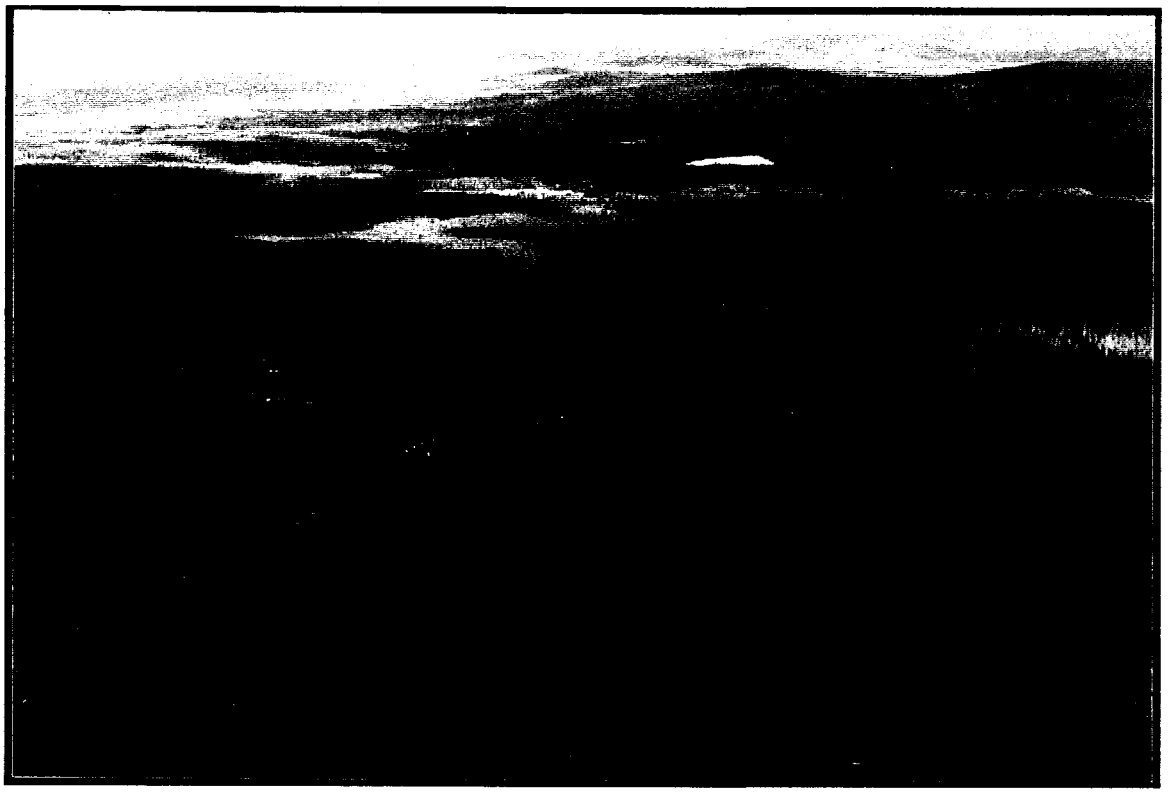
SNAG AIRSTRIP REMEDIATION/FOLLOW-UP

Snag, Yukon



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1.0 INTRODUCTION

Lorimer and Associates Ltd. (Lorimer), in association with Hemmera Resource Consultants Ltd. (Hemmera), has completed the installation of four groundwater monitoring wells around the perimeter of the permanent containment cell and a preliminary assessment of soil conditions around a newly found landfill at the former Snag airstrip (Snag) near Beaver Creek, Yukon Territory. This project was completed as part of a larger project to remediate the Snag airstrip area.

1.1 Location

The Snag airstrip is located in the Yukon Territory, approximately 400 km northwest of Whitehorse, near the town of Beaver Creek and the border with Alaska (Figure 1). It is located at kilometre 26 (Mile 16.2) along the Snag road which runs north from the Alaska Highway (62° 20'N, 140° 29'W). Snag Village is located approximately 4 km north of the airstrip. The facilities at the site in the fall of 1997 consisted of a small summer tent camp run by the White River First Nation. All of the other facilities that existed at the site had been covered or removed during the remediation of the site in 1996. The airstrip is still in use by local outfitters for re-supplying bush camps and was suitable for small fixed wing airplane traffic.

1.2 Historic Background

The historic background of the Snag site has been chronicled in previous reports (Lorimer, March 1997, Environmental Sciences Group, March 1996). In summary, the 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 the airstrip, towers and ancillary facilities for crew and residents. In addition, at least one landfill was located at the site and a beacon site was located on a hilltop approximately 7 km northeast of the airstrip. The strip was essentially abandoned in 1957 and came under the management of Indian and Northern Affairs Canada (INAC) in 1971 and under Indian and Northern Affairs Canada's (INAC) Arctic Environmental Strategy Action on Waste program in 1994.

Initial investigation of the site was carried out by the Environmental Sciences Group (ESG) of the Royal Military College of Canada (RMC) in the summer of 1995 and 1996. During the course of this investigation, the presence of soil contaminated with polychlorinated biphenyls (PSBs), metals and pesticides was identified and delineated. The remediation of these areas and the removal of all existing facilities associated with the former Snag airstrip was completed by Lorimer in the summer and fall of 1996. As part of this remediation, a five membrane, permanent containment cell was constructed on-site. As part of the long term monitoring of this cell, it was recommended that monitoring wells be installed around the periphery of this cell.

Anecdotal evidence collected during the remediation project indicated the presence of another landfill along the Snag access road, approximately 200 metres west of the junction with the road leading to the main landfill for the site. This landfill was located to the north of an approximately 60 metres long by 12 metres wide gravel pit which ran along the northern side of the Snag access road. The gravel pit was bordered to the north by a bog which was at the base of a small ridge which led up to the gravel pit. It would appear that landfill material was dumped off of the edge

of the ridge towards the bog. Landfill material was visible on surface during the initial reconnaissance of the landfill in the summer of 1996.

1.3 Scope of Work and Objectives

The overall scope of work for this project consisted of the completion of the assessment and remediation of the Snag airstrip.

The objectives of this project consisted of the installation of groundwater monitoring wells around the containment cell and the investigation of the new landfill along the Snag access road. The following tasks were completed in order to achieve this objective:

- installation of four monitoring wells around the containment cell;
- supervision of the re-seeding of the containment cell and the other open areas at the site;
- cutting of any deadfall remaining after the construction of the containment cell;
- the advancement of test pits and the collection and analysis of soil samples at the new landfill;
- collection of water samples from the new monitoring wells around the containment cell and old monitoring wells installed in 1996 around the main landfill; and
- preparation of this report.

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. Recently, these Interim Criteria have been superceded by new CCME 1996 criteria for twenty compounds. In terms of the CCME criteria, the new (1996) criteria are in effect for the twenty compounds covered by the legislation and the old (1991) criteria are in effect for any compounds not covered by the new criteria.

CCME 1991

The CCME 1991 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).

CCME 1997

The CCME 1997 soil guidelines are a result of scientific information collected since the CCME 1991 guidelines. The new guidelines are scientifically defensible and are derived specifically for the protection of ecological receptors in the environment and for the protection of human health associated with four land uses: agricultural, residential/parkland, commercial and industrial. There are three types of guideline: soil quality guidelines for environmental health (SQG_{EH}), soil quality guidelines for human health (SQG_{HH}), and the CCME 1997 recommended guidelines, which are the lower of the SQG_{EH} and SQG_{HH} guidelines for each land use.

The environmental soil quality guidelines are derived using toxicological data to determine the threshold level on key receptors. Exposure from direct soil contact is the primary derivation procedure of environmental quality guidelines for residential/parkland, commercial and industrial land uses. Another derivation procedure, also based on soil and food ingestion, is also applied in the case of agricultural land use, with the lower of the two values considered as the environmental soil quality guideline for this land use

The development of the human health soil quality guidelines is based on a different approach using steps similar to a site-specific risk assessment. Several basic assumptions were made about the sensitive receptor and the nature of the chemical exposure for each land use to establish these generic guidelines. Guidelines derived for non-carcinogens are based on the assumed threshold for toxic effects. For carcinogenic compounds presenting some risk at any level of exposure, guidelines are derived based on estimated lifetime incremental cancer risk from exposure to soil.

2.3 Yukon Territory Standards

The Yukon Territory Renewable Resource Office released the draft Yukon *Contaminated Sites Regulations* (YCSR) in 1996. The CSR standards classify land as either agricultural, urban park, residential, commercial or industrial. Compounds are regulated under either generic standards or standards that are specifically related to environmental health risks (such as toxicity to soil invertebrates and plants, for example).

2.4 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 ug/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 (Ministere 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).

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.

2.5 Remedial Objectives

Based on the anticipated future land use of the Snag site, the CCME and YCSR Residential and Parkland (RL/PL) criteria were used as remedial objectives for PAH's, benzene, toluene, ethylbenzene, xylene (BTEX), volatile petroleum hydrocarbons (VPH) and light extractable petroleum hydrocarbons (LEPH)/heavy extractable petroleum hydrocarbons (HEPH) and metals; CEPA and CCME criteria were used for PCB's; and, 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.

The groundwater samples were compared to the CCME Remediation Criteria for *freshwater Aquatic Life* and the Yukon Territory Numerical Water Standards for A*quatic Life*.

3.0 WORK PROGRAM

3.1 Monitoring Well Installation

During the remediation of the site in the summer of 1996, an auger rig was used to advance drill holes for the installation of monitoring wells around the main landfill (monitoring wells H96-1, H96-2 and H96-43) (Figure 2). It was intended to use this rig to install the monitoring wells around the containment cell, however, the rig was unable to advance through the tightly packed gravel formation and the wells were not completed.

In September of 1997, an air rotary drill rig from Midnight Sun Drilling was mobilized to the site (Photo 1). Drill holes were advanced to the groundwater table on the four sides of the containment cell using the percussive action of an air hammer drill bit and monitoring wells were installed (monitoring wells H97-4, H97-5A, H97-6 and H97-7). Monitoring welll H97-5 had to be re-drilled as the hole was lost during the installation due to bentonite falling into the standpipe. It was re-drilled 1 metre away and designated H97-5A. The standpipe for H97-5 was cut to ground level and backfilled. The cuttings were brought to surface using compressed air. Visual logging of the cuttings allowed for an assessment of the stratigraphy as well as the depth of the water table. No soil samples were submitted for analysis.

Monitoring wells were installed in each borehole using 50 mm diameter, schedule 40 riser pipe and 50 mm diameter, .010 slot, schedule 40 screens. Well screens were backfilled with filter sand to at least 0.15 over the top of the screen. Bentonite chips were used to create a seal above the filter sand. The remainder of the hole was backfilled with cuttings to within 0.15 m of surface. A lockable, upright well protector was cemented in place at each well. Keyed-alike pad locks were installed on all of the wells on-site, including the wells located at the main landfill. Well dedicated, disposable teflon bailers were installed in each well. Well construction details are shown in the borehole logs included in Appendix A.

3.2 Groundwater Sampling

Prior to sampling the groundwater in each well, an interface probe was used to determine the piezometric elevation in each well. Using this data, a minimum of three well volumes of groundwater was bailed from each well prior to the collection of the samples. For each well, the sample was placed in laboratory prepared glass and plastic bottles, packed in coolers and shipped to the project laboratory. A fresh pair of latex gloves was used for each sampling event to minimize cross contamination between wells. A duplicate was collected at a frequency of one per samples medium per analyte per sampling event This duplicate was collected in the same manner as the other samples.

3.3 Re-seeding

Decora Landscaping (Decora) of Whitehorse were mobilized to the site to complete the reseeding of the containment cell and remediated areas on-site. The seed and fertilizer mixture were choosen to be harmonious with natural vegetation, provide rapid initial cover and insure robust long term cover. The seed and fertilizer mixture was spread using manually operated broadcast seeders (Photo 1) and raked in using either hand raking or a 4 x 4 towed rake. The containment

cell was seeded with a relatively dense concentration of the seed-fertilizer mixture while other areas on-site were seeded with a less dense concentration of the seed-fertilizer mixture in order to more closely resemble natural vegetative density.

The areas that were seeded are:

- the containment cell cover soil;
- the tower site;
- the barracks site;
- the power house;
- the main landfill;
- the temporary storage pile site;
- the warehouse site; and
- several small open areas leading to these sites or created during the remediation efforts.

The air strip and road surfaces were not re-seeded.

3.4 Test Pitting

Test pits were advanced using a rubber tired backhoe at various locations in a newly discovered landfill which was discovered at the end of the 1996 remediation program (Figure 3 and Photo 2)). Test pits were advanced to a depth of between 1.2 to 1.6 metres. The soil stratigraphy was logged from the spoils pile and observations of the pit walls. Composite soil samples were collected from 6 of the 8 test pits and placed in laboratory prepared glass jars using latex gloved hands. A fresh pair of latex gloves was used for each sampling event in order to minimize cross contamination between samples. The samples were placed in coolers and shipped to the project laboratory for analysis. The soil samples were analysed for concentrations of organochlorine pesticides, metals, PAHs, PCBs and extractable petroleum hydrocarbons. The test pits were photographed and then backfilled with the test pit spoils.

Test pit logs are included in Appendix A.

4.0 RESULTS

4.1 Soil Stratigraphy

The stratigraphy around the containment cell consisted of pea size gravel with a little sand from surface to the water table, where the volumetric percentage of sand became higher. The soil became wet at a depth of approximately 15.2 m.

The stratigraphy in the vicinity of the new landfill consisted of either sand and gravel, with cobbles to 0.18 m diameter, or landfill material over a clayey silty permafrost bearing soil (Photos 3 and 4). The sand and gravel soil was found in test pits located near the top of or above the landfill. The landfill material was likely characteristic of the activities taking place at the Snag airstrip. It consisted of cans, bottles, car and machinery parts, drums, pipes, lumber, clothing, tires, chains and wire, among other things.

4.2 Analytical Results - Soil Samples

Three soil samples were submitted from those collected during the excavation of test pits in the vicinity of the new landfill. Soil sample TP1 had concentrations of chromium (38 ug/g) greater than the $CCME_{91}$ criteria for residential/park land use; concentrations of copper (146 ug/g) greater than the $CCME_{97}$ guidelines for residential/park land use; concentrations of lead (482 ug/g) greater than the $CCME_{97}$ guidelines for residential/parkland use; concentrations of tin (129 ug/g) greater than both the $CCME_{91}$ criteria and YCSR standards for residential/parkland use; and concentrations of zinc (295 ug/g) greater than the $CCME_{97}$ guidelines for residential/park land use.

Soil sample TP6 had concentrations of chromium (21 ug/g) greater than the $CCME_{91}$ criteria for residential/park land use; and concentrations of some PAHs greater than the $CCME_{91}$ criteria and/or $CCME_{97}$ guidelines and/or YCSR standards for residential park land use.

Soil sample TP8 had concentrations of chromium (40 ug/g) greater than the $CCME_{91}$ criteria for residential/park land use; concentrations of tin (185 ug/g) greater than the $CCME_{91}$ criteria and YCSR standards for residential/park land use; and concentrations of zinc (213 ug/g) greater than the $CCME_{97}$ guidelines for residential/park land use.

None of the soil samples had concentrations of PCBs, LEPH/HEPH or organochlorine pesticides in excess of either the $CCME_{91}$, $CCME_{97}$ or YCSR criteria.

The analytical results are summarized in Tables 1, 2 and 3 and the original laboratory data is included in Appendix B.

4.3 Analytical Results – Groundwater Samples

Groundwater samples were collected from the new monitoring wells around the containment cell and the monitoring wells installed in 1996 around the main landfill on-site. Analysis of the groundwater samples indicated that all of the samples had low to below detection limits concentrations of PCBs, THE and chlorinated phenols.

Analysis of the groundwater samples collected from all of the monitoring wells indicated that they all had concentrations of aluminum (dissolved aluminum concentrations ranged from 10 to 23 ug/L) in excess of the lowest of the $CCME_{91}$ freshwater aquatic life criteria. However, the concentration of dissolved aluminum was quite low and in all cases, below the YCSR Aquatic Life Standards. The $CCME_{91}$ freshwater aquatic life criteria are dependant on pH, calcium and dissolved organic carbon concentrations and, as such, the dissolved aluminum concentration could be below the pH-calcium-dissolved organic carbon specific criteria.

Analysis of groundwater sample collected from monitoring well H96 –3 indicated that it had concentrations of dissolved copper equal to the $CCME_{91}$ freshwater aquatic life criteria

Analysis of a groundwater sample collected from monitoring well H96-2 indicated that it had concentrations of dissolved zinc (71 ug/L) in excess of the $CCME_{91}$ freshwater aquatic life criteria but was much less than the YCSR Aquatic Life standard.

