MN-034

Assessment of Abandoned Yukon Mine Sites

Hayes #85

Prepared for
Public Works and Government Services Canada

February 1997
GV206.01

Consultants in Groundwater, Property Contamination and Environmental Management

GeoViro Engineering Ltd.

TABLE OF CONTENTS

1.0 INTRODUCTION AND BACKGROUND

Several abandoned exploration and development mine sites in the Yukon, including the Hayes sites have been identified and previously investigated under the Arctic Environmental Strategy Action on Waste program by the Department of Indian Affairs and Northern Development (DIAND) Technical Services. In 1996, Public Works and Government Services Canada retained GeoViro Engineering Ltd. (GeoViro) to further investigate specific sites identified by DIAND as requiring additional investigations and to determine appropriate remedial actions to close the sites in a safe and environmentally acceptable fashion. This report outlines the site investigation, findings and recommendations for the Hayes abandoned mine site.

1.1 Location

The Hayes abandoned mine/exploration site is located at a latitude of 62° 38' 38"N and longitude 138° 02' 20"W, approximately 110 km northwest of the community of Carmacks, Yukon (Figure 1.1). The site is located on a ridge between Klines Gulch and Sonora Gulch south of Hayes Creek. The site lies at an elevations of 1050 to 1100 metres above sea level (Figure 1.2).

1.2 Overview of Site Development

The following outlines the work history of the site as presented in the previous assessment report by DIAND Technical Services, 1994.

1896	Placer gold found in Klines Gulch.
1899	Spruce Stake and Old Alex claims by Alex Summerfield and Henry Marco.
1902	Restaked as Psyche and Reef claims by F. Envoldsen.
1904-1907	25 m of drifting by N. Lyons.
1945	Restaked as Little Gold and Little Gold Quartz claims by F.A. DuPont.
1946-1951	Trenching related to placer activity by DuPont.
1965	Restaked as Hayes claims for copper and molybdenum potential by Coranex Ltd. based on geochemical exploration.
1969	Restaked as the DP claims by Dawson Range Joint Venture who conducted grid soil sampling and mapping.
1970	Dozer trenching completed.
1974-1974	Restaked as Nada claims by DC Syndicate who conducted mapping and geochemical sampling.
1975-1976	Restaked as Swede claims by J. Martensson and optioned to a joint venture between Hudson Bay Mining, Tombill Mines Ltd. and Minorco Canada Ltd. who added the Sam claims and explored with mapping and geochemical sampling.

1978	11 holes drilled (490m) and dozer trenching completed on Sam 89 and 96 claims.
1979	Geochemical sampling.
1980	Magnetometer, electromagnetic surveys and 6 holes drilled (404m).
1981	Geochemical, magnetometer surveys, low frequency electromagnetic surveys, trenching and 6 holes drilled (812m).
1983	Magnetometer, electromagnetic and geochemical surveys.
1984	Property transferred to Hayes Resources Incorporated who trenched and drilled 5 holes (695m).

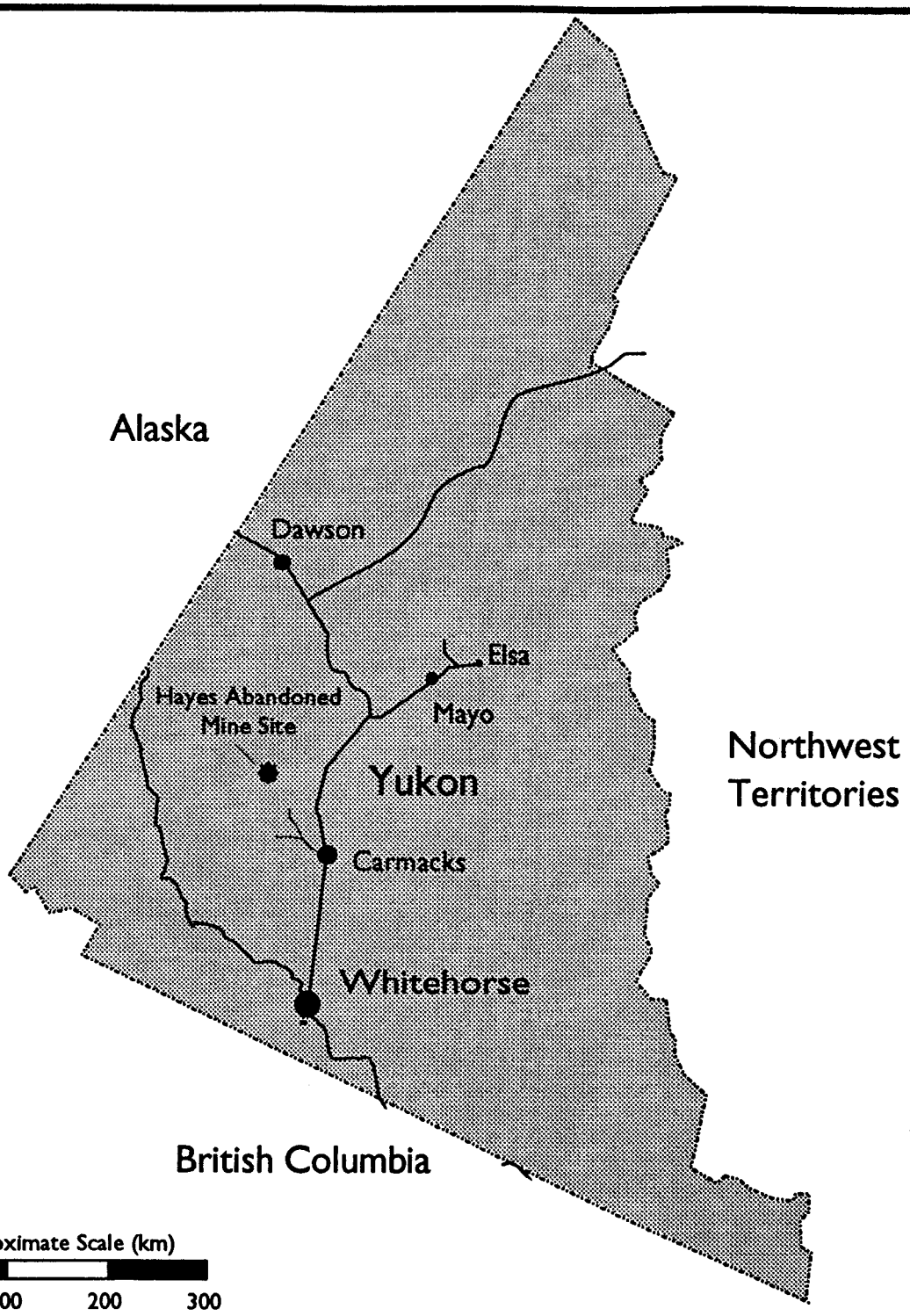
Roads, trails and exploration workings are shown in the airphoto presented as Figure 1.3.

