.00 mm	%	13	13	10	5	11
>1.00 to <4.70 mm	%	16	17	12	5	11
>4.70 to <19.0 mm	%	17	18	20	17	11
>19.0 to <50 mm	%	14	9	25	46	27
>50 mm	%	<1	<1	<1	<1	<1
Comment		gray/brown sand and gravel	yellow/brown sand and gravel	gray sand and gravel	gray sand and gravel	gray sand and gravel

Table III-8e: Results of Characterisation of CEPA Soils

	Units	BRI 02-007	BRI 02-008	BRI 02-010	BRI 02-011	BRI 02-012
<0.075 mm	%	3	6	2	2	5
>0.075 to <0.50 mm	%	38	32	44	41	37
>0.50 to <1.00 mm	%	18	11	18	15	7
>1.00 to <4.70 mm	%	20	14	23	10	7
>4.70 to <19.0 mm	%	15	25	13	7	13
>19.0 to <50 mm	%	6	12	0	8	31
>50 mm	%	<1	<1	<1	17	<1
Comment		gray sand and gravel	gray sand and gravel	gray/beige sand and gravel	brown sand and gravel	brown sand and gravel

Table III-8f: Results of Characterisation of CEPA Soils

	Units	BRI 02-013	BRI 02-014	BRI 02-015	BRI 02-016
<0.075 mm	%	3	<1	4	6
>0.075 to <0.50 mm	%	24	33	29	23
>0.50 to <1.00 mm	%	7	18	7	9
>1.00 to <4.70 mm	%	9	32	9	8
>4.70 to <19.0 mm	%	18	14	18	9
>19.0 to <50 mm	%	39	3	33	23
>50 mm	%	<1	<1	<1	22
Comment		gray sand and gravel	dark brown sand and gravel	gray sand and gravel	gray sand and gravel

Table III-8g: Results of Characterisation of CEPA Soils

	Units	BRI 02-001	BRI 02-002	BRI 02-004	BRI 02-005	BRI 02-006
Total PCBs	mg/kg	260	370	180	230	2310
Total C_{10}-C_{50}	mg/kg	1000	1400	2000	2000	3800
Total tox. equiv. dioxins	pg/g	28	28	6	5	70
Total tox. equiv. furans	pg/g	230	94	120	110	1400
Total Chorobenzenes	mg/kg	18	26	8.9	7.0	940

Table III-8g: Results of Characterisation of CEPA Soils

	Units	BRI 02-007	BRI 02-008	BRI 02-010	BRI 02-011	BRI 02-012
Total PCBs	mg/kg	95	140	340	640	170
Total C_{10}-C_{50}	mg/kg	750	1300	1200	360	<100
Total tox. equiv. dioxins	pg/g	9	7	8	8	<5
Total tox. equiv. furans	pg/g	80	80	140	140	73
Total Chorobenzenes	mg/kg	4.0	11	18	25	<1.0

Table III-8h: Results of Characterisation of CEPA Soils

	Units	BRI 02-013	BRI 02-014	BRI 02-015	BRI 02-016
Total PCBs	mg/kg	210	20	32	330
Total C_{10}-C_{50}	mg/kg	8100	<100	110	1500
Total tox. equiv. dioxins	pg/g	<5	<5	34	34
Total tox. equiv. furans	pg/g	13	14	44	180
Total Chorobenzenes	mg/kg	<1.0	<1.0	<1.0	<1.0

Table III-8i: Results of Characterisation of CEPA Soils

	Units	BRI 02-001	BRI 02-002	BRI 02-004	BRI 02-005	BRI 02-006
Ag	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
As	mg/kg	1.1	1.3	1.3	2.1	1.7
Ba	mg/kg	42	49	51	44	66
Cd	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Co	mg/kg	7.9	8.8	8.5	6.9	9.6
Cr	mg/kg	355	37	39	34	45
Cu	mg/kg	67	72	70	72	83
Hg	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	mg/kg	129	130	141	104	163
Mo	mg/kg	3.2	<2.0	2.7	2.4	4
Ni	mg/kg	37	43	41	34	45
Pb	mg/kg	11	<10	17	<10	21
Se	mg/kg	<10	<10	<10	<10	<10
Sn	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
Zn	mg/kg	77	79	81	62	96