The $CCME_{91}$ detection limits for many of the organochlorine pesticides are very low. In many cases, the method detection limit used for the analysis of the groundwater samples was greater than the $CCME_{91}$ freshwater aquatic life criteria. Future groundwater sampling should be analysed using a lower method detection limit.

The analytical data is summarized in Tables 4, 5 and 6 and the original laboratory data is included in Appendix B.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 New Landfill

The analysis for the concentrations of metals in soil samples collected around the new landfill has indicated that concentrations of chromium, copper, lead, tin and zinc exceed either the $CCME_{91}$ or the $CCME_{97}$ criteria for residential/park land use in some of the samples. This is not entirely unexpected given the presence of metallic debris in the landfill (Photo 4). The risk of exposure from these metals in slight given the location of the landfill. One of the soil samples had concentrations of various PAHs in excess of the $CCME_{91}$, $CCME_{97}$ and YCSR criteria. During the excavation of the test pits, liquid hydrocarbons or extensive hydrocarbon staining were not observed in the test pit spoils or walls. The presence of 202 litre metal drums were noted in areas of the landfill. However, these appeared to be empty. The presence of machinery, truck and car parts and drums in the landfill which may have had oily residues could have contributed to the presence of elevated PAHs in soil. In any event, the landfill is located well away from the main site of the SNAG airstrip and is covered with thick vegetation.

In order to prevent any erosion of metallic debris and perhaps further contamination of soil with metals, it is recommended that the landfill be covered with a 0.5 m layer of sand and gravel. The area is fairly densely vegetated and the natural evolution and growth of this vegetation on the covered area will act to further reduce the risk of erosion of material from the landfill.

5.2 Groundwater Analysis Around Main Landfill

The analysis of groundwater samples collected from monitoring wells installed around the main landfill indicated that general parameters, chlorinated phenols and most metals were less than the CCME and/or YCSR standards. Only zinc was determined to exceed the CCME aquatic life standard in the groundwater sample collected from monitoring well H96-2. Unfortunately, some of the parameters necessary to determine either the YCSR or CCME standard for dissolved aluminum were not checked. However, the concentration of dissolved aluminum was very low and is not likely to be a concern.

5.3 Groundwater Results Around Containment Cell

The analysis of groundwater samples collected from the monitoring wells installed around the containment cell have indicated that only aluminum may exceed the YCSR and CCME standards. The concentration of dissolved aluminum is not likely to be a concern.

The concentration of PCBs and all other metals besides aluminum were less than both the YCSR and CCME standards.

The analytical data suggests that for many of the individual organochlorine pesticides, the detection limit was set too high in order to facilitate a comparison to CCME criteria. Conversations with the laboratory have indicated that they would be unable to meet the detection limits as they are too low for the sample size normally collected. These criteria are apparently under review (Scott Tessier, CCME, pers. comm.).

Potential sources of organochlorine pesticides include material in the containment cell and residual organochlorine pesticides in the soil as a result of spraying that took place when the airport was operational (40's and 50's). However, in order for the organochlorine pesticides to reach the water table, they would have to be transported by rainwater percolating from the surface (in the case of residuals from spraying) or a leachate from the containment cell leaking through the five membrane cell bottom and then contaminating the groundwater at concentrations sufficient to overcome the effect of dilution. Both of these scenarios are highly unlikely due to the low solubility of organochlorine pesticides, the great depth to the water table (approximately 15 metres) and the large volumes of leachate that would be required to leak from the sealed containment cell which is isolated from the environment and unlikely to generate large volumes of leachate. Accordingly, it is Lorimer's and Hemmera's contention that the concentration of organochlorine pesticides in the groundwater in the vicinity of the containment cell would likely be below the CCME criteria if the lab could attain low enough detection limits for the organochlorine pesticide analytical protocol .

6.0 STANDARD LIMITATIONS

This report was prepared for the exclusive use of the Indian and Northern Affairs Canada and their representatives in accordance with the terms and conditions set forth in our proposal. The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area.

This report is based on data and information collected during the review and investigation conducted by Lorimer and Associates and Hemmera Resource Consultants Ltd. personnel and is based solely on the site conditions at the time of the field investigations and the available reports on the site as described in this report. Any use which a Third Party makes of this report, or any reliance on the decisions to be made based on it, are the responsibility of such Third Parties. Lorimer and 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.

A potential remains for the presence of unknown, unidentified or unforeseen surface and subsurface contamination. Further evidence against such potential site contamination would require additional studies, surface and sub-surface exploration and testing.

If new information is developed in future work (which may include excavations, borings, or other studies), Lorimer and Associates and Hemmera Resource Consultants Ltd. should be requested to re-evaluate the conclusions of this report and to provide amendments as required.

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TABLE 1
pH AND CONCENTRATIONS OF METALS IN SOIL
SNAG AIRSTRIP, YUKON
File: 281-004.02
ug/g (ppm)

				Sample ID	TP 1	TP 6	TP 8	Dup 1[6]
				Date Sampled	09/09/97	09/09/97	09/09/97	09/09/97
	Criteria							
	$CCME_{91}$[1]	$CCME_{97}$[2]	YCSR[3]					
Parameter								
pH	-	-	-		7.3	8.5	7.9	8.5
Metals Analysis								
Moisture (%)	-	-	-		10.6	11.7	25.8	16.5
Antimony Sb	20	-	20		< 10	< 10	< 10	< 10
Arsenic As	30	12	15 - 100[4]		< 10	< 10	< 10	< 10
Barium Ba	500	-	500		142	112	353	158
Beryllium Be	4	-	4		< 1	< 1	< 1	< 1
Cadmium Cd	5	10	15 - 4,000[5]		0.7	< 0.25	0.36	< 0.25
Chromium Cr	8	64	60 - 250[4]					
Cobalt Co	50	-	50		9	6	12	9
Copper Cu	-	63	150 - 350,000[5]			20	45	27
Lead Pb	500	140	500 - 100,000[5]			< 30	94	< 30
Mercury Hg	2	6.6	2		0.13	0.03	0.08	0.02
Molybdenum Mo	10	-	10		< 4	< 4	< 4	< 4
Nickel Ni	100	-	100		84	14	24	18
Selenium Se	3	-	3		< 3	< 3	< 3	< 3
Silver Ag	20	-	20		< 2	< 2	< 2	< 2
Tin Sn	50	-	50			6		< 5
Vanadium V	-	130	200		32	29	58	36
Zinc Zn	500	200	450 - 10,000[5]			54		63
Aluminum Al	-	-	-		12300	9010	18200	12000
Boron B	-	-	-		29	14	35	20
Calcium Ca	-	-	-		5020	8020	19400	11700
Iron Fe	-	-	-		5650	7090	6810	8590
Magnesium Mg	-	-	-		4700	4190	6150	4480
Manganese Mn	-	-	-		397	305	647	427
Phosphorus PO4	-	-	-		1430	1300	2470	1400
Sodium Na	-	-	-		272	249	1090	256
Strontium Sr	-	-	-		24	35	91	47
Titanium Ti	-	-	-		197	220	547	201

Notes:

All soil samples are composite samples

1 = Canadian Council of Ministers of the Environment, 1991, Residential/Parkland Criteria

2 = Canadian Council of Ministers of the Environment, 1997 Recommended Guidelines, Residential/Parkland

3 = Yukon Contaminated Sites Regulation Schedule 1: Generic Numerical Soil Standards for Residential/Parkland

4 = Yukon Contaminated Sites Regulation Schedule 2: Matrix Numerical Standards - Residential/Parkland

5 = Yukon Contaminated Sites Regulation Schedule 2: Matrix Numerical Standards - Residential/Parkland - based on pH

6 = Duplicate for TP 6

- = No criteria or data available

Exceeds one or more criteria =

TABLE 2
CONCENTRATIONS OF PAHs, PCBs AND EXTRACTABLE PETROLEUM HYDROCARBONS IN SOIL
SNAG AIRSTRIP, YUKON
File: 281-004.02
ug/g (ppm)

					Sample ID	TP 1	TP 6	TP 8	Dup 1[6]
					Date Sampled	09/09/97	09/09/97	09/09/97	09/09/97
	Criteria								
	$CCME_{91}$[1]	$CCME_{97}$[2]	CEPA[3]	YCSR[4]					
Parameter									
Polycyclic Aromatic Hydrocarbons									
Naphthalene	5	0.6	-	5		0.25		0.07	0.09
Acenaphthylene	-	-	-	-		< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	-	-	-	-		< 0.05	12	< 0.05	< 0.05
Fluorene	-	-	-	-		< 0.05	9.8	< 0.05	< 0.05
Phenanthrene	5	-	-	5		0.05		< 0.05	0.12
Anthracene	-	-	-	-		< 0.05	13	< 0.05	< 0.05
Total LMW-PAH's	-	-	-	-		0.3	98.2	0.07	0.21
Fluoranthene	-	-	-	-		0.07	40	< 0.05	0.1
Pyrene	10	-	-	10		0.08		< 0.05	0.1
Benzo(a)anthracene	1	-	-	1		< 0.05		< 0.05	< 0.05
Chrysene	-	-	-	-		< 0.05	16	< 0.05	< 0.05
Benzo(b)fluoranthene	1	-	-	1		< 0.05		< 0.05	< 0.05
Benzo(k)fluoranthene	1	-	-	1		-	-	-	-
Benzo(a)pyrene	1	0.7	-	1, 5[5]		< 0.05		< 0.05	< 0.05
Indeno(1,2,3-c,d)pyrene	1	-	-	1		< 0.05		< 0.05	< 0.05
Dibenz(a,h)anthracene	1	-	-	1		< 0.05	0.92	< 0.05	< 0.05
Benzo(g,h,i)perylene	-	-	-	-		< 0.05	4.3	< 0.05	< 0.05
Total HMW-PAH's	-	-	-	-		0.15	146	-	0.2
Total PAH's	-	-	-	-		0.45	244	0.07	0.41
Polychlorinated Biphenyls									
Arochlor 1242	5	-	50	-		< 0.03	< 0.03	< 0.03	< 0.03
Arochlor 1248	5	-	50	-		< 0.03	< 0.03	< 0.03	< 0.03
Arochlor 1254	5	-	50	-		< 0.03	< 0.03	< 0.03	< 0.03
Arochlor 1260	5	-	50	-		< 0.03	< 0.03	< 0.03	< 0.03
Extractable Petroleum Hydrocarbons									
LEPH-uncorrected for PAH's	-	-	-	-		< 250	< 250	< 250	< 250
HEPH-uncorrected for PAH's	-	-	-	-		600	< 250	< 250	< 250
LEPH-corrected for PAH's	-	-	-	1,000		< 250	< 250	< 250	< 250
HEPH-corrected for PAH's	-	-	-	1,000		600	< 250	< 250	< 250

Notes:

All soil samples are composite samples

1 = Canadian Council of Ministers of the Environment, 1991, Residential/Parkland Criteria

2 = Canadian Council of Ministers of the Environment, 1997 Recommended Guidelines, Residential/Parkland

3 = Canadian Environmental Protection Act, 1992

4 = Yukon Contaminated Sites Regulation Schedule 1: Generic Numerical Soil Standards for Residential/Parkland

5 = Yukon Contaminated Sites Regulation Schedule 2: Matrix Numerical Standards for Residential/Parkland (1 ug/g for toxicity to soil invertebrates and plants and 5 ug/g for intake of contaminated soil)

6 = Duplicate for TP 6

- = No criteria or data available

Exceeds one or more criteria =

TABLE 3
CONCENTRATIONS OF ORGANOCHLORINE PESTICIDES IN SOIL
SNAG AIRSTRIP, YUKON
File: 281-004.02
ug/g (ppm)

	Sample ID	TP 1	TP 6	TP 8	Dup 1[2]
	Date Sampled	09/09/97	09/09/97	09/09/97	09/09/97
	Criteria NSPA[1]				
Parameter					
Organochlorine Pesticides					
Aldrin	0.5	< 0.001	< 0.001	< 0.001	< 0.001
alpha-BHC	0.5	< 0.001	< 0.001	< 0.001	< 0.001
beta-BHC	0.5	< 0.001	< 0.001	< 0.001	< 0.001
delta-BHC	0.5	< 0.001	< 0.001	< 0.001	< 0.001
gamma-BHC (Lindane)	0.5	< 0.001	< 0.001	< 0.001	< 0.001
alpha-Chlordane	0.5	< 0.005	< 0.005	< 0.005	< 0.005
gamma-Chlordane	0.5	< 0.005	< 0.005	< 0.005	< 0.005
p,p-DDD	0.5	0.01	< 0.005	< 0.005	< 0.005
o,p-DDE	0.5	< 0.003	< 0.003	< 0.003	< 0.003
p,p-DDE	0.5	0.004	< 0.003	< 0.003	< 0.003
o,p-DDT	0.5	< 0.003	< 0.003	< 0.003	< 0.003
p,p-DDT	0.5	0.025	< 0.003	< 0.003	< 0.003
Dieldrin	0.5	< 0.003	< 0.003	< 0.003	< 0.003
Endosulfan I	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan Sulphate	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Endrin Aldehyde	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	0.5	< 0.001	< 0.001	< 0.001	< 0.001
Heptachlor Expoxide	0.5	< 0.001	< 0.001	< 0.001	< 0.001
Methoxychlor	0.5	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	0.5	< 0.3	< 0.3	< 0.3	< 0.3

Notes:
All soil samples are composite samples
1 = Netherlands Soil Protection Act, Soil Cleanup Criteria
2 = Duplicate for TP 6
- = no criteria or data available
Exceeds criteria =

TABLE 4

CONVENTIONAL PARAMETERS, PCBs, TOTAL EXTRACTABLE HYDROCARBONS AND CHLORINATED PHENOLS IN WATER

SNAG AIRSTRIP, YUKON

File: 281-004.02

				Sample ID	1	2	3	Dup 2[4]	4	5A	6	7	Dup 1[5]
				Date Sampled	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97
		Criteria											
		$CCME_{PI}$[1]	YCSR[2]										
Parameter	**Units**												
pH	pH units	6.5 - 9	-		7.63	7.34	7.41	7.45	-	-	-	-	-
Conductivity	uS/cm	-	-		353	350	356	357	-	-	-	-	-
True Color	CU	-	-		7	7	10	7	-	-	-	-	-
Hardness CaCO3	mg/L	-	-		180	182	187	187	177	181	177	182	179
Hardness (Total) CaCO3	mg/L	-	-		1040	285	226	1110	328	190	197	208	199
Total Dissolved Solids	mg/L	-	-		320	325	336	330	-	-	-	-	-
Total Suspended Solids	mg/L	-	-		7850	1680	261	7700	-	-	-	-	-
Total Alkalinity CaCO3	mg/L	-	-		410	195	200	442	-	-	-	-	-
Fluoride F	ug/L	-	-		< 50	< 50	< 50	< 50	-	-	-	-	-
Chloride Cl	ug/L	-	-		500	500	700	700	-	-	-	-	-
Nitrate N	ug/L	-	-		210	240	380	240	-	-	-	-	-
Nitrite N	ug/L	60	-		< 2	< 2	< 2	< 2	-	-	-	-	-
Sulphate SO4	ug/L	-	-		8700	8700	5900	8700	-	-	-	-	-
Chemical Oxygen Demand	ug/L	-	-		56000	< 25000	< 25000	41000	-	-	-	-	-
Total Organic Carbon C	ug/L	-	-		5500	7400	8300	2300	-	-	-	-	-
Ammonia Nitrogen N	ug/L	-	-		70	40	40	70	-	-	-	-	-
Total Phenolics	ug/L		10		< 1	< 1	< 1	< 1	-	-	-	-	-
Sulphide S	ug/L	-	-		< 100	< 100	< 50	< 100	-	-	-	-	-
Total Extractable Hydrocarbons													
TEH	ug/L	-	-		< 100	< 100	< 100	< 100	180	< 100	120	< 100	250
Polychlorinated Biphenyls													
Arochlor 1242	ug/L	-	-		-	-	-	-	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Arochlor 1248	ug/L	-	-		-	-	-	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Arochlor 1254	ug/L	-	-		-	-	-	-	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Arochlor 1260	ug/L	-	-		-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chlorinated Phenols													
Pentachlorophenol	ug/L	-	0.2 - 3[3]		< 0.05	0.16	< 0.05	0.06	-	-	-	-	-
Total Trichlorophenols	ug/L	-	-		< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	-
Total Tetrachlorophenols	ug/L	-	-		< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	-
Total Chlorinated Phenols	ug/L	-	-		< 0.05	0.16	< 0.05	0.06	-	-	-	-	-

