FINAL REPORT

Snag Airstrip Remediation
Snag, Yukon

Prepared For:

INDIAN and NORTHERN AFFAIRS CANADA

Suite 345, 300 Main Street
Whitehorse, Yukon
Y1A 2B5

Prepared By:

LORIMER & Associates
Consulting Engineers

in Association with

HEMMERA
RESOURCE CONSULTANTS LTD.

Suite 602, Cook Street
Whitehorse, Yukon
Y1A 2R6

March, 1997
File: YT20501/281-004.01

LORIMER
& Associates
Consulting Engineers

Our File: YT 205 01

31 March 1997

Arctic Environmental Strategy
Action on Waste - Yukon
Indian and Northern Affairs Canada
345-300 Main Street
Whitehorse, Yukon
Y1A 2B5

Attention: Mr. Brett Hartshorne
Manager

Re: Snag Airstrip Remediation Project
Final Report

Dear Mr. Hartshorne:

We are pleased to submit herewith ten bound copies and one unbound copy of our final report on the Snag Airstrip Remediation Project.

The report documents the remediation work carried out at Snag during the summer and fall of 1996, details the status of the site at the completion of the program and presents recommendations for future monitoring.

We have enjoyed working with you on this significant project and we thank you for the opportunity to have been of service.

Should you have any questions about the report or the work carried out, please do not hesitate to contact us.

Yours very truly,
LORIMER & Associates

Bob Lorimer, P.Eng.

RJL/

3-602 Cook Street, Whitehorse, Yukon, Y1A 2R6
Tel: (403) 667-4146 Fax: (403) 633-2581 E-mail: lorimer@yknet.yk.ca

EXECUTIVE SUMMARY

The Department of Indian and Northern Affairs Canada retained Lorimer & Associates (Lorimer) to remediate the Snag Airstrip and Beacon Sites in the Yukon Territory. The facilities at the site in the summer of 1996 consisted of eight buildings, the airstrip, and a small summer tent camp run by the White River First Nation. In addition, there was an intermediate abandoned beacon site located approximately 7 km northeast of the strip on a hilltop, and a landfill located along the Snag Road approximately 1 km southwest of the tower building.

An Environmental Assessment of Snag Airstrip was undertaken by Environmental Sciences Group (ESG), Royal Military College in Kingston, Ontario, in the summer of 1995 (ESG 1996). The assessment and cleanup recommendations proposed for the airstrip were based on requirements and guidelines defined by the *Canadian Environmental Protection Act* (CEPA, 1992), the *Canadian Council of Ministers of the Environment (CCME) Interim Canadian Environmental Quality Criteria for Contaminated Sites* (CCME, 1991), and the *Ontario Ministry of the Environment Leachate Quality Standards* (Ontario Ministry of Environment, 1992). Also, the *Netherlands' Soil Protection Act Soil Cleanup Criteria* (Ministry of Housing, Physical Planning and Environment, 1987), *British Columbia Ministry of the Environment, B.C . Special Waste Regulations* (B.C. Ministry of the Environment, 1991) and *Ministère de l'Environnement du Quèbec (MENVIQ) Contaminated Sites Rehabilitation Policy* (MENVIQ, 1988) were referenced in the absence of appropriate criteria. ESG collected and analysed soil, barrel, paint, wall swabs, building material, oil filter, water and plant samples.

Areas to be excavated and depths of excavation were based on the results of sampling programs completed by ESG in 1995 and 1996 and ESG's documentation of the site. The decision of the ultimate disposal of demolition debris from the buildings on site was also based on ESG's sampling and additional sampling carried out during the course of this program. ESG completed the collection and analyses of the confirmatory samples until July 15, 1996, after which time Lorimer staff completed the confirmatory sampling program for analyses at ESG, Cantest and AXYS Laboratories.

The objective of the remediation program undertaken by Lorimer in July to October 1996 was to return the

subject site to an environmentally safe and natural condition. Tasks completed to achieve this objective included:

- Remediation of soil and concrete containing concentrations of polychlorinated biphenyls (PCBs) above guidelines contained in CEPA and CCME;
- Remediation of leachate toxic and pesticide contaminated soils;
- Remediation of soil and building debris containing concentrations of contaminants (metals and polycyclic aromatic hydrocarbons (PAHs) in excess of the CCME Residential/Parkland (R/P) Criteria;
- Confirmatory sampling;
- Removal of non-hazardous debris to the existing landfill located nearby;
- Expansion and capping of existing landfill;
- Installation of monitoring wells at the base of the landfill slope;
- Building of a containment cell for soils and debris containing contaminant concentrations of concern in excess of the CCME Residential / Parkland criteria; and
- Covering of remediated foundations with backfill.

All soils and materials determined by ESG to contain levels of contaminants above the remediation criteria were removed. The soil and concrete determined to contain concentrations of PCBs above the CEPA criteria and soil determined to contain leachate toxics and pesticides above the CCME R/P remediation criteria were excavated and shipped offsite.

A containment cell was built south of the former Tower Building. The soil and debris determined to contain contaminant concentrations above the CCME R/P criteria were placed in the containment cell. The containment cell consisted of five liners with containment berms, and two monitoring wells. The cell was graded to facilitate drainage from the cell surface, covered and fenced off.

Two extensions were made at the existing landfill located approximately 1 km southwest of the main site. The extensions and previous landfill area were capped with borrow material and regraded. The airstrip site was left free of debris and all backfill was groomed in a manner which should promote natural recovery of

the site.

Recommendations for future work include installing groundwater monitoring wells around the containment cell. Additionally, the two interstitial monitoring wells installed through the liners in the containment cell should be locked to discourage tampering. A regular, long-term monitoring program for the wells at the containment cell and landfill should be implemented. Annual visual inspections of the containment cell and fencing should also be carried out to identify any potential problems or evidence of tampering.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

1.0 INTRODUCTION

1.1 Location

Snag Airstrip is located in the Yukon Territory, approximately 400 km northwest of Whitehorse and 29 km east of the border with Alaska. It is located at kilometre 26 (mile 16.2) along Snag Road which runs north from the Alaska Highway (62° 20'N, 140° 29'W) (Figure 1). Snag Village is located approximately 4 km north of the airstrip.

The facilities at the site in the summer of 1996 consisted of eight buildings, the airstrip, and a small summer tent camp run by the White River First Nation. In addition, there was an intermediate abandoned beacon site located approximately 7 km northeast of the strip on a hilltop, and a landfill located along the Snag Road approximately 1 km southwest of the tower building.

The eight remaining buildings at Snag Airstrip as of the summer of 1996 were in various states of disrepair. The tower building was partially torn down in an attempt to remove it in 1995. The firehall and married quarters cabin (residence building) were the only buildings still intact. The other buildings were only evidenced by their foundation remains. The airstrip, which was partially overgrown with bushes and small trees, was still in use by local outfitters for resupplying bush camps and was suitable for small fixed-wing airplane traffic.

1.2 Historic Background

Snag Airstrip was constructed in 1942 as one of a series of airstrips that formed the Northwest Staging Route, a flight corridor from Edmonton to Fairbanks. The site consisted of twelve buildings and a single gravel airstrip. The remains of eight buildings were found at the main site in the summer of 1996. These remains included the airstrip tower building, barracks building, one married quarter wood cabin, warehouse, powerhouse, pumphouse, firehall, garage pad, wells and utility holes. A landfill is located approximately 1 km southwest of the building area. An intermediate beacon site

was located on a hilltop approximately 7 km northeast of the airstrip (Figure 2).

The airstrip was administered by the Royal Canadian Air Force between 1942 and 1945. The Department of Transportation took over administration of the site in 1957, at the time it was essentially abandoned. In 1966 the airstrip was handed over to the territorial government. The airstrip came under the management of Indian and Northern Affairs Canada (INAC) in 1971 and under INAC's Arctic Environmental Strategy Action on Waste program in 1994.

An Environmental Assessment of Snag Airstrip was undertaken by Environmental Sciences Group (ESG) at the Royal Military College of Canada (RMC) in Kingston, Ontario, in the summer of 1995 (ESG 1996). The assessment and cleanup recommendations proposed for the airstrip were based on requirements outlined in the *Canadian Environmental Protection Act* (CEPA, Environment Canada),the *Canadian Council of Ministers of the Environment (CCME) Interim Canadian Environmental Quality Criteria for Contaminated Sites* (CCME, 1991), and the *Ontario Ministry of the Environment Leachate Quality Standards* (Ontario Ministry of Environment, 1992). ESG collected and analysed soil, barrel, paint, wall swabs, building material, oil filter, water and plant samples. ESG concluded that the total volume of soil containing polychlorinated biphenyls (PCBs) in excess of the CEPA criterion was approximately 34 m^3. Approximately 15 m^3 of soil was categorized as hazardous waste based on Ontario Ministry of the Environment Leachate Quality Standards. A total of 282 m^3 of soil was estimated by ESG to contain concentrations of metals above the CCME Residential/Parkland Remediation Criteria. In addition, soil samples analysed by ESG determined the presence of pesticide contaminant concentration in excess of the Ministere de l'Environment du Quebec, Contaminated Site Rehabilitation Policy (MENVIQ 1988) criteria and the Netherlands' Soil Protection Act, Soil Clean-up criteria.

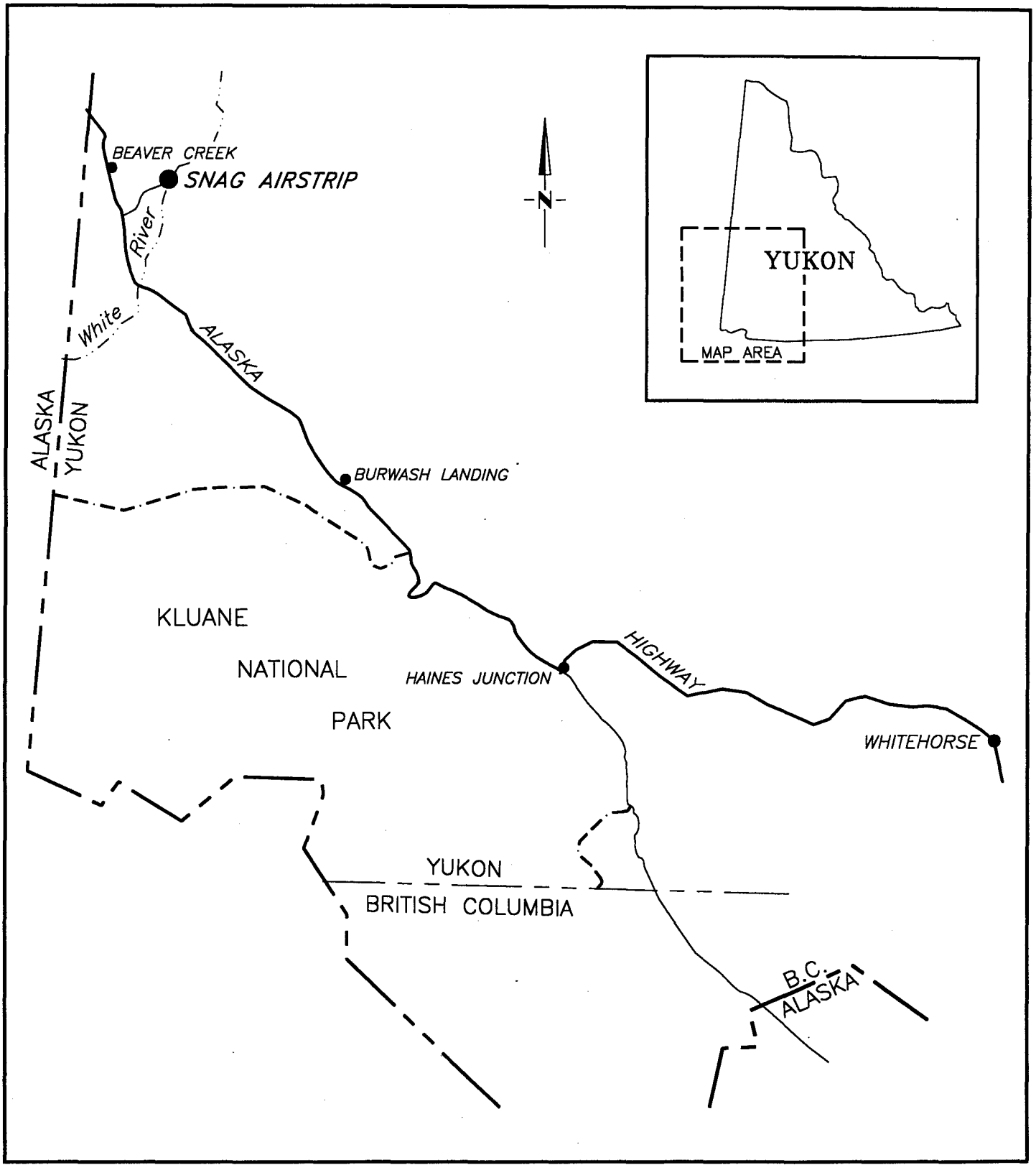
Further soil delineation was completed by ESG in June 1996. This work further defined the areas and soil volumes that required remediation. An additional 143 m^3 of pesticide/leachate toxic contaminated soil, 4 m^3 of soil contaminated with PCB concentrations in excess of the CEPA criterion and 58 m^3 of CCME level soil was defined at this time.

1.3 Scope of Work and Objectives

The volume of CEPA and CCME material to be remediated during this program was delineated in ESG's environmental assessments of the site in 1995 (ESG, 1996) and 1996. Areas to be excavated and depths of excavation were based on the results of these sampling programs and ESG's documentation of the site. The decision of the ultimate disposal of demolition debris from the buildings on site was also based on ESG's sampling and additional sampling carried out during the course of this program.

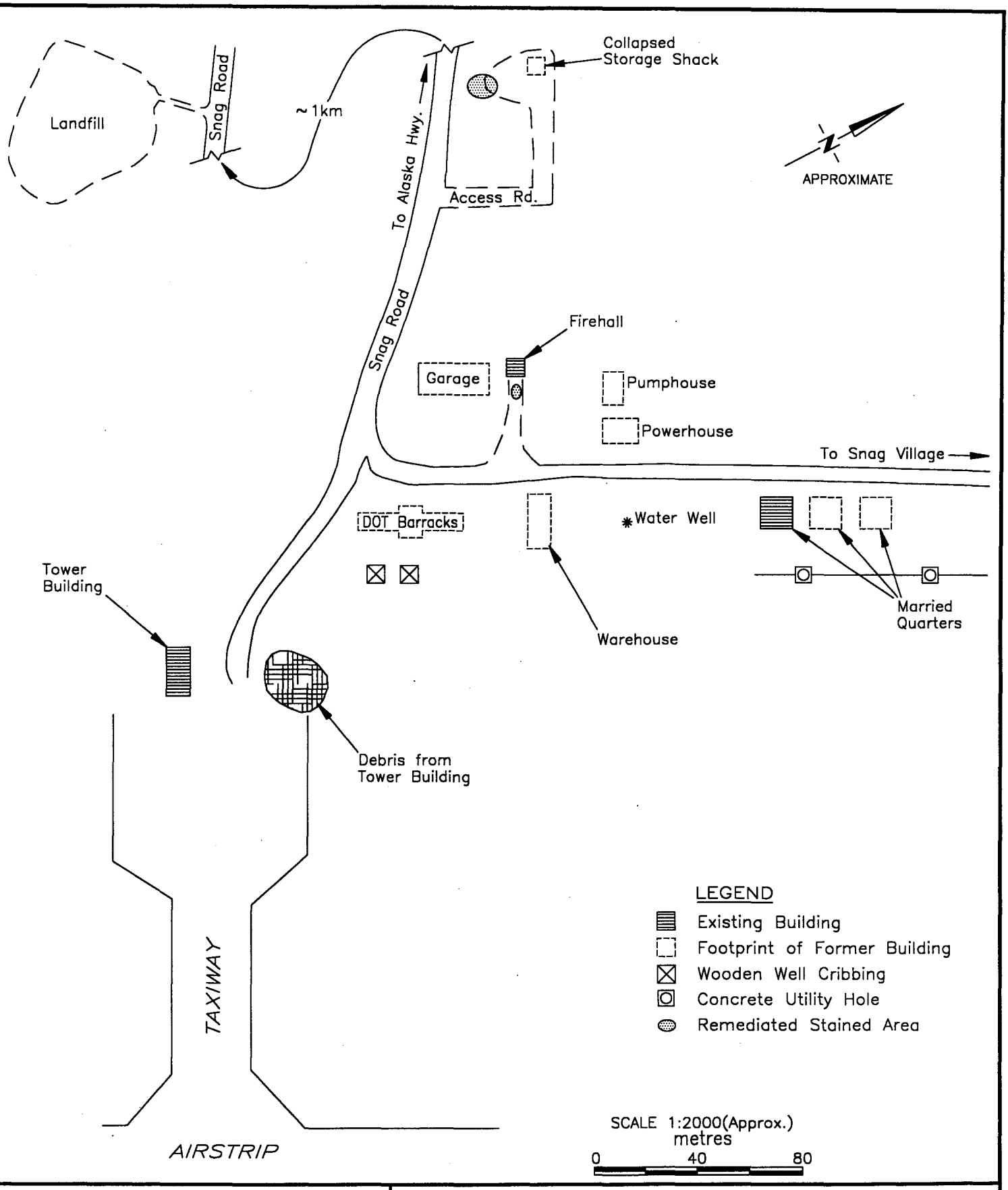
The objective of the remediation program undertaken by Lorimer & Associates (Lorimer) in July to October 1996 was to return the subject site to an environmentally safe and natural condition. To achieve this objective the following tasks were completed:

- confirmatory sampling;
- remediation of soil containing concentrations of PCBs above guidelines contained in CEPA;
- remediation of concrete foundations containing concentrations of PCBs above guidelines contained in CEPA;
- remediation of leachate toxic soils as defined by the Ontario Ministry of the Environment Leachate Quality Standard;
- remediation of pesticide contaminated soils;
- remediation of soil and building debris containing concentrations of contaminants in excess of the CCME Residential/Parkland (R/P) Criteria;
- removal of non-hazardous debris to the existing landfill located nearby;
- expansion and capping of existing landfill;
- installation of monitoring wells at the base of the landfill slope;
- building of a containment cell for soils and debris containing concentrations of metals, PCBs and PAHs in excess of the CCME R/P criteria; and
- covering of remediated foundations with backfill.



NOT TO SCALE

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON SITE LOCATION PLAN		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 1



LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON GENERAL SITE LAYOUT		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 2

2.0 REGULATORY CRITERIA

2.1 CEPA Regulations

Under the *Canadian Environmental Protection Act, Storage of PCB Material Regulations*, materials (solid or liquid) containing concentrations of PCBs in excess of 50 ppm must be remediated (Canada Gazette Part I, June 9, 1992) (CEPA 1992). The regulations govern the amount of PCB containing material that can be in or on a property and describe the required containers or drums that must be used to contain the PCB contaminated material.

The regulations do not apply to the handling, offering for transport, or transporting of PCB material governed by the *Transportation of Dangerous Goods Act* (TDGA) (TDGA 1985).

2.2 CCME Criteria

In response to the growing public concern over the potential environmental and human health effects associated with contaminated sites, the Canadian Council of Ministers of the Environment (CCME) has developed *Interim Canadian Environmental Quality Criteria for Contaminated Sites* (CCME 1991). These interim criteria have been adopted from existing guidelines and criteria currently in use in various jurisdictions across Canada. They are continuing to be assessed and are intended to be modified as required to reflect the emerging body of scientific information relevant to contaminant effects on the environment and human health.

The CCME criteria include two levels of concentrations for soil and water quality: assessment criteria; and remediation criteria. Assessment criteria are the approximate background concentrations or approximate analytical detection limits for contaminants in soil and water. Background concentration refers to a representative ambient concentration for a contaminant in soil or water. Analytical detection limits are the lowest concentration that can be routinely measured within an acceptable level of accuracy and reproducibility. Remediation criteria are generally considered to be those levels which are protective of human and environmental health for specific

uses of soil or water at contaminated sites.

If concentrations of a substance in water or soil at a site do not exceed the assessment criteria, further action is not usually required. When concentrations exceed assessment criteria, further investigation is required to assess the nature and extent of any contamination at a site. If contaminant concentrations exceed the remediation criteria for a current or proposed future land use for a site, then remediation of the site to meet the current or proposed land use criteria is required.

Soil remediation criteria have been developed for three land uses: agricultural; residential or parklands; and commercial or industrial. Water remediation criteria are based on CCME *Water Quality Guidelines* (CCREM 1987) and Health and Welfare Canada's *Drinking Water Quality Guidelines* (Health and Welfare Canada 1993).

2.3 Other Criteria

The *Transportation of Dangerous Goods Act* (TDGA) and Regulations includes a category of wastes defined as environmentally hazardous substances (Class 9.2 - Dangerous Goods). A waste which contains an environmentally hazardous substance with a 9.2 classification is a Dangerous Good or Special Waste if the concentration of the substance is greater than 0.01% (100 μg/g, or 100 parts per million (ppm)). PCB containing materials are classified as a Class 9.2 substance. Pesticides are classified as a Class 6.1 - Poisonous (toxic) and infectious substance. The TDGA contains specifications for placarding, handling and transporting dangerous goods.

Remediation criteria for pesticides are not included in the CCME criteria. In order to develop remedial objectives for these compounds, acceptable criteria in other jurisdictions were reviewed. The Ministère de l'Environnement du Québec, *Contaminated Sites Rehabilitation Policy* 1988, criteria for residential or recreational land is 2.0 ppm for total pesticides (Ministire de l'Environment du Quebec 1988). The Netherlands' *Soil Protection Act, Soil Cleanup Criteria* recommends criteria of 0.5 ppm for each chlorinated pesticide, 1.0 ppm for each non-chlorinated pesticide and 3.0 ppm for total pesticides (Ministry of Housing, Physical Planning and Environment 1987).

For leachate toxic tests performed on selected paint samples, *Ontario Regulation 347* (Ontario Ministry of Environment 1992) and BC *Special Waste Extraction Procedure* (SWEP) (British Columbia Ministry of Environment 1990) test criteria were used.

In 1988, the *B.C. Waste Management Act* was amended to include the *Special Waste Regulation* (SWR), which identifies certain wastes as being particularly hazardous. These are identified as Special Wastes in the Regulation. In April 1992, the Special Waste Regulation was amended. Special Wastes are currently defined as:

- dangerous goods that are no longer used for their original purpose, including those that are recycled, treated, or disposed; intended for recycle, treatment or disposal; or in storage or transit before recycle, treatment or disposal;
- PCB wastes;
- wastes containing dioxin;
- waste oil;
- waste asbestos;
- waste pest control product containers and wastes containing pest control products, including wastes produced in the production of treated wood products using pest control products;
- leachable toxic waste;
- waste containing tetrachloroethylene; and
- waste containing polycyclic aromatic hydrocarbon.

Each of these terms is defined more fully in the SWR.

2.4 Remedial Objectives

Based on the anticipated future land use of the Snag site, the CCME Residential and Parkland (R/P) criteria were used as remedial objectives for metals and PAHs. For material containing concentrations of PCBs, two levels of remedial criteria were used, CEPA and CCME.

In the absence of CCME and territorial criteria for pesticides, the lowest criteria level in other jurisdictions was adopted as the remedial objective for Snag. Therefore a criteria of 0.5 ppm for individual pesticides and 2.0 ppm for total pesticides was used.

For leachate toxic tests, two remedial criteria was used, *Ontario Environmental Regulation 347* and the SWEP test as defined in the B.C. Special Waste Regulations (B.C. Ministry of the Environment, 1990).

Table 1 contains a list of the remedial criteria used at Snag:

TABLE 1
REMEDIAL OBJECTIVES
SNAG AIRSTRIP, YUKON
File: 281-004
µg/g (ppm)

Criteria	CCME Criteria R/P	CEPA Criteria	Leachate Quality Standards		Netherlands Criteria	MENVIQ Criteria
			Ontario Reg 347	BC Special Waste		
Parameter						
Metals						
Arsenic, As	30		0.05	5		
Barium, Ba	500		1	100		
Boron, Bo			5	500		
Cadmium, Cd	5		0.005	0.5		
Chromium, Cr	8		0.05	5		
Cobalt, Co	50					
Copper, Cu	100					
Cyanide			0.2	20		
Flouride, Fl			2.4	150		
Lead, Pb	500		0.05	5		
Mercury, Hg	2		0.001	0.1		
Molybdenum, Mo	10					
Nickel, Ni	100					
Selenium, Se	3		0.01	1		
Silver, Ag	20		0.05	5		
Tin, Sn	50					
Zinc, Zn	500					
Antimony, Sb	20					
Beryllium, Be	4					
PCBs	5	50	0.003			
PAHs						
benzo(a)anthracene	1					
benzo(a)pyrene	1					
benzo(b)fluoranthene	1					
benzo(k)fluoranthene	1					
dibenz(a,h)anthracene	1					
indeno(1,2,3-c,d)pyrene	1					
napthalene	5					
phenanthrene	5					
pyrene	10					
Individual Pesticides					0.5	
Total Pesticides						2

All values reported in parts per million (ppm)
MENVIQ: Ministere de l'Environnement du Quebec, Contaminated Sites Rehabilitation Policy, 1988
Netherlands: Netherlands' Soil Protection Act, Soil Cleanup Criteria

3.0 FURTHER DELINEATION AND LABORATORY ANALYSIS

Further delineation of the site was completed by ESG in the summer of 1996, prior to commencing the remediation of the site. The findings of this work are contained in a separate document prepared by ESG. This work further defined the areas to be remediated, the contaminants of concern and the concentrations of the contaminants.

ESG's involvement with the project continued throughout the summer with the group providing laboratory facilities to analyse the confirmatory samples collected at Snag by Lorimer personnel. This involved shipping the majority of samples in coolers to laboratory facilities in Kingston, Ontario. Samples for analysis of concentrations of PCBs were analysed by the ESG Analytical Laboratory. Samples analysed for concentrations of inorganic elements were sent to the Analytical Services Unit, Queen's University, Kingston, Ontario. Soil requiring analysis for concentrations of pesticides were sent to AXYS Analytical Services Ltd, Victoria, B.C.

A copy of the memo detailing the transfer of ESG's responsibilities for sampling to Lorimer is included in Appendix I.

4.0 REMEDIATION PREPARATION

4.1 Health and Safety

A comprehensive Site Safety and Health Plan (Site Safety Plan) was implemented at the Snag site during the remediation program in accordance with the guidelines issued by the U.S. National Institute for Occupational Safety and Health (NIOSH) *(Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities)* and with commonly practiced Occupational Health and Safety (OH&S) requirements. The objectives of the Site Safety Plan were to protect the health and ensure the safety of personnel and visitors on the site by specifying standard safety procedures; outlining the types of personal protection and safety equipment which was required on the site; describing clean up procedures; showing lines of authority, responsibility and communication; and providing emergency procedures should they have been needed.

The site specific Health and Safety Plan is included in Appendix II.

4.2 Quality Assurance/Quality Control

Soil samples were collected using disposable, individually wrapped plastic trowels. Fresh latex gloves were worn for each sampling event. Samples were collected and placed in either plastic bags or laboratory prepared jars with the appropriate preservative if required. Samples were kept cool and transported to the appropriate laboratory as soon as possible after sampling. Chain-of-custody forms accompanied all submissions to the laboratory.

Confirmatory base samples were collected from the excavated areas according to the following guidelines:

- one discrete base sample for CEPA level PCBs for every 5 m^2 of excavated area, with at least one sample collected per excavated area; and
- one discrete base sample for pesticides, leachate toxic and CCME level soils for every 10 m^2 of excavated area, with at least one sample collected per excavated area.

Replicates are a check on laboratory and field procedures. Replicates were collected from sampling points which were known or suspected to be contaminated, with a minimum of 1 sample or 10%/parameter/matrix/site whichever was greater. Replicates were collected for samples which were submitted for a complete parameter suite. The replicates were collected, numbered, packaged, and sealed in the same manner as the other samples. The replicate sample sets were filled in parallel by matched parameter.

4.3 Selection of Borrow Pit

Soil was required to fill in excavations and to build the walls of the temporary staging cells and the permanent walls of the containment cell. Borrow pits were chosen that were close to the site and that minimized the impact to the natural area. The borrow pits were selected according to conditions outlined in a Land Use Permit (YA6X171) and Quarry Permit (96/627) provided by the local Resource Management Officer (RMO). The permit also outlined remediation measures for the borrow pit areas, in order to reduce the potential for erosion and to facilitate their return to a natural state (Appendix III). Site visits were conducted regularly by the RMO. The main borrow pit was located along the airstrip to the southwest of the work site. Several smaller pits were chosen along the road leading into the Snag Airstrip. This borrow material was used for small scale road repairs.

4.4 Temporary Staging Cells

Two temporary staging cells were constructed northeast of the tower building towards the airstrip. These cells were required to temporarily contain soil and building debris containing contaminant concentrations in excess of the CCME R/P criteria, while the permanent containment cell was being built. Although this required handling the soil and debris twice it was felt that substantial saving would be gained in building the containment cell to the exact volume of material collected, rather than anticipating the final volume and allowing a contingency. The staging cells were graded, berms constructed on three sides from borrow material and sheets of polypropylene laid on the base and sides walls. The temporary cells were completely removed at the end of the work.

4.5 Site Preparation

All remediation work was completed with the least possible disturbance to the surrounding area. However, in some cases brush was cut down in order to remove the contaminated soil and to construct the permanent containment cell.

Existing roadways were utilized wherever possible in order to reduce disturbance. An old road south of the tower building was rehabilitated to provide access to the containment cell. A short road was constructed leading from the existing road into the landfill to the base of the landfill. This road provided access for installing groundwater wells.

5.0 CONFIRMATORY SAMPLING AND SITE REMEDIATION

The following sections discuss the remediation methodology and confirmatory sampling procedure and results by area at the Snag airstrip. Confirmatory samples were collected according to the sampling protocol and frequency previously discussed. Areas that indicated concentrations of contaminants above the remedial criteria were excavated a further 0.1 m and resampled. The analyses of samples collected at the horizontal extent of the excavation indicating concentrations of contaminants above the remedial criteria triggered further vertical excavation in the area and resampling in order to ensure the complete removal of soil containing the contaminants of concern.

5.1 TOWER BUILDING

The Tower Building was located on the south side of the site and was the nearest building to the airstrip. The building was partially demolished in an attempt to move it in 1995. This resulted in scattering building debris including painted and unpainted wood, pressboard, glass and metal around the building and across the roadway to the north. The building was a wooden frame structure on a concrete foundation with a concrete chimney.

5.1.1 Areas and Contaminants of Concern

According to delineation work conducted by ESG in 1995 and 1996, the soil in the area immediately surrounding the foundation of the Tower Building and leading from the building to the south contained concentrations of metals and PCBs above the CCME criteria. The analyses of two paint chips from the interior walls indicated high concentrations of metals and PCBs in the paint. Leachate tests conducted by ESG in 1995 determined that the paint chips produced leachate (when digested in acid) with metal concentrations below the applicable leachate criteria (Table 1). According to ESG's 1996 report, asbestos analysis conducted on the insulation determined concentrations were below the detection limit of 0.5%.