Claim Status

The status of active claims as of August, 1996, in the area of the Hayes site, as provided by Indian and Northern Affairs Canada, Whitehorse belong to Duane Pohiquin of 2020-1055 West Hastings Street, Vancouver, B.C.

1.3 Site Access

The site is in a remote location and accessible by air from the community of Carmacks. An airstrip on the site allows access by helicopter and fixed wing aircraft. Current placer operations on Hayes creek north of the site and previous operations indicate the site is accessible by road and trail. A general contractor in Carmacks indicates that the site can most easily be accessed by land during the winter when the ground is frozen. The site would be accessed by travelling to Prospector Mountain then crawling a cat approximately 40 km to the site. Permits may be required to access the road by cat trails. Damage to vegetation and the environment can be expected if the site is accessed by land, however, this damage would be minimised during the winter season.



GeoViro Engineering Ltd.

TITLE

Hayes Mine Site Location

CLIENT

Public Works and Government Services, Canada

PROJECT

Yukon Abandoned Mine Sites

September, 1996	Project GV206.01	Figure 1.1

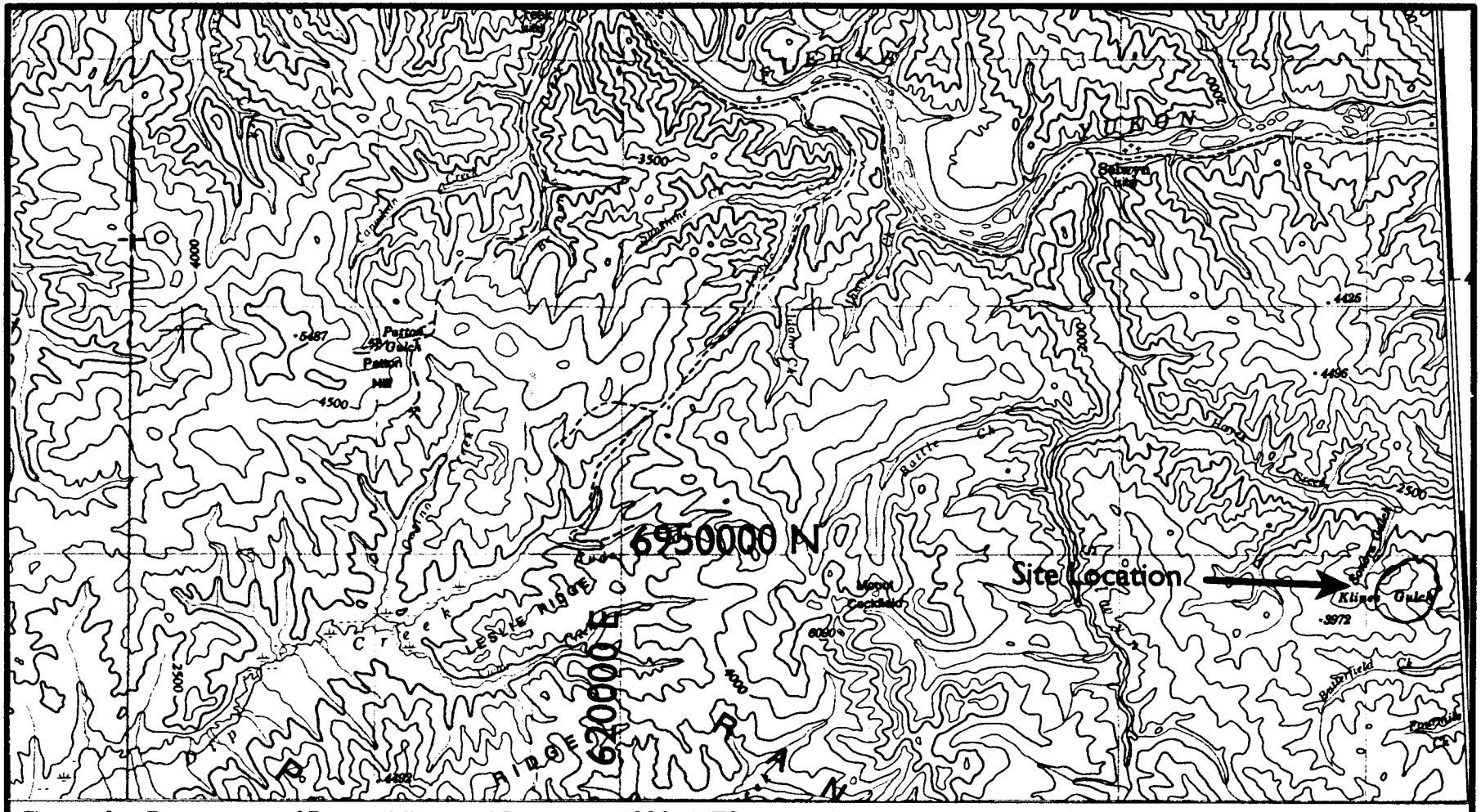


Figure after Department of Energy, Mines and Resources, 1990, NTS sheet 115 J and 115 K edition 3
"Stevenson Ridge, Yukon Territory", Scale 1:250,000., Contour Interval 500 feet.

GeoViro Engineering Ltd.	TITLE: Regional Topography, Hayes Abandoned Mine Site	
CLIENT: Public Works and Government Services Canada	PROJECT: Yukon Abandoned Mine Sites	
September, 1996	Project: GV206.01	Figure 1.2

GeoViro Engineering Ltd.

CLIENT
Public Works and Government Services, Canada

TITLE
Hayes Abandoned Mine Site Air Photo

PROJECT
Yukon Abandoned Mine Sites

September, 1996	Project GV206.01	Figure 1.3

2.0 PURPOSE AND SCOPE OF WORK

The key objectives of the assessment were to identify specific environmental and human safety risks and provide recommendations and Class "D" cost estimates for remediation or mitigation of risks.

The assessment of the site was completed in three phases. Phase I involved reviewing available site information. Phase 2 comprised the site investigation and sample collection by the project team. Phase 3 comprised the preparation of this assessment report with recommendations for remediation and mitigation.

Phase I - Data Collection and Review

After authorisation to proceed, site information was obtained, reviewed and an investigation plan developed with team members required for site investigation.

Phase 2 - Site Investigation and Sample Collection

The site investigation identified and assessed existing or potential safety and environmental risks on the site. The site investigation team comprised senior personnel with backgrounds in geological engineering and environmental chemistry. The investigation included an assessment of:

- physical properties of soil, slope stability, and potential for erosion;
- non-hazardous site debris to determine disposal options;
- potential or actual environmental pathways and receptors;