Notes:

1 = Canadian Council of Ministers of the Environment, 1991, Freshwater Aquatic Life Criteria

2 = Yukon Contaminated Sites Regulation Schedule 3: Generic Numerical Water Standards - Aquatic Life (AW)

3 = varies with pH value

4 = Duplicate for Well 1

5 = Duplicate for Well 6

- = no criteria or data available

Exceeds criteria =

TABLE 5
CONCENTRATIONS OF METALS IN WATER
SNAG AIRSTRIP, YUKON
File: 281-004.02
ug/L (ppb)

	Sample ID	1	2	3	Dup 2[3]	4	5A	6	7	Dup 1[4]
	Date Sampled	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97
	Criteria									
	$CCME_{91}$[1]	YCSR[2]								
Parameter										
Hardness			180	182	187	187	177	181	177	182	179
pH			7.63	7.34	7.41	7.45	-	-	-	-	-
Metals Analysis										
Dissolved Aluminum Al	5 - 100[6]	500[5]									
Dissolved Antimony Sb	-	300	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Arsenic As	50	500	2	2	2	2	2	1	2	2	2
Dissolved Barium Ba	-	10000	61	57	58	62	71	75	69	78	69
Dissolved Beryllium Be	-	53	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Boron B	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Dissolved Cadmium Cd	1.3[7]	13[5]	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dissolved Calcium Ca	-	-	56800	57400	60500	58900	54400	55900	54200	56100	55000
Dissolved Chromium Cr	20	20	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1
Dissolved Cobalt Co	-	500	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Copper Cu	4[7]	80[7]	3	2		2	< 1	< 1	< 1	< 1	< 1
Dissolved Iron Fe	300	3000	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30
Dissolved Lead Pb	4[7]	60[7]	2	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1
Dissolved Magnesium Mg	-	-	9200	9320	8800	9750	9970	10200	10000	10200	10200
Dissolved Manganese Mn	-	1000	17	< 1	< 1	18	14	3	2	9	2
Dissolved Mercury Hg	0.1	1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dissolved Molybdenum Mo	-	10000	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Nickel Ni	110[7]	1100[7]	2	< 1	2	1	< 1	< 1	< 1	< 1	< 1
Dissolved Phosphorus PO4	-	-	< 400	< 400	< 400	< 400	< 400	< 400	< 400	< 400	< 400
Dissolved Potassium K	-	-	2420	2090	2120	2390	1870	1730	1990	2040	1980
Dissolved Selenium Se	1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Silicon SiO2	-	-	12600	12100	12000	13000	13900	13100	13400	13100	13600
Dissolved Silver Ag	-0.1	1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dissolved Sodium Na	-	-	2500	1900	2100	2600	2100	2100	1900	2000	2000
Dissolved Strontium Sr	-	-	120	120	120	120	120	130	120	120	120
Dissolved Tellurium Te	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Thallium Tl	-	3	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dissolved Thorium Th	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dissolved Tin Sn	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Titanium Ti	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dissolved Uranium U	-	3000	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dissolved Vanadium V	-	-	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1
Dissolved Zinc Zn	30	300	24		26	9	10	15	11	10	11
Dissolved Zirconium Zr	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Notes:

1 = Canadian Council of Ministers of the Environment, 1991, Freshwater Aquatic Life Criteria

2 = Yukon Contaminated Sites Regulation Schedule 3: Generic Numerical Water Standards - Aquatic Life (AW)

3 = Duplicate for Well 1

4 = Duplicate for Well 6

5 = varies with pH value

6 = Guideline varies with pH, calcium and dissolved organic carbon concentrations

7 = Guideline changes with hardness

- = no criteria or data available

Exceeds one or more criteria =

TABLE 6
CONCENTRATIONS OF ORGANOCHLORINE PESTICIDES IN WATER
SNAG AIRSTRIP, YUKON
File: 281-004.02
ug/L (ppb)

			Sample ID	1	2	3	Dup 2[3]	4	5A	6	7	Dup 1[4]
			Date Sampled	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97	11/09/97
	Criteria											
	$CCME_{91}$[1]	YCSR[2]										
Parameter												
Organochlorine Pesticides												
Aldrin	0.004	0.04		-	-	-	-					
alpha-BHC	-	-		-	-	-	-	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
beta-BHC	-	-		-	-	-	-	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
delta-BHC	-	-		-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
gamma-BHC (Lindane)	-	-		-	-	-	-	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
alpha-Chlordane	-	-		-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
gamma-Chlordane	-	-		-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
p,p-DDD	-	-		-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
o,p-DDE	-	-		-	-	-	-	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
p,p-DDE	-	-		-	-	-	-	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
o,p-DDT	0.001	-		-	-	-	-					
p,p-DDT	0.001	-		-	-	-	-					
Dieldrin	0.004	-		-	-	-	-					
Endosulfan I	0.02	-		-	-	-	-					
Endosulfan II	0.02	-		-	-	-	-					
Endosulfan Sulphate	-	-		-	-	-	-	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Endrin	0.0023	0.023		-	-	-	-					
Endrin Aldehyde	-	-		-	-	-	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	0.01	-		-	-	-	-					
Heptachlor Epoxide	0.01	-		-	-	-	-					
Methoxychlor	-	-		-	-	-	-	< 2	< 2	< 2	< 2	< 2
Toxaphene	-	-		-	-	-	-	< 3	< 3	< 3	< 3	< 3

Notes:

1 = Canadian Council of Ministers of the Environment, 1991, Freshwater Aquatic Life Criteria

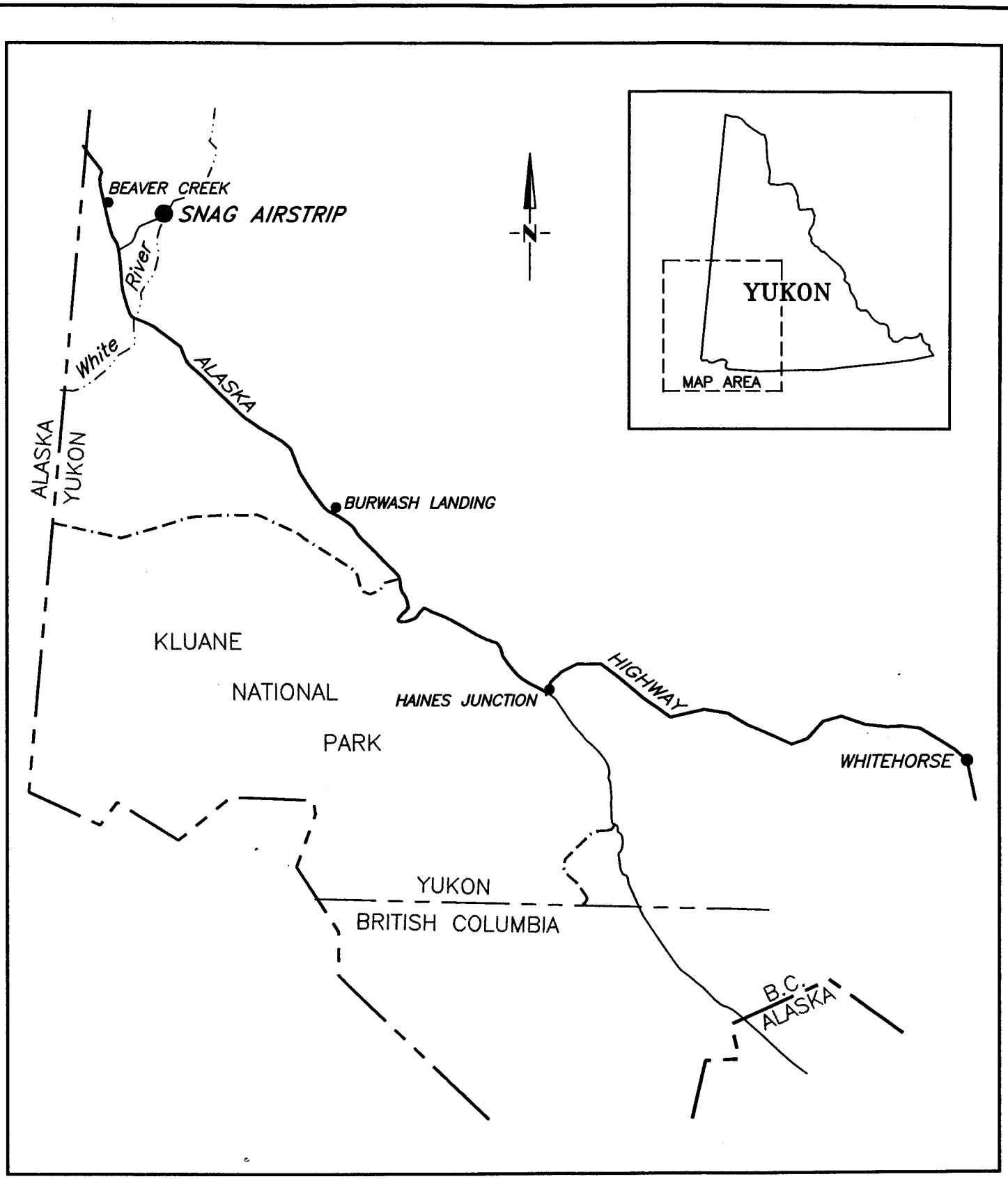
2 = Yukon Contaminated Sites Regulation Schedule 3: Generic Numerical Water Standards - Aquatic Life (AW)

3 = Duplicate for Well 1

4 = Duplicate for Well 6

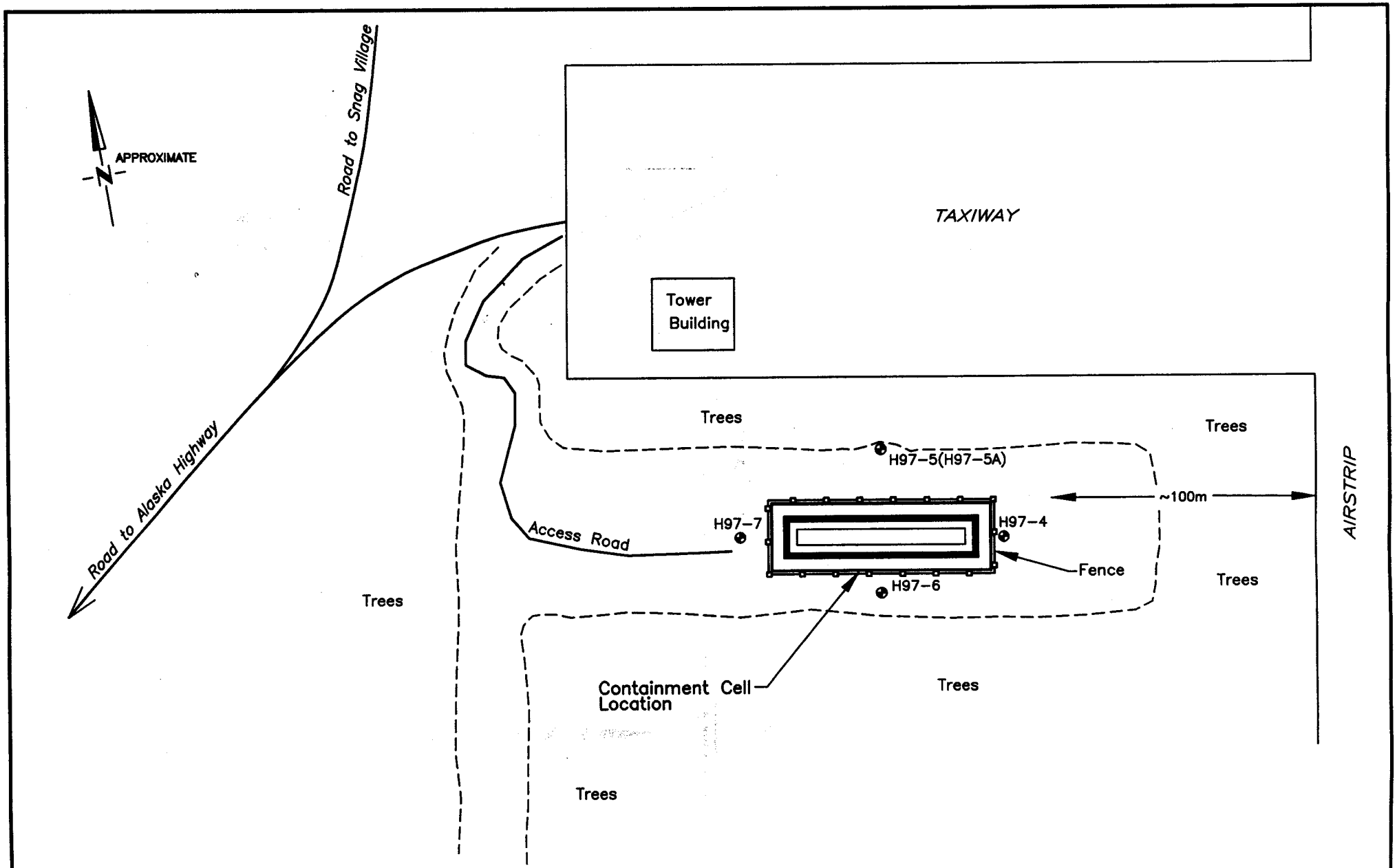
- = no criteria or data available

Exceeds one or more criteria =



NOT TO SCALE

LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON SITE LOCATION MAP		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.02	October 1998	FIGURE 1



LEGEND

H97-4 Monitoring Well Location

SCALE 1:2000(Approx.)
metres
0 40 80

LORIMER & ASSOCIATES
&
HEMMERA RESOURCE CONSULTANTS LTD.

CLIENT: INDIAN & NORTHERN AFFAIRS CANADA

SNAG AIRSTRIP REMEDIATION, YUKON

MONITORING WELL LOCATIONS
AT CONTAINMENT CELL

PROJECT No. YT20501/281-004.02 | October 1998 | FIGURE 2

PHOTO 1: Air Rotary Drill.
Note: Seeding taking place in background, using manual broadcast seeder.

PHOTO 2: Gravel Pit Above Newly Discovered Landfill.
Gravel berm defines upper edge of landfill.

PHOTO 3: Drums & Other Metallic Debris Strewn Around Landfill.

PHOTO 4: Test Pit 2 Debris.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP1**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP1 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera Pit bottomed at very hard cold (permafrost?) interface. E.O.T.P. at 1.22m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP1**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP1 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera Pit bottomed at very hard cold (permafrost?) Interface. E.O.T.P. at 1.22m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP1**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP1 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera Pit bottomed at very hard cold (permafrost?) interface. E.O.T.P. at 1.22m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP1**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP1 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera Pit bottomed at very hard cold (permafrost?) interface. E.O.T.P. at 1.22m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP2**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP2 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, copper wire, etcetera 0.76m Ash layer E.O.T.P. at 1.22m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP2**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP2 Composite (0-1.22m)	WASTE		0.5, 1.0, 1.5, 2.0, 2.5, 3.0	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, copper wire, etcetera 0.76m Ash layer E.O.T.P. at 1.22m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP2**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP2 Composite (0-1.22m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, copper wire, etcetera 0.76m Ash layer E.O.T.P. at 1.22m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP2**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP2 Composite (0-1.22m)	WASTE		0.5 1.0	1 2 3	0.0-1.22m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, copper wire, etcetera 0.76m Ash layer
				1.5 2.0 2.5 3.0	4 5 6 7 8 9 10	E.O.T.P. at 1.22m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP3**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.83m **SAND & GRAVEL**, no garbage E.O.T.P. at 1.83m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP3**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.83m **SAND & GRAVEL**, no garbage
						E.O.T.P. at 1.83m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP3**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalla

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.83m **SAND & GRAVEL**, no garbage E.O.T.P. at 1.83m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP3**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.83m **SAND & GRAVEL**, no garbage E.O.T.P. at 1.83m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP4**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5, 1.0, 1.5, 2.0, 2.5, 3.0	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	0.0-2.13m **SAND & GRAVEL**, no garbage Water seeping into pit at bottom.
						E.O.T.P. at 2.13m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG
Project No.: 281-004-02
Date: September 9, 1997

TESTPIT No: TP4

Location: Snag Airstrip, Y.T.
Contractor: -
Method: Backhoe
Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5, 1.0, 1.5, 2.0	1, 2, 3, 4, 5, 6, 7	0.0-2.13m **SAND & GRAVEL**, no garbage Water seeping into pit at bottom.
				2.5, 3.0	8, 9, 10	E.O.T.P. at 2.13m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG	**TESTPIT No: TP4**	Location: Snag Airstrip, Y.T.
Project No.: 281-004-02		Contractor: -
Date: September 9, 1997		Method: Backhoe
		Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5, 1.0, 1.5, 2.0	1, 2, 3, 4, 5, 6, 7	0.0-2.13m **SAND & GRAVEL**, no garbage **Water seeping into pit at bottom.**
				2.5, 3.0	8, 9, 10	E.O.T.P. at 2.13m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP4**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	No Sample	SAND & GRAVEL		0.5 1.0 1.5 2.0	1 2 3 4 5 6 7	0.0-2.13m **SAND & GRAVEL**, no garbage **Water seeping into pit at bottom.**
				2.5 3.0	8 9 10	E.O.T.P. at 2.13m