Table III-8j: Results of Characterisation of CEPA Soils

	Units	BRI 02-007	BRI 02-008	BRI 02-010	BRI 02-011	BRI 02-012
Ag	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
As	mg/kg	<1.0	1.2	<1.0	<1.0	<1.0
Ba	mg/kg	44	45	49	37	50
Cd	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Co	mg/kg	8.7	8.7	8.2	8.5	<5.0
Cr	mg/kg	33	36	36	30	43
Cu	mg/kg	68	65	66	83	80
Hg	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	mg/kg	124	122	109	100	97
Mo	mg/kg	<2.0	<2.0	<2.0	2.7	6.1
Ni	mg/kg	41	40	41	41	23

Pb	mg/kg	<10	84	10	<10	<10
Se	mg/kg	<10	<10	<10	<10	<10
Sn	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
Zn	mg/kg	65	75	68	83	42

Table III-8k: Results of Characterisation of CEPA Soils

	Units	BRI 02-013	BRI 02-014	BRI 02-015	BRI 02-016
Ag	mg/kg	<2.0	<2.0	<2.0	<2.0
As	mg/kg	<1.0	<1.0	<1.0	1.6
Ba	mg/kg	34	31	46	64
Cd	mg/kg	<1.0	<1.0	<1.0	<1.0
Co	mg/kg	5.7	<5.0	8.0	12.0
Cr	mg/kg	28	30	27	41
Cu	mg/kg	68	61	54	74
Hg	mg/kg	<0.1	<0.1	<0.1	<0.1
Mn	mg/kg	79	66	97	163
Mo	mg/kg	<2.0	7.1	<2.0	2.4
Ni	mg/kg	36	7.1	37	56
Pb	mg/kg	<10	<10	<10	149
Se	mg/kg	<10	<10	<10	<10
Sn	mg/kg	<2.0	<2.0	<2.0	112
Zn	mg/kg	39	22	67	200

F. Air Sampling for PCBs and Chlorobenzenes

The selection of appropriate personal protective equipment for respiration when working with PCB contaminated materials at the site is important. In the Resolution Island Health and Safety Plan (HASP), Appendix 5, a dust level of 4.4 mg/m^3 is suggested as a trigger for when a dust mask should be worn. This value is calculated using a value of 10 mg/m^3 for an 8 hour day relating to particulates not otherwise classified. A direct reading dust meter is available for use at the site. In practice dust masks must be worn in dusty conditions or at any time workers may wish to do so. Half-face respirators equipped with filters and organic vapour cartridges are worn whenever the odour of chlorobenzenes is encountered. Regulations with respect to PCBs are given in the HASP and these are in the range 0.5 to 2.0 mg/m^3, that is less than the 4.4 mg/m^3 for dust suppression. However, it should also be noted that NIOSH has set a recommended exposure limit of 0.001 mg/m^3 or about one thousandth of the NWT occupational exposure limits. The situation with PCBs is also complicated by the fact that they were manufactured and sold as mixtures, often referred to as Askarels, which contained not only PCBs but also chlorobenzenes. These more volatile compounds are responsible for the characteristic PCB odour. Regulations respecting Occupational Safety and Health made under Part II of the Canada Labour Code give a ceiling value of 5 ppm or 40 mg/m^3 for chlorobenzenes: NIOSH has the same standard for their time weighted average (TWA) concentration for a 10 hour working day.

In order to determine the levels of PCBs in the air, samples were collected using NIOSH method 5503 with an air pump and ORBO-60 adsorption tubes. The pump was run at a rate of about 170 mL/min for about 3-4 hours. Twenty air samples have been taken during the last three field seasons and all have given results below the detection limit and NIOSH level of 0.001 mg/m^3. Therefore only two samples were collected this year. Analysis of one sample gave a result of < 0.001 mg/m^3 while the other was contaminated in the laboratory.

In order to determine the level of chlorobenzenes in the air, samples were collected and analysed using NIOSH method 5517. The XAD-2 tubes and filters were extracted with hexane and the extracts run on a gas chromatograph with a mass spectrometric detector (GC/MS). In 2001, six air samples were collected and analyzed for both 1,2,4-trichlorobenzene and 1,2,3-trichlorobenzene. Neither of these compounds was present above the 0.005 mg/m^3 level though up to 0.21 ug of the 1,2,4-trichlorobenzene was found in the sample collected in the main PCB storage facility. This year four samples were collected, two in the main PCB storage facility (RI02-187 and RI02-223), one on the east side of the main PCB storage facility near the incinerators (RI02-105) and one in the S1/S4 2000 ppm area (K15) as the conical steel containers were being filled (RI02-218). This year, all samples were collected over a one hour time period.