- building structures and hazardous building materials for demolition;
- barrel contents for petroleum products to determine disposal or incineration options;
- appropriate landfill locations, if required for long term placement of wastes.

The site was photographed (selected photographs provided in Appendix A) and a detailed site plan completed, showing the location of all sources of contamination, buildings, mine workings, site debris, and sample locations.

Phase 3 - Reporting

Findings from the Phase I and Phase 2 investigations are compiled in this report in accordance with the "Generic Site Assessment Report Format" provided in the request for standing offer. The report includes recommendations to remediate and mitigate environmental and safety risks identified. Recommendations are based on, and comply with, applicable federal and/or territorial criteria and guidelines. A Class "D" cost

estimate to complete remedial work is provided in a separate document. Site plans have been prepared in AutoCAD format.

3.0 SITE ASSESSMENT METHODOLOGY

3.1 Assumptions and Limitations

The assessment was limited to the area specifically developed or occupied for mine exploration or mining purposes and immediately-adjacent areas. Roadways to the mine site were not included in the assessment.

The assumption and limitations that apply are listed below:

- information provided in DIAND Technical Services Assessment Report, 1994 is accurate;
- investigations were limited to surficial observations;
- soil conditions, volumes and areas were based on surficial observations; and
- hydrogeologic conditions are inferred and based on generally accepted principals of groundwater flow.

3.2 Assessment Criteria

The regulatory framework for managing contaminated sites includes the use of criteria/guidelines to determine the extent and severity of site contamination and to provide numerical concentrations for investigation and remediation of sites. The Canadian Council of Ministers of the Environment (CCME) and B.C. Environment, Lands and Parks, (BCELP) have developed criteria/guidelines for managing contaminated sites. The site is federally controlled, therefore, the CCME Interim Remediation Criteria are used to assess the severity of contamination and the need for further investigation or remediation. Where numerical concentrations are not established for specific contaminants in the CCME criteria the numerical concentrations provided in the BCELP "Criteria for Managing Contaminated Sites in B.C." are used. Both the CCME and BCELP have developed very similar assessment and remediation criteria for soil for agricultural, residential, parkland, commercial and industrial sites. Criteria have also been established for water for the protection of aquatic life, irrigation, livestock watering and drinking water.

For the purpose of assessing the severity of contamination and the requirement for completing remediation at this abandoned mine site, contaminant concentration is soil and water samples are compared to the commercial/industrial criteria for soil and the aquatic life criteria for water.