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

Project: SNAG	**TESTPIT No: TP5**	Location: Snag Airstrip, Y.T.
Project No.: 281-004-02		Contractor: -
Date: September 9, 1997		Method: Backhoe
		Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP5 @ 0.3m	DEBRIS				0.0-~0.3m **DEBRIS**
		SILT		0.5	1	~0.3m-0.91m Clayey **SILT**, Topsoil
				1.0	3	E.O.T.P. at 0.91m
				1.5	5	
				2.0	6	
				2.5	8	
				3.0	10	

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

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP5**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP5 @ 0.3m	DEBRIS				0.0-~0.3m **DEBRIS**
					1	~0.3m-0.91m Clayey **SILT**, Topsoil
		SILT		0.5	2	
					3	E.O.T.P. at 0.91m
				1.0	4	
				1.5	5	
					6	
				2.0	7	
					8	
				2.5	9	
				3.0	10	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG	**TESTPIT No: TP5**	Location: Snag Airstrip, Y.T.
Project No.: 281-004-02		Contractor: -
Date: September 9, 1997		Method: Backhoe
		Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP5 @ 0.3m	DEBRIS				0.0-~0.3m **DEBRIS**
		SILT		0.5	1	~0.3m-0.91m Clayey **SILT**, Topsoil
				1.0	2	
				1.5	3	E.O.T.P. at 0.91m
				2.0	4	
				2.5	5	
				3.0	6	
					7	
					8	
					9	
					10	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEDMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP5**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP5 @ 0.3m	DEBRIS				0.0-~0.3m **DEBRIS**
		SILT		0.5	1	~0.3m-0.91m Clayey **SILT**, Topsoil
				1.0	2	
				1.5	3	E.O.T.P. at 0.91m
				2.0	4	
				2.5	5	
				3.0	6	
					7	
					8	
					9	
					10	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP6**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP6 Composite (0-1.07m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.07m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera **Pit bottomed at permafrost interface.** E.O.T.P. at 1.07m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP6**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP6 Composite (0-1.07m)	WASTE		0.5 1.0 1.5 2.0 2.5 3.0	1 2 3 4 5 6 7 8 9 10	0.0-1.07m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera **Pit bottomed at permafrost interface.** E.O.T.P. at 1.07m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP6**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP6 Composite (0-1.07m)	WASTE		0.5 1.0	1 2 3	0,0-1.07m **WASTE**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera Pit bottomed at permafrost interface.
				1.5 2.0 2.5 3.0	4 5 6 7 8 9 10	E.O.T.P. at 1.07m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

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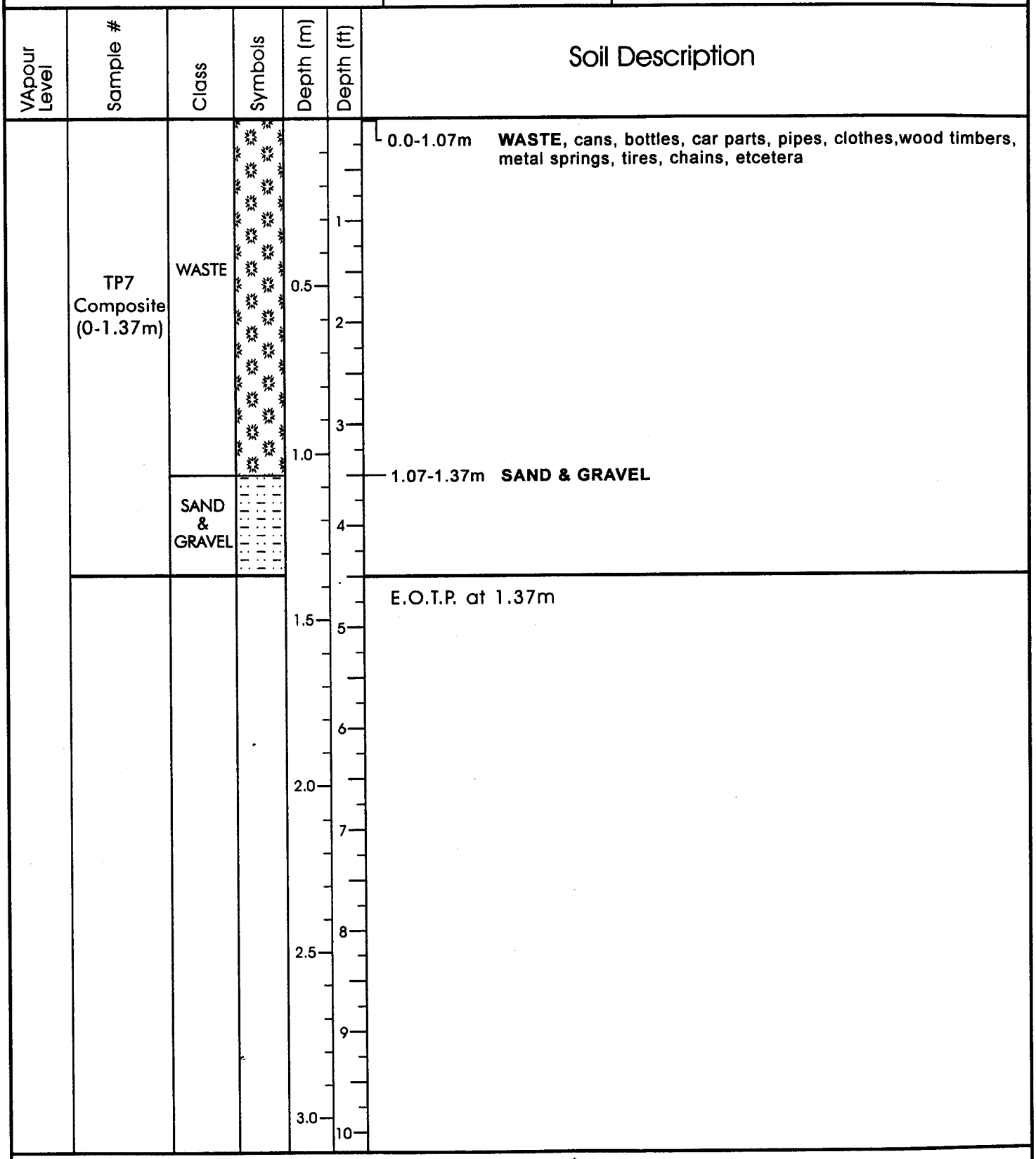
LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP7**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia



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

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP7**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP7 Composite (0-1.37m)	WASTE		0.5	1	0.0-1.07m **WASTE**, cans, bottles, car parts, pipes, clothes,wood timbers, metal springs, tires, chains, etcetera
				1.0	2	
					3	
		SAND & GRAVEL			4	1.07-1.37m **SAND & GRAVEL**
				1.5	5	E.O.T.P. at 1.37m
				2.0	6	
					7	
				2.5	8	
					9	
				3.0	10	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP7**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP7 Composite (0-1.37m)	WASTE		0.5 1.0	1 2 3	0.0-1.07m **WASTE**, cans, bottles, car parts, pipes, clothes,wood timbers, metal springs, tires, chains, etcetera
		SAND & GRAVEL			4	1.07-1.37m **SAND & GRAVEL**
				1.5 2.0 2.5 3.0	5 6 7 8 9 10	E.O.T.P. at 1.37m

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG
Project No.: 281-004-02
Date: September 9, 1997

TESTPIT No: TP8

Location: Snag Airstrip, Y.T.
Contractor: -
Method: Backhoe
Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP8 Composite (0-1.37m)	WASTE		0.5	1, 2	0.0-0.91m **WASTE under drums**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera
		SAND & GRAVEL		1.0	3, 4	0.91-1.37m **SAND & GRAVEL**
				1.5, 2.0, 2.5, 3.0	5, 6, 7, 8, 9, 10	E.O.T.P. at 1.37m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP8**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP8 Composite (0-1.37m)	WASTE		0.5	1 2	0.0-0.91m **WASTE under drums**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera
		SAND & GRAVEL		1.0	3	0.91-1.37m **SAND & GRAVEL**
				1.5	4 5	E.O.T.P. at 1.37m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.
				2.0	6 7	
				2.5	8	
				3.0	9 10	

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

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP8**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP8 Composite (0-1.37m)	WASTE		0.5	1 2	0.0-0.91m **WASTE under drums**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera
		SAND & GRAVEL		1.0	3 4	0.91-1.37m **SAND & GRAVEL**
				1.5	5	E.O.T.P. at 1.37m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.
				2.0	6 7	
				2.5	8 9	
				3.0	10	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG Project No.: 281-004-02 Date: September 9, 1997	**TESTPIT No: TP8**	Location: Snag Airstrip, Y.T. Contractor: - Method: Backhoe Logged By: Phil Scalia

VApour Level	Sample #	Class	Symbols	Depth (m)	Depth (ft)	Soil Description
	TP8 Composite (0-1.37m)	WASTE		0.5	1, 2	0.0-0.91m **WASTE under drums**, cans, bottles, car parts, pipes, clothes, wood timbers, metal springs, tires, chains, etcetera
		SAND & GRAVEL		1.0	3, 4	0.91-1.37m **SAND & GRAVEL**
				1.5, 2.0, 2.5, 3.0	5, 6, 7, 8, 9, 10	E.O.T.P. at 1.37m **NOTE:** Sample analyzed for LEPH, HEPH, PAH, Metals (residential) General Pesticides & PCBs.

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

OCT 24 1997

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
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REPORT ON: Analysis of Soil and Water Samples

REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 250
1290 Hornby Street
Vancouver, B.C.
V6Z 1W2

Att'n: Mr. Phil Scalia

CHAIN OF CUSTODY: 27014, 27015
PROJECT NAME: SNAG
PROJECT NUMBER: 281-04

NUMBER OF SAMPLES: 13

REPORT DATE: September 29, 1997

DATE SUBMITTED: September 12, 1997

GROUP NUMBER: 7091726

SAMPLE TYPE: Water and Soil

TEST METHODS:

pH in Soil - analysis was performed based on procedures described in the Manual on Soil Sampling and Methods of Analysis, published by the Canadian Society of Soil Science,1993. Analysis was performed by leaching with deionized water. Measurement was by pH meter.

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" 19th Edition, (1995) and 17th Edition (1989), published by the American Public Health Association.

Extractable Petroleum Hydrocarbons in Water/Soil (LEPH/HEPH-GNS) - analysis was performed using a draft DCM extraction-GC/FID procedure specified by the B.C. MOELP. Compounds eluting between n-decane (n-C10) and n-nonadecane (n-C19) are defined as Light Extractable Petroleum Hydrocarbons (LEPH). Compounds eluting between n-nonadecane and n-dotriacontane (n-C32) are defined as Heavy Extractable Petroleum Hydrocarbons (HEPH). These results can be compared to Generic Numerical Standard (GNS) criteria. The results may or may not be corrected for specified PAH's, as noted on the report.

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 Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS) or Graphite Furnace Atomic Absorption Spectrophotometry.

(Continued)

CANTEST LTD.

Richard S. Jornitz
Supervisor, Inorganic Testing

Organochlorine Pesticides in Water and Soil - analysis was performed using procedures based on U.S. EPA Method 608/8080, including extraction, clean-up steps, and analysis using GC/ECD.

Polynuclear Aromatic Hydrocarbons - analysis was performed using procedures based on U.S. EPA Methods 625/8270, involving extraction, clean-up steps, and analysis using GC/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.

Arsenic in Soil - analysis was performed using Zeeman background-corrected Graphite Furnace Atomic Absorption Spectrophotometry.

Cadmium in Soil - analysis was performed using background-corrected Flame Atomic Absorption Spectrophotometry.

Moisture in Soil - analysis was performed gravimetrically by heating a separate sample portion at 105 C and measuring the weight loss.

Mercury in Soil - analysis was performed using Cold Vapour Atomic Absorption Spectrophotometry.

Metals in Soil - undried representative samples were digested with a mixture of nitric acid and hydrochloric acid-"Aqua Regia". Analysis was performed using Inductively Coupled Argon Plasma Spectroscopy (ICAP) or by specific techniques as described.

Selenium in Soil - analysis was performed using Zeeman background-corrected Graphite Furnace Atomic Absorption Spectrophotometry.

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

TEST RESULTS:

(See following pages)

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		1	2	3	Dup 2	DETECTION LIMIT	UNITS
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170117	709170118	709170120	709170121		
pH		7.63	7.34	7.41	7.45	-	pH units
Conductivity		353	350	356	357	1	µS/cm
True Color		7	7	10	7	5	CU
Hardness	CaCO3	180	182	187	187	1	mg/L
Hardness (Total)	CaCO3	1040	285	226	1110	1	mg/L
Total Dissolved Solids		320	325	336	330	10	mg/L
Total Suspended Solids		7850	1680	261	7700	1	mg/L
Total Alkalinity	CaCO3	410	195	200	442	0.5	mg/L
Fluoride	F	<	<	<	<	0.05	mg/L
Chloride	Cl	0.5	0.5	0.7	0.7	0.2	mg/L
Nitrate	N	0.21	0.24	0.38	0.24	0.05	mg/L
Nitrite	N	<	<	<	<	0.002	mg/L
Sulphate	SO4	8.7	8.7	5.9	8.7	0.5	mg/L
Chemical Oxygen Demand		56	<	<	41	25	mg/L
Total Organic Carbon	C	5.5	7.4	8.3	2.3	1	mg/L
Ammonia Nitrogen	N	0.07	0.04	0.04	0.07	0.02	mg/L
Total Phenolics		<	<	<	<	0.001	mg/L
Sulphide	S	< 0.1	< 0.1	<	< 0.1	0.05	mg/L

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

CU = color units

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		4	5A	6	7		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97	DETECTION LIMIT	UNITS
CAN TEST ID:		709170123	709170124	709170125	709170126		
Hardness	CaCO3	177	181	177	182	1	mg/L
Hardness (Total)	CaCO3	328	190	197	208	1	mg/L

mg/L = milligrams per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		Dup 1		
DATE SAMPLED:		Sep 11/97	DETECTION LIMIT	UNITS
CAN TEST ID:		709170127		
Hardness	$CaCO_3$	179	1	mg/L
Hardness (Total)	$CaCO_3$	199	1	mg/L

mg/L = milligrams per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		1	1	2	2		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170117	709170117	709170118	709170118	DETECTION LIMIT	UNITS
Aluminum	Al	93.7	0.017	19.7	0.014	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.035	0.002	0.009	0.002	0.001	mg/L
Barium	Ba	2.18	0.061	0.31	0.057	0.001	mg/L
Beryllium	Be	0.003	<	<	<	0.001	mg/L
Boron	B	0.15	<	0.04	<	0.01	mg/L
Cadmium	Cd	0.003	<	0.0003	<	0.0002	mg/L
Calcium	Ca	284	56.8	76.0	57.4	0.01	mg/L
Chromium	Cr	0.18	<	0.041	<	0.001	mg/L
Cobalt	Co	0.1	<	0.021	<	0.001	mg/L
Copper	Cu	0.55	0.003	0.086	0.002	0.001	mg/L
Iron	Fe	171	<	32.7	<	0.03	mg/L
Lead	Pb	0.047	0.002	0.007	<	0.001	mg/L
Magnesium	Mg	81.3	9.20	23.0	9.32	0.05	mg/L
Manganese	Mn	16.8	0.017	1.18	<	0.001	mg/L
Mercury	Hg	0.36	<	0.15	<	0.05	µg/L
Molybdenum	Mo	0.001	<	<	<	0.001	mg/L
Nickel	Ni	0.32	0.002	0.043	<	0.001	mg/L
Phosphorus	PO4	24.2	<	3.4	<	0.4	mg/L
Potassium	K	9.48	2.42	4.44	2.09	0.01	mg/L
Selenium	Se	<	<	<	<	0.001	mg/L
Silicon	SiO2	130	12.6	70.4	12.1	0.1	mg/L
Silver	Ag	0.001	<	0.0003	<	0.0001	mg/L
Sodium	Na	7.8	2.5	3.3	1.9	0.1	mg/L
Strontium	Sr	0.43	0.12	0.17	0.12	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	0.001	0.0001	0.0001	<	0.0001	mg/L
Thorium	Th	0.015	<	0.001	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L
Titanium	Ti	1.09	<	0.65	<	0.001	mg/L
Uranium	U	0.003	<	0.0008	<	0.0005	mg/L