5.1.2 Remediation Methodology and Confirmatory Sampling

The concrete chimney and remainder of the standing building were pulled down with the use of heavy equipment. The building debris consisted predominantly of wood (painted and unpainted) and concrete. Debris from the building and surrounding area was dismantled and removed to the landfill. Although paint chips from the interior walls were determined by ESG to contain high concentrations of metals and PCBs (ESG 1996), leachate tests completed on the paint chips suggested that the paint produced leachate with metal concentrations below the applicable leachate criteria. Currently, there are no established remediation criteria regulating the concentrations of metals in paint; therefore, based on the leachate results, the painted wood was placed in the landfill. Wood and construction debris inadvertently mixed with soils containing concentrations of metals and/or pesticides in excess of the CCME R/P criteria during the demolition and remediation was placed in the containment cell with the soil.

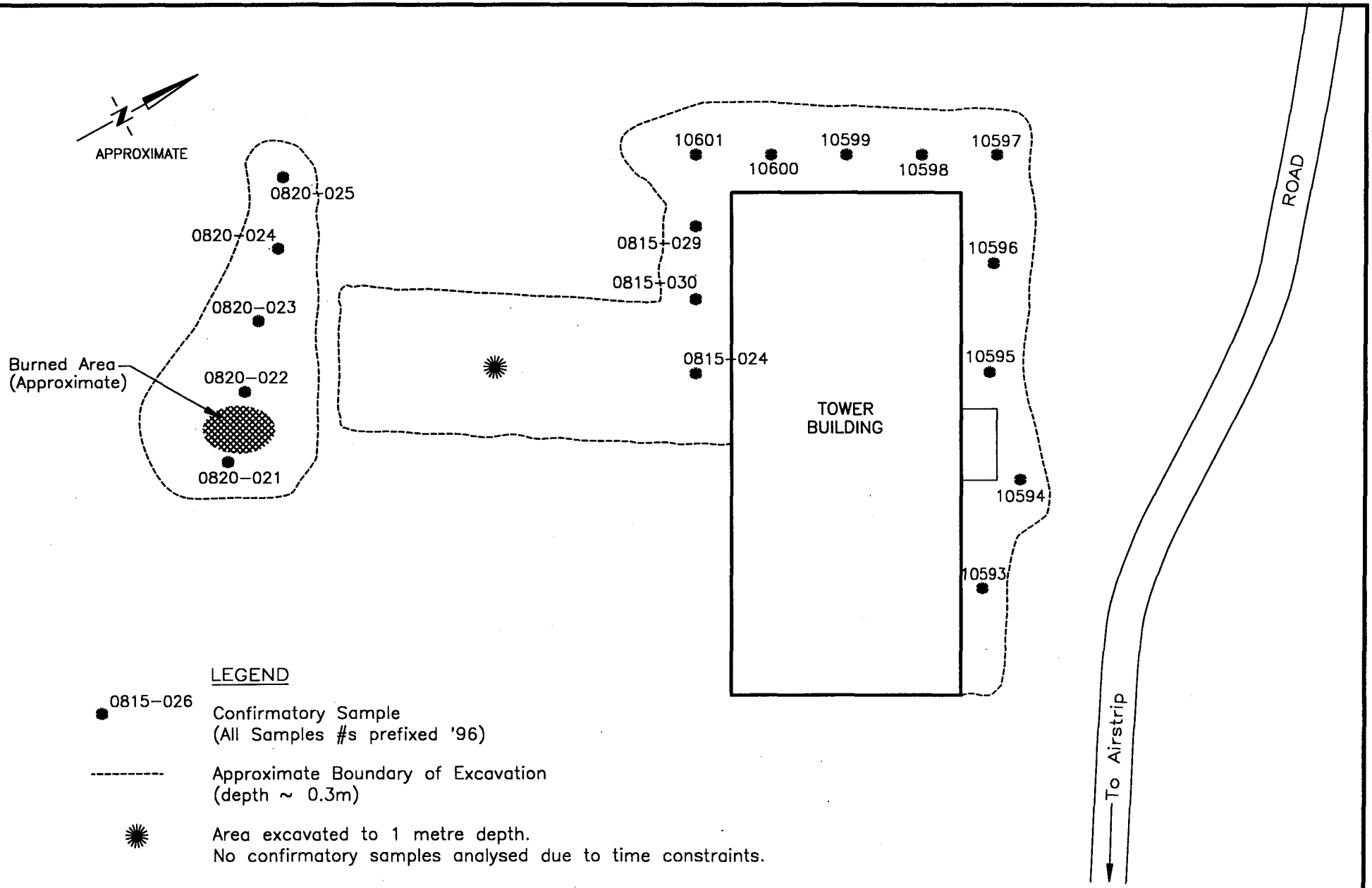
The soils determined by ESG to contain contaminant concentrations (metals and PCBs) were excavated and stockpiled in the temporary staging area. This soil was eventually moved to the permanent containment cell built on the property. The majority of soil contamination was surficial and contained in the top 0.3 m. Areas were initially excavated to this approximate depth and confirmatory samples collected (Figure 3). The analytical data is contained in Table 2 and in Appendix IVa and IVb. The initial excavation of the area south of the Tower Building indicated the soil contained concentrations of metals exceeding the CCME R/P criteria. Therefore, this area was over-excavated to a depth of 1 metre. Subsequent to consultation with Mike Palmer of Indian and Northern Affairs Canada and due to time constraints no confirmatory samples were collected for the re-excavated area.

The excavated area was covered with polypropylene sheets and left open until all of the confirmatory analyses determined that the soil in the area contained concentrations of contaminants below remediation criteria. The excavated area and building basement were then filled in with borrow material and the area was graded.

5.1.3 Conclusions

In the Tower Building area twenty four confirmatory samples, including replicates, were collected and analysed for concentrations of metals and PCBs. Of these samples, only the analyses of one (96-10601), indicated concentrations of contaminants marginally above the CCME R/P criteria. This sample location was re-excavated along with new adjacent excavations. Closure was achieved when analyses of the confirmatory samples indicated concentrations of contaminants below the remedial criteria both horizontally and vertically. Approximately 70 m^3 of soil was excavated from around the foundation building and placed in the permanent containment cell.

The building debris consisted of mainly painted and unpainted wood and concrete. Leachate tests conducted on the paint determined that concentrations of contaminants in the leachate were below the Ontario and B. C. leachate quality criteria. Therefore, the majority of the building debris was removed to the extended area of the landfill.



SCALE 1:150(Approx.)
metres
0 3 6

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON TOWER BUILDING SAMPLING LOCATIONS
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01 | March 1997 | FIGURE 3

SNAG AIRSTRIP REMEDIATION

TABLE 2
METALS & ORGANICS IN SOIL
TOWER BUILDING
µg/g

Sample Id*	Metals								PCB
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**50**
0820-021	29	38	12.5	<1.0	<10	54	52	3.3	<1
0820-022	50	42	11.5	<1.0	<10	93	80	3.7	<1
0820-023	88	36	12.4	<1.0	51	153	52	5	<1
0820-024	32	31	11.5	<1.0	<10	60	45	4	<1
0820-025	41	34	13.1	<1.0	<10	62	55	1.9	<1
0815-024	62	36	14.1	<1.0	55	141	50	3.6	<1
0815-029	43	31	13	<1.0	19	80	45	4.2	<1
0815-030	53	38	13.2	<1.0	42	121	56	4.9	<1
10593	61	30	13.9	<1.0	261	271	47	6	<1
10594	37	32	13.6	<1.0	<10	67	54	5.2	<1
10595	34	30	13.1	<1.0	95	154	44	5.6	<1
10596	41	33	12.7	<1.0	<10	85	48	4.5	<1
10597	44	32	12.9	<1.0	14	107	43	4.5	<1
10598	37	31	14.1	<1.0	13	72	44	3.7	<1
10599	39	32	13.1	<1.0	159	209	45	4.2	<1
10600	31	26	7.8	<1.0	56	88	36	3.1	<1
10601	110	39	13.4	<1.0	213	224	56	3.6	<1

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34) (Recreational / Park land use)

5.2 WELLS

Two wells were located north of the Tower Building (Figure 2). These wooden walled wells were approximately 2.5 m deep and contained frost at their base. The wood above grade was painted orange.

5.2.1 Areas and Contaminants of Concern

Based on analyses the conducted by ESG on similar coloured paint at the Beacon Site, the orange painted wood was treated as possibly containing concentrations of contaminants in excess of the CCME R/P criteria. Based on the ESG review, no other concerns were related to this area.

5.2.2 Remediation Methodology

The painted wood was manually removed and eventually placed in the containment cell. The wells were backfilled with borrow material.

5.2.3 Conclusions

Painted wood was removed to the containment cell and the wells were backfilled. No soil contamination was determined from the delineation program conducted by ESG (1996).

5.3 BARRACKS BUILDING

The Barracks Building was located approximately 50 m north of the Tower Building. The only remaining parts of the structure in 1996 were a partially painted concrete chimney and basement foundation. Pairs of concrete footings extended to the north of the building. Metal debris was scattered around the outside of the building. A thin layer of soil, moss and other organics covered the floor of the basement.

5.3.1 Areas and Contaminants of Concern

Delineation of soil surrounding the Barracks Building basement, completed by ESG in 1995 and 1996, determined concentrations of metals, including lead, zinc, copper, nickel and arsenic, at concentrations above the CCME R/P criteria (ESG 1996). The contaminated soil surrounded the foundation and extended between 2 to 4 m from the basement foundation as well as to the north between the concrete supports.

According to ESG, the debris and moss on the floor of the Barracks Building basement contained concentrations of PCBs above the CEPA criteria (ESG 1996). It was therefore assumed by ESG, based on similar site investigations, that the concrete would also contain concentrations of PCBs above CEPA criteria.

5.3.2 Remediation Methodology and Confirmatory Sampling

All metal and other non-hazardous debris were removed to the landfill during the remediation of the Barracks Building area.

The moss and debris in the Barracks Building basement determined by ESG to contain PCBs above CEPA level, were manually removed and placed in secure, blue 205 L plastic barrels (Photo 1). These barrels were stored on polypropylene sheets beside the temporary staging cell prior to removal offsite. The barrels were numbered with indelible marker in order to maintain an internal inventory.

The concrete basement floor was washed three times with a mixture of Oclansorb and Varsol. The Oclansorb mixture was barreled and treated as containing PCBs above CEPA criteria. A composite concrete sample was obtained to an approximate depth of 2.54 cm with the use of a power drill. Results from the analyses of the concrete sample analytical results (Appendix IIb) indicated the concentration of PCBs in the concrete remained above CEPA criteria to depths exceeding the core sample. Further discrete samples were taken with the use of a concrete cutter (Figure 4). These samples were analysed to obtain a vertical depth profile of PCBs in the concrete. The analyses indicated the PCBs were concentrated in the top 2.54 cm (1") of the concrete (Figure 4).

Based on these results, the concrete basement floor was removed with the use of a jack hammer attached to a Kubota KX151 tracked excavator (Photo 2). After the concrete was broken up, the hammer was removed from the extension and a bucket was attached. The bucket was used to remove the broken concrete from the basement and deposit it into 205 L plastic barrels for transport. Remaining concrete pieces were manually removed.

Subsequent to the concrete removal, the chimney of the Barracks Building was pulled down and pushed into the remains of the basement. The concrete footings that ran to the northeast of the building were also placed in the basement as backfill.

The basement was backfilled with clean fill obtained from the main borrow pit. The fill was placed to a level slightly above and outside the exposed foundation walls to allow for settlement.

Soil determined by ESG to contain concentrations of metals and PCBs above the CCME R/P criteria was excavated from the area surrounding the foundation (Figure 5, Table 3, Appendix IVa and IVb). The building foundation areas were excavated to depths between 0.3 and 1 m. The concrete supports to the northeast were removed during soil excavation of this area and eventually placed in the basement. The entire trench to the northeast was excavated to a depth of 0.3 m. Confirmatory samples were collected following the sampling frequency and protocol previously outlined.

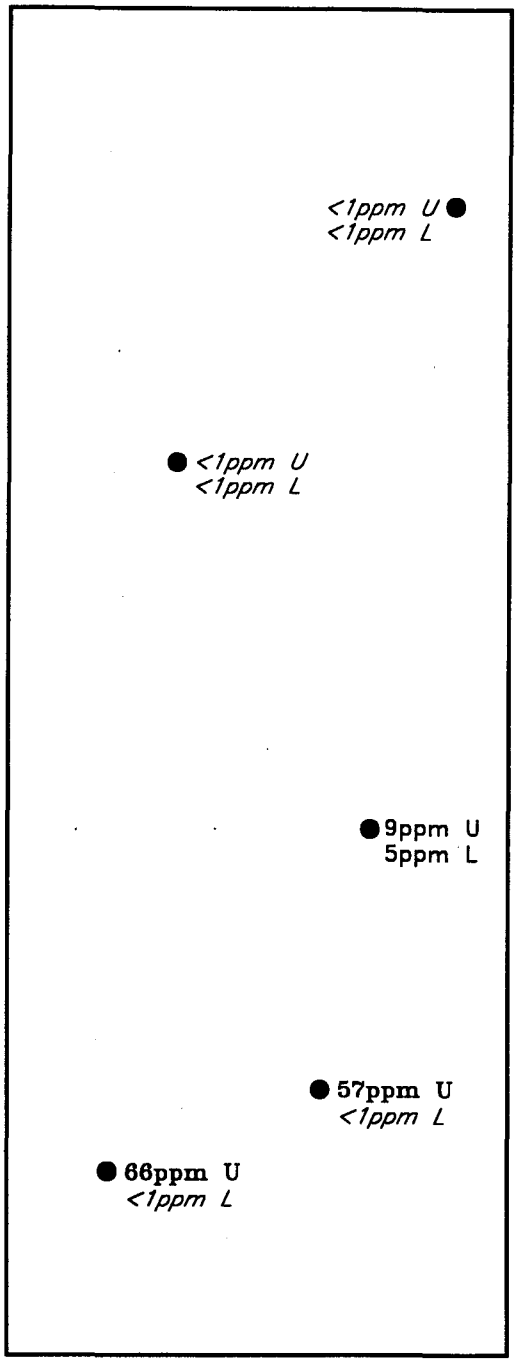
Once the analyses of confirmatory samples indicated the concentration of contaminants were below

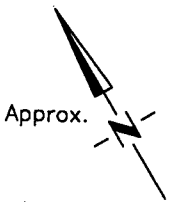
the remedial criteria, the excavated area was backfilled.

5.3.3 Conclusions

In this area, eighteen confirmatory soil samples were collected and analysed for metals and PCBs. Approximately 75 m^3 of soil was excavated around the Barracks Building foundation, including excavations in a direct line along the rear of the building where the concrete block footings had been. Closure was achieved when the confirmatory samples analysed indicated concentrations of contaminants below the remedial criteria both horizontally and vertically.

Although the concrete floor of the Barracks Building basement was washed with Oclansorb and Varsol three times, concrete confirmatory samples indicated concentrations of PCBs above the CEPA criteria. This necessitated removing the concrete floor with the use of a jackhammer and excavator. The jack-hammered concrete was barrelled and removed offsite. The excavation areas and basement were backfilled with borrow material and the area graded.



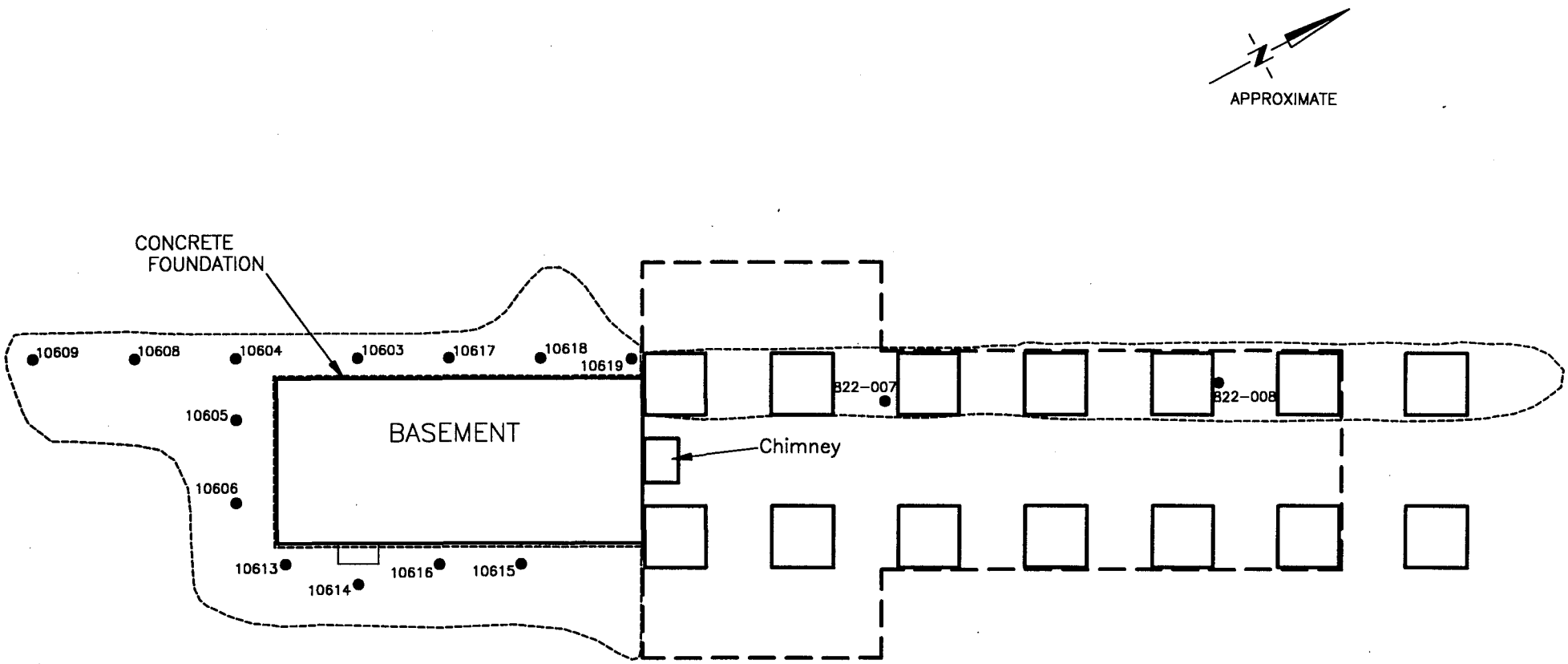


LEGEND

●	Concrete Sample
U	Upper 2.54cm of Sample
L	Lower 10.16cm of Sample (2.54–12.7cm)
>50ppm	>CEPA (50ppm)
>5ppm	>CCME RIP Criteria (5ppm)
<5ppm	<Applicable Criteria

SCALE 1:50(Approx.)
metres
0 1.0 2.0

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON PCB RESULTS BARRACKS BUILDING CONCRETE FLOOR		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 4



LEGEND

10609 Confirmatory Sample (All Samples #s prefixed '96')

------ Approximate Boundary of Excavation (depth ~ 0.3m)

SCALE 1:150(Approx.)
metres
0 3 6

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON
	BARRACKS BUILDING SAMPLING LOCATIONS
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01 | March 1997 | FIGURE 5

SNAG AIRSTRIP REMEDIATION

TABLE 3
METALS & ORGANICS IN SOIL
DOT BARRACKS
µg/g

Sample Id*	Metals								PCBs
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**50**
10603	27	25	10.6	<1.0	<10	67	40	5.8	-
10604	46	46	19.5	<1.0	15	147	78	6.2	-
10605	25	32	13.4	<1.0	<10	59	45	4.2	-
10606	23	31	13.1	<1.0	<10	78	41	4	-
10608	27	34	14.1	<1.0	<10	69	54	4.2	-
10609	35	39	13.9	<1.0	<10	59	49	4.9	-
10613	31	27	14	<1	<10	71	49	7.4	-
10614	37	32	15.8	<1.0	16	115	50	5.3	-
10615	41	32	14.4	<1.0	<10	58	55	4.8	-
10616	37	32	15	<1.0	<10	72	56	5.6	-
10617	34	29	12.6	<1.0	<10	62	43	5.8	-
10618	34	31	13.4	<1.0	<10	96	47	6	-
10619	37	32	14.2	<1.0	<10	68	48	4.4	-
822-007	33	25	13.4	<1.0	<10	69	45	4.5	2
822-008	28	38	12.8	<1.0	<10	97	60	7.4	<1

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34) (Recreational / Park land use)

PHOTO 1: Barracks Building - Manual removal of moss and debris indicated by ESG (ESG 1995) to contain concentrations of PCBs above CEPA criteria.

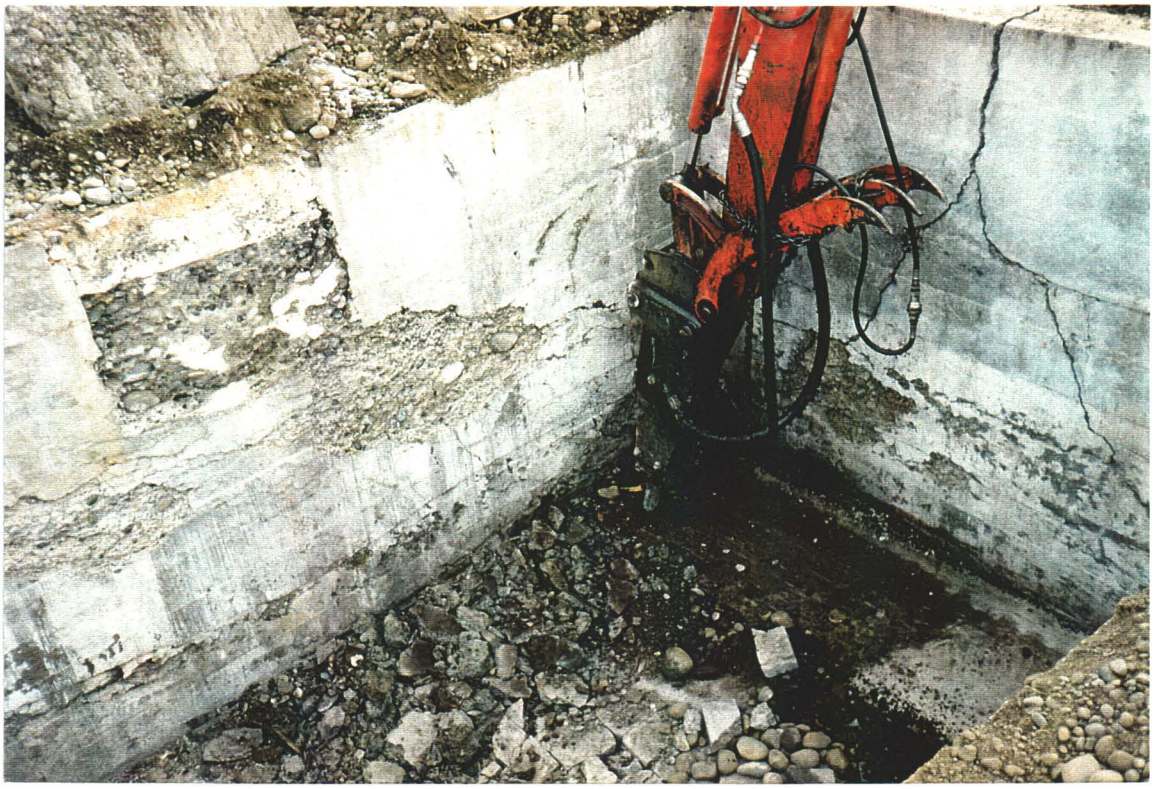


PHOTO 2: Barracks Building - Removal of concrete basement floor by jackhammer attached to an excavator.

5.4 WAREHOUSE

The Warehouse foundation was located on the east side of Snag Road between the Barracks Building and the Residence Building. Only the concrete foundation and a set of wooden steps on the east side of the foundation remained. Debris in the area surrounding the foundation included a pile of transformer plates south of the foundation, metal barrels that appeared to be used as stoves and wooden debris east of the foundation. A small amount of grey powder was located on the northeastern part of the foundation.

5.4.1 Areas and Contaminants of Concern

The soil in the area surrounding the concrete foundation was determined by ESG to contain concentrations of metals, PCBs and pesticides in excess of the CCME criteria levels (ESG 1996).

The area of soil containing contaminant concentrations in excess of the CCME criteria, including concentrations of lead, zinc, chromium, copper and PCBs, was ascertained by ESG to extend out to 2 to 5.5 m from the foundation edge to the north and west of the Warehouse (ESG 1996). Small distinct (separate) areas of containing contaminant concentrations above CCME criteria were located east of the foundation. According to ESG's delineation work, the depth of contamination was suspected to be from 0.3 to 0.4 m from surface. The transformer plates were also treated as containing concentrations of PCBs above the CCME R/P remediation criteria.

According to the field investigations completed by ESG in 1995 and 1996 the soil to the south and east of the Warehouse foundation contained concentrations of leachable toxics, particularly lead, and pesticides (ESG 1996). The depth of contamination was estimated by ESG to be 1 m. The grey powder on the east end of the concrete foundation was also treated as leachable toxic material as per instructions from ESG.

5.4.2 Remediation Methodology and Confirmatory Sampling

Excavated areas and the confirmatory sample locations from the remediation of the warehouse site are indicated on Figure 6. The areas containing soils with contaminant concentrations in excess of the CCME criteria determined by ESG were cleared of brush, excavated to a depth of approximately 0.3 to 0.4 m and confirmatory samples collected. The analytical results are presented in Table 4 and in Appendix IVa and IVb. Closure was achieved when the confirmatory sample results indicated concentrations of contaminants below the CCME R/P criteria. The soil from these areas was temporarily stored in the staging area before being permanently placed in the containment cell.

The pile of transformer plates was treated as containing concentrations of PCBs at levels above the CCME remediation criteria. The transformers were manually removed to the temporary staging cells and eventually placed in the permanent containment cell.

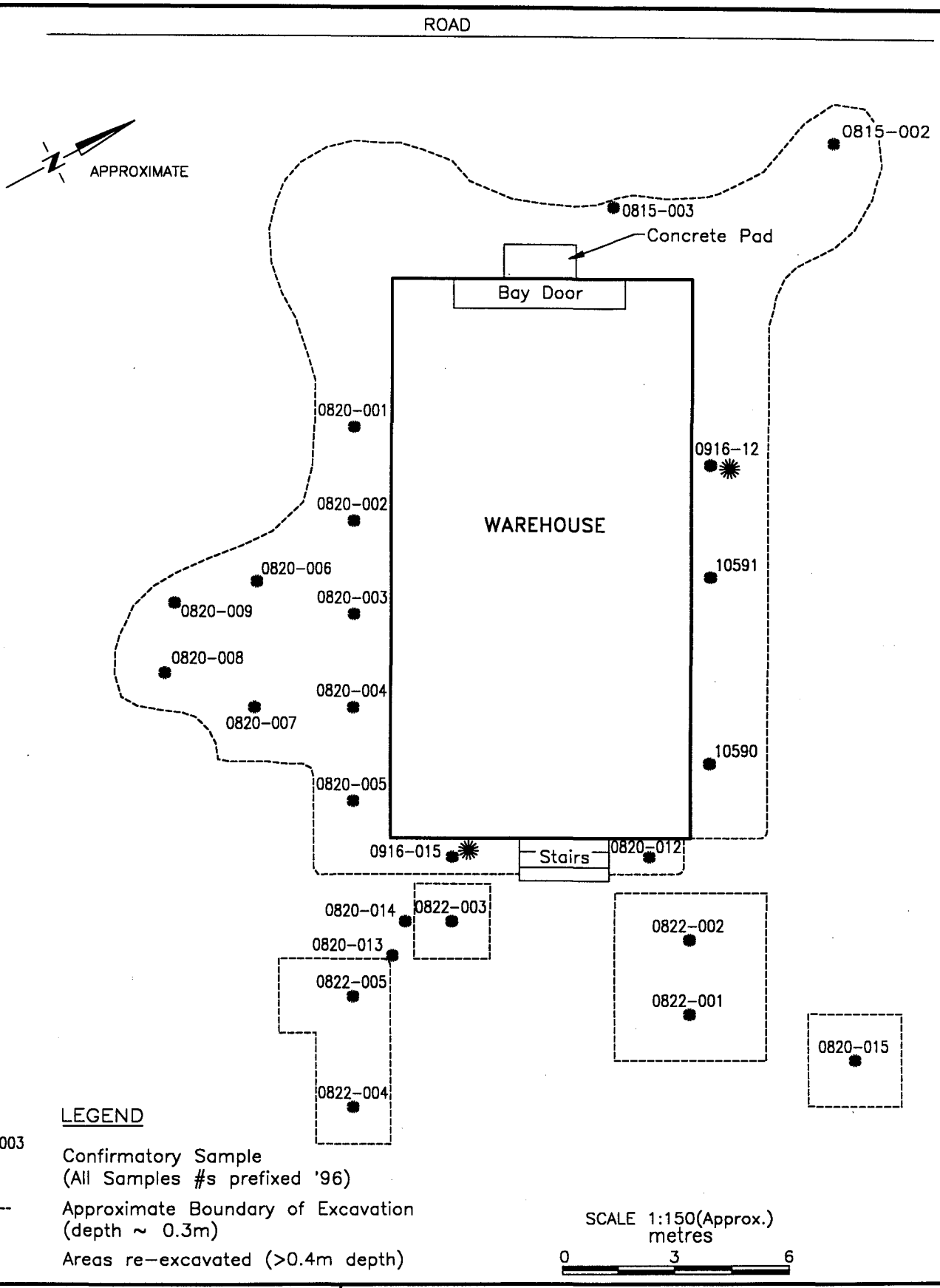
In the areas determined by ESG to be contaminated with pesticides and leachable toxics at levels requiring remediation, the soil immediately adjacent to the foundation was excavated to a depth of approximately 1.5 m. As the excavation continued further out from the foundation the depth was decreased to approximately 0.7 m. The grey powder on the east end of the concrete foundation was also treated as leachable toxic material. Pesticide and leachable toxic contaminated soil was double bagged in pre-marked heavy fibre bags (Supersacks) provided by Western Tank & Liner (Photo 3). The bags were numbered for internal inventory and eventually shipped offsite by DIAND personnel. In addition, 27 barrels were also filled. The bags and barrels were shipped to a secure compound at the former Haines-Fairbanks Pipeline pumping station at Beaver Creek for interim storage, before eventual shipment for disposal at a licenced waste facility outside of the Yukon. Confirmatory samples were collected and the area was backfilled when analytical results indicated concentrations of contaminants below the remedial criteria. The results of the confirmatory sampling program are located in Table 5 and in Appendix IIIc.

Chemical analyses of the concrete foundation by ESG indicated the concrete was non-hazardous. Therefore, the foundation was covered with approximately 0.5 m of backfill.

5.4.3 Conclusions

In this area, twenty five confirmatory soil samples were collected and analysed for concentrations of metals and PCBs. Approximately 100m^3 of soil containing concentrations of metals in excess of CCME R/P criteria was excavated around the Warehouse foundation, and an additional 158.1 m^3 of soil containing concentrations of pesticides and soils considered to be leachate toxic contaminated was excavated. Closure was achieved when the confirmatory samples analysed indicated concentrations of contaminants below the remedial criteria both horizontally and vertically.

Soil determined to contain concentrations of pesticides and leachable toxics above the applicable remediation criteria was excavated and immediately placed in Supersacks or secure barrels. The sacks each contained approximately 1 m^3 of soil; 150 sacks were filled. Twenty seven barrels holding approximately 0.3 m^3 of soil each were also filled. Closure was achieved when the confirmatory samples analysed indicated concentrations of contaminants below the remedial criteria both horizontally and vertically. The excavated areas and the concrete foundation were backfilled and the entire area was graded.



LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON WAREHOUSE SAMPLING LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 6

SNAG AIRSTRIP REMEDIATION

TABLE 4
METALS & ORGANICS IN SOIL
WAREHOUSE
µg/g

Sample Id*	Metals								PCBs
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**50**
0815-002	35	31	16.6	<1.0	<10	73	<20	0.6	<1
0815-003	42	27	11	<1.0	44	81	44	4.6	<1
0820-001	34.8	-	-	-	<10	68	33	-	-
0820-002	83.1	-	-	-	14	83	53	-	-
0820-003	60.7	-	-	-	72	126	46	-	-
0820-004	44.2	-	-	-	<10	88	65	-	-
0820-005	52.8	-	-	-	56	89	41	-	-
0820-006	21.7	-	-	-	33	65	50	-	-
0820-007	33.1	-	-	-	101	73	32	-	-
0820-008	34	-	-	-	10	65	46	-	-
0820-009	30.2	-	-	-	175	69	34	-	-
0820-012	53.2	-	-	-	222	81	54	-	-
0820-013	36.9	-	-	-	<10	77	76	-	-
0820-014	56.4	-	-	-	162	95	46	-	-
0820-015	37.2	-	-	-	16	87	47	-	-
0822-001	47	32	12.2	<1.0	<10	92	59	5.3	<1
0822-002	39	30	14.9	<1.0	<10	69	53	6.4	<1
0822-003	29	21	14.6	<1.0	<10	78	47	5.1	<1
0822-004	24	17	11.1	<1.0	<10	65	33	3.6	<1
0822-005	35	24	13.8	<1.0	42	98	40	3	<1
10590	-	-	-	-	-	-	-	-	-
10591	-	-	-	-	-	-	-	-	-

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34) (Recreational / Park land use)

SNAG AIRSTRIP REMEDIATION

TABLE 5
PESTICIDES IN SOIL
WAREHOUSE
µg/g

Sample Id*	HCB	α HCH	β HCH	γ HCH	Heptachlor	Aldrin	Oxychlordane	trans-Chlordane	cis-chlordane	o-P'-DDE	p-P'-DDE	trans-Nonachlor	cis-Nonachlor	o-P'-DDD	p-P'-DDD	p-P'-DDT	Mirex	Heptachlor Epoxide	Alpha-Endosulphan	Dieldrin	Endrin	Methoxychlor
Criteria**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
0815-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0815-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0815-003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0820-001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-013	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0820-015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0822-001	47	32	12.2	<1.0	<10	92	59	5.3	<1	47	32	12.2	<1.0	<10	92	59	5.3	<1	<1.0	<10	92	59
0822-002	39	30	14.9	<1.0	<10	69	53	6.4	<1	39	30	14.9	<1.0	<10	69	53	6.4	<1	<1.0	<10	69	53
0822-003	29	21	14.6	<1.0	<10	78	47	5.1	<1	29	21	14.6	<1.0	<10	78	47	5.1	<1	<1.0	<10	78	47
0822-004	24	17	11.1	<1.0	<10	65	33	3.6	<1	24	17	11.1	<1.0	<10	65	33	3.6	<1	<1.0	<10	65	33
0822-005	35	24	13.8	<1.0	42	98	40	3	<1	35	24	13.8	<1.0	42	98	40	3	<1	<1.0	42	98	40
0916-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
0916-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10590	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10591	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* All sample Id numbers prefixed with 96-.
** Ministere de l'Environment du Quebbec, Contaminated Sites Rehabilitation Policy Criteria (MENVIQ, 1988)

PHOTO 3: Warehouse - Soil containing concentrations of pesticides and leachable toxics exceeding the criteria were placed in pre-marked heavy fibre double bags.

5.5 POWERHOUSE AND PUMPHOUSE

The Powerhouse and Pumphouse were located on the west side of Snag Road, northwest of the Warehouse foundation (Figure 2). Only the concrete foundations and a concrete chimney of the Powerhouse remained at the time of the 1996 remediation program. A black stained generator pad was located in the southern part of the Powerhouse foundation. The remainder of one of the generators was located south of the Powerhouse, at the junction of Snag Road and the road leading to the airstrip. The concrete chimney had previously fallen and was lying across the northern part of the Powerhouse foundation. Concrete steps led from the foundation to ground level on the east side of the Powerhouse. A raised concrete platform was also located at the southern end of the Powerhouse foundation.

The Pumphouse consisted of the remains of a ground level concrete foundation and basement. A wooden rectangular box was attached on the north side of the concrete foundation. A cistern remained to the west of the Pumphouse. The basement floor was covered with dirt, moss and debris, including metal piping.

5.5.1 Areas and Contaminants of Concern

Soil samples collected and analysed by ESG indicated that the soil contained concentrations of metals, including zinc, lead, copper, cadmium and chromium, above CCME R/P criteria. The analyses of the majority of samples on the east and northern sides of the Powerhouse foundation by ESG indicated concentrations of PCBs above the CEPA criteria. In addition, the analyses of moss and debris from the concrete foundation bases indicated concentrations of PCBs above 50 ppm (CEPA level criteria).

5.5.2 Remediation Methodology and Confirmatory Sampling

Moss and debris covering the Powerhouse foundation and Pumphouse basement was manually removed and barreled. Prior to this, the chimney lying on the Powerhouse foundation was removed

from the foundation. This debris was treated as containing concentrations of PCBs above the CEPA criteria. These barrels were stored on polypropylene sheets beside the temporary staging cell prior to removal offsite. The barrels were numbered with indelible marker for internal inventory purposes.

The concrete Powerhouse foundation was washed with a mixture of Oclansorb and Varsol, three times. The Oclansorb mixture was barreled and treated as containing concentrations of PCBs above the CEPA criteria. A composite concrete sample was obtained with the use of a power drill. The analyses of the concrete sample (Appendix IIIb) indicated the concentration of PCBs in the concrete remained above CEPA criteria. Further discrete samples were taken with the use of a concrete cutter in the same locations that were drilled for bulk sampling (Photo 4). These samples were analysed to obtain a vertical depth profile of PCBs in the concrete (Figure 7). The analyses indicated the PCBs in excess of the CEPA criterion were primarily concentrated in the top 2.54 cm (1") of the concrete skim coat which had been applied to the foundation at some time in the past (Appendix IIIb).

The Powerhouse concrete foundation was removed with the use of a jack hammer attached to a Kubota KX151 tracked excavator. The concrete foundation was broken into pieces averaging 7.5 cm (3") long. This size was specified by Bovars' waste facility at Swan Hill, Alberta, the eventual disposal site. After the concrete was broken up, the hammer was removed from the extension and a bucket was attached. The bucket was used to remove the broken concrete from the basement and deposit it into 205 L plastic barrels for later transport. Remaining concrete pieces were manually removed and barreled.

The concrete chimney that was lying on the north end of the Powerhouse foundation was pushed off the foundation prior to the concrete cutting. When all excavations were completed, the chimney was pushed into one of the excavations and the area backfilled.

The Pumphouse basement lacked cross ventilation as most of the Pumphouse floor above it was still intact. Due to concerns related to the use of the Varsol wash in a confined space and given the less than satisfactory results of the concrete washing for both the Barracks Building and the Powerhouse

foundation, the Pumphouse basement was not washed with the mixture of Varsol and Oclansorb.

Concrete drill samples of the Pumphouse concrete floor were obtained and analysed in the field with immunoassay test kits provided by DIAND. These samples were analysed by personnel from Royal Rhodes, Victoria, BC. The analysis for concentrations of PCBs indicated concentrations below CCME criteria (Appendix IIId). Therefore, the concrete basement floor was left intact. The top floor and aboveground wall sections were jackhammered using the Kubota excavator. This broken concrete was placed in the basement. Borrow material was used to backfill the basement, cistern and surrounding excavations.

Areas of soil determined by ESG to contain concentrations of PCBs above the CEPA criteria were excavated to a depth of 0.45 m (Figure 8). This soil was barreled, inventoried and eventually removed offsite. Twenty six confirmatory samples were taken. Sample areas with concentrations above the criteria were excavated a further 0.1 m and either barreled if above the CEPA criteria or placed in the temporary staging area if at CCME level concentrations.

Areas determined by ESG to contain soils with concentrations of metals above the CCME remediation criteria were excavated to a depth between 0.3 and 0.4 m (Figure 8). Areas were not backfilled until all the confirmatory sample results indicated that the soil in the base and walls of the excavation contained concentrations less than the CCME R/P criteria (Appendix IVa and IVb). The results from the confirmatory sampling can be found in Table 6. The excavated soil was placed in the temporary staging area and eventually placed in the containment cell.

Upon receiving confirmatory analyses indicating the concentrations of contaminants were below the CCME criteria the excavations were backfilled with sufficient material to allow for settlement.

5.5.3 Conclusions

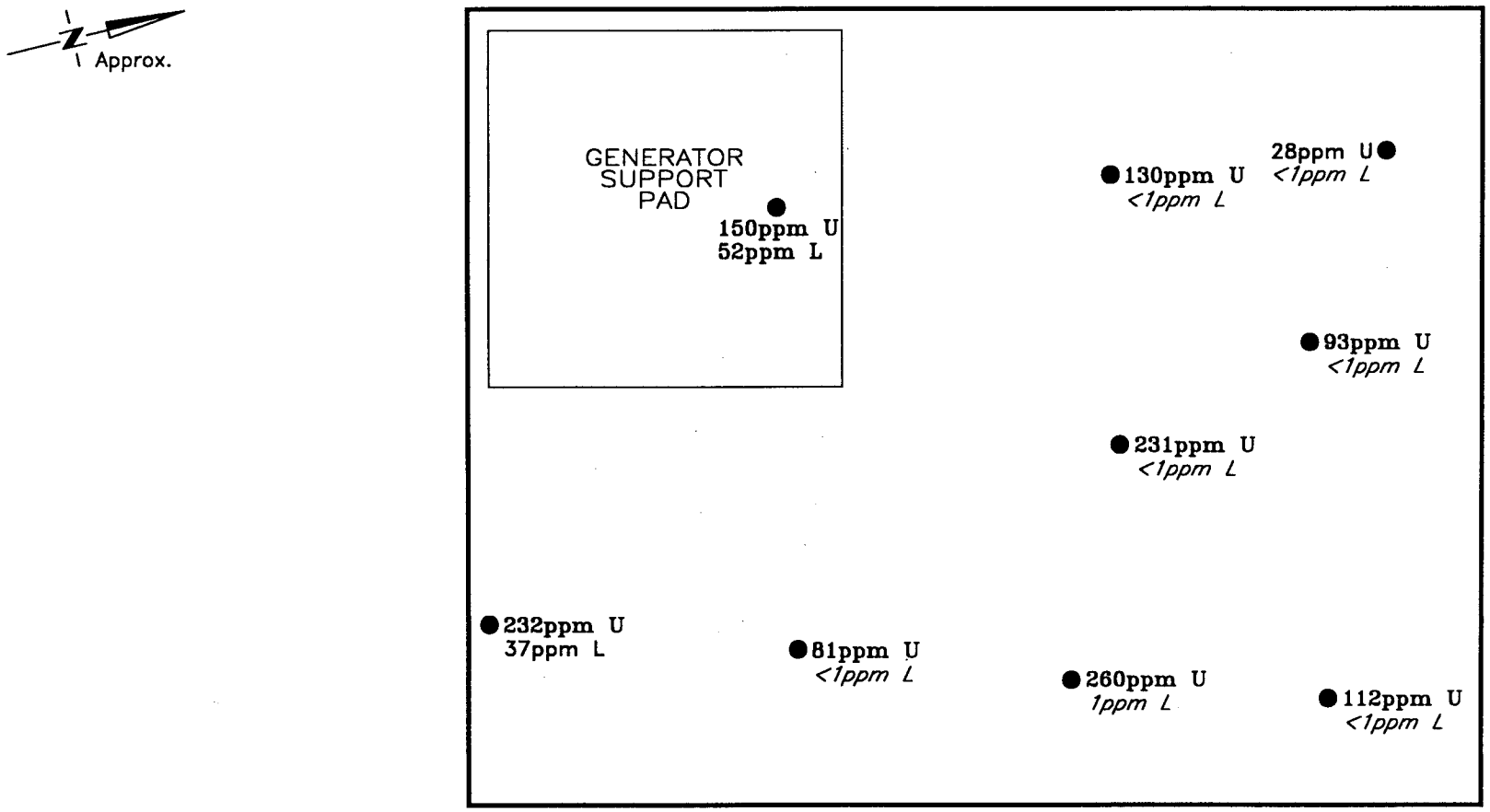
In this area, 26 confirmatory soil samples were collected and analysed for concentrations of metals and PCBs. Of these samples, the analyses of one sample indicated concentrations of contaminants

above the CCME R/P criteria and one sample containing concentrations of PCBs in excess of the CEPA criteria. Therefore, these areas required re-excavation and sampling. Approximately 95 m^3 of soil containing concentrations of metals / PCBs in excess of the CCME criteria was excavated around the Powerhouse and Pumphouse foundations. This soil was placed in the containment cell. Closure was achieved when the confirmatory samples analysed indicated concentrations of contaminants below the remedial criteria both horizontally and vertically.

Soils contained in the areas adjacent to the Powerhouse foundation on the east and northern sides were determined by ESG to contain concentrations of PCBs above the CEPA criterion. Approximately 24 m^3 of soil was excavated in these areas. This soil was placed in barrels that were sealed and eventually shipped offsite.

Although the concrete floor of the Powerhouse was washed with Oclansorb and Varsol three times, the analyses of concrete confirmatory samples indicated concentrations of PCBs remained above the CEPA criterion. The Powerhouse foundation was therefore removed with the use of a jackhammer and excavator. The concrete was barreled and removed offsite for future disposal. The excavated areas were backfilled with borrow material and graded.

The Pumphouse basement was not washed with the mixture of Oclansorb and Varsol due to confined space concerns. Concrete samples from the basement were obtained with a drill. These samples were field tested by Royal Rhodes personnel using an immunoassay kit. The analyses indicated concentrations of PCBs below the CCME criteria. Therefore, the basement floor did not require removal. The remains of the top floor and above grade walls were jack-hammered and the concrete added to the basement. The entire area including the basement, cistern and surrounding excavations were backfilled and graded.



LEGEND

●	Concrete Sample
U	Upper 2.54cm of Sample
L	Lower 10.16cm of Sample (2.54–12.7cm)
>50ppm	>CEPA (50ppm)
>5ppm	>CCME RIP Criteria (5ppm)
<5ppm	<Applicable Criteria

SCALE 1:100(Approx.)
metres
0 2 4

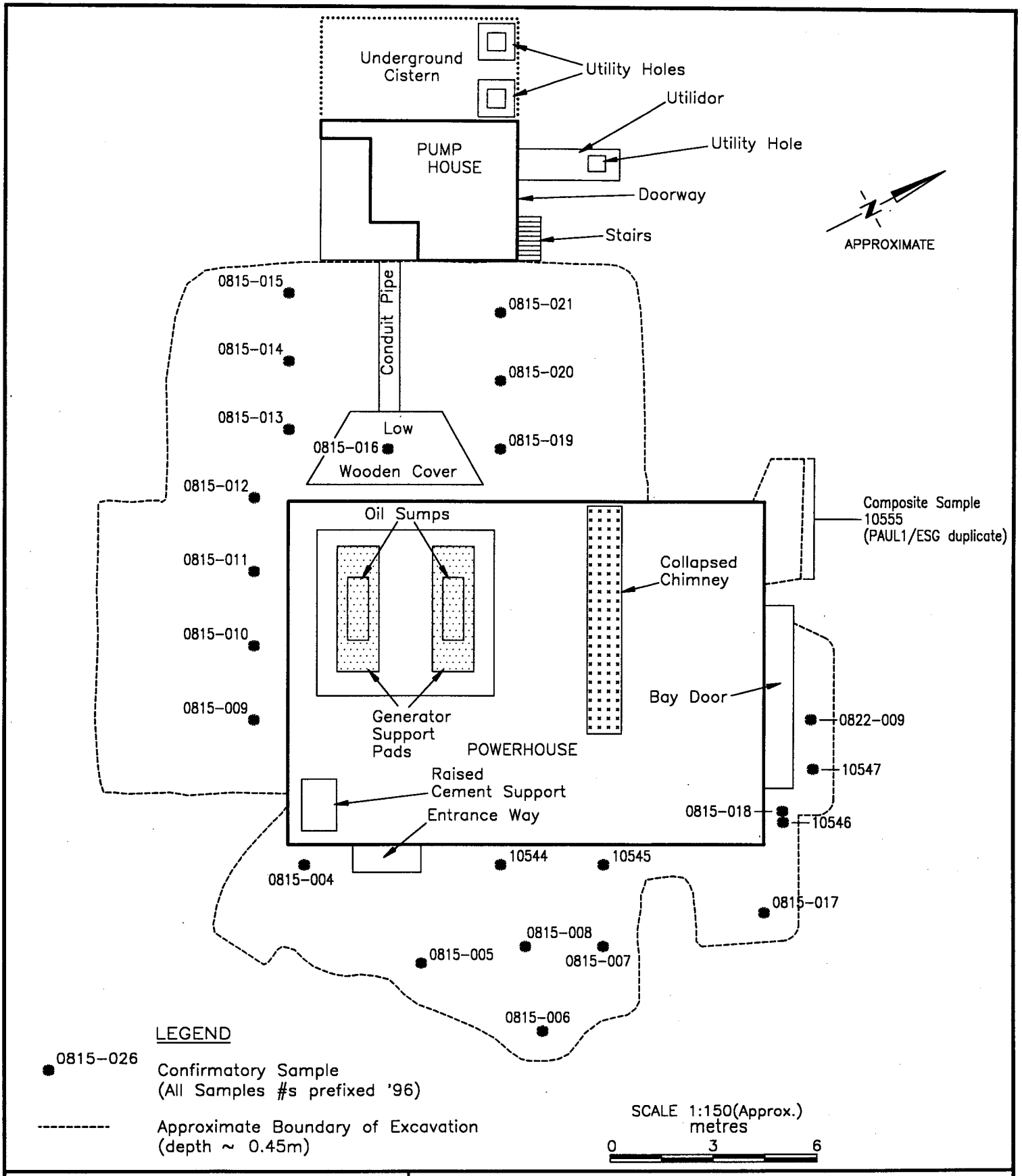
LORIMER & ASSOCIATES
&
HEMMERA RESOURCE CONSULTANTS LTD.

SNAG AIRSTRIP REMEDIATION, YUKON

PCB RESULTS
POWERHOUSE CONCRETE PAD

CLIENT: INDIAN & NORTHERN AFFAIRS CANADA

PROJECT No. YT20501/281-004.01 | March 1997 | FIGURE 7



LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON POWERHOUSE/PUMPHOUSE SAMPLING LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 8

SNAG AIRSTRIP REMEDIATION

TABLE 6
METALS AND ORGANICS IN SOIL
POWERHOUSE / PUMPHOUSE
µg/g

Sample Id*	Metals								PCBs
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**100**
0815-004	36	28	11.7	<1.0	<10	56	31	1.3	<1
0815-005	63	29	18.3	<1.0	12	81	44	4.6	<1
0815-006	73	55	23	<1.0	<10	124	82	8.6	<1
0815-007	43	32	13.8	<1.0	<10	79	76	5.5	29
0815-008	37	28	13.4	<1.0	<10	107	<20	0.5	50
0815-009	42	36	14	<1.0	<10	71	454	1	88
0815-010	48	29	14.9	<1.0	<10	86	49	4.4	<1
0815-011	47	25	13.5	<1.0	43	225	23	0.5	2
0815-012	40	29	14.4	<1.0	<10	75	<20	0.8	<1
0815-013	33	28	11.9	<1.0	<10	68	<20	0.4	<1
0815-014	37	31	13.1	<1.0	<10	80	24	0.9	<1
0815-015	37	29	12.9	<1.0	<10	85	42	1.7	<1
0815-017	43	29	14.1	<1.0	<10	83	35	1.3	<1
0815-018	51	30	13.9	<1.0	10	97	39	0.8	1
0815-019	44	29	15.1	<1.0	<10	89	58	1.6	<1
0815-020	42	35	15.9	<1.0	<10	91	<20	0.8	<1
0815-021	45	30	13.6	<1.0	<10	84	36	0.7	<1
0822-009	44	26	14.4	<1.0	<10	85	42	3.9	<1
10544	36	37	13.4	<1.0	<10	57	53	5.4	<1
10545	36	36	14.5	<1.0	<10	50	53	5.6	<1
10546	32	32	11.8	<1.0	<10	54	44	7.3	2
10547	34	31	10.9	<1.0	<10	55	40	3.2	5

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34)

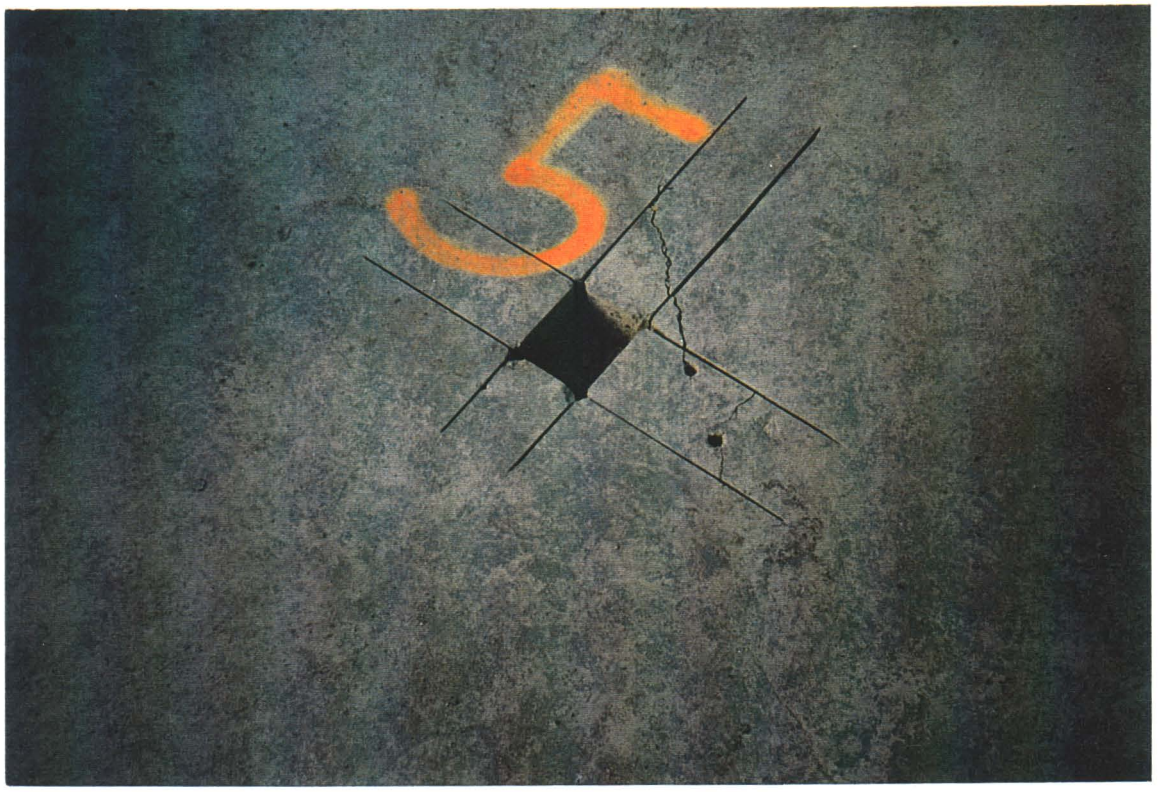


PHOTO 4: Powerhouse - Discrete concrete sample taken using a concrete cutter. Obtained vertical depth profile of PCB concentrations in concrete using this method.

5.6 FIREHALL

The Firehall was located on the western side of the site, south of the Pumphouse. This building was still standing at the time of remediation in 1996. The building was constructed of wood with exterior white shingles and a shingled roof. The interior walls were panelled with painted pressboard with insulation between the inner and outer walls.

5.6.1 Areas and Contaminants of Concern

Delineation sampling conducted by ESG in 1995 determined that the surrounding soil did not contain concentrations of contaminants above the CCME criteria (ESG 1996). According to ESG, the roofing tiles contained up to 5% asbestos. A burnt area with soil containing concentrations of zinc above the CCME criteria was identified and delineated by ESG approximately 12 m to the east of the Firehall (ESG 1996).

5.6.2 Remediation Methodology

The roof tiles and exterior building shingles were treated as asbestos containing material during the decommissioning of this area. The tiles were removed and wrapped in a double layer of polypropylene (Photo 5). The outer layer of the polypropylene bags were labelled *ACM* (asbestos containing material) with indelible marker and the bags were placed in the landfill. Their approximate positions in the landfill are marked on Figure 9.

The building was then demolished with the use of heavy equipment. The building debris was crushed and removed to the landfill. The building rested on large beams that appeared to have been creosote coated. These beams were placed in the temporary staging area and later transferred to the containment cell.

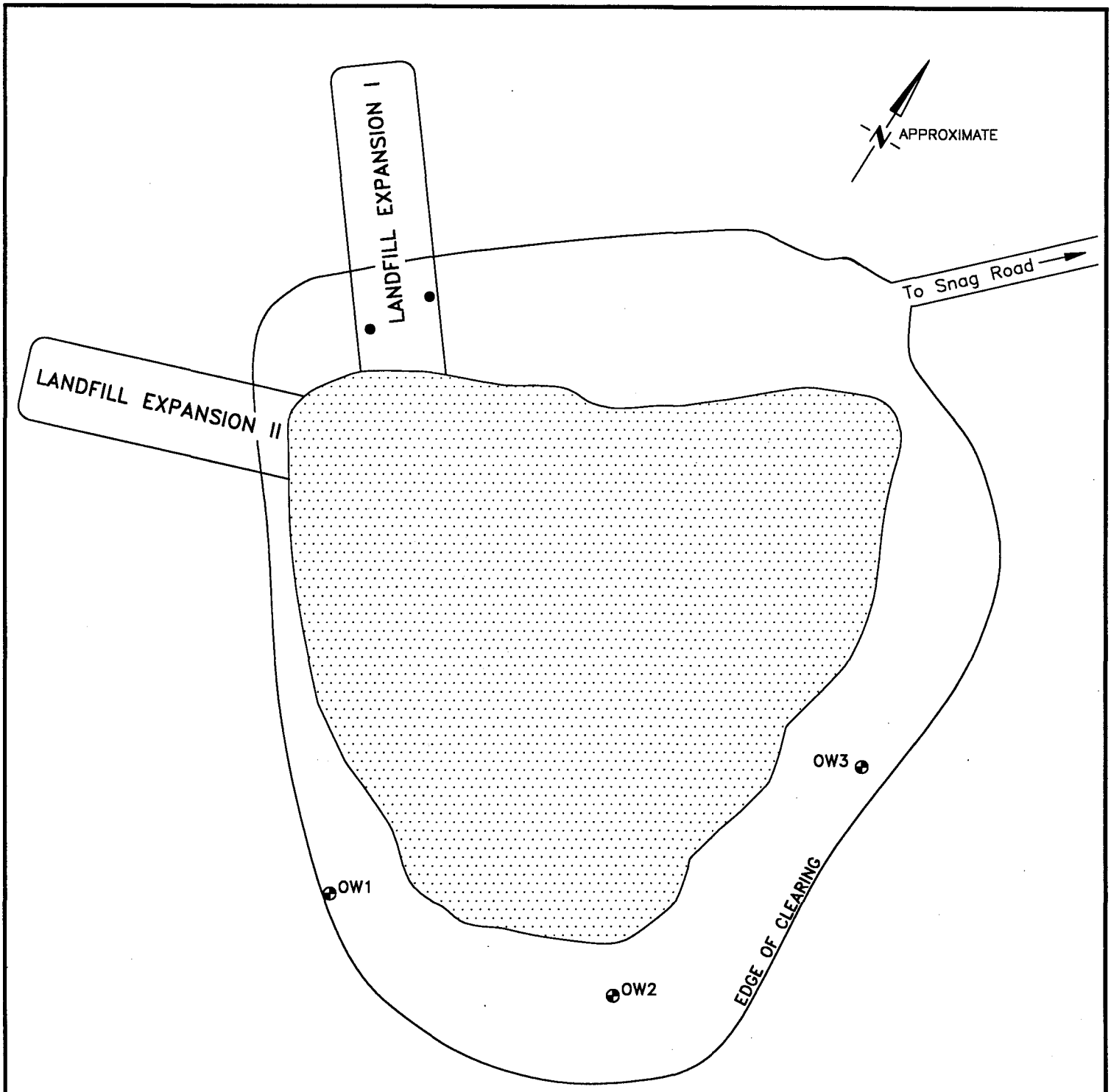
The burnt area to the east of the building was removed with the use of a backhoe, and the soil placed in the temporary staging area and then in the containment cell. One confirmatory sample (96-10610,

Appendix IVa and IVb) was taken from this area. The entire area was then backfilled and graded.

5.6.3 Conclusions

The roof and exterior wall tiles of the Firehall were treated as asbestos containing material. The tiles were wrapped in a double layer of polypropylene, labelled and placed in the landfill. Their approximate positions in the landfill were documented.

The building was demolished and the debris placed in the landfill. The suspected creosote coated foundation beams were placed in the containment cell. The burnt area to the east of the building was removed and the soil placed in the containment cell.



LEGEND

Approximate Extent of Pre-Existing Dump

Lanfill Area

OW2 Observation Well

Asbestos Containing Material (double bagged)

SCALE 1:400(Approx.)
metres
0 8 16

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON SNAG AIRSTRIP LANDFILL SAMPLING LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 9

PHOTO 5: Firehall -Removal of asbestos containing roof tiles and exterior building shingles. Tiles and shingles were double wrapped in polypropylene.

5.7 GARAGE

The remaining Garage concrete foundation was located south of the Firehall. An oil change pit was located in the north end of the foundation, with a smaller pit located on the west side. The base of both pits were covered with moss and a small amount of debris. In addition, an assortment of wood and metal debris was located on and around the foundation.

5.7.1 Areas and Contaminants of Concern

Soil samples analysed by ESG identified soil containing concentrations of metals, including zinc, lead, copper, cadmium and chromium, above CCME R/P criteria. These areas were identified at the northern end of the foundation, the southwest corner of the small pit and on the east side of the foundation. The vertical extent of the contamination was determined by ESG to be between 0.3 and 0.4 m depth (ESG 1996).

The analyses of soil samples collected by ESG from the oil change pits indicated concentrations of PCBs above the CEPA criterion. The analyses of these samples also indicated concentrations of dioxins, pesticides and PAHs exceeding the CCME R/P remediation criteria. It was observed during remediation that a sump was located on the east side of the large oil change pit. This sump was covered in black sludge with a strong hydrocarbon odour. A drainage hole was also discovered in the southwest corner of the small pit. A strong Varsol odour was observed in this area.

5.7.2 Remediation Methodology and Confirmatory Sampling

Areas delineated by ESG as containing soils with concentrations of metals above the CCME remediation criteria were excavated to a depth of between 0.3 to 0.4 m. These areas were not backfilled until the analyses of the confirmatory samples indicated that the contamination had been removed (Table 7, Appendix IVa and IVb). Sample locations are indicated on Figure 10. Four samples were also analysed for concentrations of PAHs (Table 8).The excavated soil was placed in the temporary staging area and eventually into the containment cell.

