Table 2.1.1 Soil Samples (Continued)
Summary of Laboratory Results
Radio Island, Main Station Area

Parameter	Remediation Criteria	Northwest of Heli Pad				North of Heli Pad			Northeast of Heli Pad	
	1999 CCME Residential Parkland mg/kg	ESG - 41				ESG - 40			ESG - 32	
		8444	RI-20	RI-21	RI-22	8443	RI-29	RI-30	8434	RI-31
Metals										
Antimony	20		<2.0	<2.0	<2.0		8.8	<2.0		<2.0
Arsenic	12	**53**	3.6	10.8	7.2	**16.1**	**44.5**	4.1	2.6	2.7
Barium	500		37.9	41.1	251		**644**	**768**		36.4
Beryllium	4		0.3	0.2	<0.1		0.4	0.5		0.4
Cadmium	10	**21**	<0.2	**14.4**	6.7	3.8	4.5	0.3	<1.0	<0.2
Chromium	64	59	14.2	3.2	25.5	55	54.3	52.9	22	15.4
Cobalt	50	27	13.8	29.0	**188**	15.3	21.1	17.1	8.9	18.4
Copper	63	**222**	28.6	**71.4**	**70.8**	**243**	**1230**	**122**	38	34.7
Lead	140	**351**	7.0	**174**	**458**	**1700**	**2780**	**714**	**1340**	8
Mercury	6.6		<0.05	0.72	2.12		**14.1**	1.35		0.08
Molybdenum	10		<0.4	**10.1**	8.3		7.4	1.7		<0.4
Nickel	50	**117**	**66.5**	**87.6**	**110**	**76**	**94.6**	**165**	24	**72.6**
Selenium	3		<1.0	**7.6**	**6.6**		**9.7**	1.6		<1.0
Silver	20		<1.0	<1.0	<1.0		40.0	2.4		<1.0
Thallium	1		<1.0	<1.0	<1.0		<1.0	<1.0		<1.0
Tin	50		<2.0	**54.9**	24.5		**1700**	**66.7**		<2.0
Vanadium	130		21.8	25.5	4.1		33.9	47.0		20.5
Zinc	200	**5000**	46.9	**3580**	**1670**	**1440**	**1220**	**373**	**2260**	94.9

BOLD Indicates exceedances to CCME Residential/Parkland Criteria.

Table 2.1.1 Soil Samples (Continued)
Summary of Laboratory Results
Radio Island, Main Station Area

	Remediation Criteria	**South of Main House**		**West of Pond**			**Paint Sample From Main House**
Parameter	1999 CCME Residential Parkland Mg/kg	ESG-65		ESG - 47			ESG - 41
		8470	RI-38	8450	RI-39	RI-40	RI-41
Metals							
Antimony	20				<2.0	<2.0	
Arsenic	12	6.4		8.4	7.6	6.0	
Barium	500				111	269	
Beryllium	4				0.9	0.5	
Cadmium	10	<1.0		8.7	1.0	1.2	
Chromium (total)	64	41		<20	39.4	10.6	
Cobalt	50	14.1		14.8	23.8	20.8	
Copper	63	45		**191**	**67.5**	**94.6**	
Lead	140	**268**	10.4	**660**	**264**	91.3	**111000**
Mercury	6.6				1.76	0.55	
Molybdenum	10				2.0	0.8	
Nickel	50	23		49	**70.2**	**89.2**	
Selenium	3				1.6	**5.4**	
Silver	20				< 1.0	< 1.0	
Thallium	1				<1.0	<1.0	
Tin	50				79.4	41.8	
Vanadium	130				28.2	8.9	
Zinc	200	**274**		**9200**	**1160**	**924**	

BOLD Indicates exceedances to CCME Residential/Parkland Criteria.