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REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		1	1	2	2		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170117	709170117	709170118	709170118	DETECTION LIMIT	UNITS
Vanadium	V	0.21	<	0.052	<	0.001	mg/L
Zinc	Zn	0.35	0.024	0.088	0.071	0.005	mg/L
Zirconium	Zr	0.011	<	0.004	<	0.001	mg/L

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

μg/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		3	3	Dup 2	Dup 2		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170120	709170120	709170121	709170121	DETECTION LIMIT	UNITS
Aluminum	Al	5.21	0.013	97.3	0.011	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.003	0.002	0.036	0.002	0.001	mg/L
Barium	Ba	0.12	0.058	2.15	0.062	0.001	mg/L
Beryllium	Be	<	<	0.003	<	0.001	mg/L
Boron	B	0.02	<	0.16	<	0.01	mg/L
Cadmium	Cd	<	<	0.003	<	0.0002	mg/L
Calcium	Ca	69.5	60.5	304	58.9	0.01	mg/L
Chromium	Cr	0.012	<	0.19	<	0.001	mg/L
Cobalt	Co	<	<	0.11	<	0.001	mg/L
Copper	Cu	0.023	0.004	0.56	0.002	0.001	mg/L
Iron	Fe	9.77	<	182	<	0.03	mg/L
Lead	Pb	0.003	<	0.049	<	0.001	mg/L
Magnesium	Mg	12.8	8.80	85.3	9.75	0.05	mg/L
Manganese	Mn	0.26	<	16.5	0.018	0.001	mg/L
Mercury	Hg	<	<	0.50	<	0.05	µg/L
Molybdenum	Mo	0.003	<	0.002	<	0.001	mg/L
Nickel	Ni	0.011	0.002	0.33	0.001	0.001	mg/L
Phosphorus	PO4	0.9	<	24.9	<	0.4	mg/L
Potassium	K	2.81	2.12	9.73	2.39	0.01	mg/L
Selenium	Se	<	<	<	<	0.001	mg/L
Silicon	SiO2	39.9	12.0	122	13.0	0.1	mg/L
Silver	Ag	<	<	0.001	<	0.0001	mg/L
Sodium	Na	2.9	2.1	7.5	2.6	0.1	mg/L
Strontium	Sr	0.14	0.12	0.45	0.12	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	<	<	0.001	<	0.0001	mg/L
Thorium	Th	<	<	0.016	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L
Titanium	Ti	0.24	<	1.12	<	0.001	mg/L
Uranium	U	<	<	0.003	<	0.0005	mg/L

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REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		3	3	Dup 2	Dup 2		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170120	709170120	709170121	709170121	DETECTION LIMIT	UNITS
Vanadium	V	0.016	<	0.22	0.001	0.001	mg/L
Zinc	Zn	0.036	0.026	0.36	0.009	0.005	mg/L
Zirconium	Zr	0.004	<	0.01	<	0.001	mg/L

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

μg/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		4	4	5A	5A		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170123	709170123	709170124	709170124	DETECTION LIMIT	UNITS
Aluminum	Al	18.5	0.023	0.68	0.01	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.019	0.002	0.001	0.001	0.001	mg/L
Barium	Ba	0.46	0.071	0.1	0.075	0.001	mg/L
Beryllium	Be	<	<	<	<	0.001	mg/L
Boron	B	0.05	<	0.01	<	0.01	mg/L
Cadmium	Cd	0.0007	<	<	<	0.0002	mg/L
Calcium	Ca	93.1	54.4	58.2	55.9	0.01	mg/L
Chromium	Cr	0.034	<	0.003	0.001	0.001	mg/L
Cobalt	Co	0.034	<	<	<	0.001	mg/L
Copper	Cu	0.16	<	0.008	<	0.001	mg/L
Iron	Fe	39.0	<	1.71	<	0.03	mg/L
Lead	Pb	0.015	0.001	0.008	<	0.001	mg/L
Magnesium	Mg	23.1	9.97	10.7	10.2	0.05	mg/L
Manganese	Mn	4.23	0.014	0.22	0.003	0.001	mg/L
Mercury	Hg	0.06	<	<	<	0.05	µg/L
Molybdenum	Mo	0.002	<	<	<	0.001	mg/L
Nickel	Ni	0.11	<	0.004	<	0.001	mg/L
Phosphorus	PO4	3.9	<	0.4	<	0.4	mg/L
Potassium	K	4.01	1.87	2.09	1.73	0.01	mg/L
Selenium	Se	<	<	<	<	0.001	mg/L
Silicon	SiO2	67.6	13.9	16.4	13.1	0.1	mg/L
Silver	Ag	0.0001	<	<	<	0.0001	mg/L
Sodium	Na	3.5	2.1	2.2	2.1	0.1	mg/L
Strontium	Sr	0.19	0.12	0.13	0.13	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	0.0003	<	<	<	0.0001	mg/L
Thorium	Th	0.003	<	<	<	0.0005	mg/L
Tin	Sn	<	<	0.002	<	0.001	mg/L
Titanium	Ti	0.68	<	0.034	<	0.001	mg/L
Uranium	U	0.0008	<	<	<	0.0005	mg/L

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REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		4	4	5A	5A		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170123	709170123	709170124	709170124	DETECTION LIMIT	UNITS
Vanadium	V	0.054	<	0.003	<	0.001	mg/L
Zinc	Zn	0.096	0.01	0.03	0.015	0.005	mg/L
Zirconium	Zr	0.003	<	<	<	0.001	mg/L

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

µg/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		6	6	7	7		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170125	709170125	709170126	709170126	DETECTION LIMIT	UNITS
Aluminum	Al	2.11	0.012	2.71	0.019	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.004	0.002	0.003	0.002	0.001	mg/L
Barium	Ba	0.15	0.069	0.15	0.078	0.001	mg/L
Beryllium	Be	<	<	<	<	0.001	mg/L
Boron	B	0.02	<	0.02	<	0.01	mg/L
Cadmium	Cd	<	<	<	<	0.0002	mg/L
Calcium	Ca	59.6	54.2	63.0	56.1	0.01	mg/L
Chromium	Cr	0.005	<	0.006	<	0.001	mg/L
Cobalt	Co	<	<	<	<	0.001	mg/L
Copper	Cu	0.031	<	0.017	<	0.001	mg/L
Iron	Fe	5.18	<	5.53	<	0.03	mg/L
Lead	Pb	0.003	<	0.003	<	0.001	mg/L
Magnesium	Mg	11.7	10.0	12.3	10.2	0.05	mg/L
Manganese	Mn	0.74	0.002	0.64	0.009	0.001	mg/L
Mercury	Hg	<	<	<	<	0.05	µg/L
Molybdenum	Mo	<	<	<	<	0.001	mg/L
Nickel	Ni	0.026	<	0.012	<	0.001	mg/L
Phosphorus	PO4	<	<	0.6	<	0.4	mg/L
Potassium	K	2.18	1.99	2.28	2.04	0.01	mg/L
Selenium	Se	<	<	<	<	0.001	mg/L
Silicon	SiO2	22.6	13.4	23.7	13.1	0.1	mg/L
Silver	Ag	<	<	<	<	0.0001	mg/L
Sodium	Na	2.3	1.9	2.5	2.0	0.1	mg/L
Strontium	Sr	0.13	0.12	0.14	0.12	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	<	<	<	<	0.0001	mg/L
Thorium	Th	<	<	<	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L
Titanium	Ti	0.1	<	0.13	<	0.001	mg/L
Uranium	U	<	<	<	<	0.0005	mg/L

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REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		6	6	7	7		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97		
CAN TEST ID:		709170125	709170125	709170126	709170126	DETECTION LIMIT	UNITS
Vanadium	V	0.008	<	0.009	<	0.001	mg/L
Zinc	Zn	0.029	0.011	0.052	0.01	0.005	mg/L
Zirconium	Zr	<	<	0.002	<	0.001	mg/L

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

µg/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		Dup 1	Dup 1		
SAMPLE PREPARATION:		TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97		
CAN TEST ID:		709170127	709170127	DETECTION LIMIT	UNITS
Aluminum	Al	2.3	0.013	0.005	mg/L
Antimony	Sb	<	<	0.001	mg/L
Arsenic	As	0.004	0.002	0.001	mg/L
Barium	Ba	0.16	0.069	0.001	mg/L
Beryllium	Be	<	<	0.001	mg/L
Boron	B	0.01	<	0.01	mg/L
Cadmium	Cd	<	<	0.0002	mg/L
Calcium	Ca	60.2	55.0	0.01	mg/L
Chromium	Cr	0.006	<	0.001	mg/L
Cobalt	Co	0.001	<	0.001	mg/L
Copper	Cu	0.034	<	0.001	mg/L
Iron	Fe	5.88	<	0.03	mg/L
Lead	Pb	0.003	<	0.001	mg/L
Magnesium	Mg	11.9	10.2	0.05	mg/L
Manganese	Mn	0.86	0.002	0.001	mg/L
Mercury	Hg	<	<	0.05	µg/L
Molybdenum	Mo	<	<	0.001	mg/L
Nickel	Ni	0.029	<	0.001	mg/L
Phosphorus	PO4	0.5	<	0.4	mg/L
Potassium	K	2.16	1.98	0.01	mg/L
Selenium	Se	<	<	0.001	mg/L
Silicon	SiO2	24.4	13.6	0.1	mg/L
Silver	Ag	<	<	0.0001	mg/L
Sodium	Na	2.4	2.0	0.1	mg/L
Strontium	Sr	0.13	0.12	0.001	mg/L
Tellurium	Te	<	<	0.001	mg/L
Thallium	Tl	<	<	0.0001	mg/L
Thorium	Th	<	<	0.0005	mg/L
Tin	Sn	<	<	0.001	mg/L
Titanium	Ti	0.11	<	0.001	mg/L
Uranium	U	<	<	0.0005	mg/L

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REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		Dup 1	Dup 1		
SAMPLE PREPARATION:		TOTAL	DISSOLVED		
DATE SAMPLED:		Sep 11/97	Sep 11/97	DETECTION LIMIT	UNITS
CAN TEST ID:		709170127	709170127		
Vanadium	V	0.009	<	0.001	mg/L
Zinc	Zn	0.026	0.011	0.005	mg/L
Zirconium	Zr	<	<	0.001	mg/L

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

µg/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Polychlorinated Biphenyls in Water

CLIENT SAMPLE IDENTIFICATION:	4	5A	6	7	
DATE SAMPLED:	Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97	DETECTION LIMIT
CAN TEST ID:	709170123	709170124	709170125	709170126	
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: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Polychlorinated Biphenyls in Water

CLIENT SAMPLE IDENTIFICATION:	4	5A	6	7	
DATE SAMPLED:	Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97	
CAN TEST ID:	709170123	709170124	709170125	709170126	DETECTION LIMIT
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: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Polychlorinated Biphenyls in Water

CLIENT SAMPLE IDENTIFICATION:	Dup 1	
DATE SAMPLED:	Sep 11/97	DETECTION LIMIT
CAN TEST ID:	709170127	
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: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Chlorinated Phenols in Water

CLIENT SAMPLE IDENTIFICATION:	1	2	3	Dup 2	
DATE SAMPLED:	Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97	DETECTION LIMIT
CAN TEST ID:	709170117	709170118	709170120	709170121	
Pentachlorophenol	<	0.16	<	0.06	0.05
Total Trichlorophenols	<	<	<	<	0.1
Total Tetrachlorophenols	<	<	<	<	0.05
Total Chlorinated Phenols	<	0.16	<	0.06	0.05
Surrogate Recovery					
2,4,6-Tribromophenol	120	117	106	114	-

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

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Organochlorine Pesticides in Water

CLIENT SAMPLE IDENTIFICATION:	4	5A	6	7	
DATE SAMPLED:	Sep 11/97	Sep 11/97	Sep 11/97	Sep 11/97	DETECTION LIMIT
CAN TEST ID:	709170123	709170124	709170125	709170126	
Aldrin	<	<	<	<	0.04
alpha-BHC	<	<	<	<	0.03
beta-BHC	<	<	<	<	0.06
delta-BHC	<	<	<	<	0.1
gamma-BHC (Lindane)	<	<	<	<	0.04
alpha-Chlordane	<	<	<	<	0.1
gamma-Chlordane	<	<	<	<	0.1
p,p-DDD	<	<	<	<	0.1
o,p-DDE	<	<	<	<	0.04
p,p-DDE	<	<	<	<	0.04
o,p-DDT	<	<	<	<	0.1
p,p-DDT	<	<	<	<	0.1
Dieldrin	<	<	<	<	0.02
Endosulfan I	<	<	<	<	0.1
Endosulfan II	<	<	<	<	0.04
Endosulfan Sulphate	<	<	<	<	0.7
Endrin	<	<	<	<	0.06
Endrin Aldehyde	<	<	<	<	0.2
Heptachlor	<	<	<	<	0.3
Heptachlor Epoxide	<	<	<	<	0.8
Methoxychlor	<	<	<	<	2
Toxaphene	<	<	<	<	3

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

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Organochlorine Pesticides in Water

CLIENT SAMPLE IDENTIFICATION:	Dup 1	
DATE SAMPLED:	Sep 11/97	DETECTION LIMIT
CAN TEST ID:	709170127	
Aldrin	<	0.04
alpha-BHC	<	0.03
beta-BHC	<	0.06
delta-BHC	<	0.1
gamma-BHC (Lindane)	<	0.04
alpha-Chlordane	<	0.1
gamma-Chlordane	<	0.1
p,p-DDD	<	0.1
o,p-DDE	<	0.04
p,p-DDE	<	0.04
o,p-DDT	<	0.1
p,p-DDT	<	0.1
Dieldrin	<	0.02
Endosulfan I	<	0.1
Endosulfan II	<	0.04
Endosulfan Sulphate	<	0.7
Endrin	<	0.06
Endrin Aldehyde	<	0.2
Heptachlor	<	0.3
Heptachlor Epoxide	<	0.8
Methoxychlor	<	2
Toxaphene	<	3

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

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Conventional Parameters in Soil

CLIENT SAMPLE IDENTIFICATION:	TP 1	TP 6	Dup 1	TP 8	
DATE SAMPLED:	Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97	
CAN TEST ID:	709170129	709170130	709170131	709170132	DETECTION LIMIT
pH	7.3	8.5	8.5	7.9	0.1

Results expressed as pH units

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Polycyclic Aromatic Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	TP 1	TP 6	Dup 1	TP 8	DETECTION LIMIT
DATE SAMPLED:	Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97	
CAN TEST ID:	709170129	709170130	709170131	709170132	
ANALYSIS DATE:	Sep 22/97	Sep 22/97	Sep 22/97	Sep 22/97	
Naphthalene	0.25	7.4	0.09	0.07	0.05
Acenaphthylene	<	<	<	<	0.05
Acenaphthene	<	12	<	<	0.05
Fluorene	<	9.8	<	<	0.05
Phenanthrene	0.05	56	0.12	<	0.05
Anthracene	<	13	<	<	0.05
Total LMW-PAH's	0.30	98.2	0.21	0.07	
Fluoranthene	0.07	40	0.10	<	0.05
Pyrene	0.08	41	0.10	<	0.05
Benzo(a)anthracene	<	14	<	<	0.05
Chrysene	<	16	<	<	0.05
Benzo(b)fluoranthene	<	14	<	<	0.05
Benzo(k)fluoranthene					0.05
Benzo(a)pyrene	<	11	<	<	0.05
Indeno(1,2,3-c,d)pyrene	<	5.0	<	<	0.05
Dibenz(a,h)anthracene	<	0.92	<	<	0.05
Benzo(g,h,i)perylene	<	4.3	<	<	0.05
Total HMW-PAH's	0.15	146	0.20		
Total PAH's	0.45	244	0.41	0.07	

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit
NOTE: Benzo(b)fluoranthene and Benzo(k)fluoranthene reported as total.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Polychlorinated Biphenyls in Soil

CLIENT SAMPLE IDENTIFICATION:	TP 1	TP 6	Dup 1	TP 8	
DATE SAMPLED:	Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97	
CAN TEST ID:	709170129	709170130	709170131	709170132	DETECTION LIMIT
Arochlor 1242	<	<	<	<	0.03
Arochlor 1248	<	<	<	<	0.03
Arochlor 1254	<	<	<	<	0.03
Arochlor 1260	<	<	<	<	0.03