Moss and debris covering the base of the oil-change pits were manually removed and barreled. This debris was treated as containing concentrations of PCBs above the CEPA criterion. The barrels were stored on polypropylene sheets beside the temporary staging cell prior to removal offsite. The barrels were numbered with indelible marker to maintain an internal inventory.

Soil samples were taken from the sump in the large pit and the drainage hole in the small pit. These samples were analysed for concentrations of TPH (total petroleum hydrocarbons), PCB and metals. The results indicated high concentrations of all contaminants.

The concrete pits were washed with a mixture of Oclansorb and Varsol, three times. The Oclansorb mixture was barreled and treated as containing concentrations of PCBs above the CEPA criterion. Composite concrete samples were obtained with the use of a power drill. The concrete sample analytical results (Appendix IIIb) indicated that concentrations of PCBs in the concrete remained above the CEPA criterion. Further discrete samples were taken with the use of a concrete cutter in the large pit and a hammer drill in the smaller pit. These samples were taken in the same locations that were previously drilled. These samples were analysed to obtain a vertical depth profile of PCBs in the concrete (Figure 11). The foundation was covered with a 2.54 cm (1") finished skim coat and the analyses indicated that concentration of PCBs in excess of the CEPA criterion were primarily concentrated in this layer.

The large concrete pit and sump were removed by excavating at the north end of the Garage pad. The sump and pit were removed as a nearly intact unit (Photo 6). A Terra Cotta drain pipe was discovered under the sump leading underneath the pit to drain in the sediment. Two soil samples were collected from this area. The analyses of these samples indicated concentrations of PAHs and PCBs below the remediation criteria. Although, sediment staining and a solvent odour were observed.

The sump contained some sludge and several dead rabbits (Photo 7). These contents were placed in the 205 L barrels. The sump was stored on a polypropylene sheet on the Garage pad and covered with another piece of polypropylene. The sump was later broken up using the jack hammer and

excavator, and the pieces barreled. Surrounding soils which came into contact with any spilled sludge were also barreled and treated as waste containing concentrations of PCBs in excess of the CEPA criterion. In addition, surrounding in-situ soils were barreled and an internal inventory kept. Sediments from the barrels were later analysed with an immunoassay field test kit at the request of DIAND. The results of these tests are contained in Appendix IIId. Two of the samples indicated high concentrations of PCBs, PAHs and pesticides. Therefore, these two barrels were shipped offsite with the other containers containing waste with concentrations of PCBs in excess of the CEPA criterion and pesticides in excess of the applicable remedial objective. The analyses of the remaining samples from the barrels indicated low concentrations of contaminants and these barrels were placed in the containment cell.

The small oil change pit was dug up and placed with the large pit for temporary storage on the polypropylene. The concrete was eventually broken up at the same time as the large pit and barreled. The soil underneath the small pit was excavated to a depth of an additional 1 metre. The area was backfilled when analyses of confirmatory samples taken indicated that concentrations of contaminants were below the remediation criteria.

The excavations and remaining Garage pad were backfilled with borrow sand and gravel.

5.7.3 Conclusions

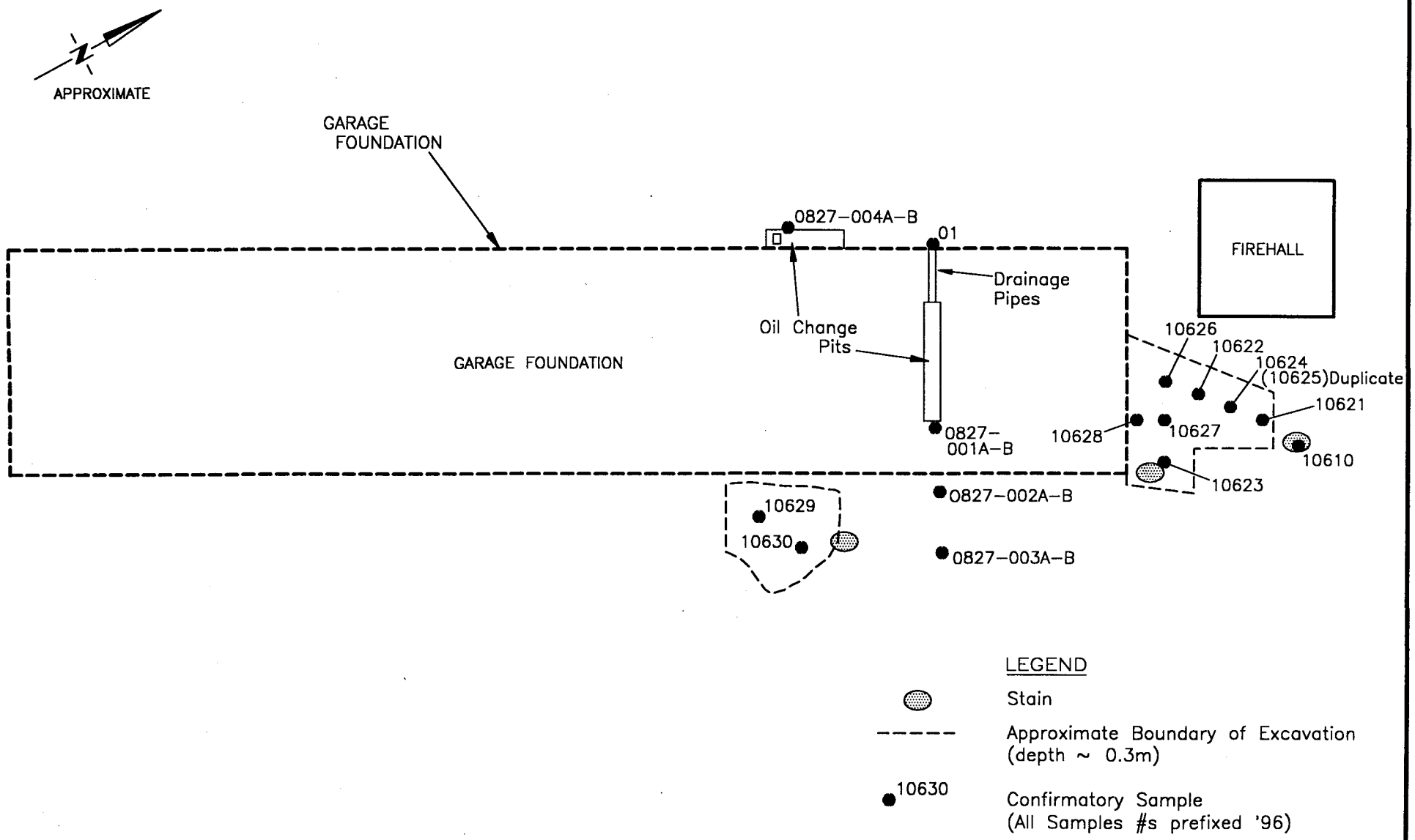
Areas determined by ESG to contain concentrations of metals above the CCME remediation criteria were excavated, and the soil eventually placed in the containment cell.

Moss and debris covering the base of the oil-change pits were removed and barreled. Although the concrete pits were washed with a mixture of Oclansorb and Varsol, analytical results of the concrete samples collected indicated the concentration of PCBs in the concrete remained above the CEPA criterion. Soil samples taken from the sump in the large pit and the drainage hole in the small pit were analysed for concentrations of TPH (total petroleum hydrocarbons), PCB and metals. The results indicated high concentrations of all contaminants.

Further discrete samples were taken to obtain a vertical depth profile of PCBs in the concrete. The analyses indicated that the PCBs in excess of the CEPA criterion were primarily concentrated in the top 2.54 cm (1") of the concrete. Both concrete pits were removed. The concrete pits were eventually broken up and placed in barrels.

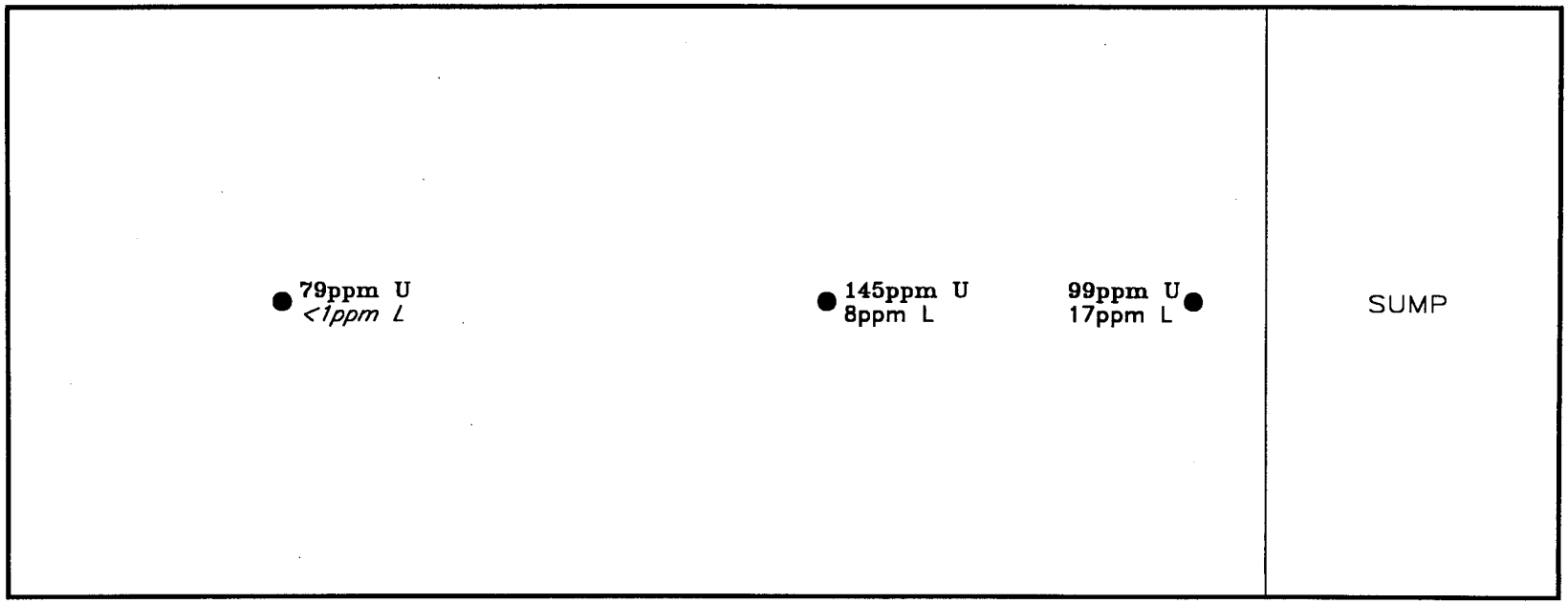
Sediment below the pits was treated as containing concentrations of PCBs above the CEPA criterion. Therefore, it was excavated and placed in barrels. A field immunoassay kit was used to analyse sediment from the barrels. Two of the samples indicated high concentrations of PCBs and these barrels were shipped offsite with the other containers containing waste with concentrations of PCBs in excess of the CEPA criterion and pesticide concentrations in excess of the applicable remedial objective. The analyses of the remaining samples indicated low concentrations of contaminants. Therefore, these barrels were placed in the containment cell.

The excavations and remaining Garage pad were backfilled with borrow sand and gravel.



SCALE 1:250(Approx.)
metres
0 5 21

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON		
	FIREHALL/GARAGE FOUNDATION SAMPLING LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 10



LEGEND

●	Concrete Sample
U	Upper 2.54cm of Sample
L	Lower 10.16cm of Sample (2.54–12.7cm)
>50ppm	>CEPA (50ppm)
>5ppm	>CCME RIP Criteria (5ppm)
<5ppm	<Applicable Criteria

SCALE 1:25
metres
0 0.5 1.0

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON		
	PCB RESULTS GARAGE PIT CONCRETE		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 11

SNAG AIRSTRIP REMEDIATION

TABLE 7
METALS AND ORGANICS IN SOIL
GARAGE FOUNDATION
µg/g

Sample Id*	Metals								PCBs
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**50**
0827-001B	39.5	-	-	-	<10	79	41	-	
0827-002B	36.9	-	-	-	236	155	38	-	
0827-003B	38.1	-	-	-	<10	68	41	-	
0827-004B	41.5	-	-	-	<10	64	38	-	
10610	94	44	12.3	<1.0	185	81	50	5.9	-
100621	39	33	13.3	<1.0	100	90	55	6.2	<1
10622	47	36	14.1	<1.0	27	67	55	6.4	<1
10623	39	36	16.1	<1.0	<10	65	57	6.9	<1
10624	40	37	15.9	<1.0	113	81	53	5.8	-
10625	39	31	14.7	<1.0	68	82	52	4.4	43
10626	36	35	13.9	<1.0	43	81	47	6.1	53
10627	33	34	14.5	<1.0	15	494	46	4.8	6
10628	30	28	12.5	<1.0	10	50	47	5.9	<1
10629	35	29	12.1	<1.0	<10	39	43	5	<1
10630	34	52	11.6	<1.0	32	65	39	4.6	-

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34) (Recreational / Park land use)

SNAG AIRSTRIP REMEDIATION

TABLE 8
PAHs IN SOIL
GARAGE FOUNDATION
µg/g

Parameter	Criteria**	Sample Id*			
		0827-001A	0827-002A	0827-003A	0827-004A
Naphthalene		4.4	2.7	6.1	0.58
Acenaphthylene		<.2	<.3	<.25	<.09
Acenaphthene		<.12	<.12	<.31	<.26
Fluorene		0.52	0.61	<.25	<.05
Phenanthrene	5	1.1	2.3	3.2	0.31
Anthracene		<.15	<.25	0.32	<.08
Fluoranthene		0.46	2.2	2.1	0.6
Pyrene	5	0.76	5.8	2.5	0.71
Benzo(a)anthrazene	1	<.05	0.72	0.7	<.04
Chrysene		0.49	4.4	1.4	0.33
Benzofluorantenes	1	0.83	5.2	1.5	0.32
Benzo(e)pyrene		0.95	10	0.94	<.18
Benzo(a)pyrene	1	<.26	4.5	0.66	<.22
Perylene		1.4	8.5	<.24	<.31
Dibenz(a,h)Anthracene	1	<.59	<.80	<.72	<.70
Indeno(1,2,3-c,d)pyrene	1	2.8	9.1	0.78	<.28
Benzo(g,h,i)perylene		6.8	39	0.98	<.23
C1 naphthalenes		5.8	6.6	20	<.22
C2 naphthalenes		6.8	7.6	31	<.71
C3 naphthalenes		6.4	14	228	<.05
C4 naphthalenes		2.9	12	28	<.24
C1 phen, anth		0.32	4.4	3.6	<.04
C2 phen, anth		0.96	<.20	<.35	<.34
C3 phe, anth		<.11	<.07	4.4	<.12
C4 phen, anth		<.37	<.23	<.41	<.39
Dibenzothiophene		<.16	0.65	0.37	<.16
C1 dibenzothiophene		<.04	<.02	0.53	<.04
C2 dibenzothiophene		<.03	<.02	<.00	<.03

* All sample Id numbers prefixed with 96-.
** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991.(CCME EPC-CS34) (Recreational / Park land use)

PHOTO 6: Garage - Photograph of large concrete garage pit with sump removed

PHOTO 7: Garage - Concrete sump from garage pit. Note, black sludge in sump.
NOTE: This sludge was removed and placed in secure barrels for disposal.

5.8 RESIDENCE BUILDING

One of the Married Quarter Cabins remained intact at the north end of the site. The only evidence of the other two Married Quarter Residences were the remainder of the concrete foundations. Wood and metal debris was scattered around the area. Utility holes were also located to the north, east and south of the Residence Building.

5.8.1 Areas and Contaminants of Concern

ESG determined that the surrounding soil did not contain concentrations of contaminants at levels above the adopted remediation criteria (ESG 1996). According to ESG, the concentration of asbestos in the wall insulation was below the detection limit of 0.5 %. The analyses of paint samples collected from painted surfaces by ESG indicated concentrations of lead in excess of the CCME R/P criteria.

5.8.2 Remediation Methodology and Confirmatory Sampling

All painted surfaces from the interior and exterior of the building were removed. This included interior wallboards, painted wood, ceiling boards, exterior trim, and window frames. The painted wood was placed in the temporary staging cells and then into the containment cell. In addition, the remainder of a metal exhaust vent in the roof that was deemed to be a physical hazard was removed. This was placed in the landfill.

Unpainted wood and metal debris inside the building and in the surrounding area was removed to the landfill. The utility holes and concrete foundations in the surrounding area were backfilled with borrow material. A pipe suspected pipe suspected of containing asbestos was discovered and wrapped appropriately prior to transfer to the landfill.

5.8.3 Conclusions

All interior and exterior painted surfaces at the Residence Building were removed and eventually stored in the containment cell. Unpainted wood and metal debris was removed to the landfill. The utility holes and concrete foundations adjacent to the building were backfilled. The shell of the Residence Building was left intact, and the surrounding area was levelled off.

5.9 ACCESS ROAD

The Access Road led from the Snag Road to a cleared area and was located to the northwest of the main site (Figure 2). Nothing remained in this area except broken red clay pipes, wood from a collapsed storage shed, wood and metal debris, a burnt area and a pile of burnt D size batteries.

5.9.1 Areas and Contaminants of Concern

ESG determined that the soil at the end of the Access Road did not contain concentrations of contaminants above remediation criteria (ESG 1996). The burnt area located near the collapsed storage shed, (Figure 2) was treated as containing concentrations of contaminants (metals and PCBs) above the CCME R/P criteria. A burnt pile of approximately 100 D-size batteries was located on the west side of the Access Road between two trees. This pile was treated as leachable toxic material.

5.9.2 Remediation Methodology and Confirmatory Sampling

The burn stain was removed with the use of the backhoe. The soil was treated as containing concentrations of metals and PCBs above the CCME remediation criteria. It was therefore removed and placed in the temporary staging cell and later moved to the containment cell. A confirmatory sample was taken in the centre of the excavated area. The results are located in Appendix IVa.

The burnt pile of batteries was treated as leachable toxic material and was placed in the bags provided for leachable toxic and pesticide contaminated soil. The bag was shipped offsite. A confirmatory sample was taken at the base of the area and analysed for cadmium, mercury and lead. The results for this sample are shown in Appendix IVa.

Wood from the collapsed storage shed, other wood and metal debris, and the red clay pipes were removed from the Access Road to the landfill.

5.9.3 Conclusions

General non-hazardous debris was removed from the area and placed in the landfill expansions. A burn stain was treated as containing concentrations of contaminants above the CCME remediation criteria. It was therefore removed and stored in the containment cell. A burnt pile of batteries was placed in the bags provided for leachable toxic and pesticide contaminated soil and shipped offsite.

5.10 BEACON SITE

The Beacon Site was located on top of a hill approximately 7.5 km northeast of the Airstrip. The site could only be reached by helicopter. The burnt remains of a building were located in the centre of the cleared area at the site. Also remaining were dismantled orange painted wooden antenna towers at the four corners of the site and the remains of an orange painted wooden fence on the northeastern side of the site.

5.10.1 Areas and Contaminants of Concern

According to ESG's 1995 delineation work, copper, nickel, zinc and arsenic were present at concentrations exceeding the CCME R/P remediation criteria in samples collected in the vicinity of the building remains. The analyses of paint samples from the antenna towers indicated high concentrations of lead, zinc, chromium and cobalt according to ESG's 1996 report.

5.10.2 Remediation Methodology and Confirmatory Sampling

According to ESG, the CCME contaminated soil in the centre of the site required excavating to a depth of 0.3 to 0.4 m. This soil was rocky, dense brown clay with burn layers evident at the surface and at a depth of 0.05 m. The soil was removed manually, loaded into barrels and slung with the use of the helicopter (Photo 8) to the temporary storage cells were the barrels were unloaded. One of the nets broke during transfer, causing one barrel to drop to the ground. The barrel was located intact and was retrieved. Nine confirmatory samples and one duplicate where taken from the excavated area (Figure 12). The results of these samples are located in Table 9 and in Appendix IVa and IVb. The excavated area was not backfilled.

The painted wood towers and fence and metal debris were removed from the site with the use of the helicopter (Photo 9). The metal debris was placed in the landfill. A composite paint sample was taken from the antenna tower wood. Leachate analysis conducted on the paint by ESG showed leachate concentrations were below the Ontario Regulation 347 and BC SWEP standards (Appendix

IVe). Therefore the wood was placed in the landfill.

5.10.3 Conclusions

The soil determined by ESG to contain concentrations of metals above the CCME remediation criteria was removed with the use of the helicopter to the temporary staging cells at the main Snag site. This soil was placed in the containment cell upon its completion.

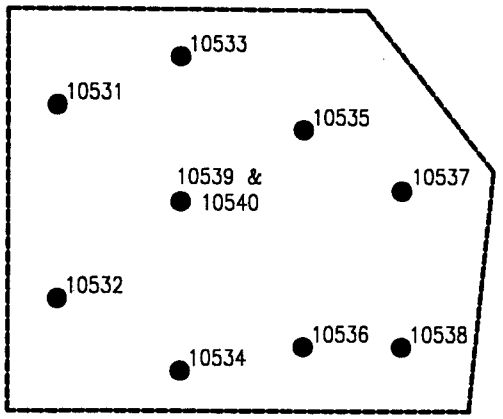
The analyses of a composite paint sample taken from the antenna tower wood indicated concentrations of metals below the leachate standards adopted. Therefore the wood and metal debris were placed in the landfill.

SAMPLING LOCATIONS

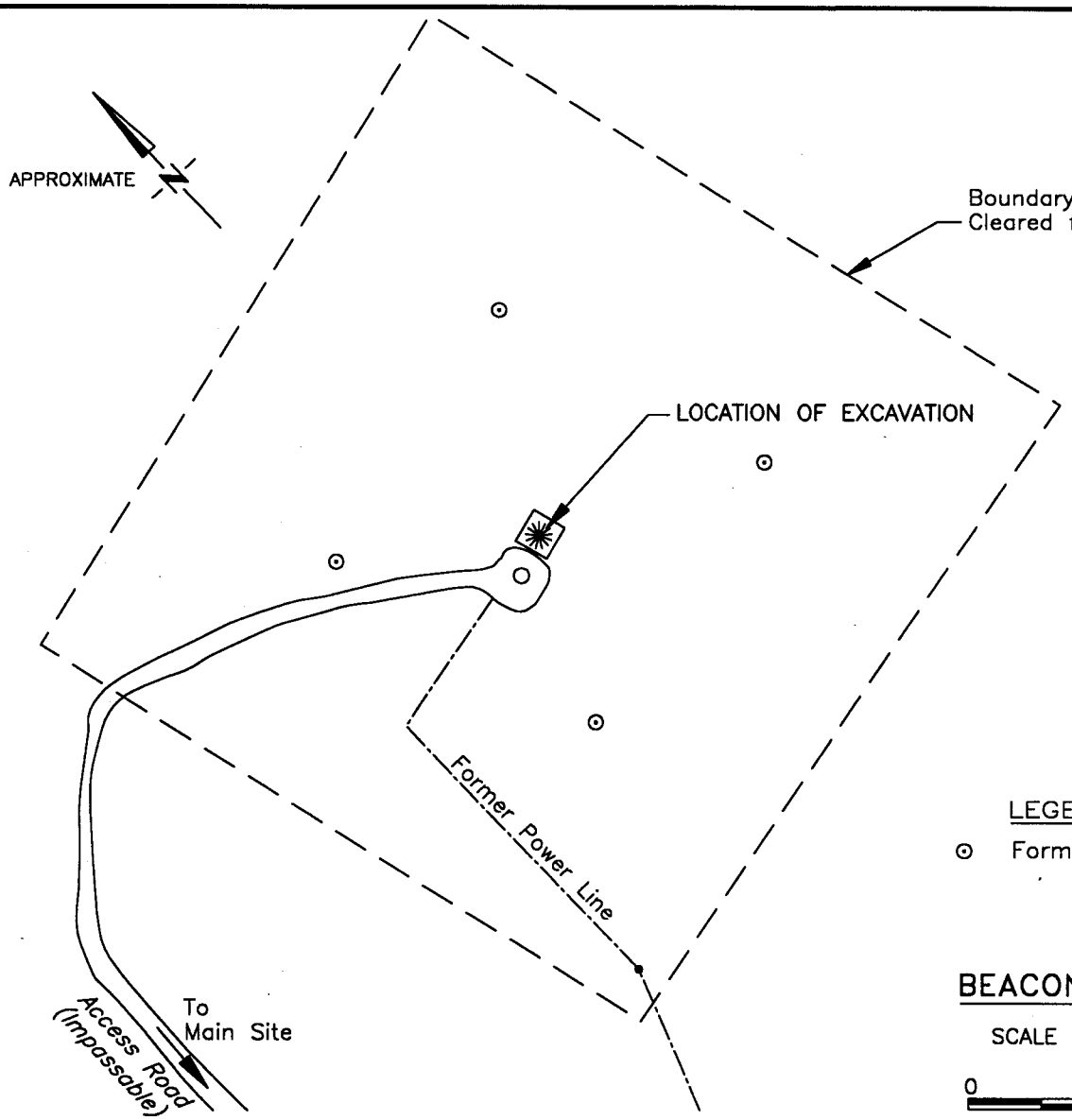
LEGEND

10531 — Confirmatory Sample (All Samples #s prefixed '96')

——— Approximate Boundary of Excavation (depth ~ 0.3m)



SCALE: 0 — 3 metres



LEGEND

⊙ Former Wood Towers

BEACON SITE PLAN

SCALE 1:2500(Approx.)
metres
0 — 50 — 100

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON		
	BEACON SITE PLAN & CONFIRMATORY SAMPLING LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 12

SNAG AIRSTRIP REMEDIATION

TABLE 9
METALS AND ORGANICS IN SOIL
BEACON SITE
µg/g

Sample Id*	Metals								PCBs
	Cu	Ni	Co	Cd	Pb	Zn	Cr	As	
Criteria**	**100**	**100**	**50**	**5**	**500**	**500**	**250**	**30**	**50**
10531	28	24	15.4	<1.0	<10	59	49	7.2	-
10532	51	43	22	<1.0	<10	67	74	6.7	-
10533	28	29	18.5	<1.0	16	80	58	7.4	-
10534	46	40	19.8	<1.0	<10	69	62	5.6	-
10535	45	38	19.1	<1.0	26	95	56	6.1	-
10536	49	37	18.9	<1.0	<10	78	58	8	-
10537	45	35	21	<1.0	<10	82	57	5.9	-
10538	37	31	19.9	<1.0	<10	65	50	4.8	-
10539	38	30	14.6	<1.0	42	82	62	5.4	-
10540	33	30	14.1	<1.0	78	88	61	6.1	-

* All sample Id numbers prefixed with 96-.

** Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991. (CCME EPC-CS34) (Recreational / Park land use)

PHOTO 8: Beacon Site - Excavated soil, painted wood and metal debris were slung by helicopter to the temporary staging cells, where the the nets were unloaded.

PHOTO 9: Beacon Site - Painted wood towers and fence debris, removed from the Beacon Site, in one of the temporary staging cells.

File: 281-004.01
INDIAN & NORTHERN AFFAIRS CANADA
Snag Airstrip, Yukon

LORIMER & Associates Consulting Engineers & HEMMERA
HEMMERA RESOURCE CONSULTANTS LTD.

6.0 LANDFILL

An existing landfill was located approximately 1 km southwest of the main building sites at the Snag Airstrip at the end of a short Access Road (Figure 9). The landfill sloped to the east and was capped with coarse sand and gravel. Two bodies of rusted vehicles were located at the top of the slope. In addition, other open or partially buried domestic debris was evident in the area.

Delineation sampling completed by ESG in 1995 determined no concentrations of contaminants above the adopted remediation criteria.

6.1 Asbestos Material

Material determined by ESG to contain concentrations of asbestos above 5% and material suspected to contain asbestos were double bagged in polypropylene. This material was removed from the Firehall and Residence Building. The outside bags were marked *ACM* (Asbestos Containing Material) with indelible marker and their approximate locations in the landfill were recorded (Figure 9).

6.2 Metal and Wood Debris

General metal and wood debris at the Snag Airstrip site that did not contain or was not suspected to contain concentrations of contaminants above the remediation criteria was placed in a new expansion of the landfill.

Composite paint samples taken from the Tower Building and a separate sample from the painted wood from the Beacon site showed leachate results below the leachate criteria. Therefore painted wood debris from these two locations were placed in the landfill. In addition, the Firehall building, unpainted wood from the Residence Building, painted wood from the tower building and the collapsed storage shed from the Access Road were placed in the landfill. Metal debris, particularly from the Barracks Building area, was placed in the landfill extension.

6.3 Expansion and Closure Methodology

In order to obtain the capacity required to contain the non-hazardous waste material from the Snag Airstrip and Beacon sites, the nearby existing landfill was expanded prior to decommissioning. Two expansion cuts, approximately two metres deep, were made at the top of the slope of the landfill (Figure 9). The non-hazardous material from the remediation program was placed in these expansions. Both expansions were recapped with their own excavated material and borrow material as required.

To achieve final closure of the landfill, additional borrow material was placed across the entire landfill area. The slope was regraded to a more stable angle.

6.4 Ground Water Monitoring Wells

To facilitate access for the drill rig an unpaved road was constructed from the road leading into the landfill to the toe of the landfill (Photo 10). The road included a small turnaround pad at the base. Borrow material was placed on the road to stabilize it. Three groundwater monitoring wells were placed at the bottom of the landfill slope (Figure 9).

Monitoring wells were installed by Peace Drilling using an auger rig at three locations along the toe of the landfill. These locations were selected to best intercept the presumed groundwater flow in the vicinity of the landfill and allow for groundwater samples which would represent the landfill's impact. These wells were developed and samples obtained soon after their installation. The analytical results of the groundwater samples indicated concentrations of metals, TEH (total extractable hydrocarbons), PCBs and chlorinated phenols below CCME drinking water criteria (Appendix IVf). The well borehole logs are contained in Appendix V.

PHOTO 10: Landfill - Unpaved road constructed from road leading into landfill to the toe of the landfill. Photograph taken from toe of landfill.

7.0 CONTAINMENT CELL

The containment cell was built according to drawings and specifications provided by Hemmera Resource Consultants Ltd. and Lorimer & Associates. The containment cell was built to store soil and debris containing concentrations of contaminants above the CCME R/P remediation criteria.

7.1 CCME Contaminated Soil and Debris

Soil and debris determined by ESG to contain concentrations of contaminants above the CCME R/P remediation criteria were placed in the temporary storage cells during the site remediation. The soil and debris was subsequently transferred to the containment cell upon its completion.

7.2 Leachate Debris

Painted wood from the Residence Building was determined by ESG to contain concentrations of contaminants above the leachate remediation criteria. Therefore, this material was placed into the temporary storage cells during remediation and subsequently transferred to the containment cell.

7.3 Site Selection and Construction Methodology

Several criteria were established for site selection for the containment cell. These were; even terrain, good underlying ground water drainage, accessibility to borrow materials, minimal removal of vegetation, an unobtrusive site, central location and approval by DIAND and the White River First Nation.

The site chosen is located east of the Tower Building (Figure 13). This site is adjacent to an old road which was rehabilitated for access to the containment cell. A site sufficiently large to accommodate both the cell and planned security fence was flagged and cleared.