Samples were analysed for all di-, tri-, tetra- and penta- chlorobenzenes. Results are presented in Tables III-9 and III-10. Normally the trichlorobenzenes are the main chlorobenzene constituents of Askarel mixtures but it was found, as reported in Section E of the chapter and in Chapter VII: Appendix, that other chlorobenzenes were present in the soil and that tetrachorobenzenes were present at the relatively high concentrations. The relative amounts of each chlorobenzene compounds from the air sampling program are similar to those in the soil. The highest air concentration found was for 1,2,4 trichlorobenzene of 0.008 mg/m^3, very much below the federal regulated value of 37 mg/m^3. Despite the low values in Table III-10, it is recommended that half-face respirators equipped with organic cartridges and filters be worn when the odour of PCBs is encountered because the actual concentrations may be higher on occasion and because the Inuit workers appear to be very susceptible to elevated levels of hydrocarbon vapours.

Table III-9: Chlorobenzene Compounds Found in Air Samples Collected at Resolution Island (ug per tube plus filter)

Sample	RI02-105	RI02-187	RI01-218	RI01-223
1,2- dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,3- dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,4- dichlorobenzene	<0.01	<0.01	<0.01	<0.01
1,2,3 trichlorobenzene	<0.01	0.09	0.02	0.02
1,2,4 trichlorobenzene	<0.01	0.03	<0.01	<0.01
1235, 1245,1246- tetra chlorobenzene	<0.01	<0.01	<0.01	<0.01
1,2,3,4 tetrachlorobenzene	<0.01	0.05	<0.01	0.01
Pentachlorobenzene	<0.01	<0.01	<0.01	<0.01

Table III-10: Chlorobenzene Concentrations in Air Samples Collected at Resolution Island (mg per m^3)

Sample	RI02-105	RI02-187	RI01-218	RI01-223
1,2- dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,3- dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,4- dichlorobenzene	<0.001	<0.001	<0.001	<0.001
1,2,3 trichlorobenzene	<0.001	<0.001	0.001	0.002
1,2,4 trichlorobenzene	<0.001	0.008	<0.001	<0.001
1235, 1245,1246- tetra chlorobenzene	<0.001	0.003	<0.001	<0.001
1,2,3,4 - tetra chlorobenzene	<0.001	0.004	<0.001	0.001
Pentachlorobenzene	<0.001	<0.001	<0.001	<0.001

G. Drinking Water

1. Analysis

A thorough testing of the drinking water at Resolution Island was performed twice during the summer. In addition, the new drinking water lake was sampled and analyzed to comply with the water board requirements.

2. Methods

Water samples were collected in one litre polyethylene bottles for general water quality parameters and inorganic elements analysis and in one litre Teflon bottles for PCB analysis. For the analysis of phenols, a bottle containing an aliquot of phosphoric acid was used, for mercury, a bottle with an aliquot of sodium dichromate solution was used and, for bacteriological measurements, a sterile bottle was employed. Upon receipt in the laboratory, all samples were stored at 4 ^{o}C. Tests were performed using standard laboratory procedures

3. Drinking Water

Analytical results are shown in Table III-11. None of the parameters measured, with the exception of one of the pH readings were above the OME guidelines. The water at Resolution Island contains no buffering capacity and is quite acidic. Addition of sodium carbonate was undertaken this year and pH values were measured daily. The pH values ranged from 4.4 to 8.6 with a mean value of 5.9. pH results were obtained from 35 samples.

Table III-11: Drinking Water Results and Guidelines

Parameter	Units	W001 30 July	W002 12 August	OME Guidelines
Alkalinity	mg/L	<1	<1	30-500
Ammonia	mg/L	<0.1	<0.1	-
Calcium	mg/L	6.6	7.5	-
COD	mg/L	<3	<3	-
Conductivity	uS/cm	83	104	-
Copper	mg/L	0.163	0.086	<1.0