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Extractable Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	TP 1	TP 6	Dup 1	TP 8	
DATE SAMPLED:	Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97	DETECTION LIMIT
CAN TEST ID:	709170129	709170130	709170131	709170132	
LEPH-uncorrected for PAH's	<	<	<	<	250
HEPH-uncorrected for PAH's	600	<	<	<	250
LEPH-corrected for PAH's	<	<	<	<	250
HEPH-corrected for PAH's	600	<	<	<	250

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Metals Analysis in Soil

CLIENT SAMPLE IDENTIFICATION:		TP 1	TP 6	Dup 1	TP 8	DETECTION LIMIT	UNITS
DATE SAMPLED:		Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97		
CAN TEST ID:		709170129	709170130	709170131	709170132		
Moisture		10.6	11.7	16.5	25.8	0.1	%
Antimony	Sb	<	<	<	<	10	µg/g
Arsenic	As	<	<	<	<	10	µg/g
Barium	Ba	142	112	158	353	1	µg/g
Beryllium	Be	<	<	<	<	1	µg/g
Cadmium	Cd	0.70	<	<	0.36	0.25	µg/g
Chromium	Cr	38	21	26	40	2	µg/g
Cobalt	Co	9	6	9	12	1	µg/g
Copper	Cu	146	20	27	45	1	µg/g
Lead	Pb	482	<	<	94	30	µg/g
Mercury	Hg	0.13	0.03	0.02	0.08	0.001	µg/g
Molybdenum	Mo	<	<	<	<	4	µg/g
Nickel	Ni	84	14	18	24	2	µg/g
Selenium	Se	<	<	<	<	3	µg/g
Silver	Ag	<	<	<	<	2	µg/g
Tin	Sn	129	6	<	185	5	µg/g
Vanadium	V	32	29	36	58	1	µg/g
Zinc	Zn	295	54	63	213	1	µg/g
Aluminum	Al	12300	9010	12000	18200	10	µg/g
Boron	B	29	14	20	35	1	µg/g
Calcium	Ca	5020	8020	11700	19400	1	µg/g
Iron	Fe	5650	7090	8590	6810	2	µg/g
Magnesium	Mg	4700	4190	4480	6150	0.1	µg/g
Manganese	Mn	397	305	427	647	0.2	µg/g
Phosphorus	PO4	1430	1300	1400	2470	20	µg/g
Sodium	Na	272	249	256	1090	5	µg/g
Strontium	Sr	24	35	47	91	1	µg/g
Titanium	Ti	197	220	201	547	1	µg/g

% = percent
< = Less than detection limit

µg/g = micrograms per gram, on a dry weight basis.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	TP 1	TP 6	Dup 1	TP 8	
DATE SAMPLED:	Sep 9/97	Sep 9/97	Sep 9/97	Sep 9/97	
CAN TEST ID:	709170129	709170130	709170131	709170132	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	0.01	<	<	<	0.005
o,p-DDE	<	<	<	<	0.003
p,p-DDE	0.004	<	<	<	0.003
o,p-DDT	<	<	<	<	0.003
p,p-DDT	0.025	<	<	<	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Expoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. (μg/g)
< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Polycyclic Aromatic Hydrocarbons in Soil (QC# 26913)

Parameter	Blank (ug/g)	Blank Limits	Certified Standard (% Recovery)	Certified Standard Limits	Duplicate (R.P.D.)	Duplicate Limits
Naphthalene	< 0.05	0.05	92	57 - 111	16.2	40
Acenaphthylene	< 0.05	0.05	80	45 - 135	9.1	40
Acenaphthene	< 0.05	0.05	-	-	2.9	40
Fluorene	< 0.05	0.05	-	-	2	40
Phenanthrene	< 0.05	0.05	54	49 - 97	0	40
Anthracene	< 0.05	0.05	77	54 - 129	3.1	40
Fluoranthene	< 0.05	0.05	77	59 - 124	0	40
Pyrene	< 0.05	0.05	62	46 - 84	1.6	40
Benzo(a)anthracene	< 0.05	0.05	-	-	0	40
Chrysene	< 0.05	0.05	77	53 - 114	0	40
Benzo(b)fluoranthene	< 0.05	0.05	80	67 - 141	26.7	40
Benzo(a)pyrene	< 0.05	0.05	-	-	0	40
Indeno(1,2,3-c,d)pyrene	< 0.05	0.05	56	49 - 102	0	40
Dibenz(a,h)anthracene	< 0.05	0.05	80	61 - 126	0	40
Benzo(g,h,i)perylene	< 0.05	0.05	-	-	0	40

ug/g = micrograms per gram
< = Less than detection limit
R.P.D. = Relative Percent Difference

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Polychlorinated Biphenyls in Soil (QC# 27019)

Parameter	Blank (ug/g)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Spike (% Recovery)	Spike Limits
Arochlor 1242	< 0.03	0.03	NC	25	-	-
Arochlor 1248	< 0.03	0.03	NC	25	-	-
Arochlor 1254	< 0.03	0.03	NC	25	91	75 - 125
Arochlor 1260	< 0.03	0.03	NC	25	-	-

ug/g = micrograms per gram
R.P.D. = Relative Percent Difference
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Metals Analysis in Soil (QC# 4157)

Parameter		Duplicate (R.P.D.)	Duplicate Limits
Antimony	Sb	NC	30
Arsenic	As	NC	30
Barium	Ba	16.9	30
Beryllium	Be	NC	30
Cadmium	Cd	NC	30
Chromium	Cr	5.4	30
Cobalt	Co	10.5	30
Copper	Cu	4.5	30
Mercury	Hg	10.9	30
Selenium	Se	NC	30
Silver	Ag	NC	30
Tin	Sn	NC	30
Vanadium	V	12.6	30
Zinc	Zn	1	30

ug/g = micrograms per gram
R.P.D. = Relative Percent Difference
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

CANTEST

Batch Quality Control for Conventional Parameters in Water

Parameter		QC Type	QC Result	Units	Lower Limit	Upper Limit
pH		Duplicate	0.0	R.P.D.	0	3
		Duplicate	0.2	R.P.D.	0	3
		Duplicate	0.5	R.P.D.	0	3
		Duplicate	0.8	R.P.D.	0	3
Conductivity		Duplicate	0.6	R.P.D.	0	5
		Duplicate	0.8	R.P.D.	0	5
		Duplicate	0.9	R.P.D.	0	5
		Duplicate	1.3	R.P.D.	0	5
		Duplicate	1.4	R.P.D.	0	5
True Color		Calibration Verification	100.0	% Recovery	80	105
		Duplicate	NC	R.P.D.	0	10
Total Suspended Solids		Blank	< 1	mg/L	0	3
Fluoride	F	Blank	< 0.05	mg/L	0	0.05
		Dionex Certified Standard	104.5	% Recovery	90	110
		Duplicate	NC	R.P.D.	0	20
		Duplicate	PASS	R.P.D.	0	20
Chloride	Cl	Blank	< 0.2	mg/L	0	0.2
		Dionex Certified Standard	102.3	% Recovery	90	110
		Duplicate	0.0	R.P.D.	0	20
		Duplicate	0.0	R.P.D.	0	20
		Duplicate	PASS	R.P.D.	0	20
		Duplicate	PASS	R.P.D.	0	20
Nitrate	N	Blank	< 0.05	mg/L	0	0.05
		Dionex Certified Standard	100.1	% Recovery	90	110
		Duplicate	NC	R.P.D.	0	20
		Duplicate	PASS	R.P.D.	0	20
Nitrite	N	Blank	< 0.002	mg/L	0	0.002

(Continued on next page)

Batch Quality Control for Conventional Parameters in Water

Parameter		QC Type	QC Result	Units	Lower Limit	Upper Limit
Nitrite	N	Spike	95.0	% Recovery	80	120
		Calibration Verification	101.0	% Recovery	93	107
		Duplicate	NC	R.P.D.	0	20
Sulphate	SO4	Blank	< 0.5	mg/L	0	1
		Dionex Certified Standard	100.7	% Recovery	90	110
		Duplicate	0.3	R.P.D.	0	20
		Duplicate	0.5	R.P.D.	0	20
		Duplicate	3.3	R.P.D.	0	20
		Duplicate	3.5	R.P.D.	0	20
Chemical Oxygen Demand		Spike	100.0	% Recovery	80	120
		Calibration Verification	101.5	% Recovery	85	115
		Duplicate	9.7	R.P.D.	0	14
Total Organic Carbon	C	Blank	< 1	mg/L	0	1
		Certified Standard	100.0	% Recovery	87	113
		Duplicate	PASS	R.P.D.	0	12
Ammonia Nitrogen	N	Blank	< 0.02	mg/L	0	0.02
		Spike	95.2	% Recovery	80	120
		Duplicate	0.8	R.P.D.	0	20
Total Phenolics		Blank	< 0.001	mg/L	0	0.001
		Spike	100.0	% Recovery	80	120
		Duplicate	0.0	R.P.D.	0	20
Sulphide	S	Blank	< 0.05	mg/L	0	0.05
		Duplicate	NC	R.P.D.	0	15

uS/cm = microsiemens per centimeter
CU = color units
mg/L = milligrams per liter
< = Less than detection limit
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Dissolved Metals Analysis in Water (QC# 4126)

Parameter		Dissolved Blank (mg/L)	Dissolved Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Duplicate (R.P.D.)	Duplicate Limits
Aluminum	Al	< 0.005	0.015	-	-	-	-
Antimony	Sb	< 0.001	0.001	NC	20	-	-
Arsenic	As	< 0.001	0.001	NC	20	-	-
Barium	Ba	< 0.001	0.001	-	-	-	-
Beryllium	Be	< 0.001	0.001	-	-	-	-
Boron	B	< 0.01	0.03	-	-	-	-
Cadmium	Cd	0.00021	0.001	PASS	20	-	-
Calcium	Ca	0.03	0.05	10.5	15	2.9	15
Chromium	Cr	< 0.001	0.001	NC	20	-	-
Cobalt	Co	< 0.001	0.001	NC	20	-	-
Copper	Cu	< 0.001	0.001	NC	20	-	-
Iron	Fe	< 0.03	0.03	NC	15	NC	15
Lead	Pb	< 0.001	0.001	NC	20	-	-
Magnesium	Mg	< 0.05	0.05	PASS	15	3.2	15
Manganese	Mn	< 0.001	0.001	-	-	-	-
Mercury	Hg	< 0.05	0.1	NC	20	-	-
Molybdenum	Mo	< 0.001	0.001	PASS	20	-	-
Nickel	Ni	< 0.001	0.001	NC	20	-	-
Phosphorus	PO4	< 0.4	0.4	-	-	-	-
Potassium	K	0.01643	0.05	NC	20	-	-
Selenium	Se	< 0.001	0.001	NC	20	-	-
Silicon	SiO2	< 0.1	0.3	NC	12	3.4	12
Silver	Ag	< 0.0001	0.001	NC	20	-	-
Sodium	Na	< 0.1	0.2	PASS	15	2.7	15
Strontium	Sr	< 0.001	0.001	-	-	-	-
Thallium	Tl	0.00022	0.001	NC	20	-	-
Thorium	Th	< 0.0005	0.0005	NC	20	-	-
Tin	Sn	< 0.001	0.005	NC	20	-	-
Titanium	Ti	< 0.001	0.001	-	-	-	-
Uranium	U	< 0.0005	0.0005	NC	20	-	-
Vanadium	V	< 0.001	0.001	-	-	-	-
Zinc	Zn	< 0.005	0.01	-	-	-	-
Zirconium	Zr	< 0.001	0.001	-	-	-	-

mg/L = milligrams per liter
Mercury Hg expressed as: ug/L (micrograms per liter)
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Dissolved Metals Analysis in Water (QC# 4126)

Parameter		Duplicate (R.P.D.)	Duplicate Limits	Duplicate (R.P.D.)	Duplicate Limits	Duplicate (R.P.D.)	Duplicate Limits
Aluminum	Al	PASS	20	PASS	20	NC	20
Antimony	Sb	NC	20	NC	20	NC	20
Arsenic	As	PASS	20	PASS	20	PASS	20
Cadmium	Cd	NC	20	NC	20	NC	20
Calcium	Ca	0.8	15	0.5	15	1.4	15
Chromium	Cr	NC	20	PASS	20	PASS	20
Cobalt	Co	NC	20	NC	20	NC	20
Copper	Cu	NC	20	NC	20	2.2	20
Iron	Fe	PASS	15	NC	15	NC	15
Lead	Pb	NC	20	NC	20	NC	20
Magnesium	Mg	2.2	15	1	15	1.1	15
Mercury	Hg	NC	20	NC	20	NC	20
Molybdenum	Mo	PASS	20	PASS	20	3.3	20
Nickel	Ni	PASS	20	NC	20	NC	20
Potassium	K	2.6	20	9	20	0.6	20
Selenium	Se	NC	20	NC	20	0	20
Silicon	SiO2	0	12	0.8	12	0.8	12
Silver	Ag	NC	20	NC	20	NC	20
Sodium	Na	0	15	0	15	1.3	15
Thallium	Tl	NC	20	NC	20	NC	20
Thorium	Th	NC	20	NC	20	NC	20
Tin	Sn	NC	20	NC	20	NC	20
Uranium	U	NC	20	NC	20	2.6	20

mg/L = milligrams per liter
Mercury Hg expressed as: ug/L (micrograms per liter)
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 4154)

Parameter		Duplicate (R.P.D.)	Duplicate Limits	Duplicate (R.P.D.)	Duplicate Limits	Graphite Furnace Spike (% Recovery)	Graphite Furnace Spike Limits
Aluminum	Al	6.5	20	-	-	-	-
Antimony	Sb	NC	20	-	-	-	-
Arsenic	As	NC	20	NC	20	-	-
Cadmium	Cd	NC	20	NC	20	-	-
Calcium	Ca	2.1	15	-	-	-	-
Chromium	Cr	NC	20	-	-	-	-
Cobalt	Co	NC	20	-	-	-	-
Copper	Cu	8.6	20	-	-	-	-
Iron	Fe	0	15	PASS	15	-	-
Lead	Pb	NC	20	11.9	20	-	-
Magnesium	Mg	PASS	15	1.9	15	-	-
Molybdenum	Mo	NC	20	-	-	-	-
Nickel	Ni	PASS	20	-	-	-	-
Potassium	K	11.2	20	-	-	-	-
Selenium	Se	NC	20	NC	20	89	75 - 125
Silicon	SiO2	2.7	12	-	-	-	-
Silver	Ag	NC	20	-	-	-	-
Sodium	Na	0	15	-	-	-	-
Thallium	Tl	NC	20	-	-	-	-
Thorium	Th	NC	20	-	-	-	-
Tin	Sn	NC	20	-	-	-	-
Uranium	U	NC	20	NC	20	-	-

mg/L = milligrams per liter
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 4154)

Parameter		Graphite Furnace Spike (% Recovery)	Graphite Furnace Spike Limits	ICP Spike (% Recovery)	ICP Spike Limits	ICP Spike (% Recovery)	ICP Spike Limits
Iron	Fe	-	-	112	80 - 120	110	80 - 120
Selenium	Se	97	75 - 125	-	-	-	-
Silicon	SiO2	-	-	111	74 - 120	101	74 - 120

mg/L = milligrams per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 4154)

Parameter		ICPMS Spike (% Recovery)	ICPMS Spike Limits	ICPMS Spike (% Recovery)	ICPMS Spike Limits	Total Blank (mg/L)	Total Blank Limits
Aluminum	Al	-	-	-	-	< 0.005	0.015
Antimony	Sb	101	70 - 130	106	70 - 130	< 0.001	0.001
Arsenic	As	103	70 - 130	106	70 - 130	< 0.001	0.001
Beryllium	Be	-	-	-	-	< 0.001	0.001
Boron	B	-	-	-	-	< 0.01	0.03
Cadmium	Cd	105	70 - 130	113	70 - 130	< 0.0002	0.001
Calcium	Ca	-	-	-	-	0.02	0.05
Chromium	Cr	101	70 - 130	104	70 - 130	< 0.001	0.001
Cobalt	Co	74	70 - 130	71	70 - 130	< 0.001	0.001
Copper	Cu	91	70 - 130	100	70 - 130	< 0.001	0.001
Iron	Fe	-	-	-	-	< 0.03	0.03
Lead	Pb	94	70 - 130	106	70 - 130	< 0.001	0.001
Magnesium	Mg	-	-	-	-	< 0.05	0.05
Manganese	Mn	-	-	-	-	< 0.001	0.001
Molybdenum	Mo	99	70 - 130	94	70 - 130	< 0.001	0.001
Nickel	Ni	98	70 - 130	99	70 - 130	< 0.001	0.001
Phosphorus	PO4	-	-	-	-	< 0.4	0.4
Potassium	K	-	-	-	-	0.01397	0.05
Selenium	Se	-	-	-	-	< 0.001	0.001
Silicon	SiO2	-	-	-	-	< 0.1	0.3
Silver	Ag	-	-	-	-	< 0.0001	0.001
Sodium	Na	-	-	-	-	0.2	0.2
Strontium	Sr	-	-	-	-	< 0.001	0.001
Thallium	Tl	-	-	-	-	< 0.0001	0.001
Thorium	Th	-	-	83	70 - 130	< 0.0005	0.0005
Tin	Sn	-	-	-	-	< 0.001	0.005
Titanium	Ti	-	-	-	-	< 0.001	0.001
Uranium	U	100	70 - 130	102	70 - 130	< 0.0005	0.0005
Vanadium	V	-	-	-	-	< 0.001	0.001
Zinc	Zn	-	-	-	-	< 0.005	0.01
Zirconium	Zr	-	-	-	-	< 0.001	0.001

mg/L = milligrams per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Instrument Quality Control for the HP 4500 ICPMS (QC# 27109)