Brush and debris were removed, and the dimensions and locations of the containment berms were

delineated and flagged. To facilitate compaction of the berms, the sand & gravel for construction was placed in lifts approximately 0.3 m high. The loads were staged so that the dozer would be required to pass over the previously spread lift and the entire length of the berm was constructed before another lift was applied (Photo 11). This method of building in shallow lifts and using the equipment to repeatedly compact the materials was continued until the berms reached the desired dimensions (1.5 m high).

In preparation for installation of the geotextiles and liners, personnel carefully walked the cell, paying special attention to the floor of the cell and the interior surfaces of the berms, removing any sharp objects. The liners were then installed using a heavy equipment vehicle at each corner and all personnel spread across the leading edge of the liner and pulling it across the cell. Once each liner was in place, adjustments were made, wrinkles pulled out and confirmation made that it was "seated" properly before repeating the process with the next liner. The liners consisted of a LP 801 geotextile liner on the ground, a 30 mil PVC liner, another LP 801 geotextile liner, a 30 mil PVC Arctic liner and a final heavy LP 1001 geotextile liner. The soil and debris was placed onto this final heavy geotextile liner (Photo 12). The as-built containment cell drawings are located in Figure 14.

In order to monitor the performance of the liners and check for the occurance of leaks, two monitoring wells were installed in the interstices of the liners (Photo 13). The first was installed in between the 30 mil PVC liner and the 30 mil PVC Arctic Liner, and the second was installed in between the 30 mil PVC Arctic Liner and the heavy LP 1001 geotextile. The first monitoring well can be used to monitor breaches in the primary liner and the second monitoring well can be used to monitor breaches in the cover system. The monitoring wells consisted of 2" schedule 40 PVC 010 slot screen connected to 2" schedule 40 PVC riser pipes. The screen section was placed in the lowest point of the cell, with the riser poking through the liners above at the edge of the berm. The wells were protected using a 6" ABS pipe which was secured using sandbags. The bottom 0.6 m of the screened section of the 2" pipe protruded from the 6" ABS pipe and was covered with filter sand in order to facilitate drainage. The liners were sealed around the protruding pipes with custom fabricated "boots" made from the same material as the membranes. These were glued onto the liner and secured to the pipes using hose clamps. Screw top closures were installed on the wells. The

wells were not locked at the time. These wells should be secured in the near future to prevent tampering with the wells.

After filling of the cell was completed, a 20 mil PVC cover system was installed. All liners, including the cover were secured in a key trench excavated around the perimeter of the containment cell. The cover, once in place, was covered with a layer of topsoil approximately 0.3 m thick (Photo 14), which had been set aside for this purpose as the borrow pit was being developed. The topsoil cover protects the PVC cover from UV radiation and facilitates revegetation which will consist of grass seed mix to be planted at a later date. The grass will also serve to secure the topsoil cover in place and prevent less desirable natural revegetation which might damage the underlying cover.

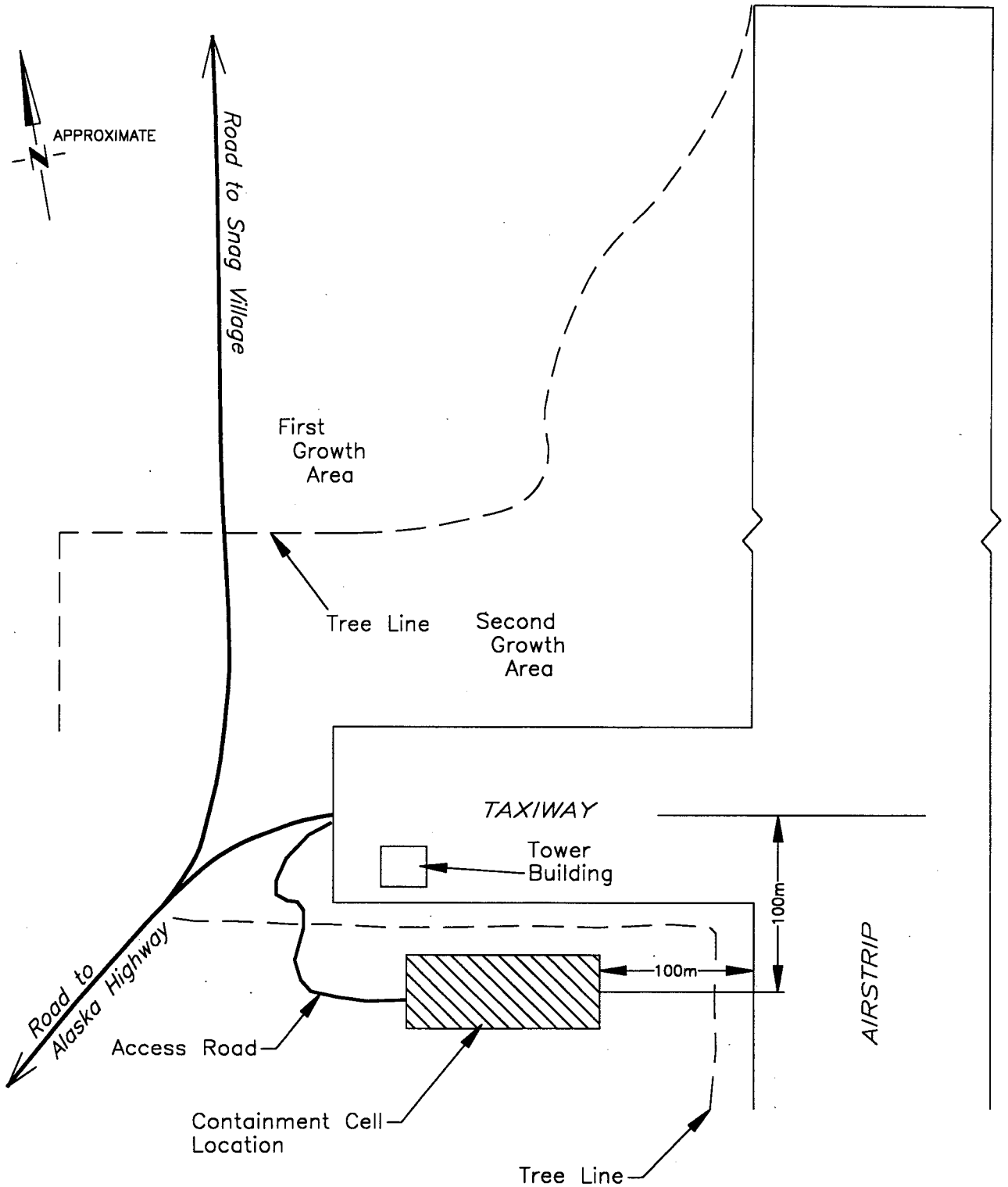
7.4 Fence Construction

Under the direction of Lorimer personnel, a security fence was erected around the containment cell, effectively placing it in a locked compound. This fence was a minimum of six feet high, capped with strands of barbed wire, and equipped with a locking gate.

The fence line was erected approximately eight metres from the toe of the containment berms allowing room for any equipment which might be required for upkeep or monitoring.

7.5 Monitoring Wells

It was also the intention to install observation wells in the vicinity of the containment cell, however the conditions were deemed too difficult for the available auger rig. Time constraints did not permit mobilizing a new rig and so it was agreed that monitoring wells would be installed there at a later date. However, the two wells, previously discussed, were installed directly in the containment cell which will allow for sampling.



NOT TO SCALE

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION , YUKON CONTAINMENT CELL LOCATION		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.01	March 1997	FIGURE 13

PHOTO 11: Containment Cell - Containment cell with compacted berms subsequent to grading. View looking east.

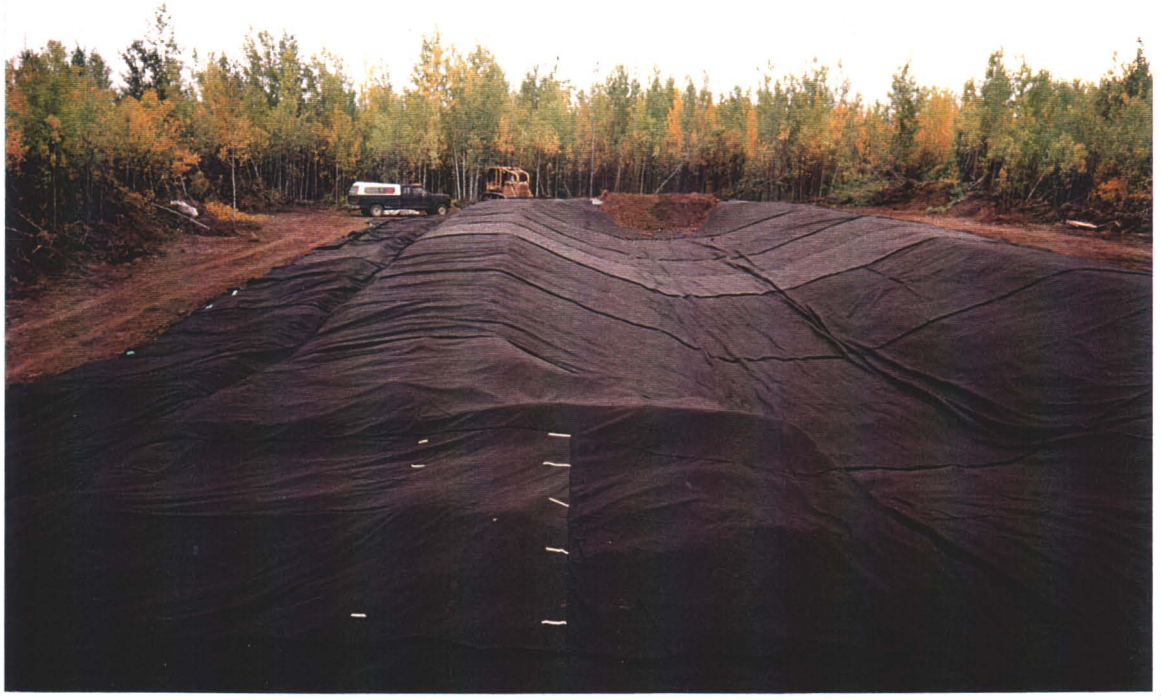


PHOTO 12: Containment Cell - Initial loads in containment cell. Soil and debris placed onto final heavy geotextile liner.

PHOTO 13: Containment Cell - Two monitoring wells in containment cell. Note: Liners were sealed around protruding pipes with custom fabricated boots.

PHOTO 14: Containment Cell - Coverage of containment cell with layer of topsoil.

8.0 WASTE REMOVAL OFFSITE

Soil and concrete containing concentrations of PCBs above the CEPA remediation criterion required not only excavation but also removal offsite and transport to a secure facility licensed to handle PCB waste. In addition, soil containing concentrations of pesticides above the adopted remediation criteria required removal offsite to a treatment facility licenced to treat this type of waste.

8.1 CEPA Debris Barrels

Soil, moss and debris determined by ESG to contain concentrations of PCBs above 50 ppm were excavated and stored in secure 205 L barrels. The barrels were securely fastened, numbered with indelible marker and identified with PCB warning labels and TDG Class 9 labels. In total, 158 barrels were filled with PCB contaminated material. An additional eight barrels were filled with water removed from the excavated areas. This water will be sampled for concentrations of PCBs when the water thaws. The barrels were removed from the site by DIAND personnel to a fenced and locked compound at the former Haines-Fairbanks Pipeline pump station in Beaver Creek. The barrels were eventually removed to a licenced waste facility (Swan Hills, Alberta) by a licenced carrier.

8.2 CEPA Contaminated Concrete

Confirmatory samples collected by Lorimer staff indicated that some of the concrete contained concentrations of PCBs above the CEPA criterion. This necessitated that removal of this concrete. The concrete was broken up and placed in secure 205 L barrels. The approximate volume of concrete removed offsite was 3 m^3. The barrels were removed from the site by DIAND and Lorimer personnel to the fenced and locked pump station compound in Beaver Creek. The barrels were eventually removed to a licensed waste facility (Swan Hills, Alberta) by a licenced carrier.

8.3 Pesticide Contaminated Soil

Analyses of oil on the south and east sides of the Warehouse foundation sampled by ESG indicated concentrations of pesticides above the adopted criteria. Intermingled in this area was soil indicated by ESG to contain concentrations of contaminants above the leachate toxic criteria. This soil was excavated directly into Supersacks and barrels. The 150 Supersacks and 27 barrels were temporarily stored onsite on a layer of polypropylene. The Supersacks and barrels were removed from the site by DIAND and Lorimer personnel to the fenced and locked pump station compound in Beaver Creek. The Supersacks and barrels were eventually removed to a licensed waste facility (Swan Hills, Alberta) by a licenced carrier.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The analyses of confirmatory samples collected by ESG and Lorimer staff suggest that all soil and materials labelled by ESG during the assessment work in 1996 as containing levels of contaminants above the remediation criteria were removed. The soil and debris containing contaminant concentrations in excess of the CCME R/P criteria were placed in the containment cell built on the site. Soil and concrete containing concentrations of PCBs above the CEPA criterion were placed in secure barrels and shipped offsite to a fenced compound in Beaver Creek. Soil containing leachate toxics and pesticide concentrations above remediation criteria were excavated and placed in supersacks and barrels and were shipped offsite.

The analytical data collected during this decommissioning and remediation suggest that the area surrounding the former Snag landing strip is suitable for residential and parkland use as defined by the CCME criteria and the soil and building materials remaining on site do not contain concentrations of PCBs in excess of the CEPA criteria.

The containment cell was built south of the former Tower Building. The containment cell consisted of five liners with containment berms, and two monitoring wells. The cell was covered and fenced off.

Two extensions were made at the existing landfill located approximately 1 km southwest of the main site. The extensions and previous landfill area were capped with borrow material and regraded.

The airstrip site was left free of debris and all backfill was groomed in a manner which should promote natural recovery of the site. Borrow pits were remediated in accordance with requirements set forth by the RMO under the terms of the Land Use Permit (Permit No. YA6X171 ; Appendix III).

Recommendations for future work include installing groundwater monitoring wells around the containment cell. Additionally, the two interstitial monitoring wells installed through the liners in the containment cell should be locked to discourage tampering. A regular, long-term monitoring

program for the wells at the containment cell and landfill should be implemented. Annual visual inspections of the containment cell and fencing should also be carried out to identify any potential problems or evidence of tampering.

10.0 STANDARD LIMITATIONS

This report is based on data and information provided by Environmental Sciences Group of the Royal Military College of Canada, Kingston, Ontario and data collected during the sampling and supervision of the remedial works conducted by Lorimer & Associates personnel in association with Hemmera Resource Consultants Ltd. and is based solely on the site conditions at the time of the field investigations as described in this report.

Conditions between sample locations may vary. A potential remains for the presence of unknown, unidentified, or unforeseen surface and sub-surface contamination. Further evidence against such potential site contamination would require additional surface and sub-surface exploration and testing. Some of the conclusions of this report are based on a comparison of chemical analytical results to criteria currently used by CCME and CEPA. In the event that these criteria are changed, amended, or replaced, Lorimer & Associates should be requested to re-evaluate the conclusions of this report, and provide amendments as required.

This report was prepared by Lorimer & Associates in association with Hemmera Resource Consultants Ltd. for the account of Indian and Northern Affairs Canada. The material in it reflects Lorimer & Associates and Hemmera Resource Consultants Ltd. judgment in light of the information available to them at the time of preparation. Any use which a Third Party makes of this letter report, including any reliance or decision based on it, are the responsibility of such Third Parties. Lorimer & Associates and Hemmera Resource Consultants Ltd. accept no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

LORIMER & ASSOCIATES

PROFESSIONAL 31 MAR 97 R.J. LORIMER TERRITORY ENGINEER

Robert Lorimer, P.Eng.
Principal Consultant

HEMMERA RESOURCE CONSULTANTS LTD.

Bruce Willmer, M.Sc., P.Geo.
Principal Consultant

Yasmin Nizami, M.Sc. (Eng)
Environmental Specialist

REFERENCES

B.C. Environment, Lands and Parks. 1995. *Criteria for Managing Contaminated Sites in British Columbia* (CMCS 1995), August 1995

British Columbia Ministry of Environment. 1990. *Waste Management Act, Special Waste Regulation, B.C.* Reg 63/88 (as amended by B.C. Reg 10/89, and 106/89), No. 7 - April 1992.

British Columbia Ministry of the Environment. 1989. *Criteria for Managing Contaminated Sites in British Columbia-Draft 6.* November 21, 1989.

Canadian Council of Ministers of the Environment. 1991. *Interim Canadian Environment Quality Criteria for Contaminated Sites.* CCME EPC-CS34. September, 1991.

Canadian Council of Resource and Environment Ministers. 1987. *Canadian Water Quality Guidelines.* Water Quality Branch, Inland Waters Directorate, Environment Canada.

Canadian Environmental Protection Act. 1992. *Storage of PCB Material Regulations.* August 27, 1992.

Environmental Sciences Group. 1996. *An Environmental Assessment of Snag Airstrip, Yukon Territory.* March 1996.

Health and Welfare Canada. 1993. *Guidelines for Canadian Drinking Water Quality* - Fifth Edition. 1993. Minister of National Health and Welfare.

Ministère de l'Environment du Quèbec (MENQIV). 1988. *Contaminated Sites Rehabilitation Policy.* 1988. Prepared by Direction des Substances Dangereuses.

Ministry of Housing, Physical Planning and Environment. 1987. Extract from: *Environmental Program of the Netherlands* 1988-1991. The Hague: Staatsuitgeverij. 1987.

National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (EPA). 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.* U.S. Government Printing Office, Washington, D.C.

Ontario Ministry of the Environment General Waste Management Regulation under the Environmental Protection Act. 1992. *Regulation 347 of the Revised Regulations of Ontario.*

Transport of Dangerous Goods Act, S.B.C. 1985. *Transportation of Dangerous Goods Regulations of Canada,* SOR/85-77, January 18, 1985 (as amended from time to time).

APPENDIX I

LETTER FROM ESG TRANSFERRING RESPONSIBILITIES TO LORIMER

Date: 07/15/96

To: Ms. Yasmin Nizami, Project Manager, Snag Airstrip Cleanup

CC: Mr. Brett Hartshorne, Action on Waste, DIAND

Dr. Ken Reimer, Director, ESG
Mr. Bob Lorimer, Lorimer & Assoc.
Mr. Bruce Willmer, Hemmera Resource Consultants Ltd.

From: Dawn Pier, ESG, Scientific Advisor, Snag Airstrip Cleanup

Subject: Transfer of Responsibility Upon Departure of ESG team

---

Dear Ms. Nizami,

The following memo is intended to confirm the details of our conversations of the past few days concerning the transfer of certain ESG's responsibilities in the cleanup of Snag Airstrip to you. The necessity of handing over these responsibilities is a function of prior ESG commitments and the regrettable discrepancies between the time we budgeted for this project and the practical issues surrounding the progress of work at the site. The following duties will be undertaken by you in our absence:

1. Direction and observation of excavation of CEPA[1], leachate toxic[2] and CCME[3] soils as per the maps prepared by ESG (maps will be updated by ESG and sent to you as outstanding data becomes available).

2. Collection of confirmatory soil samples following soil excavation in the following manner:

   - CEPA soils: 1 discrete confirmatory sample per $5m^2$ and at least one sample collected per excavated area.
   - Leachate toxic and CCME soils: 1 discrete confirmatory sample per 10 m^2 and at least one sample collected per excavated area.

---

[1] Refers to soils containing polychlorinated biphenyls in excess of 50 ppm.

[2] Refers to soils containing leachable levels of contaminants (lead in this case) as per the Ontario Ministry of the Environment's Leachate Quality Standards.

[3] Refers to soils containing one or more inorganic elements or PCBs in excess of the Canadian Council of Ministers of the Environment Residential/Parkland Remediation Criteria.

- Field duplicates will be collected for 10% of confirmatory soil samples.

3. Shipment of confirmatory soil samples, any waste water samples and concrete samples to the appropriate analytical lab using the coolers, mailing labels, chains of custody and financial coding provided. Samples for inorganic and PCB analysis are to be sent to the Analytical Services Unit at Queen's University, while soil requiring pesticide analysis should be sent to AXYS Analytical Services Ltd. in Victoria, BC.

4. Triple washing of the concrete pads at the powerhouse, garage oil change pits (2), and the pump house and barracks building basements following soil excavation. As we discussed, this involves rubbing a mixture of oclansorb and varsol along the concrete surface with brooms and collecting the resultant waste for disposal in the appropriate blue barrels for PCB waste.

5. Sampling of the concrete foundations at the powerhouse, garage oil change pits (should there prove to be any concrete bottom in these), and the pump house and barracks basements after they are triple cleaned in the manner outlined above.

6. Return to the Action on Waste Office of Indian and Northern Affairs in Whitehorse of equipment (including all non-consumables and any remaining consumables) that was purchased jointly by DIAND and ESG for use in cleanup activities.

Data from confirmatory samples will be sent to the attention of ESG as well as to you at the Beaver Creek Forestry Office. Should any questions or concerns related to the above activities arise I can be contacted at (613) 541-6000 ext. 6564 (office) or 549-7046 (home) or can be reached by fax at (613) 541-6596. I appreciate your help and cooperation in this matter.

Sincerely,

Dawn Pier

Dawn Pier
Environmental Sciences Group

DP/DP

APPENDIX II

HEALTH AND SAFETY PLAN

DRAFT HEALTH AND SAFETY PLAN FOR SNAG AIRSTRIP REMEDIATION, YUKON

The purpose of the Safety Execution Plan (SEP) is to establish requirements for protecting the health and safety of field personnel during the activities conducted on the site. The SEP has been prepared to ensure that the consulting, drilling and transportation personnel are suitably protected during drilling and sampling operations until such time as the soils have been confirmed to be at non-hazardous levels. The plan contains safety information, instruction and procedures.

APPLICATION

This Health and Safety Plan will apply to all persons working at the Snag Airstrip during the remediation project. This includes:

- Hemmera/Lorimer staff;
- RMC/ESG/DCC/DIAND staff; and
- First Nations bands involved.

All unauthorized persons will be kept off-site

SCOPE AND OBJECTIVES

The objectives of the SEP are to protect the health and ensure the safety of personnel on the site by specifying standard safety procedures; outlining the types of personal protection and safety equipment which will be required on this site; describing clean up procedures; and providing emergency procedures should they be needed. The Workers Compensation Board (WCB) has no specific guidelines regarding the protection of workers on sites containing potentially contaminated substances. Thus, the guidelines issued by the U.S. National Institute for Occupational Safety and Health (NIOSH) were used as a reference to develop this plan. While it is expected that field personnel will not come in physical contact with contaminated soil, precautions as provided herein would apply if it becomes necessary for them to do so. Otherwise normal WCB requirements for field personnel will apply. The enforcement of the plan will include the following:

- Evaluation of previous site reconnaissance, the identification of known hazards and evaluation of riks associated with the site activities.
- List of key personnel and alternatives responsible for site safety, emergency response and protection of team members.
- Description of actions to be taken to mitigate existing hazards to make the work environment less hazardous.
- Description of the levels of personal protection clothing and equipment to be warn by personnel during various site operations.
- Description of any site-specific mediacl supply requirements.
- Description of periodic air monitoring, personnel monitoring and environmental sampling if needed.
- Description of decontamination procedures for personnel and equipment.
- Establishment of Standard Operating Procedures (SOPs). SOPs are activities that can be standardized (such as decontamination and respirator fit testing) and where a checklist concerning completion of the procedure can be used.
- Establishment of a Contingency Plan for safe and effective response to emergencies.

If it becomes necessary to vary the procedures described in this SEP, DIAND will be immediately

notified in writing by the Consultant. Any subcontractors involved in the activities will be made aware of the procedures and will be responsible for ensuring their staff conform to the most recent version of the SEP.

SCOPE OF WORK

The remediation activities undertaken by the contractor involve:

- Removal and disposal of contaminated soil and debris;
- Demolition and disposal of buildings and other structures;
- Possible varsol extraction of PCB contaminated concrete;
- Closure/covering of structures including manholes, wells, pits, and basements; and
- Closure of existing landfill.

The advisory aspects of this project to be completed by Environmental Sciences Group (ESG) include:

- Delineation sampling and field analysis of materials prior to removal/excavation or decontamination;
- Confirmatory sampling and field analysis of materials after removal/excavation or decontamination;
- Staging activities such as sampling/analysis of collected materials and labelling of containers;
- Observation of the cleanup activites;
- Participation in minor cleanup activities (light shovelling, loose debris collection; and
- Participation in varsol extraction of PCB contaminated concrete (if required).

SITE CHARACTERIZATION AND BACKGROUND

A site assessment of Snag Airstrip was completed by ESG on June 13,1994 and from June 28 to July 6, 1995. The environmental assessment of the site addressed visible debris and physical structures, the dump and contaminated soil. The sampling program included the collection and analyses of samples from soil, palnt, water, barrel, paint chip, wall swab, building material and oil filters.

The total volume of soil containing polychlorinated biphenyls (PCBs) exceeding CEPA (Canadian Environmental Protection Act) criteria was approximately 34 m^3. Approximately 15 m^3 of soil at the site was categorized as hazardous waste based on Ontarion Ministry of the Environment Leachate Quality Standards. A total of 282 m^3 os soil was estimated by ESG to contain metals above the CCME Residential/Parkland Remediation Criteria.

The NIOSH guidelines for assessing chemical and physical hazards were used by Hemmera/Lorimer to determine the level of worker protection required when working around excavated soils. The type and level of worker protection was determined upon review of the analylitical results (EGS 1996), and will be further reviewed as the amount of information on the chemical and physical nature of the soils increases. The level of worker protection may be adjusted as the site characterization becomes more refined. Adjustments to the level of protection will be determined by the Consultant and will be supplied immediately to any contractors and subcontractors involved in the activities in the program.

Standard Safety Procedures

A health and safety officer (HSO) will be designated for the program. The HSO will have the responsibility of ensuring that the appropriate safety procedures, as outlined in this document, are followed with regard to the site activities. The fundamental safety guidelines for which the HSO will be responsible in overseeing are described in the following sections.

In areas of no suspected organic contamination, the HSO will use olfactory or vapour monitoring (Draeger tubes) to evaluate the presence of organic vapours. As a contingency, respirators will be available for excavation and sampling personnel for use if excessive vapours are detected. Under normal circumstances, modified NIOSH Level C protective gear will be adequate for all personnel on-site. This means standard NIOSH Level C protective clothing without respirators.

The first day procedure at the area will be for the HSO to inspect the soil and ascertain whether organic vapours are at concentrations of concern prior to sampling. The HSO may monitor the air quality during sampling to confirm that the safety precautions are appropriate. The air quality may be monitored on a regular basis by the HSO for comparison to earlier findings. The air quality monitoring program may be increased or reduced depending on results of initial test results. Respirators will be available for use at the site at all times.

If any suspicious material is encountered a site safety meeting will be held to review this plan.

Drilling equipment used for analytical sampling must be water washed (preferably steam cleaned) to remove potential contaminants prior to drilling of the next borehole.

Site Personnel Requirements

Site personnel must:

- be aware of the potential hazards which they may encounter on the site, for example the consistency/stability of the soils, and follow set procedures in the event of emergency;
- avoid unprotected contact with any contaminated soil or moisture from the soil due to walking through the soil, kneeling or sitting in the sampling area, or from equipment which may have come in contact with the soil;
- remove contact lenses if they begin to create irritation due to dust or organic vapours;
- wear required protective equipment at all times while in the sampling area. If vapours are encountered personnel having any facial hair or jewellery which would interfere with the proper functioning of the safety equipment should retreat from the site; and
- all personnel should shower at the end of each day.

Site personnel must NOT:

- consume any food or drink, chew gum or tobacco, or smoke while sampling;
- consume any alcoholic beverages, or prescription drugs which may have a deleterious effect on their abilities to perform their tasks during the day in which they are sampling; and
- act in any way which is less than completely professional and safe.

Modified NIOSH Level C Protective Equipment

Modified NIOSH Level C protection is expected to provide a proper level of protection for personnel in direct contact with soils at this site. The modified characteristics of NIOSH Level C protective equipment include:

Required:

- work coveralls (polyethylene-coated tyvek suits);
- safety glasses and/or goggles;
- polyvinyl chloride (PVC) undergloves and neoprene overgloves;
- rubber boots with steel toe and shank; and
- hard hat.

Contingency:

- sunscreen;
- MSHA/NIOSH approved filter-type respirators with OV/AG/Hepa filter cartridges;
- tear resistant tape to repair small rips in tyvek coveralls;
- if handling potentially sharp objects (glass, metallic objects, etc.) then a suitable protective outer glove must be worn;
- disposable outer boots; and
- hearing protection if working around machinery for any length of time.

In addition, if rubber gloves are to be worn for extended periods of time, or if there is a chance of periodic liquid splashes coming in contact with exposed areas of the skin, a high quality barrier cream should be used to reduce the chances of contact dermatitis developing. This barrier cream must be non-greasy, non-toxic, and able to allow the skin to sweat and breath normally. Care must be taken to periodically examine protective clothing while being worn, and on removal, for signs of wear and liquid entry.

Safety and Emergency Equipment

The following equipment should always be within close proximity of workers on the site:

- first aid kit with wool and reflective blankets;
- eyewash;
- respirators with OV/AG/Hepa cartridges;
- at least five gallons of water for use in emergency washes;
- as required by WCB regulations and subject to the number of personnel on-site, at least one person with CPR training on site whenever work is in progress;
- ear protection and safety head strap for glasses;and
- access to dependable 2-way communication with the Environmental Consultants' office.

Clean Up

The following equipment should be on-hand for post-sampling clean up:

- long handled bristle brushes;
- biodegradable detergent;
- buckets with rinse water;
- trash containers with plastic liner bags;
- paper or cloth towels for post-decontamination drying; and
- a supply of plastic trash bags.

Emergency Procedures

In the case of a medical emergency, if the problem is relatively minor, such as heat exhaustion, the standard clean up procedures outlined previously should be followed before medical care is administered. In the event of a major medical emergency such as cessation of breathing, stroke, cardiac arrest, etc., lifesaving care must be administered IMMEDIATELY without consideration of clean up. If ingestion, inhalation, or contact with a potential toxin is itself responsible for the medical emergency, the patient must be brought into the care of a physician as soon as possible. In the event of contact with an irritant with the skin or eyes, the area must be immediately flushed with copious amounts of water.

APPENDIX III

LAND USE PERMIT

Bob Lorimer.

Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

LAND RESOURCES
LAND USE SECTION
345-300 Main Street
Whitehorse, Yukon
Y1A 2B5

Your file / Votre reference

Our file / Notre reference

13 June 1996

YA6X171
96/627

Northern Affairs Program
Action on Waste
Arctic Environmental Strategy
345-300 Main Street
Whitehorse, Yukon
Y1A 2B5

Attention: Brett Hartshorne

Dear Sir:

LAND USE PERMIT YA6X171 AND QUARRY PERMIT 96/627
CONTAMINATED SITE REMEDIATION, QUARRY & CAMPSITE
- SNAG AIRSTRIP, 30 KM EAST OF BEAVER CREEK

Attached is your Land Use Permit YA6X171 and Quarry Permit 96/627 with annexed operating conditions.

I wish to draw your attention to operating condition 3.1 which requires that your contact N. Wortley at (403) 862-7224, the Inspector located in Beaver Creek prior to commencement of your operation.

Should you have any questions please contact me at (403) 667-3173.