North of Former Generator House	G8456 and 8460, Tag # 52 and 56	RI-18 and RI-19	Exceedances of CCME-1999 for copper, lead, zinc, and CWS-PHC.	See Figure 2.0. This site is combined with several others due to drainage patterns in ravine.
Low Area North of Helipad	G8444, Tag # 41	RI-20, 21, and 22	Exceedances of CCME-1999 for Heavy Metals in all three delineation samples	140 m^3
Low Area/Ravine North of Helipad	G8443, Tag # 40	RI-29, and 30	Exceedances of CCME-1999 for arsenic, barium, copper, lead, mercury, nickel, selenium, tin and zinc for sample RI-29 and barium, copper, lead, nickel, tin and zinc for sample RI-30.	50 m^3
Low Area/Ravine Northeast of Helipad	G8434, Tag # 32	RI-31	No exceedances for Lead or Zinc in delineation sample. Exceedances for nickel exist.	40 m^3
Ravine Partially Filled with Debris Northeast of Main House	G8417, Tag # 16	RI-32 and 33	Exceedances of CCME-1999 for copper, lead, nickel and zinc in both samples and tin for sample RI-33.	70 m^3
Ravine East of Debris, Northeast of Main House	G8419, Tag # 18	RI-34 and 35	Exceedances of CCME-1999 for Copper, Lead, and Zinc in both samples and tin for sample RI-34.	65 m^3
Far East Ravine, Northeast of Main House	G8420, Tag # 19	RI-36 and 37	Exceedances of CCME-1999 for nickel, tin and zinc in sample RI-37.	30 m^3
Ravine Adjacent and South of Main House	G8470, Tag # 65	RI-38	No exceedances for Lead in delineation sample. G8470 exceeded CCME-1999.	12 m^3
Ravine Adjacent and West of Freshwater Pond	G8450, Tag # 47	RI-39 and RI-40	Exceedances of CCME-1999 for copper, nickel, lead, selenium and zinc in both samples. G8450 exceeded CCME-1999.	25 m^3
Total Soil Volume Exceeding CCME Metals Criteria				***750 m^3/1000m^3**
Total Soil Volume Exceeding CCME CWS – PHC Criteria				***312 m^3/400m^3**
Total Soil Volume Exceeding One Or More CCME Criteria (rounded up)				***1070 m^3/1400m^3**

*Note: The first volume indicates the estimated volume of soil exceeding criteria and the second volume includes a 25% contingency.

2.2 Additional Sampling, Leachable Levels of Lead

During the preparation of the Radio Island report, the high levels of lead in select sample were discussed with PWGSC Project Manager, Chris Doupe. These high levels of lead may pose a concern and/or problem for future disposal due to their potential to leach out high levels of lead.

In order to classify the soil samples as hazardous or non-hazardous (requiring disposal in a Class 1 or Class 2 landfill respectively), three soil samples were chosen to represent the

2.3 Beach Area and Coal Off-Loading Site

The beach area on the north side of the island was used to unload supply ships of coal and supplies. The site consists of an old hut that has burned and collapsed, a coal stockpile area, and a winch location where the bags of coal were winched to the main site. There area also several barrels and small piles of debris on the ground surface in this area.

The barrel locations were investigated and sampled by ESG in 1996. The location of identified areas having exceedances and requiring delineation in the vicinity of the beach area is presented in Figure 2.2.

Table 2.3.1 on the following page identifies the locations having exceedances in the ESG report and presents the subsequent delineation sampling results for these areas. Appendix B provides site and sample location photographs, and Appendix C presents the laboratory reports.

The data in Table 2.3.1 uses the same criteria presented in the in ESG report however, since the ESG report was published, two new sets of relevant criteria have been published by the CCME. The first is the Canadian Environmental Soil Quality Guidelines, 1999, which presents updated scientifically defensible soil chemistry derived from the CCME 1991 Interim Canadian Environmental Quality Criteria for Contaminated Sites. The second set of newly published criteria is the Canada Wide Standards for Petroleum Hydrocarbons in Soil January 2001, (CWS-PHC). The CWS is a 3-tiered, risk-based, remedial standard developed for four generic land uses – agriculture, residential /parkland, commercial, and industrial. The CWS criteria applied to the Radio Island Site is Residential/Parkland for course-grained soils between 0 and 1.5 m in depth.