BCELP has established petroleum hydrocarbon criteria for contaminated sites. The hydrocarbon classes are incorporated as "substances" with corresponding remediation standards. The substance classes are:

VPH - volatile petroleum hydrocarbons (C_5 - C_9)
LEPH - light extractable petroleum hydrocarbons (C_{10} - C_{18})
HEPH - heavy extractable petroleum hydrocarbons (C_{19} - C_{32})

3.3 Methods

3.3.1 Background Information

Available background information collected and reviewed during the first phase of work included

- historical land use and mine development information provided in DIAND report;
- land claim status provided by Whitehorse Mining District;
- infrastructures;
- site location and access;
- area mineralisation and geology;
- climatic data; and
- topographic maps and aerial photography;

3.3.2 Site Assessment Components

The site assessment was conducted to identify existing or potential safety and environmental risks. The assessment at the site included the following components:

Trenches and Excavations were inspected and slope stability assessed.

Non-Hazardous Site Debris was inventoried during a site reconnaissance.

Hazardous Materials were inventoried and sampled for analyses.

Buildings and Structures were inspected for hazardous materials, construction and material details; measured; and assessed for stability.

3.3.3 Sampling Methods and Quality Assurance

Our sample collection and handling protocols follow currently acceptable CCME and American EPA practices. Soil and water samples were placed in laboratory prepared glass and plastic containers. A clean pair of disposable vinyl gloves was used to handle each set of samples. All sampling equipment was cleaned between the collection of each sample to prevent cross-contamination. All samples were placed in coolers under a chain-of-custody procedure. To ensure the integrity of the analytical information, all sample numbers and requested analyses were recorded on the field site plan and on a multiple copy chain-of-custody form that accompanied each cooler.

Soil and drum sampling methods are provided in Appendix B. No water resources were identified on or near the site.

Quality Assurance (QA) is a set of procedures for ensuring that analytical results are accurately representative of field conditions. A complete QA program includes both a field and laboratory component. The project laboratories (CanTest and Chemex) complete national and in-house quality control programs on an on-going basis. In addition to the laboratory's quality programs the following measures were implemented:

- chain-of-custody procedures and forms;
- a sample labelling and location identification plan;
- use of laboratory prepared sample containers;
- regular maintenance and cleaning of field equipment.

4.0 ENVIRONMENTAL SETTING

4.1 Mineralisation

Minor gold and silver values have been found in quartz-calcite veins occurring along a northwest trending shear zone that cuts a small, rhyolite porphyry body. The gold and silver values are reported to be associated with the minerals boulangerite and bournonite occurring within pyritic quartz-calcite veins.

North of the rhyolite porphyry, a quartz-monzonite to syenite stock intrudes metasedimentary country rock. Traces of molybdenite and copper, associated with the minerals molybdenite and chalcopyrite respectively, have been found within the intrusive, as well as along the bleached, quartz-veined contact zone.

4.2 Climate

Temperature and precipitation data for Carmacks, provided by Environment Canada Climatic Data Services have been used for the Hayes site. The climate of the area is characterised by moderate rainfall and seasonal temperature extremes. Average monthly temperatures vary from -28.6 °C in January to 14.8 °C in July. Since the site is at a higher elevation than Carmacks, the mean temperatures at the site may be slightly different, i.e. slightly lower average in the summer. The average annual precipitation for Carmacks is 276.7 mm. Based on our experience at other sites in this area, precipitation will vary with elevation. The Hayes site may experience greater precipitation than Carmacks. Approximately 66% of the total annual precipitation falls as rainfall with almost 90% of the rainfall occurring from June to September.

4.3 Vegetation

The site is covered by sparse vegetation at the top of the eroded ridge to moderate vegetation coverage in more protected areas at lower elevations. The vegetation is comprised predominantly of alder, black spruce and moss. Trails on-site, that are easily identified on the airphoto (Figure 1.3) dated 1968, are now moderately overgrown. Minor vegetation is being re-established in trenches and excavations (Photo 1, Appendix A). The site (other than the eroded peak) is mantled by a very thin layer of topsoil (10 cm) that is underlain by granular rocky material with no organic content; therefore, disturbed areas require a long period of time to re-establish vegetation. The thin layer of topsoil is evident at the top of the trench shown in Photo 1.

4.4 Fish and Wildlife Resources

A study of fish and wildlife resources was not within the scope of this project. No surface water bodies were identified on the site. Hayes Creek located 5 km north of the site is most likely the closest fish bearing water body. Yukon Renewable Resources reports that the upper tributaries of Hayes Creek are placer mined, however, most of the habitat associated with Hayes Creek is undisturbed and of significant value. Yukon Placer Authorization has deferred the water quality (allows higher than background levels of turbidity) in Hayes Creek to accommodate the nearby mining interests. Hayes Creek drains to the Yukon river approximately 20 km to the northwest. Wildlife observed during the site investigation included small rodents and grouse.

4.5 Site Topography, Drainage and Soils

The site lies within the watershed of Hayes creek and its tributaries. Valleys and drainage coarse are present to the north, west and east of the site. The general area, however, slopes down to the north towards Hayes creek approximately 300 m lower in elevation.

The top of the site where the camp and airstrip are located has been eroded and the surface soil comprises mostly weathered coarse granular and rocky material. More protected areas at lower elevations are covered with a thin layer (10 cm) of topsoil underlain by coarse granular and rocky material.

4.6 Hydrogeology

Assessment of the hydrogeological characteristics of the site was not within the scope of this project. However, groundwater characteristics can be inferred with some degree of confidence, based on site location, topography and our experience at other similar sites in this area.