Yours truly,

Mark Zrum
Head, Land Use

MW/sd

cc. R.M.O., Beaver Creek

Canada

Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

QUARRYING PERMIT

TERRITORIAL QUARRYING REGULATIONS

Permit Fee = $ Royalty @ 1 .50 per m³ $ TOTAL = $ Receipt No. in the amount of $ OR Free Permit under Section 12(2)(c) of the Territorial Quarrying Regulations	Permit No. 96/627 Land Use Permit Number YA6X171 Commencement Date 15 June 1996 Expiry Date 14 June 1997 Issued at Whitehorse, Yukon Land Agent

NORTHERN AFFAIRS PROGRAM
ACTION ON WASTE
ARCTIC ENVIRONMENTAL STRATEGY

of

345-300 MAIN STREET, WHITEHORSE, YUKON, Y1A 2B5

is hereby authorized to take 8000 cubic metres of **GRANULAR FILL**

from the lands described as follows:

EXISTING QUARRY SITES IN THE GENERAL VICINITY OF SNAG AIRSTRIP, YUKON

SUBJECT TO THE FOLLOWING CONDITIONS:

1. This Permit expires twelve months from the date of issue or when the authorized quantity of material has been quarried or removed, whichever is sooner.
2. This Permit does not grant to the Permittee any exclusive right or lease hold interest in the land described herein.
3. This Permit shall not be assigned.
4. All quarrying under this Permit shall be carried out in accordance with the Mining Safety Ordinance.
5. This Permit is issued subject to the provisions of the Territorial Quarrying Regulations and the conditions set out herein. Failure to comply with the Provisions of the Regulations and the conditions prescribed in this Permit may result in cancellations of the Permit in accordance with Section 12(5) of the Territorial Quarrying Regulations without prior notice to the Permittee.
6. The Permittee will identify the work area to the satisfaction of the Resource Management Officer prior to the removal of any material and any change of location will require prior approval of the Resource Management Officer.
7. The material removed from this pit is to be used only for the purpose described by the Permittee unless otherwise authorized by the Land Agent.
8. Upon completion of the operation, all cut banks three metres or over will be backsloped to a two horizontal to one vertical slope, or otherwise to the satisfaction of the Resource Management Officer.
9. No material is to be removed from any land protected by a registered mineral claims, placer lease or gravel reservation without the Permittee obtaining prior permission of the registered owner(s).
10. The Permittee shall advise the Head, Land Use of the total amount of material actually used upon completion of the operation.

Canada

Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

LAND USE PERMIT
NORTHERN AFFAIRS PROGRAM

PERMIS D'UTILISATION DES TERRES
PROGRAMME DES AFFAIRES DU NORD

Permit Class - Catégorie de permis	Permit No - No de permis
A	YA6X171

Subject to the Territorial Land Use Regulations and the terms and conditions in this Permit, authority is hereby granted to

Sous réserve du Règlement sur l'utilisation des terres territoriales et aux conditions de ce permis

NORTHERN AFFAIRS PROGRAM
ARCTIC ENVIRONMENTAL STRATEGY (AES)
ACTION ON WASTE PROGRAM

Permittee - Détenteur de permis

To proceed with the Land Use operation described in the application of

Est autorisé à entreprendre les travaux d'exploitation des terres décrits dans la demande de permis du

Signature	Date
BRETT HARTSHORNE	24 MAY 1996

Type of Land Use Operation - Genre de travaux d'exploitation des terres

CONTAMINATED SITE REMEDIATION PROJECT, QUARRY & CAMPSITE

Location - Emplacement

SNAG AIRSTRIP, 30 KM EAST OF BEAVER CREEK

This permit may be assigned, extended, discontinued, suspended or cancelled pursuant to the Territorial Land Use Regulations

Ce permis peut faire l'objet d'une cession, d'une prolongation, d'une cessation, d'une suspension ou d'une annulation, en vertu du Règlement sur l'utilisation des terres territoriales

Dated at WHITEHORSE, YUKON
Daté à

Engineer
Ingénieur

This 11 TH Day of JUNE
Ce _____ jour de _____, 1996.

Commencement Date 15 JUNE 1996
Date du début des travaux _____

Expiry Date 31 MARCH 1997
Date d'achèvement _____

NOTE

IT IS A CONDITION OF THIS PERMIT THAT THE PERMITTEE COMPLY WITH ANY OTHER APPLICABLE ACT, REGULATION, ORDINANCE, BY-LAW OR ORDER. DEFAULT HEREOF MAY RESULT IN SUSPENSION OR CANCELLATION OF THIS PERMIT.

REMARQUE

LE DÉTENTEUR DU PRÉSENT PERMIS DOIT SE CONFORMER À TOUT AUTRE REGLEMENT, LOI, DÉCRET, REGLEMENT MUNICIPAL OU ARRETÉ APPLICABLE. LE MANQUEMENT À CETTE OBLIGATION POURRAIT DONNER LIEU À LA SUSPENSION OU À L'ANNULATION DU PERMIS.

Canada

LAND USE PERMIT TERMS AND CONDITIONS

NAME OF PERMITTEE: Northern Affairs Program
Action on Waste
Arctic Environmental Strategy

The following terms and conditions are made pursuant to Section 31(1) of the Territorial Land Use Regulations and are hereby annexed to and form part of Permit **YA6X171.**

3.0 PLANS

.1	The Permittee's field supervisor shall contact or meet with N. Wortley, the Land Use Inspector at the Beaver Creek office of Indian and Northern Affairs Canada. Phone 403-862-7224 at least 48 hours prior to the commencement of this Land Use Operation.	**CONTACT INSPECTOR**
.2	The Permittee shall not conduct this Land Use Operation on any lands not designated in the accepted application, unless otherwise authorized in writing by the Engineer.	**PLANS**
.3	The Permittee shall, in accordance with Section 33 of the Territorial Land Use Regulations submit a Final Plan.	**FINAL PLAN**
.4	The Permittee shall, prior to the expiry date of this Permit, apply for formal identification of the site and ensure permanent warning signs are posted at the site.	**FORMAL IDENTIFICATION**
.5	The Permittee shall, prior to commencing this Land Use Operation, submit a plan of all campsites to the Engineer for approval.	**CAMPSITE PLAN**

4.0 NOTICES/REPORTS

.1	The Permittee shall provide in writing the Land Use Inspector the following information at least 10 days prior to completion of the Land Use Operation: (a) his plan for removal or storage of equipment and materials; and (b) when final clean-up and restoration of the lands used will be completed.	**REPORTS BEFORE REMOVAL**

.../2

.2 The Permittee shall provide in writing to the Engineer, at least 48 hours prior to commencement of this Land Use Operation, the following information: **IDENTIFY AGENT**

(a) person, or persons, in charge of the field operation to whom notices, orders, and reports may be served; and

(b) alternates; and

(c) all the methods for contacting the above person(s).

.3 The Permittee shall supply a Campsite Development Plan at least 5 days prior to camp establishment. The plan will include a map of the camp, proximity to water, location of sewage/grey water facilities, and a copy of the Health Canada septic disposal permit if applicable. **CAMPSITE DEVELOPMENT PLAN**

5.0 DISPLAY PERMIT/INSTRUCT EMPLOYEES AND CONTRACTORS

.1 The Permittee shall display a copy of this permit on the permit site. **DISPLAY PERMIT**

.2 The Permittee shall ensure that a copy of this Permit and operating conditions is provided to and understood by all contractors and sub-contractors prior to the start-up of this Land Use Operation. **PERMIT CONTRACTORS & SUB-CONTRACTORS**

6.0 EQUIPMENT

.1 The Permittee shall not use any equipment except of the type, size and number that is listed in the accepted application unless otherwise authorized in writing by the Land Use Inspector. **ONLY APPROVED EQUIPMENT**

7.0 PETROLEUM

.1 The Permittee shall clearly mark with stakes or flags the location of any spill of any petroleum and forthwith report the time, manner, location, amount and type of spill to the Engineer and Environmental Protection Service. (Environmental Protection Service can be contacted at Phone (403) 667-7244, Whitehorse, Yukon). **REPORT PETROLEUM SPILLS**

.2 The Permittee shall not allow petroleum products to spread to surrounding lands or into water bodies. **FUEL CONTAINMENT**

.../3

.3	The Permittee shall provide in writing to a Land Use Inspector the location, map and quantity of all petroleum fuel caches within 10 days after establishment.	**REPORT FUEL LOCATION**
.4	The Permittee shall not place any petroleum fuel storage containers within 30 metres of the normal high water mark of any stream.	**FUEL BY STREAM**
.5	The Permittee shall mark all stationary petroleum products storage facilities with flags, posts or similar devices so that they are at all times plainly visible to local vehicle travel.	**MARK FUEL LOCATION**
.6	The Permittee shall mark all fuel containers with the Permittee's name.	**MARK CONTAINERS**
.7	The Permittee shall have a Spill Contingency Plan in place or ensure that the haul contractor has a Spill Contingency Plan in place to provide for response to and clean-up of any spills of fuel or other hazardous materials.	**SPILL CONTINGENCY PLAN**

9.0 WILDLIFE HABITAT

.1	The Permittee shall take every precaution to ensure that wildlife habitat is not damaged.	**HABITAT DAMAGE**

14.0 DISPOSAL - GARBAGE AND SOLID WASTE

.1	The Permittee shall remove all garbage and debris from the area of the Land Use Operation to a disposal site approved in writing by the Land Use Inspector.	**REMOVE GARBAGE**
.2	The Permittee shall ensure that the Land Use area is kept clean and tidy at all times.	**CLEAN WORK AREA**
.3	The Permittee shall burn all combustible garbage and debris in a container acceptable to the Land Use Inspector.	**INCINERATION**
.4	The Permittee shall burn all garbage and debris at least daily.	**GARBAGE DISPOSAL**
.5	The Permittee shall keep all garbage and debris in a covered metal container until disposed of.	**GARBAGE CONTAINERS**

.../4

.6 The Permittee shall remove all non-combustible garbage and debris from the Land Use area to a disposal site approved in writing by the Land Use Inspector. **REMOVE NON-COMBUSTIBLE**

.7 The Permittee shall remove all scrap metal, discarded machinery and parts, drums, buildings and building materials associated with the Land Use Operation. **REMOVE WASTE MATERIAL**

.8 The Permittee shall deposit all scrap metal, discarded machinery and parts, drums at the metal salvage site located at on site. **DEPOSIT WASTE MATERIAL**

15.0 DISPOSAL - SEWAGE AND LIQUID WASTE

.1 The Permittee shall obtain appropriate sewage disposal authorization required by law from the appropriate authority and provide a copy at least 48 hours prior to operation commencement to the Land Use Inspector. **SEWAGE DISPOSAL**

.2 The Permittee shall not allow sewage to spread to surrounding lands or water bodies. **CONTAIN SEWAGE**

16.0 DISPOSAL - TOXIC WASTE

.1 The Permittee shall clearly mark with stakes or flags the location of any spill of liquid or dry chemicals or other toxic substance and forthwith report the time, manner, location, amount and type of spill to the Engineer and Environmental Protection Service. (Environmental Protection Service can be contacted at Phone 403 667-7244, Whitehorse, Yukon). **REPORT CHEMICAL SPILLS**

18.0 EROSION CONTROL / PREVENTION

.1 The Permittee shall locate all camps on gravel, sand or other durable land. **CAMP LOCATION**

19.0 RESTORATION

.1 The Permittee shall complete all clean-up and restoration of the lands used prior to the expiry date of this Permit. **CLEAN-UP**

.../5

21.0 OTHER MATTERS

.1	The Engineer reserves the right to close any area to the Permittee during periods when dangers to natural resources are severe.	**CLOSURE**
.2	The Permittee shall be liable for any costs of clean-up resulting from this Land Use operation.	**CLEAN-UP LIABILITY**

M. Zrum
Head, Land Use

APPENDIX IVa

ANALYTICAL RESULTS OF METAL CONCENTRATIONS

Sheet1

SAMP		NI	CO	CD	PB	ZN	CR	AS	
960815-02[illegible]		35	14.1	<1.0	<10	76	52	7.4	
960815-023	38	32	14.2	<1.0	<10	68	49	6.0	*
960815-024	62	36	14.1	<1.0	55	141	50	3.6	
960815-025	451	48	16.3	<1.0	7787	279	58	5.7	
960815-026	790	69	18.0	<1.0	3247	1118	66	7.1	
9608[illegible]5-027	314	42	16.2	<1.0	2342	433	50	5.3	
960[illegible]5-028	128	54	15.9	<1.0	374	820	61	5.2	
[illegible]0815-029	43	31	13.0	<1.0	19	80	45	4.2	
[illegible]0815-030	53	38	13.2	<1.0	42	121	56	4.9	
[illegible]0815-031	45	32	11.9	<1.0	29	101	54	4.4	
960820-021	29	38	12.5	<1.0	<10	54	52	3.3	
960820-022	50	42	11.5	<1.0	<10	93	80	3.7	
[illegible]	88	36	12.4	<1.0	51	153	52	5.0	
96[illegible]	32	31	11.5	<1.0	<10	60	45	4.0	
960820-[illegible]	41	34	13.1	<1.0	<10	62	55	1.9	
960820-[illegible]26	283	34	12.6	<1.0	92	193	55	4.3	
96-10554	40	34	12.1	<1.0	<10	92	52	5.4	*
96-10555	38	34	11.2	<1.0	12	97	54	5.3	
96-10590	40	26	12.8	<1.0	<10	85	46	4.8	
96-10591	47	29	12.9	<1.0	124	101	47	5.1	
96-10592	48	29	13.6	<1.0	2829	106	3	5.7	
96-0822-00	45	30	15.4	<1.0	<10	64	55	6.6	
96-0822-00	47	32	12.2	<1.0	<10	92	59	5.3	
96-0822-00	39	30	14.9	<1.0	<10	69	53	6.4	
96-0822-00	29	21	14.6	<1.0	<10	78	47	5.1	
96-0822-00	24	17	11.1	<1.0	<10	65	33	3.6	
96-0822-00	35	24	13.8	<1.0	42	98	40	3.0	
96-0822-00	33	25	13.4	<1.0	<10	69	45	4.5	
96-0822-00	28	38	12.8	<1.0	<10	97	60	7.4	
96-0822-00	44	26	14.4	<1.0	<10	85	42	3.9	
int on concrete									
281-04	23	18	7.7	<1.0	26235	16965	34	3.1	
mess	36	39	12.5	<1.0	14	155	52	16.1	
Mess	36	46	11.8	<1.0	14	164	50	16.9	
960815-023	38	35	14.0	<1.0	<10	76	52	6.5	
960815-023	33	29	14.3	<1.0	<10	61	46	5.5	
96-10554	39	33	11.7	<1.0	<10	86	52	5.6	
96-10554	41	35	12.5	<1.0	<10	98	52	5.2	

Post it [illegible] 9 pages
To Paul [illegible] From Paula Whitley
Co./Dept. [illegible] Co. [illegible]
Phone # [illegible] Phone # [illegible]

Sample 960820-025 added

Sheet1

SNAG					
Sample					
	CU	PB	ZN	CR	
960820-001	34.8	<10	68	33	
960820-002	83.1	14	53	53	
960820-003	60.7	72	126	46	
960820-004	44.2	<10	88	65	
960820-005	52.8	56	89	41	
960820-006	21.7	33	65	50	
960820-007	33.1	101	73	32	*
960820-008	34.0	10	65	46	
960820-009	30.2	175	69	34	
960820-010	32.7	103	70	146	
960820-011	104.2	1625	65	37	
960820-012	53.2	222	81	54	
960820-013	36.9	<10	77	76	
960820-014	56.4	162	95	46	
960820-015	37.2	16	87	47	
960820-016	35.9	10	80	64	*
960827-001B	39.5	<10	79	41	
960827-002B	36.9	236	155	38	
960827-003B	38.1	<10	68	41	
960827-004B	41.5	<10	64	38	

Post-it™ Fax Note 7671	Date 27/9	# of pages ▶ 1
To Dawn.	From Paula	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

SNAG

SNAG

SAMPLE	CU	NI	CO	CD	PB	ZN	CR	AS
96-0815-001	123	31	13.1	<1.0	2485	289	51	5.3
96-0815-002	35	31	16.6	<1.0	<10	73	<20	0.6
96-0815-003	42	27	11.0	<1.0	44	61	44	4.6
96-0815-004	36	28	11.7	<1.0	<10	56	31	1.3
96-0815-005	63	29	18.3	<1.0	12	95	58	1.2
96-0815-006	73	55	23	<1.0	<10	124	82	8.6
96-0815-007	43	32	13.8	<1.0	<10	79	76	5.5
96-0815-008	37	28	13.4	<1.0	<10	107	<20	0.5
96-0815-009	42	36	14.0	<1.0	<10	71	54	1.0
96-0815-010	48	29	14.9	<1.0	<10	86	49	4.4
96-0815-011	47	25	13.5	<1.0	43	225	23	0.5
96-0815-012	40	29	14.4	<1.0	<10	75	<20	0.8
96-0815-013	33	28	11.9	<1.0	<10	68	<20	0.4
96-0815-014	37	31	13.1	<1.0	<10	80	24	0.9
96-0815-015	37	29	12.9	<1.0	<10	85	42	1.7
96-0815-017	43	29	14.1	<1.0	<10	83	35	1.3
96-0815-018	51	30	13.9	<1.0	10	97	39	0.8
96-0815-019	44	29	15.1	<1.0	<10	89	58	1.6
96-0815-020	42	35	15.9	<1.0	<10	91	<20	0.9
96-0815-021	45	30	13.6	<1.0	<10	84	36	0.7

2 WHSE

PWRHSE

Post-it™ Fax Note 7671 | Date 5.9.96 | # of pages ▶ 1

To Paul Oliver | From Paula Whitley

Co./Dept. SNAG jobsite | Co. Queen's U

Phone # | Phone # 613 545 2642

Fax # 403 862 7601 | Fax # 613 545 2897

Sheet1

	100	100	50	5	500	500	250	30	
SAMPLE	CU	NI	CO	CD	PB	ZN	CR	AS	
10621	39	33	13.3	<1.0	100	90	55	6.2	
10622	47	36	14.1	<1.0	27	67	55	6.4	
10623	39	36	16.1	<1.0	<10	65	57	6.9	
10624	40	37	15.9	<1.0	113	81	53	5.8	
10625	39	31	14.7	<1.0	68	82	52	4.4	*
10626	38	35	13.9	<1.0	43	81	47	6.1	
10627	33	34	14.5	<1.0	15	494	46	4.8	
10628	30	28	12.5	<1.0	10	50	47	5.9	
10629	35	29	12.1	<1.0	<10	39	43	5.0	
10639	34	52	11.6	<1.0	32	65	39	4.6	*
10543	43	38	13.4	<1.0	40	69	45	3.1	
10544	36	37	13.4	<1.0	<10	57	53	5.4	
10545	38	36	14.5	<1.0	<10	50	53	5.6	
10546	32	32	11.8	<1.0	<10	54	44	7.3	
10547	34	31	10.9	<1.0	<10	55	40	3.2	
10548	785	29	11.5	28.6	1940	4880	5610	23.3	
10549	443	34	13.6	40.1	2620	462	104	23.9	

* Average of Duplicate Samples.

Post-it™ Fax Note 7671	Date 14 8	# of pages ▶ 1
To Yasmin Nizami	From Paula Whitley	
Co./Dept. ESS.	Co. ASO-Queens.	
Phone #	Phone # 613 545 2642	
Fax # 604 669 0430	Fax # 613 545 2897	

Sheet1

RESULTS OF ANALYSES OF SNAG SOIL SAMPLES

TO: YASMIN NIZAMI
FAX: 604-669-0430

SAMPLE	CU (100)	NI (100)	CO (50)	CD (5)	PB (500)	ZN (500)	CR (250)	AS (30)	
96-10531	28	24	15.4	<1.0	<10	59	49	7.2	
96-10532	51	43	22	<1.0	<10	67	74	6.7	
96-10533	28	29	18.5	<1.0	16	80	58	7.4	
96-10534	46	40	19.8	<1.0	<10	69	62	5.5	*
96-10535	45	38	19.1	<1.0	26	95	56	6.1	
96-10536	49	37	18.9	<1.0	<10	78	58	8.0	
96-10537	45	35	21	<1.0	<10	82	57	5.9	
96-10538	37	31	19.9	<1.0	<10	65	50	4.8	
96-10539	38	30	14.6	<1.0	42	82	62	5.4	
96-10540	33	30	14.1	<1.0	78	88	61	6.1	
96-10593	61	30	13.9	<1.0	261	271	47	6.0	
96-10594	37	32	13.8	<1.0	<10	67	54	5.2	
96-10959	34	30	13.1	<1.0	95	154	44	5.6	*
96-10596	41	33	12.7	<1.0	<10	85	48	4.5	
96-10597	44	32	12.9	<1.0	14	107	43	4.5	
96-10598	37	31	14.1	<1.0	13	72	44	3.7	
96-10599	39	32	13.1	<1.0	159	209	45	4.2	
96-10600	31	26	7.8	<1.0	56	88	36	3.1	*
96-10601	110	39	13.4	<1.0	213	224	56	3.6	
96-10602	48	32	12.1	<1.0	285	288	47	4.6	
96-10603	27	25	10.6	<1.0	<10	67	40	5.8	
96-10604	46	46	19.5	<1.0	15	147	78	6.2	
96-10605	25	32	13.4	<1.0	<10	59	45	4.2	*
96-10606	23	31	13.1	<1.0	<10	78	41	4.0	
96-10607	23	29	12.4	<1.0	25	86	38	3.9	
96-10608	27	34	14.1	<1.0	<10	69	54	4.2	
96-10609	35	39	13.9	<1.0	<10	59	49	4.9	
96-10610	94	44	12.3	<1.0	185	81	50	5.9	
96-10611	26	28	13.8	16	<10	1315	54	3.8	
96-10613	31	27	14.0	<1.0	<10	71	49	7.4	
96-10614	37	32	15.8	<1.0	16	115	50	5.3	*
96-10615	41	32	14.4	<1.0	<10	58	55	4.8	
96-10616	37	32	15.0	<1.0	<10	72	56	5.6	
96-10617	34	29	12.6	<1.0	<10	62	43	5.8	
96-10618	34	31	13.4	<1.0	<10	96	47	6.0	
96-10619	37	32	14.2	<1.0	<10	68	48	4.4	
96-10620	33	26	12.6	<1.0	<10	61	38	6.2	*

* = average of duplicate samples

APPENDIX IVb

ANALYTICAL RESULTS OF PCB CONCENTRATIONS

ANALYSIS REPORT

ANALYTICAL RESULTS FOR: PCBs

CLIENT: ESG

SAMPLE TYPE: SOIL

AXYS FILE: 9623

DATE: 11/Sept/96

METHOD NO.: CL-S-01/Ver.2

INSTRUMENT: GC-ECD

CONCENTRATION IN: ng/g

SAMPLE NO.	SAMPLE I.D.	SAMPLE SIZE: g/dry	% MOISTURE:	AROCLOR 1242		AROCLOR 1254		AROCLOR 1260	
9623-21	960827-001 B	5.52	2.3	<210		<180		<94	
9623-22	960827-002 B	8.76	4.6	<76		1800	66	940	34
9623-23	960827-003 B	5.14	3.6	<250		<210		<110	
9623-24	960827-004 B	4.95	2.1	<350		<180		<96	

1. < = Less than the detection limit indicated
2. NDR = Peak detect d not meet quantification criteria
3. Data have not been blank corrected.
4. Concentrations are recovery corrected

Approved

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 05/96

CLIENT: ESG

PROJECT: ESG - Snag airship.

SAMPLE	TEST	UNIT	RESULT
96-10529	PCB	ug/g	1116 ppm
96-10541	"	"	191 ppm
96-10542	"	"	54 ppm
96-10593	"	"	<1 ppm
96-10594	"	"	<1 ppm
96-10595	"	"	<1 ppm
96-10596	"	"	<1 ppm
96-10597	"	"	<1 ppm
96-10598	"	"	<1 ppm

Barracks Bldg

Power Bldg

Generator area/Power Bldg

Power Bldg

ANALYST: Stephen Duffy

DATE: Aug 07/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 05 /96

CLIENT: ESG

PROJECT: ESG - Snag airship

SAMPLE	TEST	UNIT	RESULT
96-10599	PCB	ug/g	<1 ppm
96-10600	"	"	<1 ppm
96-10601	"	"	<1 ppm
96-10602	"	"	<1 ppm

Tower

ANALYST: Stephen Duffy

DATE: Aug 07/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 09/96

CLIENT: ESG

PROJECT: ESG - Smog Airship

SAMPLE	TEST	UNIT	RESULT
96-10624	PCB	ug/g	<1 ppm
96-10625	PCB	ug/g	<1 ppm
96-10626	PCB	ug/g	2 ppm
96-10549	PCB	ug/g	137 ppm
96-10627	PCB	ug/g	Still to come
96-10628	PCB	ug/g	<1 ppm
96-10629	PCB	ug/g	Still to come.

soil from oil pit sump

CEPA

ANALYST: Stephen Duffy

DATE: Aug 13/96 at 7:15 pm.

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 09/96

CLIENT: ESG

PROJECT: ESG Smag - Air Strip

SAMPLE	TEST	UNIT	RESULT	
Garage → 96-10629	PCB	ug/g	< 1 ppm	
Garage Fuelhall → 96-10627	PCB	ug/g	6 ppm	CCME
small pit → 96-10548	PAH (Total)	ug/g	27 ppm	> CCME
oil pit → 96-10549	PAH (Total)	ug/g	507 ppm	> CCME

ANALYST: Stephen Duffy

DATE: Aug 14/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 9/96

CLIENT: ESG

PROJECT: ESG Snag Airship

50ppm CEPA
5ppm CCME

SAMPLE	TEST	UNIT	RESULT	
concrete from oil pit 96-10550	PCB	ug/g	296 ppm	CEPA
concrete from wash pit 96-10551	PCB	ug/g	7 ppm	CCME
dup. of 51 96-10552	PCB	ug/g	4 ppm	
soil from small pit drain 96-10548	PCB	ug/g	97 ppm	CEPA
Garage 96-10630	PCB	ug/g	<1 ppm	
Dup. 630 96-10543	PCB	ug/g	<1 ppm	
96-10544	PCB	ug/g	<1 ppm	
96-10545	PCB	ug/g	<1 ppm	
Power house soils 96-10546	PCB	ug/g	2 ppm	

ANALYST: Stephen Duffy

DATE: Aug 13/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 9/96

CLIENT: ESG

PROJECT: ESG Smog - Airship

SAMPLE	TEST	UNIT	RESULT
96-10547	PCB	ug/g	5 ppm
96-10621	PCB	ug/g	<1 ppm
96-10622	PCB	ug/g	<1 ppm
96-10623	PCB	ug/g	<1 ppm

soil from powerhouse (inside of shed)

Fireball Garage

CCME

ANALYST: Stephen Duffy

DATE: Aug 13/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26/96

CLIENT: ESG

PROJECT: ESG Snag

SAMPLE	TEST	UNIT	RESULT
96-0822-001	PCB	ug/g	<1 ppm
96-0822-002	"	"	<1 ppm
96-0822-003	"	"	<1 ppm
96-0822-004	"	"	<1 ppm
96-0822-005	"	"	<1 ppm
96-0822-006	"	"	<1 ppm
96-0822-007	"	"	2 ppm
96-0822-008	"	"	<1 ppm
96-0822-009	"	"	<1 ppm

Rear L/H corner of warehouse

Rear R/H

Rear R/H

Accessed Barracks

French exit

R/H Power house by generator (redo of SA1)

ANALYST: Stephen Duffy

DATE: Aug 31/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 26 Aug 96

CLIENT: ESG

PROJECT: SNAG

SAMPLE	TEST	UNIT	RESULT
96-0815-010	PCB	ug/g	< 1 ppm
96-0815-011	PCB	ug/g	2 ppm
96-0815-012	PCB	ug/g	< 1 ppm
96-0815-013	PCB	ug/g	< 1 ppm
96-0815-014	PCB	ug/g	< 1 ppm
96-0815-015	PCB	ug/g	< 1 ppm
96-0815-016	PCB	ug/g	3 ppm

L/H side rear of Powerhouse

ANALYST: [signature]

DATE: Aug 28/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 26 Aug 96

CLIENT: ESG

PROJECT: SNAG

SAMPLE	TEST	UNIT	RESULT
96-0815-001	PCB	ug/g	< 1 ppm
96-0815-002	"	"	< 1 ppm
96-0815-003	"	"	< 1 ppm
96-0815-004	"	"	< 1 ppm
96-0815-005	"	"	< 1 ppm
96-0815-006	"	"	< 1 ppm
96-0815-007	"	"	< 1 ppm
96-0815-008	"	"	< 1 ppm
96-0815-009	"	"	< 1 ppm

Front of Warehouse

Front of Powerhouse

HA Side of Powerhouse

ANALYST: Allison Ritter

DATE: 28 Aug 96

ESG Analy[illegible]al Laboratory

Royal Military College, Sawyer Building, Rm 3100
King[illegible], ON

DATE SUBMITTED: 26 Aug 96

CLIENT: ESG

PROJECT: SNAG

	SAMPLE	TEST	UNIT	RESULT
R/A corner of Powerhouse	96-0815-017	PCB	µg/g	< 1 ppm
	96-0815-018	"	"	1 ppm
Rear of Powerhouse	96-0815-019	"	"	< 1 ppm
	96-0815-020	"	"	< 1 ppm
	96-0815-021	"	"	< 1 ppm
QA split	96-0815-022		"	< 1 ppm
QA split	96-0815-023	"	"	< 1 ppm
Rear trench	96-0815-024	"	"	< 1 ppm
Tower Bldg.	96-0815-025	"	"	< 1 ppm

ANALYST: Stephen Duffy

DATE 29 Aug 96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26/96

CLIENT: ESG

PROJECT: ESG - 2nag

SAMPLE	TEST	UNIT	RESULT
96-0815-026	PCB	ug/g	< 1 ppm
96-0815-027	PCB	ug/g	< 1 ppm
96-0815-028	PCB	ug/g	< 1 ppm
96-0815-029	PCB	ug/g	< 1 ppm

Tower Bldg.

ANALYST: Stephen Duffy

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED : Aug 96

CLIENT : ESG

PROJECT : SNAG - ESG

SAMPLE	TEST	UNIT	RESULT
96-0815-30	PCB	ug/g	< 1 ppm
96-0815-31	PCB	ug/g	< 1 ppm
96-10590	PCB	ug/g	< 1 ppm
96-10591	PCB	ug/g	< 1 ppm
96-10592	PCB	ug/g	< 1 ppm
96-10553	"	"	< 1 ppm

Power ser trans [redacted]

L/H Were house Trench

ANALYST: Stephen Duffy

DATE: Aug 30/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26

CLIENT: ESG

PROJECT: ESG Snag

SAMPLE	TEST	UNIT	RESULT
96-020-021	PCB	ug/g	<1 ppm
96-020-022	"	"	<1 ppm
96-020-023	"	"	<1 ppm
96-020-024	"	"	<1 ppm
96-020-025	"	"	<1 ppm
-020-026	"	"	<1 ppm
10558	"	"	<1 ppm
96-10559	"	"	<1 ppm
96-10560	"	"	5 ppm

Large trench near Tower Bldg

Barracks Concrete

ANALYST: Steph Duffy

DATE: Aug 31/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE: Aug 26/96

CLIENT: 6

PROJECT: ESG - Snagg

	SAMPLE	TEST	UNIT	RESULT
PWRHSE #4 BTM	96-10573	PCB	ug/g	<1 ppm
PWRHSE TOP #5	96-10580	PCB	ug/g	81 ppm
#5 BTM	96-10581	PCB	ug/g	<1 ppm
PAINT TOWER BLDG	281-04	PCB	ug/g	<1 ppm

ANALYST: Stephen Dyer

DATE: Sept 4/

TOTAL P.02

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26/96

CLIENT: ESG

PROJECT: ESG - Smag.