The data presented in Table 2.3.1 indicates that there are exceedances outside of the ESG sampled areas and that delineation as been achieved in some areas. Table 2.3.2 below briefly describes each site in the vicinity of the beach area, and presents the results of the investigations conducted. Table 2.3.2 also provides and estimate as to the volume of impacted soil at each location. The sites are identified on Figure 2.2.

Table 2.3.2 Results of Delineation

Area Description	ESG Identifier	Earth Tech Sample #	Summary of Results	Estimated Volume
Former Beach Hut (Indicated as Burnt House on Figure 2.2)	G8428, Tag # 26 G8427, Tag # 25	RI-23, RI-24, RI-25, 26, and 27	Exceedances of CCME-1999 for copper, lead, nickel, selenium and zinc.	44 m^3
North of Coal Stockpile	No Tag	RI-28	No Exceedance of CWS-PHC.	0 m^3
Total Soil Volume Exceeding One Or More CCME Criteria (rounded up)				***50 m^3/65m^3**

*Note: The first volume indicates the estimated volume of soil exceeding criteria and the second volume includes a 25% contingency.

3.0 MATERIALS AND DEBRIS INVENTORY

3.1 Non Hazardous Debris

A systematic and detailed inventory and volume estimate of non-hazardous material was completed for all areas of the Radio Island Navigational Aid and Weather Station. The purpose of this estimate is to allow for site remediation planning by establishing the volume of material to be landfilled on site, and to estimate the time and resources to accomplish this task.

The table below presents the results of this inventory, which was generally conducted south to north. The building volumes have been calculated based on building demolition. Photographs of these areas are located in Appendix B.

Table 3.1 Non Hazardous Debris Volume

Area	Description	Type of Non-Hazardous Debris	Volume	Photo
1	Former Helipad and Beacon Tower	Cables, metal structure, wood and domestic debris.	35 m^3	3.1
2	Vicinity of Former Power House on east and west sides and north south along ravine.	Concrete foundations, steel frame columns, trusses/beams; wooden sill foundation, concrete, C channels, metal debris, cable from helipad to tower site, and crushed barrels (70).	105 m^3	3.2
3	Vicinity of Main House on east and west sides and north south along ravines.	Concrete foundations, steel frame columns, trusses/beams, wooden foundation(s), concrete, C channels, metal debris, crushed barrels, wire cable, bricks wooden structures (helipad, hut, and winch shed), winch mechanism and motor, and submersed debris in pond and low areas.	130 m^3	3.3
4	Beach Hut and coals Stockpile	Metal from winch system, scrap metal from hut, wooden ladder/platform, cables, poles, wires, crushed barrels (30), and 26 m^3 of coal.	45 m^3	3.4
		Total Crushed Volume (rounded up)	***320 m^3/400m^3**	

***NOTE: THE FIRST VOLUME INDICATES THE ESTIMATED VOLUME OF SOIL EXCEEDING CRITERIA AND THE SECOND VOLUME INCLUDES A 25% CONTINGENCY.**

4.0 POTENTIAL LANDFILL SITES AND BORROW AREAS

4.1 Potential Landfill Sites

The Earth Tech project team investigated potential landfill areas on Radio Island that were within a reasonable hauling distance for potential sites at which to landfill the non-hazardous physical debris during the site clean-up. As noted in the ESG report, the island is comprised of rugged bedrock with very little fine materials or flat areas.

As the island is comprised primarily of ravines and rock faces, the number of possible locations identified were few. Two potential sites were identified including:

- Site 1 – Natural depression in bedrock southeast of former building foundation.
- Site 2 – Freshwater pond/reservoir west of main house.