QC Type: Certified Standard NIST 1643D

Parameter		% Recovery	Limits
Aluminum	Al	92	80 - 120
Antimony	Sb	104	80 - 120
Arsenic	As	98	80 - 120
Barium	Ba	95	80 - 120
Beryllium	Be	99	80 - 120
Cadmium	Cd	97	80 - 120
Calcium	Ca	97	80 - 120
Chromium	Cr	94	80 - 120
Cobalt	Co	83	80 - 120
Copper	Cu	95	80 - 120
Lead	Pb	89	80 - 120
Magnesium	Mg	93	80 - 120
Manganese	Mn	97	80 - 120
Molybdenum	Mo	98	80 - 120
Nickel	Ni	93	80 - 120
Potassium	K	106	80 - 120
Silver	Ag	101	80 - 120
Sodium	Na	91	80 - 120
Strontium	Sr	98	80 - 120
Thallium	Tl	95	80 - 120
Vanadium	V	95	80 - 120
Zinc	Zn	100	80 - 120

CANTEST

Batch Quality Control for Organochlorine Pesticides in Water (QC# 27183)

Parameter	Blank (ug/L)	Blank Limits	Spike (% Recovery)	Spike Limits
Aldrin	< 0.04	0.04	51	30 - 130
alpha-BHC	< 0.03	0.03	84	47 - 122
beta-BHC	< 0.06	0.06	100	48 - 134
delta-BHC	< 0.1	0.1	115	43 - 132
gamma-BHC (Lindane)	< 0.04	0.04	95	48 - 129
alpha-Chlordane	< 0.1	0.1	-	-
gamma-Chlordane	< 0.1	0.1	-	-
p,p-DDD	< 0.1	0.1	86	59 - 128
o,p-DDE	< 0.04	0.04	-	-
p,p-DDE	< 0.04	0.04	57	56 - 135
o,p-DDT	< 0.1	0.1	-	-
p,p-DDT	< 0.1	0.1	63	48 - 153
Dieldrin	< 0.02	0.02	65	55 - 127
Endosulfan I	< 0.1	0.1	95	59 - 132
Endosulfan II	< 0.04	0.04	122	48 - 141
Endosulfan Sulphate	< 0.7	0.7	61	44 - 143
Endrin	< 0.06	0.06	62	52 - 146
Endrin Aldehyde	< 0.2	0.2	116	27 - 126
Heptachlor	< 0.3	0.3	104	33 - 134
Heptachlor Epoxide	< 0.8	0.8	63	54 - 130
Methoxychlor	< 2	2	-	-
Toxaphene	< 3	3	-	-

ug/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Polychlorinated Biphenyls in Water (QC# 27088)

Parameter	Blank (ug/L)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Spike (% Recovery)	Spike Limits
Arochlor 1242	< 0.4	0.4	NC	25	83	75 - 125
Arochlor 1248	< 0.2	0.2	NC	25	-	-
Arochlor 1254	< 0.4	0.4	NC	25	-	-
Arochlor 1260	< 0.1	0.1	NC	25	-	-

ug/L = micrograms per liter
R.P.D. = Relative Percent Difference
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Chlorinated Phenols in Water (QC# 27134)

Parameter	Blank (ug/L)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Spike (% Recovery)	Spike Limits
Pentachlorophenol	< 0.05	0.05	NC	25	111	75 - 147
2,3,4-Trichlorophenol	< 0.1	0.1	NC	25	98	63 - 117
2,3,5-Trichlorophenol	< 0.1	0.1	NC	25	109	65 - 113
2,3,6-Trichlorophenol	< 0.1	0.1	NC	25	107	55 - 119
2,4,5-Trichlorophenol	< 0.1	0.1	NC	25	119	55 - 119
2,4,6-Trichlorophenol	< 0.1	0.1	NC	25	112	55 - 119
3,4,5-Trichlorophenol	< 0.1	0.1	NC	25	98	55 - 119
2,3,4,5-Tetrachlorophenol	< 0.05	0.05	NC	25	85	65 - 113
2,3,4,6-Tetrachlorophenol	< 0.05	0.05	NC	25	100	66 - 128

ug/L = micrograms per liter
R.P.D. = Relative Percent Difference
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

CANTEST

Batch Quality Control for Total Extractable Hydrocarbons in Water (QC# 27095)

Parameter	Blank (ug/L)	Blank Limits	Spike (% Recovery)	Spike Limits
TEH	< 100	100	95	75 - 125

ug/L = micrograms per liter

REPORTED TO: Hemmera Resource Consultants Ltd.

REPORT DATE: September 29, 1997

GROUP NUMBER: 7091726

CANTEST

Batch Quality Control for Total Extractable Hydrocarbons in Water (QC# 27095)

Parameter	Blank (ug/L)	Blank Limits	Spike (% Recovery)	Spike Limits
TEH	< 100	100	95	75 - 125

ug/L = micrograms per liter

CANTEST

Batch Quality Control Frequency Summary

Conductivity Analysis (Batch# 4120)

QC Type	No. Samples
Duplicate	5
Batch Size	41

pH Analysis (Batch# 4122)

QC Type	No. Samples
Duplicate	4
Batch Size	31

Dissolved Metals Preparation (Batch# 4126)

QC Type	No. Samples
Dissolved Blank	1
Duplicate	5
Batch Size	46

Water Lab Ion Chromatography (Batch# 4130)

QC Type	No. Samples
Blank	1
Duplicate	7
Batch Size	56

Suspended Solids Analysis (Batch# 4142)

QC Type	No. Samples
Blank	1
Duplicate	3
Batch Size	25

(Continued on next page)

CANTEST

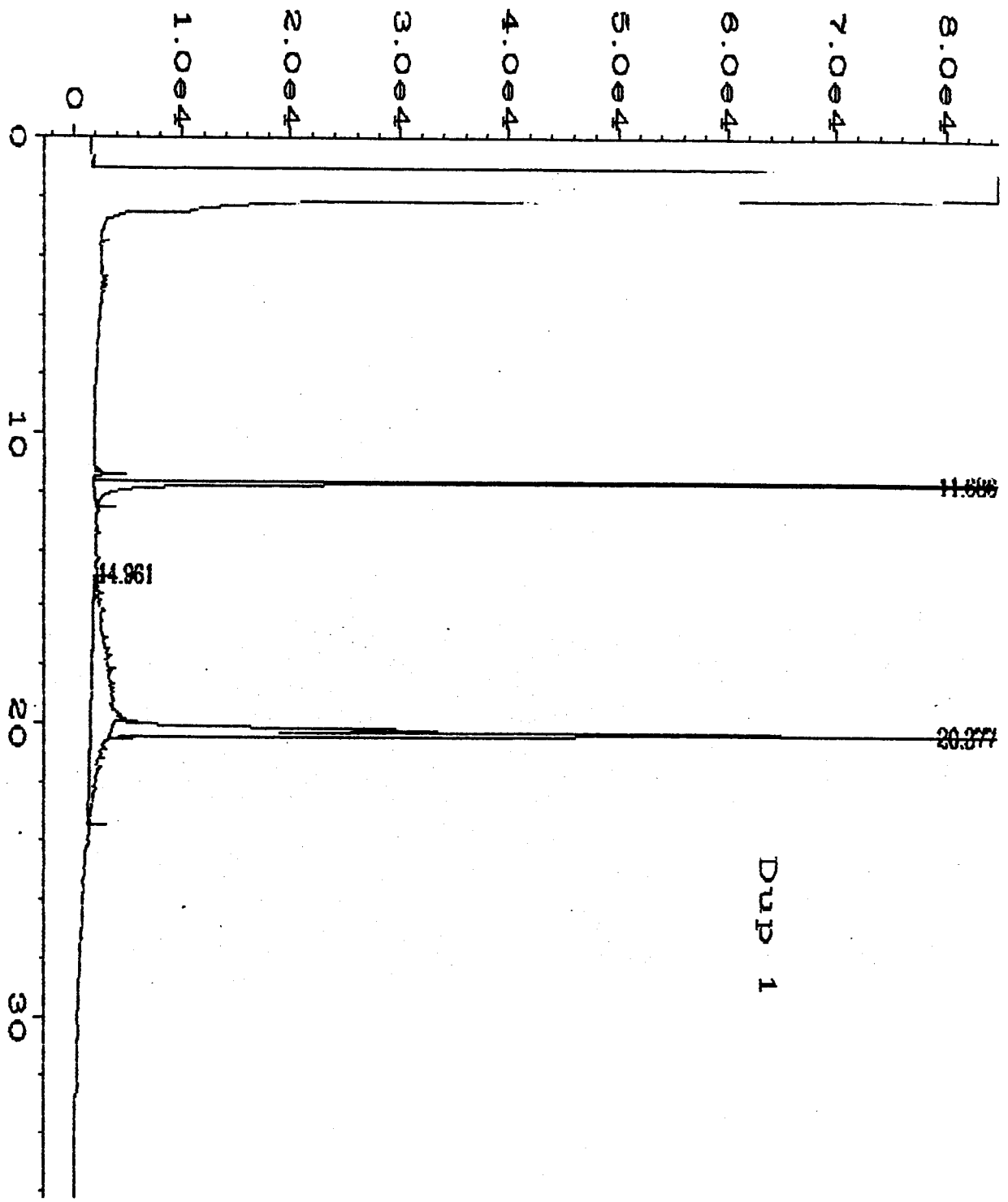
Batch Quality Control Frequency Summary

Total Metals Preparation (Batch# 4154)

QC Type	No. Samples
Total Blank	1
Duplicate	2
Graphite Furnace Spike	2
ICP Spike	2
ICPMS Spike	2
K by AE Spike	2
Batch Size	73

Soil/Solid Metals Preparation (Batch# 4157)

QC Type	No. Samples
Duplicate	1
SRM 2711 Montana Soil	1
Batch Size	14



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Instrument : FID-B
Sample Name : 70917012?
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Report Created on: 24 Sep 97 12:47 PM

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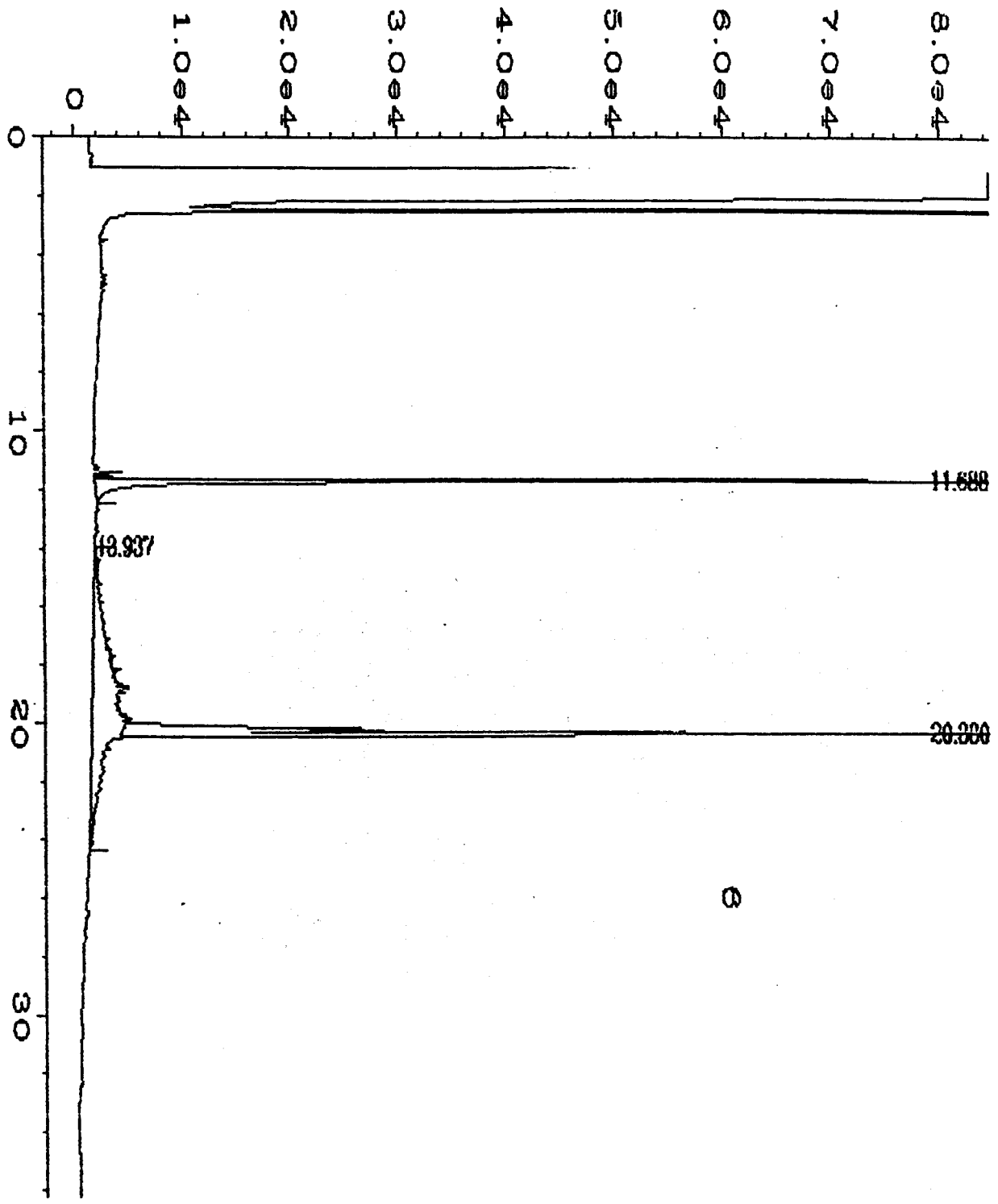
Analysis Method : !TEH.MTH