Since the site is located near the upper reaches of a ridge, several hundred metres higher in elevation than significant surface water bodies, the area is inferred to be located in a groundwater recharge area. Recharge to the groundwater regime in the area of the main camp site will occur primarily from precipitation. A portion of the precipitation will infiltrate the ground, migrate downward to the groundwater table, located some distance below surface, and then flow in a horizontal and downward direction until it discharges at topographic low areas, that occur as creeks in this area. Discharge may also occur locally on the lower and middle slopes below the site in the form of seeps and springs where low permeability barriers to flow such as till, permafrost, or tight bedrock force upward movement of groundwater. There was no evidence of near surface groundwater during the site investigation. The amount of recharge to the ground will depend on the hydrogeologic character of the surficial soils and upper bedrock zone.

The rate of groundwater flow through the groundwater bearing medium will depend on the amount of recharge to the aquifer and the hydraulic conductivity of the aquifer bearing medium. The hydraulic conductivity of the bedrock in this area is most dependent on the fracture network in the rock and is expected to be low. No attempt has been made to estimate the depth to groundwater, flow velocity or volume.

4.7 Permafrost

No evidence of permafrost was encountered during the site reconnaissance. However, permafrost may be encountered in areas of this site.

5.0 SITE DESCRIPTION AND FINDINGS

The main roadways, airstrip, trails, trenching and excavations are identified on the airphoto (Figure 1.3). The site layout highlighting significant site workings, structures and debris is provided in Figures 5.1 and 5.2. The site and Hayes creek are shown in Photo 2, Appendix A, taken from the air on the day of the site visit.

5.1 Buildings, Infrastructure, and Equipment

The buildings, infrastructure and equipment discussed in this section are those identified during the site reconnaissance of September 10, 1996. Several buildings, in various states of deterioration, are present. No buildings or structures were identified beyond the main camp area adjacent to the airstrip. Location of buildings, equipment and debris are shown on Figures 5.1 and 5.2.

5.1.1 Buildings

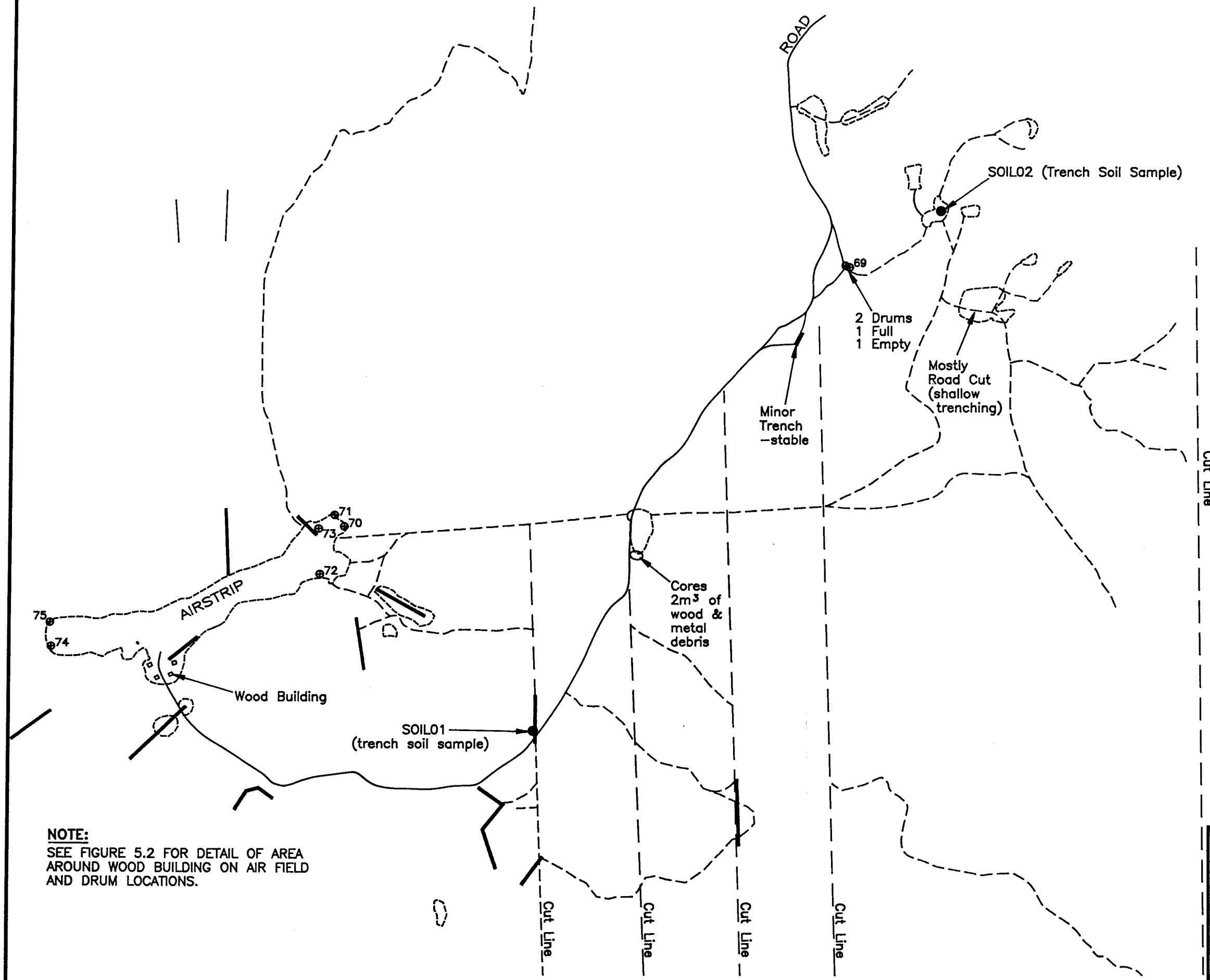
Four buildings/tent structures were identified at the camp site area located near the southwest end of the airstrip. The layout and location of the buildings are detailed in Figure 5.2. This section details the building construction and material details and debris within the buildings. Names provided for each buildings are given based our best interpretation of use.