Site 1 – Natural depression in bedrock, is shown in Photo 4.1. This area is a low area that has ponded water collected in it. The depression is approximately 20 m in width, 25 m long, with rock face heights of approximately 3 m on average surrounding the depression. The natural depression in the bedrock is of low permeability as indicated by the ponded/standing water. Debris was observed submersed at the bottom of the natural depression.

This area is approximately 30 m to the southeast from a former building foundation. The proximity to clean up areas in the southern portion of the site makes the area a suitable choice for the land filling of crushed non-hazardous debris. The capacity of the site assuming debris placed to a depth of 3 m over an area of 20 m by 25 m is 1,500 m^3.

Site 2 – Freshwater pond/reservoir west of the main house is shown in Photo 4.2. This is also a natural low area in the bedrock. The depression has a small dam located in the drainage channel/ravine to the west of the reservoir that served as control mechanism to control the height of water within the reservoir. There is a substantial amount of debris submersed at the bottom of this natural depression. It is believed the reservoir was a source of potable water for the site.

The reservoir has rock face walls on four sides and is very impermeable. The depth of the reservoir is an approximate depth of 4 m deep. This area is adjacent and west of the main house and is approximately 37 m long by 14 m wide. The capacity of the site assuming debris placed to a depth of 4 m over the area is 2,072 m^3.

4.2 Borrow Material

The areas surveyed and sampled on Radio Island did not yield any signs of borrow material. This was also identified in the ESG report.

6.0 CLOSURE

The usage of this report is limited by the Standard Earth Tech Special Provisions-Environmental Site Services, which are attached as Appendix D to this report.

APPENDIX B
PHOTOGRAPHS

Photo 2.3 Facing north at location ESG-68 far background in ravine, RI-06 near sampler, RI-05 in middle and RI-04 on right.