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Sample Name	: 70917012S	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
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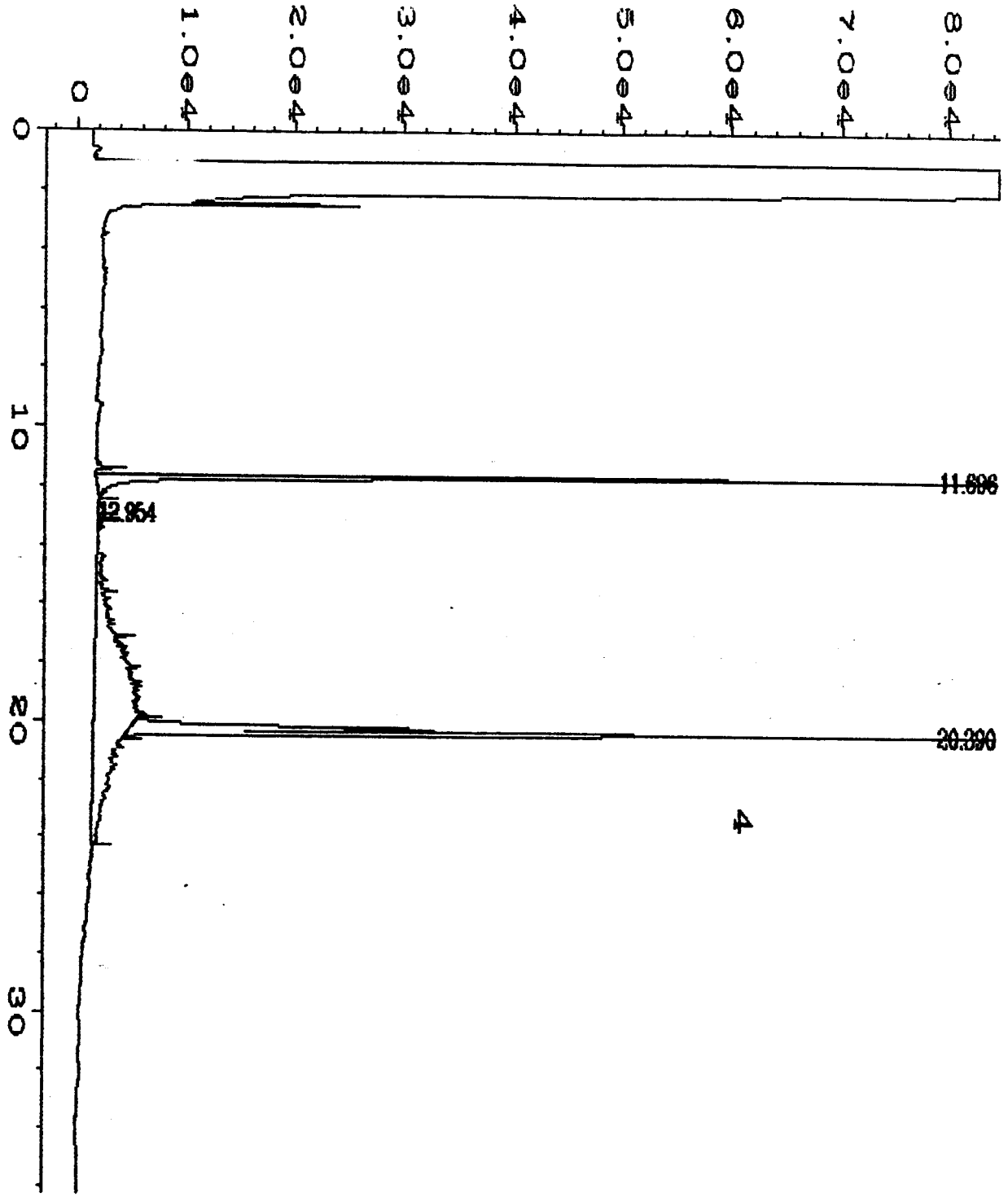
Report Created on:	24 Sep 97 12:45 PM	Analysis Method	: TEH.MTH



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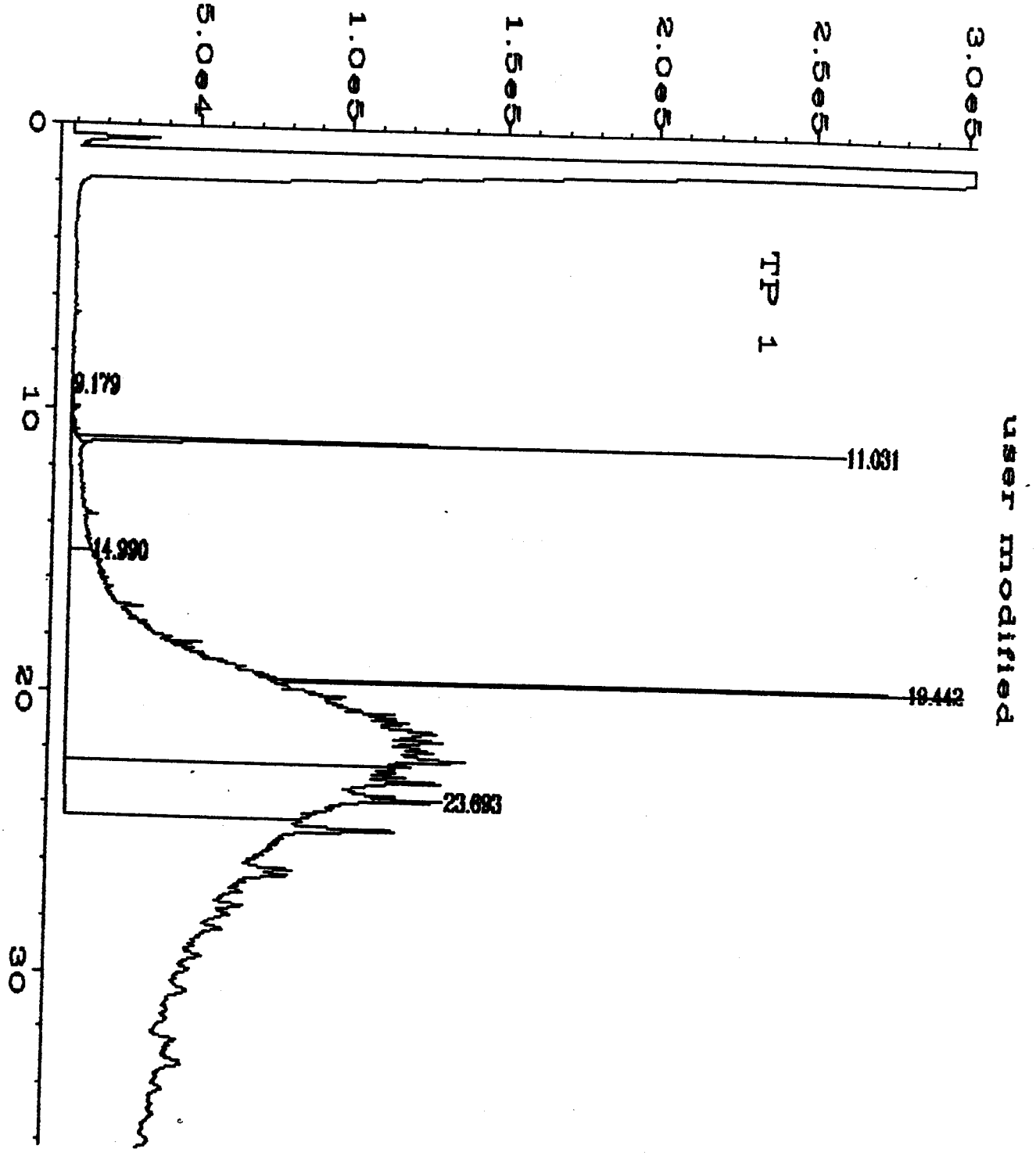
Operator : kf
Instrument : F1D-B
Sample Name : 7091701Z3
Run Time Bar Code:
Acquired on : 23 Sep 97 10:54 PM
Report Created on: 24 Sep 97 12:43 PM

Page Number : 1
Vial Number : 89
Injection Number : 1
Sequence Line : 4
Instrument Method: TEHBAKL.MTH
Analysis Method : TEH.MTH

Hemmers.
709 1726



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Operator : kf
Instrument : FID-A
Sample Name : 709170129
Run Time Bar Code:
Acquired on : 24 Sep 97 04:15 PM
Report Created on: 25 Sep 97 10:44 AM

Page Number : 1
Vial Number : 10
Injection Number : 1
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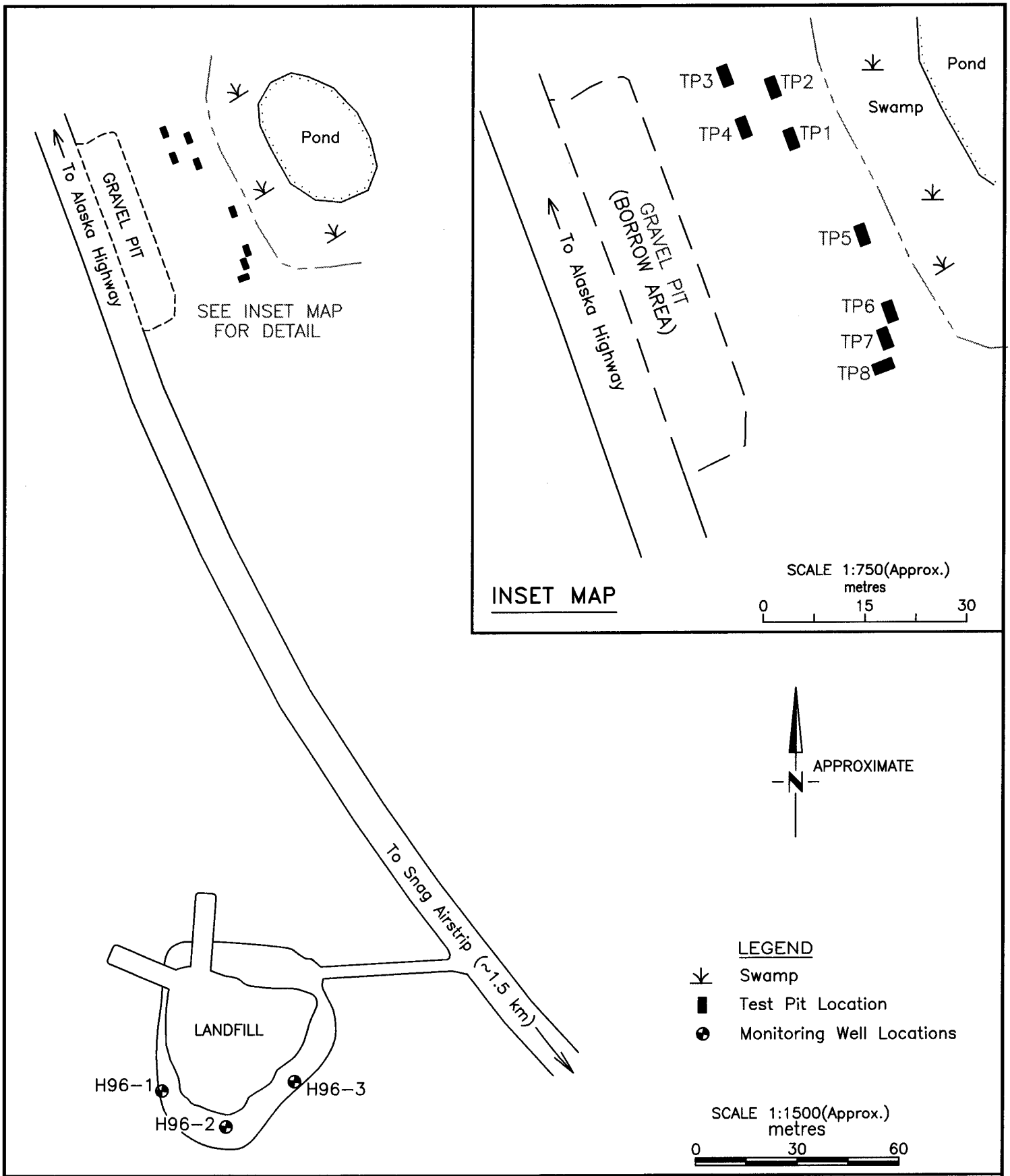
Instrument Method: TEHBAKE.MTH
Analysis Method : TEH.MTH



LORIMER & ASSOCIATES & HEMMERA RESOURCE CONSULTANTS LTD.	SNAG AIRSTRIP REMEDIATION, YUKON NEWLY DISCOVERED LANDFILL TEST PIT LOCATIONS		
CLIENT: INDIAN & NORTHERN AFFAIRS CANADA	PROJECT No. YT20501/281-004.02	October 1998	FIGURE 3

Project: SNAG AIRSTRIP REMEDIATION
Project No.: 281-004-02
Date: September 4, 1997
Elevation: Top of Pipe = 30.502m

MONITORING WELL H97-4

Location: Snag Airstrip, Y.T.
Contractor: Midnight Sun Drilling
Method: Air Rotary
Logged By: Phil Scalia

NOTE: Elevation measured relative to Monitoring Well H97-7 Top of Pipe Set @ 30.488m (100 feet).

VApour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Piezometer Installation	Piezometer Construction Details
					Surface		Well Protector Stickup = 0.31m
		1	5		0-0.19.2m **GRAVEL & Sand,** <1" diameter pea gravel; sand till		Concrete 0-0.46m
		2					
		3	10				
		4					
		5	15				0.46-14.9m Cuttings
		6	20				
		7					
		8	25				
		9	30				
		10					
		11	35				
		12	40				
		13					
		14	45				
		15	50				Sept.7, 1997 Elev.=14.942m
		16					14.9-15.2m Bentonite
		17	55				15.2-17.7m Cuttings
		18	60				17.7-19.2m Screening
		19					17.7-19.2m Sand
		20	65		E.O.H. at 19.2m (63')		End of Well 19.2 m
		21	70				
		22					
		23	75				

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG AIRSTRIP REMEDIATION
Project No.: 281-004-02
Date: September 4, 1997
Elevation: Top of Pipe = N/A

MONITORING WELL H97-5

Location: Snag Airstrip, Y.T.
Contractor: Midnight Sun Drilling
Method: Air Rotary
Logged By: Phil Scalia

NOTE: Well decommissioned.

VApour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Piezometer Installation	Piezometer Construction Details
					Surface		Well Protector Stickup = 0.31m
		0-19	0-63		0-0.19.2m **GRAVEL & Sand,** <1" diameter pea gravel; sand till		Concrete 0-0.46m 0.46-14.9m Cuttings 14.6-15.2m Bentonite 15.2-16.8m Slough 16.8-19.2m Sand 17.7-19.2m Screening
		20	65		E.O.H. at 19.2m (63')		End of Well 19.2 m
		21	70				
		22	75				
		23					

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG AIRSTRIP REMEDIATION
Project No.: 281-004-02
Date: September 4, 1997
Elevation: Top of Pipe = 30.466m

MONITORING WELL H97-5A

Location: Snag Airstrip, Y.T.
Contractor: Midnight Sun Drilling
Method: Air Rotary
Logged By: Phil Scalia

NOTE: Elevation measured relative to Monitoring Well H97-7 Top of Pipe Set @ 30.488m (100 feet).

VApour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Piezometer Installation	Piezometer Construction Details
					Surface		Well Protector Stickup = 0.31m
		1	5		0-0.19.2m **GRAVEL & Sand,** <1" diameter pea gravel; sand till		Concrete 0-0.46m
		2					
		3	10				
		4					
		5	15				0.46-14.9m Cuttings
		6	20				
		7					
		8	25				
		9	30				
		10					
		11	35				
		12	40				
		13					
		14	45				
		15	50				Sept.7, 1997 Elev.=15.136m 14.6-15.2m Bentonite
		16					
		17	55				15.2-17.5m Slough
		18	60				17.5-19.2m Sand
		19					17.7-19.2m Screening
		20	65		E.O.H. at 19.2m (63')		End of Well 19.2 m
		21	70				
		22					
		23	75				

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG AIRSTRIP REMEDIATION
Project No.: 281-004-02
Date: September 4, 1997
Elevation: Top of Pipe = 30.488m

MONITORING WELL H97-7

Location: Snag Airstrip, Y.T.
Contractor: Midnight Sun Drilling
Method: Air Rotary
Logged By: Phil Scalia

NOTE: Monitoring Well H97-7 Top of Pipe Set @ 30.488m (100 feet).

VApour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Piezometer Installation	Piezometer Construction Details
					Surface		Well Protector Stickup = 0.31m
		1	5		0-0.19.2m **GRAVEL & Sand,** <1" diameter pea gravel; sand till		Concrete 0-0.46m
		2					
		3	10				
		4					
		5	15				0.46-14.3m Cuttings
		6	20				
		7					
		8	25				
		9					
		10	30				
		11					
		12	40				
		13					
		14	45				
		15	50				Sept.7, 1997 Elev.=15.248m 14.3-14.9m Bentonite
		16					
		17	55				15.2-17.5m Slough
		18	60				17.1-18.9m Sand 17.4-18.9m Screening
		19					18.9-19.2m Slough
		20	65		E.O.H. at 19.2m (63')		End of Well 18.9 m
		21	70				
		22					
		23	75				

Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates Consulting Engineers & HEMMERA RESOURCE CONSULTANTS LTD.

Project: SNAG AIRSTRIP REMEDIATION
Project No.: 281-004-02
Date: September 4, 1997
Elevation: Top of Pipe = 30.488m

MONITORING WELL H97-6

Location: Snag Airstrip, Y.T.
Contractor: Midnight Sun Drilling
Method: Air Rotary
Logged By: Phil Scalia

NOTE: Elevation measured relative to Monitoring Well H97-7 Top of Pipe Set @ 30.488m (100 feet).

VApour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Piezometer Installation	Piezometer Construction Details
					Surface		Well Protector Stickup = 0.31m
		1	5		0-0.19.2m **GRAVEL & Sand, <1" diameter pea gravel; sand till**		Concrete 0-0.46m
		2					
		3	10				
		4					
		5	15				0.46-16.5m Cuttings
		6	20				
		7					
		8	25				
		9					
		10	30				
		11					
		12	35				
		13					
		14	40				
		15					Sept.7, 1997 Elev.=15.174m
		16	45				
		17					16.5-17.1m Bentonite
		18	50				17.1-19.2m Sand
		19					17.7-19.2m Screening
		20	55		E.O.H. at 19.2m (63')		End of Well 19.2 m
		21					
		22	60				
		23					
			65				
			70				
			75				

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