Camp Building

The camp building (Photos 3, Appendix A) is of wood construction with a tin roof. The building is 4.9 x 3.65 m in area and does not have any insulation. The building was full of debris (Photo 4, Appendix A) comprising a freezer, camp supplies, tent tarps, tools, kitchen supplies, table, chairs, books and other non-hazardous debris. It appears as though the camp supplies and equipment were stored in this building with the expectation that they would be recovered or used at a later date.

Bunkhouse No. 1

A bunkhouse comprised of a wood platform and metal frame (Photo 5, Appendix A) is located approximately 15 m west of the camp building. This bunkhouse is 4.75 x 4.15 m in area and three metal bunks are present on the wood platform.



NOTE:
SEE FIGURE 5.2 FOR DETAIL OF AREA AROUND WOOD BUILDING ON AIR FIELD AND DRUM LOCATIONS.

Approx.
N

LEGEND

- Trail
- SOIL01 — Sample Location and Identification
- 69 — 45 Gallon Drum and Drum Identification
- Trench

NOTES: All samples numbers prefixed GV206HAY.
All locations and dimensions are approximate.
Based on site conditions of September 10, 1996.

SCALE 1:5000(Approximate)
metres
0 100 200

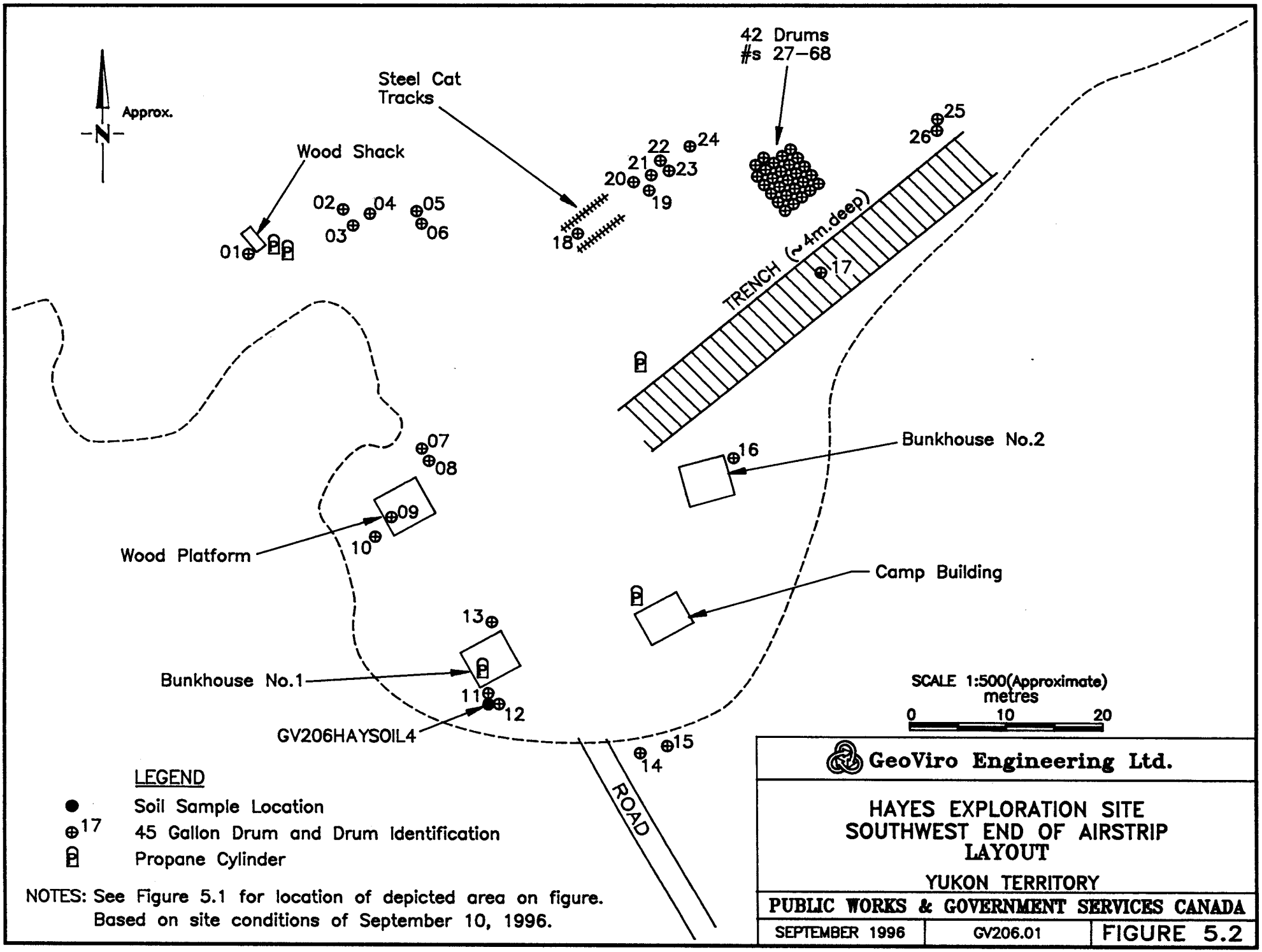
GeoViro Engineering Ltd.