Parameter	Units	W001 30 July	W002 12 August	OME Guidelines
Hardness	mg/L	27.2	31.5	80-100
Iron	mg/L	<0.05	<0.05	<0.30
Lead	mg/L	<0.010	<0.010	<0.010
Magnesium	mg/L	2.6	3.1	-
PCB	ug/L	<3	<3	< 3.0
pH	-	6.4	5.4	6.5-8.5
Phenols	ug/L	<1.0	<1.0	-
Potassium	mg/L	2.6	<0.2	-
Sodium	mg/L	<1.0	6.4	<200
Sulphate	mg/L	35	37	<500
Nitrate	mg/L	<0.05	<0.05	<10
Nitrite	mg/L	<0.05	<0.05	<1.0
Chloride	mg/L	4.0	4.5	<250
TDS	mg/L	1.2	<1.0	<500
TKN	mg/L	0.03	0.04	-
TSS	mg/L	1.4	14.7	<500
Zinc	mg/L	0.066	0.055	5
Total Coliforms	Cts/100 mL	<2	0; 0	5
Faecal Coliforms	Cts/100 mL	0	0; 0	0
Faecal Streptococci	Cts/100 mL	<2	<2; <2	0
E coli	Cts/100 mL	0	0; 0	0
Standard Plate Ct (48hrs)	Cts/1 mL	0	2; 2	500
Background Count	Cts/100 mL	0	0; 40	250

H. Lake Water

In order to comply with the water board licence, water samples were required to be collected from the water lake and runoff from the new non-hazardous landfills. However, there was no runoff from the two non-hazardous landfills so only results from the water lake are presented here. A sample of lake water was collected on 11 August, 2002 and analyzed to give the results presented in Table III-12.

Table III-12: Lake Water Results

Parameter	Unit	Lake Water
Copper	mg/L	0.011
Iron	mg/L	<0.05
Lead	mg/L	<0.005
Manganese	mg/L	<0.05
Mercury	mg/L	<0.0005
Cadmium	mg/L	<0.001
Nickel	mg/L	0.064
Chromium	mg/L	<0.005
Cobalt	mg/L	0.014
Zinc	mg/L	0.034
Phenols	ug/L	<1.0
pH	-	4.0
TSS	mg/L	5.6
Nitrate	mg/L	<0.05
Nitrite	mg/L	<0.05
Oil and Grease	mg/L	<1.0
BOD	mg/L	<3.0
Faecal Coliforms	Cts/100 mL	0; 0

I. Background Water Studies

In order to establish background data, water samples were collected from several locations and analysed for PCBs, and the eight elements of the DEW Line Clean Up Criteria. Analytical procedures were used to give low detection limits. Results are given in Tables III-13 and III-14 which also include data from 2001. For PCBs, low but measurable levels were found in water flowing passed the old officer's mess and behind the imploded tank in 2001; PCBs were again detected this year in water flowing by the old officer's mess. Results for eight elements in the DLCU criteria agree well with results obtained in the original 1993 site assessment. Copper, cobalt, nickel and zinc levels are relatively constant and represent background values. For arsenic, cadmium, and chromium all results were below the method detection limits. For lead, all results were below the detection limit, except a low level was measured in the water flowing by the lead dump this year.

Table III-13: Sampling Locations and Collection Dates of Background Water Samples

Sample Number	Sample Description and Location	Date Collected
RI01-W007	Water flowing in the beach dump stream	20 July 2001
RI01-W008	Water flowing behind imploded tank	20 July 2001
RI01-W009	Water flowing by the old officer's mess	20 July 2001
RI01-W024	Water flowing behind imploded tank	22 August 2001
RI01-W025	Water flowing from the maintenance dump	22 August 2001
RI02-W005	Water flowing in the beach dump stream	9 August 2002
RI02-W008	Water flowing by the old officer's mess	9 August 2002
RI02-W010	Water flowing behind imploded tank	9 August 2002

Table III-14: Analytical Results Obtained from Background Water Samples

Element	Unit	RI01-W007	RI01-W008	RI01-W009	RI01-W024	RI01-W025
		Beach dump	Imploded tank	Officer's mess	Imploded tank	Maint. dump
PCBs	ppb	<0.02	0.03	0.04	<0.02	<0.02
As	ppm	<0.003	<0.003	<0.003	<0.003	<0.003
Cd	ppm	<0.001	<0.001	<0.001	<0.001	<0.001
Co	ppm	0.017	0.011	0.024	0.023	0.014
Cr	ppm	<0.005	<0.005	<0.005	<0.005	<0.005
Cu	ppm	0.014	0.015	0.017	0.020	0.015
Ni	ppm	0.061	0.036	0.127	0.082	0.021
Pb	ppm	<0.010	<0.010	<0.010	<0.010	<0.010
Zn	ppm	0.035	0.048	0.162	0.073	0.122