(Conc)

SAMPLE	TEST	UNIT	RESULT
BARRACKS BLDG #1 TOP 96-10564	PCB	ug/g	66 ppm
" #1 BTM 96-10565	"	"	21 ppm
PWR HOUSE #6 BTM 96-10583	"	ug/g	1 ppm
PWR HSE #7 TOP 96-10584	PCB	ug/g	150 ppm
#7 BTM 96-10585	PCB	ug/g	52 ppm
PWR HSE #8 TOP 96-10586	——→	——→	Still to Come
#8 BTM 96-10587	——→	——→	Still to Come
PWR HSE #9 TOP 96-10588A	——→	——→	Still to Come
#9 BTM 96-10589A	——→	——→	Still to Come

ANALYST: [signature]

DATE: Sept 5/96

Post-it® Fax Note 7671	Date Sept 4/96	# of pages ▶ 2
To Phil Scalia	From Bruce Williams	
Co./Dept. Hemmera/Lorax	Co.	
Phone #	Phone #	
Fax # 403-862-7601	Fax #	

ESG Analy
Royal Military Colleg
Ki

DATE SUBMITTED: Aug 26/96

CLIENT: ESG

PROJECT: ESG - Snag

	SAMPLE	TEST	UNIT	RESULT
(Conc)				
BARRACKS TOP #5	96-10556	PCB	ug/g	<1 ppm
#5 BTM	96-10557	"	"	<1 ppm
PWRHSE #1 TOP	96-10566	"	"	112 ppm
#1 BTM	96-10567	"	"	<1 ppm
PWRHSE #2 BTM	96-10568	"	"	<1 ppm
#2 TOP	96-10569	"	"	28 ppm
PWRHSE #3 BTM	96-10570	"	"	<1 ppm
#3 TOP	96-10571	"	"	130 ppm
PWRHSE #4 TOP	96-10572	"	"	231 ppm

ANALYST: Stephen Duffy

DATE: Sept 4/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26 196

CLIENT: ESG

PROJECT: ESG - Smag

SAMPLE	TEST	UNIT	RESULT
96-10561 Barracks Concrete	PCB	ug/g	9 ppm
96-10562	"	"	57 ppm
96-10563	"	"	<1 ppm

ANALYST: Stephen Roffey

DATE: Sept 2 196

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26

CLIENT: ESG

PROJECT: ESG - Snag

	SAMPLE	TEST	UNIT	RESULT
PWR HSE #8 TOP	96-10586	PCB	ug/g	93 ppm
#8 BTM	96-10587	PCB	ug/g	<1 ppm
PWRHSE #9 TOP	96-10588	PCB	ug/g	232 ppm
#9 BTM	96-10589	PCB	ug/g	37 ppm

ANALYST: Stephen Duffy

DATE: Sept 6/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: Aug 26 196

CLIENT: ESG

PROJECT: ESG - Snag

SAMPLE	TEST	UNIT	RESULT
(CONC) GP #1 TOP 96-10574	PCB	ug/g	99 ppm
#1 BTM 96-10575	"	"	17 ppm
GP #2 TOP 96-10576	"	"	145 ppm
#2 BTM 96-10577	"	"	8 ppm
GP #3 TOP 96-10578	"	"	79 ppm
#3 BTM 96-10579	"	"	21 ppm
QA/QC SPLIT OF 10555 96-10557	"	"	11 ppm
(SOILS) PWRITSE 1ft REAR CORNER → 96-10555	"	"	1 ppm
(CONC) PWRITSE #6 TOP 96-10582	"	"	260 ppm

ANALYST: Steph Duff

DATE: Sept 5/96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 15 July 96

CLIENT: ESG

PROJECT: ESG SNAG

	SAMPLE	TEST	UNIT	RESULT	
4740	96-10052	PCB		138 ppm *	50ppm CEPA
4733	96-10057	"		22 ppm	
4732	96-10060	"		1500 ppm *	
4742	96-10061	"		220 ppm *	
4745	96-10062	"		2900 ppm *	
4747	96-10063	"		4000 ppm *	←
4736	96-10067	"		28 ppm	
4746	96-10085	"		7 ppm	
4813	96-10106	"		728 ppm *	

ANALYST: R Allison Lutter

DATE: 23 July 96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 23 July 96

CLIENT: ESG

PROJECT: ESG SNAG

	SAMPLE	TEST	UNIT	RESULT
[redacted]	96-10065	PCB	1	[redacted]
4779	96-10096	"	1	35 ppm
4783	96-10097	"	1	35 ppm
4788	96-10098	"	1	4 ppm
4818	96-10108	"	1	7 ppm
4829	96-10136	"	1	< 1 ppm
4824	96-10137	"	1	< 1 ppm
4820	96-10141	"	1	1 ppm
4828	96-10142	"	1	13 ppm

ANALYST: Allison Rutter

DATE: 26 July 96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 15 July 96

CLIENT: ESG

PROJECT: ESG SNAG

	SAMPLE	TEST	UNIT	RESULT
4807	96-10115	PCB		12 ppm
4812	96-10117	"		8 ppm
4819	96-10128	"		5 ppm
4743	96-10059	"		465 ppm *
4731	96-10058	"		100 ppm *

ANALYST: Allison Rutter

DATE: 23 July 96

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 23 July 96

CLIENT: ESG

PROJECT: ESG SNAG

SAMPLE	TEST	UNIT	RESULT
4823 96-10143	PCB		< 1 ppm

ANALYST: Allison Rutter

DATE: 26 July 96

Feuillets de transmission par télécopieur / Post-it™ Fax Note 7671	Date	# of pages / Nbre de pages ▶ 1
To / A: Dawn	From / De: Allison	
Co./Dept. / Cie/Service	Co. / Cie	
Phone # / N° de tél.	Phone # / N° de tél.	
Fax # / N° de télécopieur: 541-6576	Fax # / N° de télécopieur	

oratory
ding, Rm 3100

DATE SUBMITTED: 23 July 96

CLIENT: ESG

PROJECT: ESG SNAG

SAMPLE	TEST	UNIT	RESULT
4773 96-10093	PCB	/	21 ppm
4825 96-10135	PCB	/	15 ppm

ANALYST: Allison Rutter

DATE: 26 June 96

Faxed on
29 July

ESG Analytical Laboratory

Royal Military College, Sawyer Building, Rm 3100
Kingston, ON

DATE SUBMITTED: 23 July 96

CLIENT: ESG

PROJECT: ESG SNAG

SAMPLE	TEST	UNIT	RESULT
4823 96-10143	PCB		< 1 ppm

ANALYST: Allison Rutter

DATE: 26 July 96

APPENDIX IVc

ANALYTICAL RESULTS OF PESTICIDE CONCENTRATIONS

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-01

ESG I.D.: 960820-001

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 5.00 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.5

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	10
alpha HCH	ND	56
beta HCH	ND	92
gamma HCH	ND	76
Heptachlor	ND	110
Aldrin	ND	35
Oxychlordane	ND	260
trans-Chlordane	ND	31
cis-Chlordane	ND	32
o,p'-DDE	ND	8.5
p,p'-DDE	ND	10
trans-Nonachlor	ND	31
cis-Nonachlor	ND	26
o,p'-DDD	ND	13
p,p'-DDD	ND	14
p,p'-DDT	ND	15
Mirex	ND	23
Heptachlor Epoxide	ND	6.2
alpha-Endosulphan (I)	ND	5.4
Dieldrin	ND	8.1
Endrin	ND	34
Methoxychlor	ND	37

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-02

ESG I.D.: 960820-002

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.47 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 12

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	10
alpha HCH	ND	57
beta HCH	ND	93
gamma HCH	ND	75
Heptachlor	ND	120
Aldrin	ND	38
Oxychlordane	ND	270
trans-Chlordane	ND	32
cis-Chlordane	ND	34
o,p'-DDE	ND	9.4
p,p'-DDE	ND	11
trans-Nonachlor	ND	33
cis-Nonachlor	ND	27
o,p'-DDD	ND	13
p,p'-DDD	ND	15
p,p'-DDT	ND	20
Mirex	ND	28
Heptachlor Epoxide	ND	5.4
alpha-Endosulphan (I)	ND	4.4
Dieldrin	ND	7.0
Endrin	ND	26
Methoxychlor	ND	29

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-03

ESG I.D.: 960820-003

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.84 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 6.3

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	9.5
alpha HCH	ND	62
beta HCH	ND	86
gamma HCH	ND	70
Heptachlor	ND	92
Aldrin	ND	28
Oxychlordane	ND	210
trans-Chlordane	ND	25
cis-Chlordane	ND	26
o,p'-DDE	ND	6.9
p,p'-DDE	ND	8.3
trans-Nonachlor	ND	25
cis-Nonachlor	ND	21
o,p'-DDD	ND	10
p,p'-DDD	ND	12
p,p'-DDT	ND	17
Mirex	ND	26
Heptachlor Epoxide	ND	5.2
alpha-Endosulphan (I)	ND	4.4
Dieldrin	ND	6.8
Endrin	ND	25
Methoxychlor	ND	28

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-04

ESG I.D.: 960620-004

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.79 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 8.1

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	7.7
alpha HCH	ND	41
beta HCH	ND	68
gamma HCH	ND	56
Heptachlor	ND	67
Aldrin	ND	20
Oxychlordane	ND	150
trans-Chlordane	ND	16
cis-Chlordane	ND	19
o,p'-DDE	ND	4.9
p,p'-DDE	ND	5.8
trans-Nonachlor	ND	18
cis-Nonachlor	ND	15
o,p'-DDD	ND	7.6
p,p'-DDD	ND	8.5
p,p'-DDT	ND	11
Mirex	ND	17
Heptachlor Epoxide	ND	4.8
alpha-Endosulphan (I)	ND	3.5
Dieldrin	ND	5.7
Endrin	ND	24
Methoxychlor	ND	26

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-05

ESG I.D.: 960820-005

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 5.04 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.8

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	7.9
alpha HCH	ND	44
beta HCH	ND	72
gamma HCH	ND	59
Heptachlor	ND	76
Aldrin	ND	23
Oxychlordane	ND	170
trans-Chlordane	ND	21
cis-Chlordane	ND	22
o,p'-DDE	ND	5.5
p,p'-DDE	ND	6.6
trans-Nonachlor	ND	21
cis-Nonachlor	ND	17
o,p'-DDD	ND	6.7
p,p'-DDD	ND	9.7
p,p'-DDT	ND	12
Mirex	ND	18
Heptachlor Epoxide	ND	4.3
alpha-Endosulphan (I)	ND	3.6
Dieldrin	ND	5.6
Endrin	ND	20
Methoxychlor	ND	23

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

Post-it® Fax Note 7671	Date Sept 12	# of pages ▶ 9
To Paul Oliver	From Paul Sanborn	
Co./Dept. LDA's	Co. HRC	
Phone #	Phone # 669-0424	
Fax # 862-7221	Fax # 665-0430	

EPORT

CLIENT: ESG

ESG I.D.: 960820-006

SAMPLE TYPE: Soil

SAMPLE SIZE: 3.89 g dry

% MOISTURE: 27

AXYS ID: 9623-08A

DATE: 12/Sept/96

METHOD NO.: CL-S-01/Ver.2

INSTRUMENT: GC-MS/GC-ECD

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	10
alpha HCH	ND	60
beta HCH	ND	98
gamma HCH	ND	80
Heptachlor	ND	120
Aldrin	ND	35
Oxychlordane	ND	260
trans-Chlordane	ND	32
cis-Chlordane	ND	33
o,p'-DDE	ND	8.8
p,p'-DDE	ND	10
trans-Nonachlor	ND	32
cis-Nonachlor	ND	26
o,p'-DDD	ND	13
p,p'-DDD	ND	15
p,p'-DDT	ND	19
Mirex	ND	26
Heptachlor Epoxide	ND	5.5
alpha-Endosulphan (I)	ND	5.5
Dieldrin	ND	7.2
Endrin	ND	31
Methoxychlor	ND	33

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-068
DUPLICATE

ESG I.D.: 960820-006

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 3.65 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 28

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	10
alpha HCH	ND	58
beta HCH	ND	94
gamma HCH	ND	78
Heptachlor	ND	94
Aldrin	ND	29
Oxychlordane	ND	210
trans-Chlordane	ND	26
cis-Chlordane	ND	27
o,p'-DDE	ND	7.1
p,p'-DDE	ND	8.5
trans-Nonachlor	ND	26
cis-Nonachlor	ND	21
o,p'-DDD	ND	11
p,p'-DDD	ND	12
p,p'-DDT	ND	17
Mirex	ND	24
Heptachlor Epoxide	ND	6.1
alpha-Endosulphan (I)	ND	5.7
Dieldrin	ND	8.0
Endrin	ND	34
Methoxychlor	ND	36

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-07

ESG I.D.: 960820-007

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.41 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 18

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	8.6
alpha HCH	ND	50
beta HCH	ND	81
gamma HCH	ND	67
Heptachlor	ND	83
Aldrin	ND	25
Oxychlordane	ND	190
trans-Chlordane	ND	23
cis-Chlordane	ND	24
o,p'-DDE	ND	6.1
p,p'-DDE	ND	7.3
trans-Nonachlor	ND	23
cis-Nonachlor	ND	19
o,p'-DDD	ND	9.5
p,p'-DDD	ND	10
p,p'-DDT	ND	15
Mirex	ND	22
Heptachlor Epoxide	ND	4.9
alpha-Endosulphan (I)	ND	4.1
Dieldrin	ND	6.4
Endrin	ND	27
Methoxychlor	ND	29

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9629-08

ESG I.D.: 960820-008

DATE: 12/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.52 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 14

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	8.7
alpha HCH	ND	47
beta HCH	ND	77
gamma HCH	ND	63
Heptachlor	ND	78
Aldrin	ND	24
Oxychlordane	ND	180
trans-Chlordane	ND	21
cis-Chlordane	ND	22
o,p'-DDE	ND	5.6
p,p'-DDE	ND	6.7
trans-Nonachlor	ND	21
cis-Nonachlor	ND	18
o,p'-DDD	ND	8.8
p,p'-DDD	ND	9.9
p,p'-DDT	ND	14
Mirex	ND	20
Heptachlor Epoxide	ND	4.7
alpha-Endosulphan (I)	ND	4.5
Dieldrin	ND	6.2
Endrin	ND	26
Methoxychlor	ND	28

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

ESG I.D.: 960820-009

SAMPLE TYPE: Soil

SAMPLE SIZE: 4.11 g dry

% MOISTURE: 19

AXYS ID: 9623-09

DATE: 13/Sept/96

METHOD NO.: CL-S-01/Ver.2

INSTRUMENT: GC-MS/GC-ECD

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	10
alpha HCH	ND	98
beta HCH	ND	150
gamma HCH	ND	130
Heptachlor	ND	83
Aldrin	ND	26
Oxychlordane	ND	210
trans-Chlordane	ND	26
cis-Chlordane	ND	27
o,p'-DDE	ND	7.1
p,p'-DDE	ND	8.4
trans-Nonachlor	ND	21
cis-Nonachlor	ND	17
o,p'-DDD	ND	11
p,p'-DDD	ND	12
p,p'-DDT	ND	19
Mirex	ND	22
Heptachlor Epoxide	ND	6.6
alpha-Endosulphan (I)	ND	5.4
Dieldrin	ND	7.9
Endrin	ND	27
Methoxychlor	ND	34

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-10A

ESG I.D.: 960820-010

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.59 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 17

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	8.1
alpha HCH	ND	92
beta HCH	ND	140
gamma HCH	ND	120
Heptachlor	ND	76
Aldrin	ND	23
Oxychlordane	ND	190
trans-Chlordane	ND	24
cis-Chlordane	ND	25
o,p'-DDE	ND	6.5
p,p'-DDE	ND	7.6
trans-Nonachlor	ND	20
cis-Nonachlor	ND	15
o,p'-DDD	ND	10
p,p'-DDD	ND	11
p,p'-DDT	ND	17
Mirex	ND	19
Heptachlor Epoxide	ND	5.8
alpha-Endosulphan (I)	ND	4.8
Dieldrin	ND	6.9
Endrin	ND	23
Methoxychlor	ND	30

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-10B
DUPLICATE

ESG I.D.: 960820-010

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.38 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 18

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	7.6
alpha HCH	ND	79
beta HCH	ND	120
gamma HCH	ND	110
Heptachlor	ND	60
Aldrin	ND	19
Oxychlordane	ND	150
trans-Chlordane	ND	19
cis-Chlordane	ND	20
o,p'-DDE	ND	5.2
p,p'-DDE	ND	6.1
trans-Nonachlor	ND	15
cis-Nonachlor	ND	12
o,p'-DDD	ND	8.3
p,p'-DDD	ND	9.0
p,p'-DDT	ND	16
Mirex	ND	18
Heptachlor Epoxide	ND	5.4
alpha-Endosulphan (I)	ND	4.3
Dieldrin	ND	6.4
Endrin	ND	22
Methoxychlor	ND	28

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-11

ESG I.D.: 960820-011

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.86 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.2

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	8.1
alpha HCH	ND	100
beta HCH	ND	160
gamma HCH	ND	140
Heptachlor	ND	89
Aldrin	ND	28
Oxychlordane	ND	230
trans-Chlordane	ND	28
cis-Chlordane	ND	29
o,p'-DDE	ND	29
p,p'-DDE	ND	34
trans-Nonachlor	ND	23
cis-Nonachlor	ND	18
o,p'-DDD	ND	42
p,p'-DDD	ND	45
p,p'-DDT	ND	94
Mirex	ND	31
Heptachlor Epoxide	ND	5.8
alpha-Endosulphan (I)	ND	4.8
Dieldrin	ND	7.5
Endrin	ND	28
Methoxychlor	ND	32

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-12

ESG I.D.: 960820-012

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 5.09 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 5.8

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	7.5
alpha HCH	ND	82
beta HCH	ND	130
gamma HCH	ND	110
Heptachlor	320	65
Aldrin	ND	20
Oxychlordane	ND	160
trans-Chlordane	830	20
cis-Chlordane	650	21
o,p'-DDE	ND	5.5
p,p'-DDE	10	6.3
trans-Nonachlor	190	16
cis-Nonachlor	36	13
o,p'-DDD	ND	8.9
p,p'-DDD	ND	9.5
p,p'-DDT	48	19
Mirex	ND	19
Heptachlor Epoxide	53	5.7
alpha-Endosulphan (I)	ND	3.8
Dieldrin	ND	5.9
Endrin	ND	22
Methoxychlor	ND	25

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-13

ESG I.D.: 960820-013

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.87 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.6

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	5.4
alpha HCH	ND	66
beta HCH	ND	100
gamma HCH	ND	88
Heptachlor	ND	50
Aldrin	ND	15
Oxychlordane	ND	130
trans-Chlordane	ND	16
cis-Chlordane	ND	16
o,p'-DDE	ND	4.2
p,p'-DDE	ND	4.9
trans-Nonachlor	ND	13
cis-Nonachlor	ND	10
o,p'-DDD	ND	6.9
p,p'-DDD	ND	7.4
p,p'-DDT	ND	14
Mirex	ND	16
Heptachlor Epoxide	ND	4.8
alpha-Endosulphan (I)	ND	3.9
Dieldrin	ND	6.0
Endrin	ND	20
Methoxychlor	ND	26

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-14

ESG I.D.: 960820-014

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.97 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 5.1

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	7.4
alpha HCH	ND	97
beta HCH	ND	150
gamma HCH	ND	130
Heptachlor	ND	69
Aldrin	ND	21
Oxychlordane	ND	170
trans-Chlordane	ND	22
cis-Chlordane	ND	22
o,p'-DDE	ND	6.0
p,p'-DDE	8.6	7.0
trans-Nonachlor	ND	18
cis-Nonachlor	ND	14
o,p'-DDD	ND	9.5
p,p'-DDD	ND	10
p,p'-DDT	ND	19
Mirex	ND	22
Heptachlor Epoxide	ND	3.7
alpha-Endosulphan (I)	ND	3.0
Dieldrin	ND	4.7
Endrin	ND	18
Methoxychlor	ND	20

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-15

ESG I.D.: 960820-015

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 5.84 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.2

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	4.6
alpha HCH	ND	59
beta HCH	ND	92
gamma HCH	ND	78
Heptachlor	1000	41
Aldrin	ND	13
Oxychlordane	ND	110
trans-Chlordane	2500	14
cis-Chlordane	2000	14
o,p'-DDE	ND	5.7
p,p'-DDE	ND	6.7
trans-Nonachlor	580	11
cis-Nonachlor	100	8.6
o,p'-DDD	ND	10
p,p'-DDD	ND	11
p,p'-DDT	NDR 28	23
Mirex	ND	15
Heptachlor Epoxide	120	5.3
alpha-Endosulphan (I)	ND	4.7
Dieldrin	ND	6.9
Endrin	ND	23
Methoxychlor	ND	30

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT: ESG

AXYS ID: 9623-16

ESG I.D.: 960820-016

DATE: 13/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.99 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 4.1

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
HCB	ND	5.6
alpha HCH	ND	63
beta HCH	ND	99
gamma HCH	ND	84
Heptachlor	ND	43
Aldrin	ND	13
Oxychlordane	ND	110
trans-Chlordane	ND	23
cis-Chlordane	ND	19
o,p'-DDE	ND	3.5
p,p'-DDE	ND	5.3
trans-Nonachlor	ND	11
cis-Nonachlor	ND	8.7
o,p'-DDD	ND	6.0
p,p'-DDD	ND	6.4
p,p'-DDT	ND	13
Mirex	ND	13
Heptachlor Epoxide	ND	5.3
alpha-Endosulphan (I)	ND	4.6
Dieldrin	ND	6.7
Endrin	ND	22
Methoxychlor	ND	29

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

F A X T R A N S M I S S I O N

AXYS | Axys Analytical Services Ltd

POST OFFICE BOX 2219, 2045 MILLS ROAD, SIDNEY, BRITISH COLUMBIA, CANADA V8L 3S8

TEL (604) 656-0881
FAX (604) 656-4511

DATE: 22 November 1996 TIME: TOTAL PAGES (INCL. THIS PAGE) 6

CONTACT: Pat Fortin/Sandra Englander/Jasmin Nizami/Brett BATCH NO: CL-0933

ORGANIZATION: ESG OUR FILE: 9623

ADDRESS: SAMPLE NO: 25 & 26

FAX: 477-8721 / 1-613-541-6596 / 1-604-669-0430 /1-403-667-3206

FROM: Dale Hoover

MESSAGE:

Attached are the results for two soil samples submitted for Pesticide analysis. An electronic copy of the data will be forwarded by E-mail. If you have any questions, please do not hesitate to call.

Regards

BATCH SUMMARY

Batch ID: CL-0933	***Date:*** 22 November 1996
Analysis Type: Pesticides	***Matrix Type:*** Soil

BATCH MAKEUP

Samples: 9623 - 25 - 26	***Blank:*** CL-S-BLK 933
	Reference or Spike: CL-S-SPM 658
	Duplicate:

Comments

1. The samples were worked up following your instructions for samples containing potentially high levels of pesticides. For this reason the detection limits exceed routine Axys limits.

PESTICIDE ANALYSIS REPORT

CLIENT SAMPLE I.D: Procedural Blank

CLIENT: ESG

SAMPLE TYPE: Blank

SAMPLE SIZE: 5.0 g

AXYS ID: CL-S-BLK 933

DATE: 22/Nov/96

METHOD NO.: CL-S-01/Ver.2

INSTRUMENT: GC-MS/GC-ECD

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
Hexachlorobenzene	ND	0.12
alpha HCH	ND	0.49
beta HCH	ND	0.78
gamma HCH	ND	0.69
Heptachlor	ND	2.6
Aldrin	ND	0.89
Oxychlordane	ND	4.0
trans-Chlordane	ND	0.71
cis-Chlordane	ND	0.68
o,p'-DDE	ND	0.2
p,p'-DDE	ND	0.22
trans-Nonachlor	ND	0.62
cis-Nonachlor	ND	0.47
o,p'-DDD	ND	0.21
p,p'-DDD	ND	0.22
p,p'-DDT	ND	0.28
Mirex	ND	0.24
Heptachlor Epoxide	ND	0.03
alpha-Endosulphan (I)	ND	0.04
Dieldrin	ND	0.04
Endrin	ND	0.13
Methoxychlor	ND	0.2

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT SAMPLE I.D: Spiked Matrix

AXYS ID: CL-S-SPM 656

CLIENT: ESG

DATE: 22/Nov/99

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 10.0 g

INSTRUMENT: GC-MS/GC-ECD

CONCENTRATION IN: ng/g

Compounds	Determined	Expected	% Recovery
Hexachlorobenzene	5.4	5.4	100
alpha HCH	5.3	5.8	91
beta HCH	6.6	6.5	101
gamma HCH	5.6	5.9	95
Heptachlor	6.9	6.4	108
Aldrin	4.7	4.3	109
Oxychlordane	8.2	7.0	117
trans-Chlordane	4.2	3.4	124
cis-Chlordane	5.1	4.8	106
o,p'-DDE	6.9	6.1	113
p,p'-DDE	5.5	5.5	100
trans-Nonachlor	4.8	4.2	114
cis-Nonachlor	2.8	3.1	90
o,p'-DDD	6.1	5.8	105
p,p'-DDD	6.4	6.6	97
p,p'-DDT	6.3	6.1	103
Mirex	5.4	5.4	100
Heptachlor Epoxide	2.7	3.8	71
alpha-Endosulphan (I)	4.0	3.8	105
Dieldrin	3.5	4.9	71
Endrin	8.1	8.9	91
Methoxychlor	21	22	95

1. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT SAMPLE I.D: 960916-15

AXYS ID: 9623-25

CLIENT: ESG

DATE: 22/Nov/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.86 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 7.2

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
Hexachlorobenzene	ND	37
alpha HCH	ND	160
beta HCH	ND	260
gamma HCH	ND	220
Heptachlor	ND	330
Aldrin	ND	110
Oxychlordane	ND	660
trans-Chlordane	ND	150
cis-Chlordane	ND	150
o,p'-DDE	ND	42
p,p'-DDE	ND	46
trans-Nonachlor	ND	160
cis-Nonachlor	ND	120
o,p'-DDD	ND	42
p,p'-DDD	ND	45
p,p'-DDT	ND	61
Mirex	ND	48
Heptachlor Epoxide	ND	6.2
alpha-Endosulphan (I)	ND	7.6
Dieldrin	ND	7.7
Endrin	ND	30
Methoxychlor	ND	34

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

PESTICIDE ANALYSIS REPORT

CLIENT SAMPLE I.D: 960916-12

AXYS ID: 9623-25

CLIENT: ESG

DATE: 22/Nov/96

SAMPLE TYPE: Soil

METHOD NO.: CL-S-01/Ver.2

SAMPLE SIZE: 4.86 g dry

INSTRUMENT: GC-MS/GC-ECD

% MOISTURE: 5.0

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
Hexachlorobenzene	ND	32
alpha HCH	ND	120
beta HCH	ND	200
gamma HCH	ND	170
Heptachlor	ND	220
Aldrin	ND	73
Oxychlordane	ND	430
trans-Chlordane	ND	99
cis-Chlordane	ND	94
o,p'-DDE	ND	24
p,p'-DDE	ND	26
trans-Nonachlor	ND	84
cis-Nonachlor	ND	64
o,p'-DDD	ND	26
p,p'-DDD	ND	27
p,p'-DDT	ND	36
Mirex	ND	35
Heptachlor Epoxide	ND	6.4
alpha-Endosulphan (I)	ND	8.0
Dieldrin	ND	8.0
Endrin	ND	31
Methoxychlor	ND	36

1. SDL = Sample Detection Limit
2. ND = Not Detected
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

Approved

APPENDIX IVd

ANALYTICAL RESULTS OF PAH CONCENTRATIONS AND IMMUNOASSAY FIELD TEST RESULTS

PAH ANALYSIS REPORT

CLIENT SAMPLE I.D.: 980827-008A

AXYS FILE: 9623-19

CLIENT: ESG

DATE: 11/Sept/98

SAMPLE TYPE: Soil

METHOD NO.: PH-0-01/Ver.2

SAMPLE SIZE: 9.81 g dry

INSTRUMENT: GC-MS

% MOISTURE: 4.2

CONCENTRATION IN: ng/g

Compounds		Concentration	(SDL)
Naphthalene		6.1	0.15
Acenaphthylene		<0.25	
Acenaphthene		<0.31	
Fluorene		<0.25	
Phenanthrene		5.2	0.09
Anthracene		0.32	0.09
Fluoranthene		2.1	0.04
Pyrene		2.5	0.04
Benz(a)anthracene		0.7	0.09
Chrysene		1.4	0.05
Benzofluoranthenes	NDR	1.3	0.21
Benzo(e)pyrene		0.94	0.20
Benzo(a)pyrene	NDR	0.55	0.34
Perylene		<0.24	
Dibenz(a,h)anthracene		<0.72	
Indeno(1,2,3-cd)pyrene	NDR	0.76	0.30
Benzo(ghi)perylene		0.96	0.24
C1 naphthalenes		20	0.07
C2 naphthalenes		31	0.20
C3 naphthalenes		28	0.06
C4 naphthalenes		22	0.29
C1 phen,anth		8.5	0.06
C2 phen,anth		<0.35	
C3 phen,anth		4.4	0.15
C4 phen,anth		<0.41	
Dibenzothiophene	NDR	0.37	0.16
C1 dibenzothiophene		0.53	0.05
C2 dibenzothiophene		<0.03	

Surrogate Standards	% Recovery
Naphthalene d-8	82
Acenaphthene d-10	84
Phenanthrene d-10	99
Pyrene d-10	91
Chrysene d-12	79
Benzo(e)pyrene d-12	82
Perylene d-12	77
Dibenz(ah)anthracene d-14	69
Benzo(ghi)perylene d-12	87
2-Methylnaphthalene d-10	53

Approved

1. SDL = Sample Detection Limit
2. ND = Less than the detection limit indicated
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

PAH ANALYSIS REPORT

CLIENT SAMPLE I.D.: 960827-004A

AXYS FILE: 9623-20

CLIENT: ESG

DATE: 11/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: PH-S-01/Ver.2

SAMPLE SIZE: 10.14 g dry

INSTRUMENT: GC-MS

% MOISTURE: 2.6

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
Naphthalene	0.58	0.11
Acenaphthylene	<0.09	
Acenaphthene	<0.26	
Fluorene	<0.05	
Phenanthrene	0.31	0.07
Anthracene	<0.08	
Fluoranthene	0.60	0.04
Pyrene	0.71	0.04
Benz(a)anthracene	<0.04	
Chrysene	0.33	0.05
Benzofluoranthenes	NDR 0.32	0.19
Benzo(e)pyrene	<0.18	
Benzo(a)pyrene	<0.22	
Perylene	<0.31	
Dibenz(ah)anthracene	<0.70	
Indeno(1,2,3-cd)pyrene	<0.28	
Benzo(ghi)perylene	<0.23	
C1 naphthalenes	<0.22	
C2 naphthalenes	<0.17	
C3 naphthalenes	<0.05	
C4 naphthalenes	<0.24	
C1 phen,anth	<0.04	
C2 phen,anth	<0.34	
C3 phen,anth	<0.12	
C4 phen,anth	<0.39	
Dibenzothiophene	<0.16	
C1 dibenzothiophene	<0.04	
C2 dibenzothiophene	<0.03	