HAYES EXPLORATION SITE
SITE LAYOUT

YUKON TERRITORY

PUBLIC WORKS & GOVERNMENT SERVICES CANADA

SEPTEMBER 1996	GV206.01	FIGURE 5.1


Approx.
N
Steel Cat Tracks
42 Drums #s 27–68
Wood Shack
01
02
03
04
05
06
18
19
20
21
22
23
24
25
26
TRENCH (~4m.deep)
17
Bunkhouse No.2
16
07
08
09
10
Wood Platform
Camp Building
13
Bunkhouse No.1
11
12
GV206HAYSOIL4
14
15
ROAD
SCALE 1:500(Approximate)
metres
0
10
20
LEGEND
Soil Sample Location
17 45 Gallon Drum and Drum Identification
Propane Cylinder
NOTES: See Figure 5.1 for location of depicted area on figure.
Based on site conditions of September 10, 1996.
GeoViro Engineering Ltd.
HAYES EXPLORATION SITE
SOUTHWEST END OF AIRSTRIP
LAYOUT
YUKON TERRITORY
PUBLIC WORKS & GOVERNMENT SERVICES CANADA
SEPTEMBER 1996
GV206.01
FIGURE 5.2

Bunkhouse No. 2

This bunkhouse is located approximately 10 m north of the camp building and comprises a wood platform and frame structure (Photo 6, Appendix A). This bunkhouse is 4.9 x 4.3 m in area and four metal bunks are present.

Wood Platform

A 4.9 x 4.3 m wood platform with no walls is situated 14 m northwest of bunkhouse No. 1. The platform is shown in Photo 7, Appendix A. One metal bunk, a wood bench, a tarp and two fuel drums are present on or adjacent to the structure.

Wood Shack

A small wood shack (2.5 x 1.2 m) is situated near the airstrip approximately 55 m northwest of the camp building (Photo 8, Appendix A). This shack was the location where blasting caps, fuses and bags of explosives were identified during the 1993 site visit by DIAND staff. According to the helicopter pilot, the RCMP had subsequently travelled to the site and disposed of this dangerous material. The shack and site are currently void of any of this explosive-type debris.

5.1.2 Infrastructure (Excavations and Trenches)

Several trenches are located near the camp site and to the south, north and east of the camp site. Little or no activity has occurred east of the site. Photo 1, Appendix A shows a typical trench. Many of the trenches are evident in Figure 1.3 (airphoto) and Figure 5.1.

The excavated material is very sandy to rocky in nature and the excavations are generally shallow and the slopes do not show signs of deep-seated instability, nor do they appear to present a significant health and safety issue at this time.

Soil samples were collected from the base of two trenches (Soil 01 and Soil 02, Figure 5.1) and analysed for total metal concentrations. The results of the analysis indicate that the native weather soil contains high concentrations of arsenic (1090 and 246 mg/kg). The complete results of metal concentrations for the two samples are provided in Table C1, Appendix C, and the laboratory report is provided in Appendix D.

5.2 Non-Hazardous Materials

We covered the majority of the site by foot and did leave the trails and roads on a regular basis to identify as much material as possible within our time limitations. The location of much of the equipment and debris found is shown on Figures 5.1 and 5.2. Details of this material is provided below and where the material is deemed to be hazardous further information is provided in Section 5.3.

A list and approximate location of site debris follows:

- 73 - 200 litre drums (several full or partially full) located near the camp site and along the airstrip.
- 2 - 200 litre drums (1 completely full of diesel fuel) are located 700 to 800 m northeast of the airstrip;
- cores in core boxes and a small amount of metal and wood debris at a clearing approximately 350 m east of the airstrip (Photo 9, Appendix A);
- metal debris, gas driven screening device, fuel heating stoves (Photo 10, Appendix A), small pails, cores and core boxes adjacent to bunkhouse No. 1.
- 8 metal bunks in bunkhouses.
- 5 large propane cylinders, three are empty and the two by the wood shack are almost empty (Figure 5.2).
- caterpillar tracks.
- approximately 5 m^3 of material in camp building (Photo 4, Appendix A)
- several small cans (empty) and metal debris by old drill and generator and upper south adit;

Many of the drums at the camp site are shown in composite Photo 11, Appendix A.

5.3 Hazardous Materials

Hazardous material identified include the contents in the fuel drums and the propane cylinders. The two propane cylinders beside the wood shack contain a very small amount of propane. The other three cylinders were empty. Table 5-1 lists the drums that contained some liquid, details of the drum contents and results of analysis. Contents of selected drums were analysed for total organic halogens (TOX), polychlorinated biphenyls (PCB) and metals. The drum locations are shown if Figure 5.2. The location of Drum 69 is shown in Figure 5.1.

The laboratory reports for the TOX and PCB analysis are provided in Appendix D.