Element	Unit	RI02-005	RI02-008	RI02-010
		Beach dump	Officer's mess	Imploded tank
PCBs	ppb	<0.02	0.05	<0.02
As	ppm	<0.003	<0.003	<0.003
Cd	ppm	<0.001	<0.001	<0.001
Co	ppm	0.017	0.021	0.021
Cr	ppm	<0.005	<0.005	<0.005
Cu	ppm	0.015	0.021	0.017
Ni	ppm	0.059	0.093	0.068
Pb	ppm	0.014	<0.010	<0.010
Zn	ppm	0.031	0.072	0.051

J. Background Plant Samples

Background plant monitoring was initiated this year to track the levels of PCB contamination during and after the cleanup.

1. Analytical Method

Plant samples were wrapped in foil and placed in ziplock bags. Samples were not washed and were kept frozen prior to analysis. Samples were air dried in the laboratory. Once dried 0.5 g of dried sample was accurately weighed and then ground in a mortar and pestle with sodium sulphate and Ottawa sand. The ground sample was transferred to a thimble, spiked with DCBP, and extracted by soxhlet for 4 hours at 4 - 6 cycles per hour using 250 mL of dichloromethane. The extract was then concentrated to approximately 10 mL, passed through a 0.45 um filter and then further concentrated to 1.0 mL. This concentrated extract was applied to a GPC column to separate the PCBs from the lipids. The PCB fraction was rotoevaporated, the solvent exchanged to hexane and the extract applied to a Florisil column for cleanup. This final extract was concentrated to 0.5 mL and run by GC/ECD. Values are reported on a dry weight basis.

2. Plant Analysis Results

The results are shown in Table III-15 and the locations on Map III-6. Photographs III-7 and III-8 show the collection of the plants and the recording of locations by GPS. Results indicate that a significant amount of PCBs is present in many of the plants collected. All PCBs showed the Aroclor 1260 pattern. Plants near to PCB contaminated areas contain Tier I and Tier II levels of PCBs. Two areas, which could be considered background were found, the drinking water lake and an area near the S1/S4 beach area. Plants were taken from the drinking water lake area in both 2001 and 2002. Low levels were found in both years. Further background sampling points more distant (> 1 km) from the site need to be established in 2003.

These results are similar to those obtain at Saglek Bay, Labrador (LAB-2)[2]. This study found that plants taken from 1- 2 km from the base at Saglek Bay gave plant PCB levels in the range 1-20 ppb whereas the results from less than 1 km away gave similar results to those found here.