Surrogate Standards	% Recovery
Naphthalene d-8	79
Acenaphthene d-10	70
Phenanthrene d-10	73
Pyrene d-10	79
Chrysene d-12	82
Benzo(a)pyrene d-12	86
Perylene d-12	82
Dibenz(ah)anthracene d-14	67
Benzo(ghi)perylene d-12	67
2-Methylnaphthalene d-10	67

Approved

1. SDL = Sample Detection Limit
2. ND = Less than the detection limit indicated
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

PAH ANALYSIS REPORT

CLIENT SAMPLE I.D.: HS6 N.R.C. Polycyclic Aromatic Hydrocarbons in marine sediments

AXYS FILE: PH-S-CRM 342

CLIENT: ESG

DATE: 11/Sept/96

SAMPLE TYPE: Sediment

METHOD NO.: PH-S-01/Ver.2

SAMPLE SIZE: 1.02 g dry

INSTRUMENT: GC-MS

CONCENTRATION IN: ng/g

Compounds	Determined	Expected
Naphthalene	4400	4100 +/- 1100
Acenaphthylene	180	190 +/- 50
Acenaphthene	190	230 +/- 70
Fluorene	350	470 +/- 120
Phenanthrene	3200	3000 +/- 600
Anthracene	820	1100 +/- 400
Fluoranthene	3200	3540 +/- 650
Pyrene	2500	3000 +/- 600
Benz(a)anthracene	1500	1600 +/- 300
Chrysene	2300	2000 +/- 300
Benzofluoranthenes	4800	4230 +/- 750
Benzo(a)pyrene	1800	2200 +/- 400
Dibenz(ah)anthracene	360	490 +/- 160
Indeno(1,2,3-cd)pyrene	1700	1950 +/- 580
Benzo(ghi)perylene	1600	1780 +/- 720

Surrogate Standards	% Recovery
Naphthalene-d8	49
Acenaphthene-d10	69
Phenanthrene d-10	69
Pyrene d-10	72
Chrysene d-12	61
Benzo(a)pyrene d-12	53
Perylene d-12	48
Dibenz(ah)anthracene d-14	37
Benzo(ghi)perylene d-12	30
2-Methylnaphthalene d-10	50

1. Concentrations are recovery corrected

Approved

DATE	8/14/96			
	RESULTS			
			ng/g (ppb)	
PAH			#1	#2
			96-10548	96-10549
Naphthalene		1	20643	374186
Acenaphylene		2	26	0
Acenapthene		3	0	52450
Fluorene		4	161	45885
Phenanthrene		5	474	17571
Anthracene		6	0	3118
Fluroanthene		7	1153	2085
Pyrene		8	1318	3149
Benzo(a)anthracene		9	237	1205
Chrysene		10	421	2635
Benzo(b)fluoranthene		11	313	0
Benzo(k)fluoranthene		12	274	431
Benzo(a)pyrene		13	275	194
Indeno(1,2,3-cd)pyrene		14	495	0
Dibenz(a,h)anthracene		15	0	0
Benzo(ghi)perylene		16	1076	4238
Total			26868	507145
Comments:				

(3)

- 96 10548 · 27 ppm
49 507 ppm

PAH ANALYSIS REPORT

CLIENT SAMPLE I.D.: 960827-001A

AXYS FILE: 9623-17

CLIENT: ESG

DATE: 11/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: PH-S-01/Ver.2

SAMPLE SIZE: 7.74 g dry

INSTRUMENT: GC-MS

% MOISTURE: 3.3

CONCENTRATION IN: ng/g

Compounds		Concentration	(SDL)
Naphthalene		4.4	0.16
Acenaphthylene		<0.20	
Acenaphthene		<0.12	
Fluorene		0.52	0.07
Phenanthrene		1.1	0.07
Anthracene		<0.15	
Fluoranthene		0.46	0.04
Pyrene		0.76	0.04
Benz(a)anthracene		<0.05	
Chrysene		0.49	0.05
Benzofluoranthenes	NDR	0.83	0.20
Benzo(e)pyrene		0.95	0.18
Benzo(a)pyrene		<0.26	
Perylene	NDR	1.4	0.22
Dibenz(ah)anthracene		<0.59	
Indeno(1,2,3-cd)pyrene	NDR	2.8	0.24
Benzo(ghi)perylene	NDR	6.8	0.18
C1 naphthalenes		5.8	0.08
C2 naphthalenes		6.8	0.22
C3 naphthalenes		6.4	0.06
C4 naphthalenes		2.9	0.30
C1 phen,anth		0.32	0.05
C2 phen,anth		0.96	0.32
C3 phen,anth		<0.11	
C4 phen,anth		<0.37	
Dibenzothiophene		<0.16	
C1 dibenzothiophene		<0.04	
C2 dibenzothiophene		<0.03	

Surrogate Standards	% Recovery
Naphthalene d-8	54
Acenaphthene d-10	58
Phenanthrene d-10	73
Pyrene d-10	85
Chrysene d-12	79
Benzo(a)pyrene d-12	88
Perylene d-12	83
Dibenz(ah)anthracene d-14	84
Benzo(ghi)perylene d-12	84
2-Methylnaphthalene d-10	47

Approved

1. SDL = Sample Detection Limit
2. ND = Less than the detection limit indicated
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

PAH ANALYSIS REPORT

CLIENT SAMPLE I.D.: 960827-002A

AXYS FILE: 9623-18

CLIENT: ESG

DATE: 11/Sept/96

SAMPLE TYPE: Soil

METHOD NO.: PH-S-01/Ver.2

SAMPLE SIZE: 12.61 g dry

INSTRUMENT: GC-MS

% MOISTURE: 3.4

CONCENTRATION IN: ng/g

Compounds	Concentration	(SDL)
Naphthalene	2.7	0.08
Acenaphthylene	<0.30	
Acenaphthene	<0.12	
Fluorene	NDR 0.61	0.03
Phenanthrene	2.3	0.07
Anthracene	<0.25	
Fluoranthene	2.2	0.03
Pyrene	5.6	0.03
Benz(a)anthracene	NDR 0.72	0.03
Chrysene	NDR 4.4	0.03
Benzofluoranthenes	NDR 5.2	0.12
Benzo(e)pyrene	10	0.11
Benzo(a)pyrene	NDR 4.5	0.20
Perylene	NDR 8.5	0.14
Dibenz(ah)anthracene	<0.80	
Indeno(1,2,3-cd)pyrene	9.1	0.15
Benzo(ghi)perylene	39	0.12
C1 naphthalenes	6.6	0.04
C2 naphthalenes	7.6	0.10
C3 naphthalenes	14	0.03
C4 naphthalenes	12	0.14
C1 phen,anth	4.4	0.03
C2 phen,anth	<0.20	
C3 phen,anth	<0.07	
C4 phen,anth	<0.23	
Dibenzothiophene	NDR 0.65	0.09
C1 dibenzothiophene	<0.02	
C2 dibenzothiophene	<0.02	

Surrogate Standards	% Recovery
Naphthalene d-8	72
Acenaphthene d-10	79
Phenanthrene d-10	82
Pyrene d-10	88
Chrysene d-12	78
Benzo(a)pyrene d-12	84
Perylene d-12	77
Dibenz(ah)anthracene d-14	76
Benzo(ghi)perylene d-12	78
2-Methylnaphthalene d-10	84

Approved

1. SDL = Sample Detection Limit
2. ND = Less than the detection limit indicated
3. NDR = Peak detected but did not meet quantification criteria
4. Data have not been blank corrected
5. Concentrations are recovery corrected

10 Sep '91

IMMUNOASSAY RESULTS (w/ MATT DODD & DOUG BRIGHT

Barrels

E16
E17
E18
E19
E20
E21
E22
E23
E24
E25

GP's

M1
M2
M3
M4
M5
M6

Barrels

F1
F2
F3
F4
F5
F6
F7
F8

Not w/ PHA

E5 (A3) = GP #1

E8 (A4) = GP #2

E10, 11, 12 = (A5)

E9, E13, 14, 15 (A6)

E1, E2, E3, E4 (A1)

E6, E7 (A2)

Ship
E5
E9
, rest to Cell

PCB field Test

Tube No	Sample	ABS	conc
C0	0 ppm	0.94	
C1	5 ppm	0.52	
C2	10 ppm	0.46	
C3	50 ppm	0.27	
M1		0.89	< 5 ppm
M2		0.92	"
M3		0.89	"
M4		0.87	"
M5		0.89	"
M6		0.86	"
E16		0.83	"
E17		0.89	"
E18		0.88	"
E19		0.88	"
E20		0.71	"
E20		0.72	"
E21		0.72	"
E22		0.91	"
E23		0.81	"
E24		0.86	"

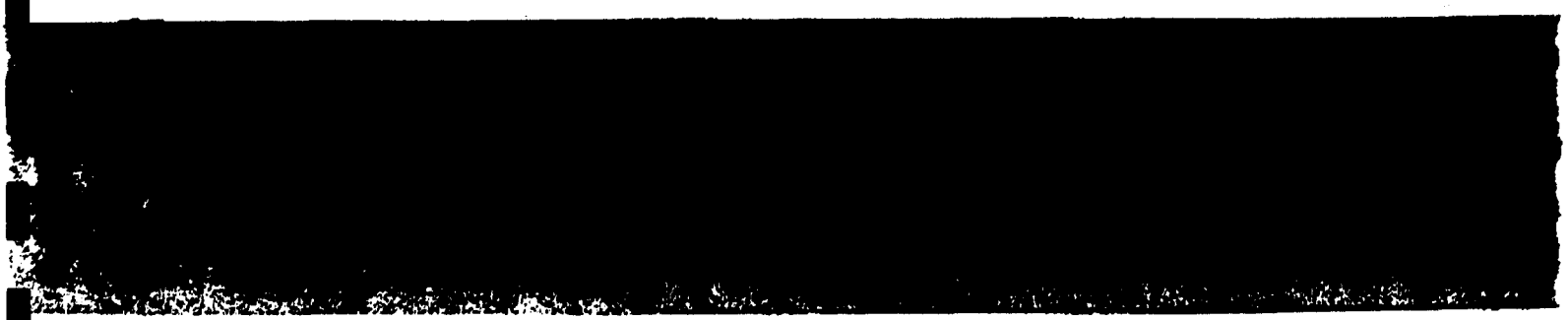
over

IMMUNOASSAY ANALYSIS FOR PAH

Extraction : 5g of soil extracted with 5 ml of methanol

Dilutions : Dilute 10 mL of extracts with 1 mL of methanol to give ratio of 1:100

Tube #	Sample #	Abs	Conc
NC		1.02	
C1	calibrator 1	0.58	
C2	calibrator 2	0.18	
m1	sample m1	0.94	<10 ppm
m2	✓ m2	1.01	<10 ppm
m3	✓ m3	0.91	<10 ppm
m4	✓ m4	0.93	<10 ppm
m5	✓ m5	0.92	<10 ppm
m6	✓ m6	0.90	<10 ppm
E20	✓ E20	0.95	<10 ppm



SNAG AIRSTRIP CLEAN-UP | 10 Sept 96

1330h - Derek, Rick, Matt, Doug, Paul

A1 - E1, E2, E3, E4
A2 - E6, E7
A3 - E5
A4 - E8
A5 - E10, 11, 12.
A6 - E13, 14, 15

M1 - Bottom of Deep Garage Pit - Deep
M2 - " " " " " - Shallow
M3 - " of Small Garage Pit -
M4 " " " " " -

~~A7~~ E16 - ~~E21~~ E24 (9 total)

M5 Side of Deep Garage Pit (1 m down; back (B) wall)
M6 Side of Deep Garage Pit (2 m down; side (S) wall.) L/H

F1 - F8 (8 total)

APPENDIX IVe

ANALYTICAL RESULTS OF LEACHATE TESTS

(613) 541-600 Ext. 6161

Environmental Sciences Group
Royal Military College

Bldg 62, Royal Military College, Kingston, Ont. K7K 5L0
Tel: (613) 541-6000 ext.6161, FAX:(613) 541-6596
Email: reimer-k@rmc.ca

Feuillets de transmission par télécopieur
Post-it™ Fax Note 7671B

To / À: Bob	From / De: BRETT
Co./Dept. / Cie/Service	Co. / Cie
Phone # / N° de tél.	Phone # / N° de tél.
Fax # / N° de télécopieur 667-4146	Fax # / N° de télécopieur 667-3199
Date: 02/08/96	# of pages / Nbre de pages ▶ 1

Date: 2 August 1996

To: Brett Hartshorne
Manager, Action on Waste
Indian & Northern Affairs
Whitehorse, Yukon

Fax: 403-667-3206

Total being transmitted (including this cover): 1

From: Ken Reimer

Subject: Paint Leachate Results — which paint

Tower SNC1 inside composite Ont. 3.4.7 BC SWEP Beacon site PCB's leachate not for HBMS.

The leachate results for the paint were as follows (in mg/L; i.e. ppm):

Arsenic: <0.05; Barium: <0.10; Cadmium: ,<0.010; Chromium: <0.05; Lead: 0.74; Mer... <0.001; Silver: <0.05; Selenium: <0.010; Copper: <0.05; Nickel: <0.10; Cobalt: 0.96; Zin... and PCBs: <0.007.

You can see that lead does leach to a certain extent but less than the 5.0 ppm trigger that is used for the leachate toxic soils. I am certain that Environment Canada can give you their opinion of these data and provide the necessary advice.

IC/

-where sample from
-what protocol
acid / base
pH neutral

Dr. John S. Poland,
Analytical Services Unit,
Tel (613) 545-2642/ Fax (613) 545-2897

DEPARTMENT OF CHEMISTRY
Tel 613 545-2616
Fax 613 545-6669

Queen's University
Kingston, Canada
K7L 3N6

Results of Analysis of Samples for ESG Analytical Laboratory
submitted August, 1996

Method: The leachate test was carried out according to the Ontario Environment protocol as given in regulation 347 to give the following results.

Sample	SNAG 96-10553
pH at start of test	4.2
Volume of 0.5N acetic acid used (160 mL max.)	0
pH at end of test	4.3

SWEP
5 W Reg.

Parameter	Sample	SNAG 96-10553	Regulation 347 Criteria	
Arsenic	mg/L	<0.05	<0.05	5
Barium	mg/L	<1.0	<1.0	100
Cadmium	mg/L	<0.005	<0.005	0.5
Chromium	mg/L	0.24	<0.05	5
Lead	mg/L	1.0	<0.05	<5ppm
Mercury	mg/L	<0.001	<0.001	0.1
Selenium	mg/L	*	<0.010	1.0
Silver	mg/L	<0.05	<0.05	5.0
Boron	mg/L	<1.0	<5.0	500
Cyanide	mg/L	<0.1	<0.2	20
Fluoride	mg/L	1.0	<2.4	150
PCBs	mg/L	<0.001	<0.003	

* equipment failure, results will follow

Post-it™ Fax Note 7671 | Date 15,8,96 | # of pages ▶

To Yasmin Nizami	From Paula Whitley
Co./Dept. ESG	Co. ASU-Queens
Phone # 604-	Phone # 613 545 2642
Fax # 604 669 0430	Fax # 613 545 2897

Dr. John S. Poland,
Analytical Services Unit,
Tel (613) 545-2642/ Fax (613) 545-2897

DEPARTMENT OF CHEMISTRY
Tel 613 545-2616
Fax 613 545-6669

Queen's University
Kingston, Canada
K7L 3N6

Results of Analysis of Samples for ESG Analytical Laboratory
submitted August, 1996

Method: The leachate test was carried out according to the Ontario Environment protocol as given in regulation 347 to give the following results.

Sample	SNAG 96-10553
pH at start of test	4.2
Volume of 0.5N acetic acid used (1 mL, 3x)	0
pH at end of test	4.3

Parameter	Sample	SNAG 96-10553	Regulation 347 Criteria
Arsenic	mg/L	<0.05	<0.05
Barium	mg/L	<1.0	<1.0
Cadmium	mg/L	<0.005	<0.005
Chromium	mg/L	0.24	<0.05
Lead	mg/L	1.0	<0.05
Mercury	mg/L	<0.001	<0.001
Selenium	mg/L	<0.010	<0.010
Silver	mg/L	<0.05	<0.05
Boron	mg/L	<1.0	<5.0
Cyanide	mg/L	<0.1	<0.2
Fluoride	mg/L	1.0	<2.4
PCBs	mg/L	<0.001	<0.003

N.B.
N.B.

Post-it Fax Note 7671 | Date 9/9/96 | # of pages ▸ 1
To Yasmin Dejani | From Paula Whitley
Co./Dept. | Co.
Phone # | Phone # 613 545 2642
Fax # 604 669 0430 | Fax # 613 545 2897

Post-it Fax Note 7671 | Date 5.9.96 | pages ▸ 1
To Paul Oliver | From Paula Whitley
Co./Dept. SNC-Lavalin | Co. Queen's U
Phone # | Phone # 613 545 2642
Fax # 403 862 7601 | Fax # 613 54

APPENDIX IVf

ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		OW1	OW2	OW3	Check	DETECTION LIMIT	UNITS
DATE SAMPLED:		Sep 7/96	Sep 7/96	Sep 7/96	Sep 7/96		
CAN TEST ID:		609100117	609100118	609100119	609100120		
pH		7.80	7.51	7.74	7.81	-	pH units
Conductivity		363	386	374	364	1	µS/cm
True Color		5	5	5	5	5	CU
Hardness	CaCO3	184	193	186	188	1	mg/L
Hardness (Total)	CaCO3	312	593	1070	292	1	mg/L
Total Dissolved Solids		315	350	325	320	10	mg/L
Total Suspended Solids		36400	13600	10700	46100	1	mg/L
Total Alkalinity	CaCO3	303	226	317	276	0.5	mg/L
Fluoride	F	<	<	0.21	0.21	0.05	mg/L
Chloride	Cl	0.7	0.8	1.2	0.7	0.2	mg/L
Nitrate	N	<	0.40	0.39	<	0.05	mg/L
Nitrite	N	<	<	<	<	0.002	mg/L
Sulphate	SO4	8.3	8.3	7.1	8.4	1	mg/L
Chemical Oxygen Demand		101	58	81	96	25	mg/L
Total Organic Carbon	C	7.2	11	3.9	11	1	mg/L
Ammonia Nitrogen	N	0.07	0.03	0.07	<	0.02	mg/L
Total Phenolics		0.002	<	0.001	0.001	0.001	mg/L
Sulphide	S	<	<	<	<	0.5	mg/L

µS/cm = microsiemens per centimeter
CU = color units
mg/L = milligrams per liter
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		OW1	OW1	OW2	OW2	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 7/96	Sep 7/96	Sep 7/96	Sep 7/96		
CAN TEST ID:		609100117	609100117	609100118	609100118		
Aluminum	Al	27.2	0.026	93.6	0.025	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.017	<	0.030	<	0.001	mg/L
Barium	Ba	0.39	0.073	0.98	0.077	0.001	mg/L
Beryllium	Be	<	<	0.002	<	0.001	mg/L
Boron	B	0.083	0.051	0.073	0.041	0.005	mg/L
Cadmium	Cd	0.0003	<	0.0008	<	0.0002	mg/L
Calcium	Ca	86.8	57.6	130	60.9	0.01	mg/L
Chromium	Cr	0.051	<	0.16	<	0.001	mg/L
Cobalt	Co	0.021	<	0.061	<	0.001	mg/L
Copper	Cu	0.091	0.003	0.26	0.002	0.001	mg/L
Iron	Fe	37.1	0.05	135	0.07	0.03	mg/L
Lead	Pb	0.007	<	0.024	<	0.001	mg/L
Magnesium	Mg	23.0	9.64	65.1	10.0	0.05	mg/L
Manganese	Mn	1.54	0.16	2.34	0.11	0.001	mg/L
Mercury	Hg	0.8	<	0.6	<	0.05	µg/L
Molybdenum	Mo	0.003	0.003	0.002	0.002	0.001	mg/L
Nickel	Ni	0.055	0.002	0.14	0.002	0.001	mg/L
Phosphorus	PO4	2.6	<	9.9	<	0.4	mg/L
Potassium	K	6.54	3.27	11.1	3.41	0.01	mg/L
Selenium	Se	<	<	<	<	0.001	mg/L
Silicon	SiO2	120	11.7	270	10.8	0.1	mg/L
Silver	Ag	0.0006	0.0003	0.0010	0.0003	0.0001	mg/L
Sodium	Na	6.6	2.2	12.3	2.5	0.1	mg/L
Strontium	Sr	0.24	0.14	0.39	0.14	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	0.0002	<	0.0005	<	0.0001	mg/L
Thorium	Th	0.0025	<	0.008	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L
Titanium	Ti	1.37	0.002	3.27	0.001	0.001	mg/L
Uranium	U	0.0009	<	0.0021	<	0.0005	mg/L
Vanadium	V	0.074	<	0.21	<	0.001	mg/L
Zinc	Zn	0.082	<	0.25	<	0.005	mg/L
Zirconium	Zr	0.013	<	0.014	<	0.001	mg/L

mg/L = milligrams per liter
µg/L = micrograms per liter
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		OW3	OW3	Check	Check		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 7/96	Sep 7/96	Sep 7/96	Sep 7/96		
CAN TEST ID:		609100119	609100119	609100120	609100120	DETECTION LIMIT	UNITS
Aluminum	Al	139	0.041	21.2	0.030	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.042	<	0.015	<	0.001	mg/L
Barium	Ba	1.52	0.091	0.33	0.067	0.001	mg/L
Beryllium	Be	0.004	<	<	<	0.001	mg/L
Boron	B	0.079	0.035	0.042	0.028	0.005	mg/L
Cadmium	Cd	0.0016	<	0.0003	<	0.0002	mg/L
Calcium	Ca	253	59.2	81.4	58.9	0.01	mg/L
Chromium	Cr	0.26	<	0.043	<	0.001	mg/L
Cobalt	Co	0.098	<	0.018	<	0.001	mg/L
Copper	Cu	0.40	0.003	0.080	0.003	0.001	mg/L
Iron	Fe	232	0.04	32.4	0.03	0.03	mg/L
Lead	Pb	0.046	<	0.006	<	0.001	mg/L
Magnesium	Mg	107	9.13	21.6	9.89	0.05	mg/L
Manganese	Mn	4.28	0.21	1.36	0.15	0.001	mg/L
Mercury	Hg	0.8	<	0.6	<	0.05	µg/L
Molybdenum	Mo	0.004	0.004	0.003	0.003	0.001	mg/L
Nickel	Ni	0.23	0.003	0.048	0.002	0.001	mg/L
Phosphorus	PO4	15.6	<	2.1	<	0.4	mg/L
Potassium	K	13.9	3.85	5.26	2.61	0.01	mg/L
Selenium	Se	< 0.002 (a)	<	<	<	0.001	mg/L
Silicon	SiO2	339	11.1	93.1	11.8	0.1	mg/L
Silver	Ag	0.0011	0.0003	0.0006	0.0003	0.0001	mg/L
Sodium	Na	14.7	2.9	5.0	2.3	0.1	mg/L
Strontium	Sr	0.53	0.15	0.21	0.13	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	0.0008	<	0.0001	<	0.0001	mg/L
Thorium	Th	0.015	<	0.0020	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L
Titanium	Ti	4.75	0.002	1.04	0.002	0.001	mg/L
Uranium	U	0.0031	<	0.0008	<	0.0005	mg/L
Vanadium	V	0.32	<	0.059	<	0.001	mg/L
Zinc	Zn	0.35	<	0.069	<	0.005	mg/L
Zirconium	Zr	0.022	<	0.014	<	0.001	mg/L

mg/L = milligrams per liter µg/L = micrograms per liter

< = Less than detection limit

(a) = Detection limit raised due to dilutions necessitated by sample matrix

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		Cell		
SAMPLE PREPARATION:		TOTAL		
DATE SAMPLED:		Sep 7/96		
CAN TEST ID:		609100121	DETECTION LIMIT	UNITS
Lead	Pb	0.014	0.001	mg/L

mg/L = milligrams per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

CANTEST

Total Extractable Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CAN TEST ID	TEH
OW1	Sep 7/96	609100117	<
OW2	Sep 7/96	609100118	<
OW3	Sep 7/96	609100119	<
Check	Sep 7/96	609100120	<
DETECTION LIMIT			100
UNITS			µg/L

µg/L = micrograms per liter
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

CANTEST

Polychlorinated Biphenyls in Water

CLIENT SAMPLE IDENTIFICATION:	Cell	
DATE SAMPLED:	Sep 7/96	DETECTION LIMIT
CAN TEST ID:	609100121	
Arochlor 1242	<	0.4
Arochlor 1248	<	0.2
Arochlor 1254	<	0.4
Arochlor 1260	<	0.1

Results expressed as micrograms per liter (µg/L)
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: October 16, 1996

GROUP NUMBER: 6091025

Chlorinated Phenols in Water

CLIENT SAMPLE IDENTIFICATION:	OW1	OW2	OW3	Check	
DATE SAMPLED:	Sep 7/96	Sep 7/96	Sep 7/96	Sep 7/96	DETECTION LIMIT
CAN TEST ID:	609100117	609100118	609100119	609100120	
Pentachlorophenol	0.082	<	<	<	0.05
Total Trichlorophenols	<	<	<	<	0.1
Total Tetrachlorophenols	<	<	<	<	0.05
Total Chlorinated Phenols	0.082	<	<	<	0.05
Surrogate Recovery					
2,4,6-Tribromophenol	112	107	98	87	-

Results expressed as micrograms per liter (µg/L)
Surrogate recoveries expressed as percent (%)
< = Less than detection limit

CANTEST

CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

Analysis Report

REPORT ON: Results of Testing

REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 210
1290 Hornby Street
Vancouver, B.C.
V6Z 2G4

Att'n: Mr. Phil Scalia

CHAIN OF CUSTODY: 18665
PROJECT NUMBER: 281-04

NUMBER OF SAMPLES: 5

REPORT DATE: October 16, 1996

DATE SUBMITTED: September 10, 1996

GROUP NUMBER: 6091025

SAMPLE TYPE: Water

TEST METHODS:

Conventional Parameters - analyses were performed using procedures based on those described in "British Columbia Environmental Laboratory Manual For the Analysis of Water, Wastewater, Sediment and Biological Materials" (1994 Edition), Province of British Columbia and "Standard Methods for the Examination of Water and Wastewater" 17th Edition, (1989) and 16th Edition (1985), published by the American Public Health Association.

Mercury in Water - analysis was performed using procedures based on Standard Methods for the Examination of Water and Wastewater section 3112 B, acid permanganate digestion , analysis using Cold Vapour Atomic Absorption

Metals in Water - analysis was performed using Inductively Coupled Plasma Spectroscopy (ICP) or Graphite Furnace Atomic Absorption.

Metals in Water - analysis was performed using procedures based on U.S. EPA Method 200.8, Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

Polychlorinated Biphenyls - analysis was performed using procedures based upon U.S. EPA Methods 608/8080, involving extraction, clean-up steps, and analysis using GC/ECD. Aroclors 1242, 1248, 1254 and 1260 were included.

Chlorinated Phenols - analysis was performed using procedures based on U.S. EPA Methods 604/8040, involving extraction, derivatization, clean-up steps, and analysis using GC/ECD.

Total Extractable Hydrocarbons - analysis was perfomed using procedures based on USEPA Method 8015 and BC MOELP Environmental Laboratory Manual (1994) Method X366, involving dichloromethane extraction and analysis usin GC/FID. Components in the C10 to C30 range are included, using an alkane standard for quantitation.

TEST RESULTS:

(See following pages)

CAN TEST LTD.

Richard S. Jornitz
Supervisor, Inorganic Testing

APPENDIX V

LANDFILL GROUNDWATER WELL BOREHOLE LOGS

Project: SNAG
Project No.: 281-004.01

BOREHOLE : OW - 1

Date Drilled: Aug. 19,1996 | LOCATION: Landfill, Snag Airstrip, Yukon
Rig:B61 | ELEVATION:
Contractor: PEACE DRILLING | CO-ORDINATES:
Sampling: Auger Rig

NOTES: -POSSIBLE PERCHED WATER TABLE AT 10.36 TO 10.97 M

Depth (m)	OVA	Blows / 6"	Sample #	Symbols	SOIL DESCRIPTION	Piezometer Installation	PIEZOMETER CONSTRUCTION DETAILS	ANALYSIS
-2.0							WELLPROTECTOR CONCRETE BENTONITE AUGUST 19, 1996	
0.0	0 ppm				SAND AND GRAVEL -MOSTLY GRAVEL, DRY		CUTTINGS	
2.0					CLAY TILL -GREY			
4.0					SAND AND GRAVEL -MOSTLY GRAVEL, DRY -MOIST AT 10.36 M			
6.0								
8.0							BENTONITE	
10.0							SAND	
12.0					SILT/FINE SAND -CLAY BANDS, WET			
14.0					EOH @ 12.8M			
16.0								
18.0								

Project: SNAG
Project No.: 281-004.01

BOREHOLE : OW - 2

Date Drilled: Aug. 19,1996 | LOCATION: Landfill, Snag Airstrip, Yukon
Rig:B61 | ELEVATION:
Contractor: PEACE DRILLING | CO-ORDINATES:
Sampling: Auger Rig

NOTES:

Depth (m)	OVA	Blows / 6"	Sample #	Symbols	SOIL DESCRIPTION	Piezometer Installation	PIEZOMETER CONSTRUCTION DETAILS	ANALYSIS
-2.0							WELLPROTECTOR CONCRETE BENTONITE AUGUST 19, 1996	
0.0					SAND AND GRAVEL -MOSTLY GRAVEL, DRY		CUTTINGS	
2.0	0 ppm				SILT -LITTLE CLAY, MOIST, SOFT			
4.0								
6.0					SAND AND GRAVEL -MOSTLY GRAVEL -WATER AT 10.36 M			
8.0							BENTONITE	
10.0							SAND	
12.0					EOH @ 11.12 M			
14.0								
16.0								
18.0								

HEMMERA RESOURCE CONSULTANTS LTD.
ENVIRONMENTAL ENGINEERING, SCIENCE AND MANAGEMENT

Project: SNAG
Project No.: 281-004.01

BOREHOLE : OW - 3

Date Drilled: Aug. 22,1996	LOCATION: Landfill, Snag Airstrip, Yukon
Rig:B61	ELEVATION:
Contractor: PEACE DRILLING	CO-ORDINATES:
Sampling: Auger Rig	SOIL DESCRIPTION
NOTES:	

Depth (m) | OVA | Blows / 6" | Sample # | Symbols | Piezometer Installation | PIEZOMETER CONSTRUCTION DETAILS | ANALYSIS

-2.0

0.0

2.0

4.0

6.0

8.0

10.0

12.0

14.0

16.0

18.0

0 ppm

WELLPROTECTOR
CONCRETE
BENTONITE
AUGUST 22, 1996

CUTTINGS

SAND AND GRAVEL
-MOSTLY GRAVEL, DRY

BENTONITE

SAND AND GRAVEL
-SOFTER MATERIAL, EASIER DRILLING

SAND

EOH @ 14.94 M