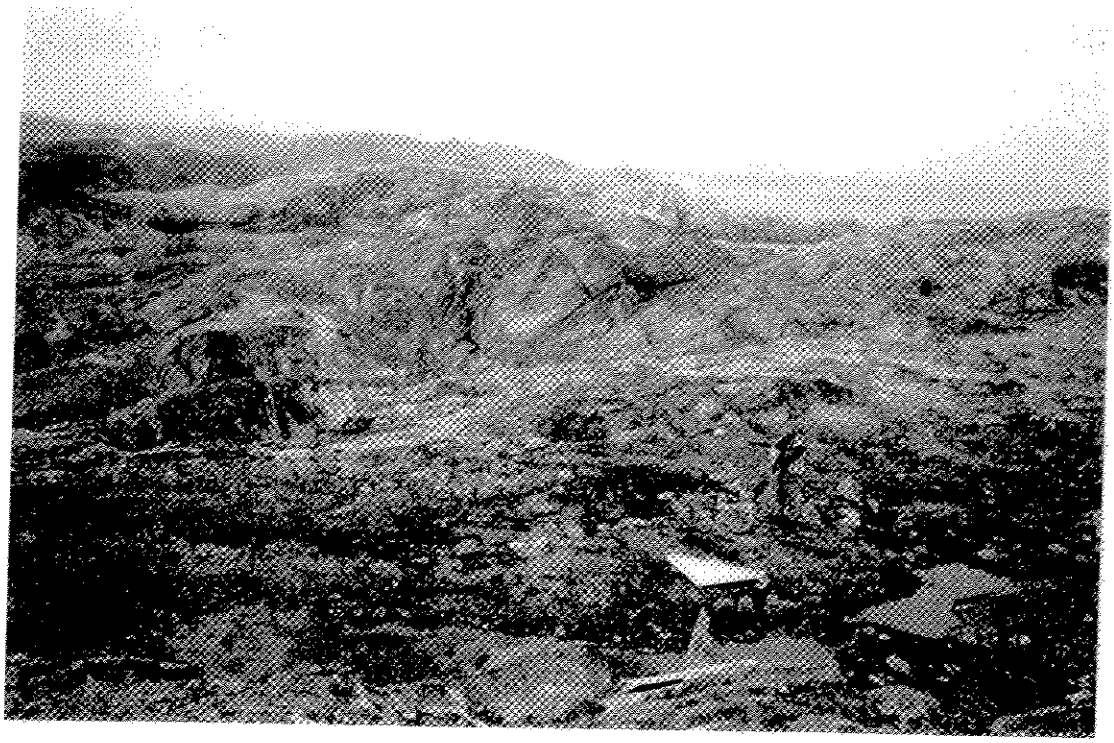

Photo 2.4 Facing southeast at ESG-64 on far left, RI-09 left foreground, RI-07 centre and RI-08 on right near edge of water.

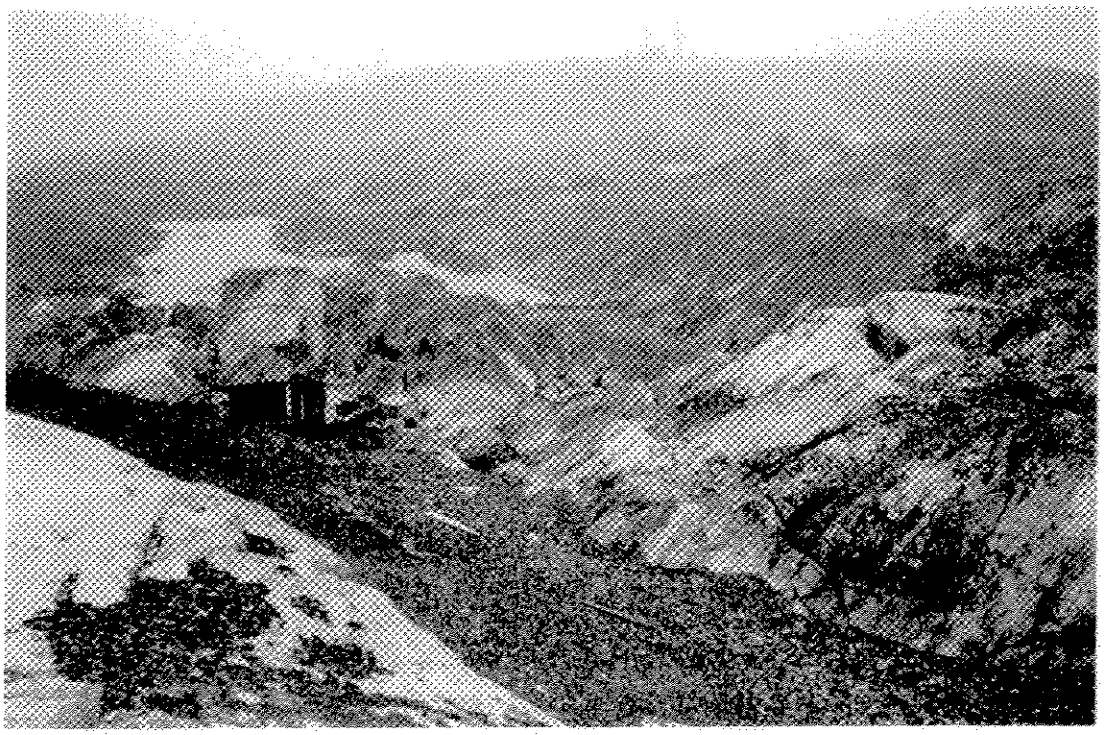

Photo 2.7 Facing south at ESG-59, right and foreground and RI-15 in center.

Photo 2.8 Facing northwest at ESG-50 along south wall of powerhouse. RI-16 (not shown) south of ESG-50.

Photo 2.11 Facing northeast at RI-19 near sample. Note main house, winch shed, freshwater pond, and helipad in background.

Photo 2.12 Facing southeast at low flat area northwest of helipad (background). From left RI-20, 21, 22. ESG-41 in slope/drainage pattern near barrel in background.