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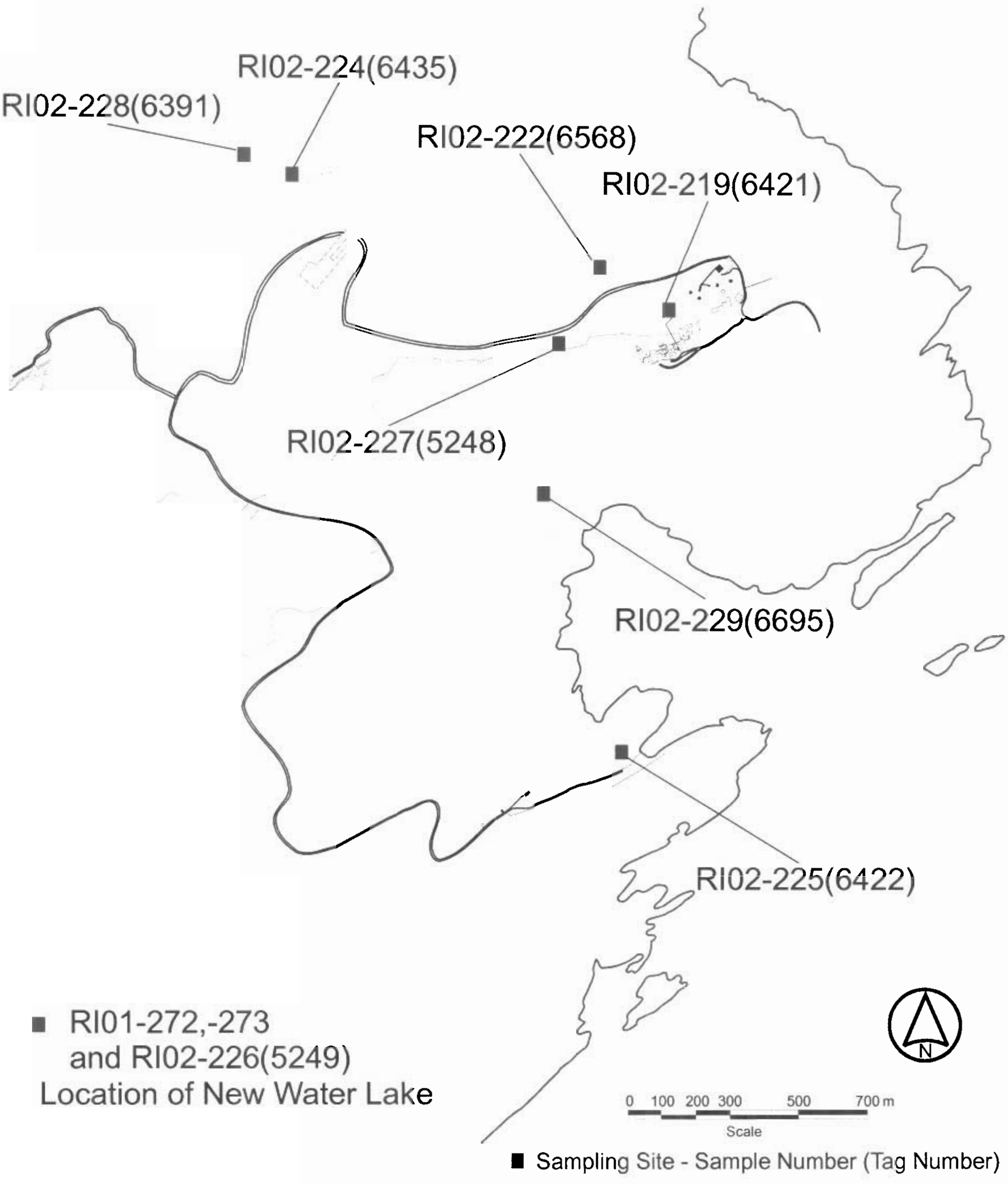
[2] Environmental Sciences Group 1999. Saglek food chain results update. Royal Military College Kingston

Map III-6: Locations of Background Plant Samples



Photograph III-7: Shakeel and Jason Collecting a Background Plant Sample near to the Drinking Water Lake

Photograph III-8: Collecting a Plant Background Sample from Beyond the North End of the Airstrip

Table III-15: Results of Analyses of Background Plant Samples

Sample	PCBs (ng/g)	Location
RI01-272	<50	Drinking water lake
RI01-273	<50	Drinking water lake
RI02-219	1700	Officer's mess
RI02-222	400	100 m NE Main PCB Storage Facility
RI02-224	11000	Airstrip Dump Toe
RI02-225	170	Beach Dump Stream
RI02-226	61	Drinking Water Lake
RI02-227	3300	Imploded Tank
RI02-228	130	100 m from airstrip dump in drainage path
RI02-229	<50	S1/S4 Beach Area

K. Quality Control Data

Quality control was maintained through the analysis of standards, duplicates, and blanks.

1. PCB Quality Control/Quality Assurance

Samples were analyzed for PCBs by the GC/ECD method in the laboratories at Resolution Island and Queen's University. Table III-17 gives the results for blanks and spiked samples for QA/QC samples run by the GC/ECD method at the ASU laboratory in Kingston. Table III-18 gives the results for blanks and spiked samples for QA/QC samples run by the GC/ECD method at the mobile laboratory at Resolution Island. The relative standard deviations given in the Table III-19 for laboratory duplicates demonstrate that the analyses were effective. Table III-20 show the QA/QC data for the chlorobenzene analyses. The ASU report for the Lake Water analysis is also given.

Table III-17: PCB Concentrations in Blank and Spiked QA/QC Samples at the ASU Laboratory in Kingston

Sample	Units	PCB Concentrations (ppm)
Blank	µg/g	<1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0
Control	µg/g	4.0; 5.2: 5.3: 4.3: 4.7; 4.7; 4.2; 4.8: 4.3; 4.0
Control Target	µg/g	5.0

Table III-18: PCB Concentrations in Blank and Spiked QA/QC Samples at the Mobile Laboratory at Resolution Island

Sample	Units	PCB Concentrations (ppm)
Blank	µg/g	<1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0; <1.0
Control	µg/g	6.6: 6.1: 5.4: 5.7; 5.7; 4.3; 6.1; 3.5; 4.0; 5.9; 5.8; 5.5; 5.7; 6.0; 5.8; 6.5; 4.5; 5.5; 5.2; 5.5
Control Target	µg/g	5.0

Table III-19: PCB Concentrations in Laboratory Duplicate Analysis by GC/ECD in Samples From Various Locations at the Site; Data is from both Laboratories

Sample Number (prefix: RI01-)	Sample Location	PCB Concentrations (ppm)	Standard Deviation	Relative Standard Deviation (RSD) (%)
005	K16-K17	45, 38	4.9	12
011	J14-K15	400; 268	93	28
019	L17	15.9; 15.0	0.6	4.1
036	K15-L15	31 ; 41	7.1	19
190	K14-K13	6.9 ; 6.6	0.2	3.1
040	K14	14.0 ; 11.9	1.5	11
047	J15-K15	14.3 ; 13.5	0.6	4.1
205	I9	22 ; 35	9.2	32
173	I9, I10	2.9 ; 5.3	1.7	41
147	K12	19.7; 22.1	1.7	8
153	J12	8.7; 15.1	4.5	38
154	J13	79.0; 74.3	3.3	4.3
207	J12	28; 28	0	0
107	J13	32;34	1.4	4.3
076	I12	63; 74	7.8	11
034	PCL dump	5.3; 6.7	1.0	16
058	S1/S4 beach	174; 236	44	21
203	S1/S4 beach	93; 98	3.5	3.7
163	S1/S4 beach	7.6: 7.4	0.1	1.9
RI02-BTC8	Barriers	75; 101	18	21
RI02-BES5	Barriers	<1.0; <1.0	0	0
018	S1/S4 beach	<1.0; <1.0	0	0
Average RSD	-	-	-	13

Table III-20: QA/QC Data for the Analysis of Chlorobenzenes in Air

Sample	Blank	Control Target	Control Sample
1,2- dichlorobenzene	<0.01	0.010	0.009
1,3- dichlorobenzene	<0.01	0.010	0.010
1,4- dichlorobenzene	<0.01	0.010	0.009
1,2,3 trichlorobenzene	<0.01	0.010	0.009
1,2,4 trichlorobenzene	<0.01	-	-
1235, 1245,1246- tetra chlorobenzene	<0.01	0.010	0.009
1,2,3,4 tetra chlorobenzene	<0.01	-	-
Pentachlorobenzene	<0.01	0.010	0.008

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Tel 613 533-2642 Fax 613 533-2897

ASU #:	5346	Report I.D.	RI Lake Water ASU5346
Client:	DIAND	Date Submitted:	13-Aug-02
		Date Analysis Initiated:	13-Aug-02
		Date Reported:	26-Aug-02
Method:	Standard Methods	Matrix:	Water

Parameter	Units	W004	BLANK	QC	QC TARGET
Copper	mg/L	0.011	<0.005	7.8	8.0
Iron	mg/L	<0.05	<0.05	16.0	16.0
Lead	mg/L	<0.005	<0.005	39.2	40.0
Manganese	mg/L	<0.05	<0.05	15.8	16.0
Mercury	mg/L	<0.0005	<0.0005	0.0022	0.0020
Cadmium	mg/L	<0.001	<0.001	4.1	4.0
Nickel	mg/L	0.064	<0.005	8.0	8.0
Chromium	mg/L	<0.005	<0.005	4.0	4.0
Cobalt	mg/L	0.014	<0.005	8.0	8.0
Zinc	mg/L	0.034	0.018	14.5	15.0
Phenols	ug/L	<1.0	<1.0	9.0	10.0
pH	-	4.0	-	-	-
TSS	mg/L	5.6	-	-	-
Nitrate	mg/L	<0.05	<0.05	0.96	1.00
Nitrite	mg/L	<0.05	<0.05	0.89	1.00
Oil and Grease	mg/L	<1.0	<1.0	-	-
BOD	mg/L	<3.0	-	-	-
Faecal Coliforms	Cts/100 mL	0; 0	-	-	-

Prepared by: ____________

Authorization: ____________
Allison Rutter, PhD
Assistant Director