Selected samples (HYD03, HYD05/06 & HYD17/18) were analysed for metal concentrations and the results are provided in Table C2, Appendix C and the laboratory report is provided in Appendix D.

TABLE 5-1
INVENTORY OF DRUMS CONTAINING GREATER THAN A FEW LITRES OF FUEL
HAYES ABANDONED MINE SITE, YUKON

Drum Identification/ Sample Number	Suspected Fuel	Estimated Volume (litres)	TOX (mg/kg)	PCB (mg/kg)
Drum 02 / HYD02	diesel	200	5	na
Drum 03 / HYD03	diesel	200	3	na
Drum 05 / HYD05	jet	5	9 (comp. of 05 & 06)	na
Drum 06 / HYD06	jet	5	9 (comp of 05 & 06)	na
Drum 07 / HYD07	unknown	5	na	na
Drum 08 / HYD08	diesel	5	na	na
Drum 09 / HYD09	diesel	5	6 (comp. of 09 & 10)	na
Drum 10 / HYD10	diesel	5	6 (comp. of 09 & 10)	na
Drum 12 / HYD12	diesel	5	na	na
Drum 17 / HYD17	jet ?	5	51 (comp of 17 & 18)	non detectable
Drum 18 / HYD18	unknown	5	51 (comp of 17 & 18)	non detectable
Drum 19 / HYD19	unknown	5	7 (comp. of 19 & 24)	na
Drum 24 / HYD24	unknown	5	7 (comp. of 19 & 24)	na
Drum 25 / HYD25	diesel	5	na	na
Drum 26 / HYD26	diesel	200	<2	na
Drum 27 / HYD27	diesel	5	na	na
Drum 34 / HYD34	jet	100	<2	na
Drum 35 / HYD35	?	5	na	na
Drum 36 / HYD36	diesel	5	2	na
Drum 69 / HYD69	diesel	200	<2	na

na - not analysed
analysis by Chemex Labs Alberta Inc., Edmonton Alberta

The results of the analyses indicate that none of the parameters tested exceed the allowable levels for fuel in uses other than for Cement Kilns provided in Part 6, Section 41 of the B.C. Waste Management Act, Special Waste Regulations.

A soil sample (GV206HAYSOIL4) was collected in a small area of surficial staining adjacent to where diesel drums were placed to provide fuel to the heater in Bunkhouse No. 1. The sample was analysed for light and heavy extractable petroleum hydrocarbon (LEPH and HEPH) concentrations. The results of the analysis indicate that the sample contains 56000 mg/kg LEPH and 17000 mg/kg HEPH. The GC trace of the sample suggests that the hydrocarbon in the soil is a very weathered heating oil (greater than 10 years). These concentrations exceed the CMCS criteria for hydrocarbon contaminated soil and may exceed the

special waste criteria (3% oil and grease). The volume of contaminated soil is less than 0.5 m^3 and in its present state does not pose an environmental or health hazard. Degradation of the hydrocarbon contamination is apparently slow in this environment. The results of the analysis are shown in Table C3, Appendix C and the laboratory report along with the GC trace is provided in Appendix D.

5.4 Mine Openings

An exploratory adit that was supposedly started over 90 years ago was not identified during our site reconnaissance. No adit was identified during the 1993 site visit by DIAND staff.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The recommendations for mitigation of this site are based on being able to access the site during the summer months so that equipment can complete excavations and burial of non-hazardous material. A permit may be required for site access, since a lengthy cat trail may need to be established if one does not currently exist. A Class "D" cost estimate to complete the mitigative work is provided under separate cover.

6.1 Health and Safety

Buildings - several building on-site are in various states of deterioration. The camp building is standing and in fair condition. The other buildings do not pose an immediate health and safety hazard. The floor boards on the buildings are slightly deteriorating and in the future may pose a health and safety hazard to people walking on the floors. To prevent a future health and safety issue and to improve the site appearance, all structures should be levelled and non-hazardous and combustible materials burnt in an approved location on-site. Non-hazardous and non-combustible material should be landfilled on site.

Our understanding is that burning may occur without a permit in the months of October to March and a permit is required if open burning is to occur from April to September. The remote site is suitable for open burning of non-hazardous combustible material because the debris is located beside a large open area with little vegetation (airstrip). We recommend informing the appropriate DIAND officials prior to any open burning, regardless of the time of year.

The excavations on-site are generally shallow and the slopes do not show signs of deep-seated instability, nor do they appear to present a significant health and safety issue at this time.

6.2 Environmental Risks

Drum Contents - The contents of all drums should be flared on-site and the drums crushed and buried on-site.

The small amount of propane should be flared on-site and the cylinders taken off-site. The flaring of propane will likely only take a few minutes to complete.

The hydrocarbon staining beside bunkhouse No. 1 does not pose a significant risk to human health or the environment and therefore should be left as is. At the most, we would recommend adding fertiliser and tilling the small volume of stained soil to possibly speed-up the biodegradation of the hydrocarbon.

6.3 Aesthetic Concerns

Aesthetic concerns arise from the distribution of metal and wood debris, buildings, and cleared vegetation from excavation and trenching work and roadways.

Buildings are constructed largely of wood. The buildings should be levelled and all non-hazardous combustible material burnt on-site on the airstrip. As discussed in Section 6.1 the Hayes site is suitable for open burning.

Non-hazardous metal debris including empty drums, stoves, pipes, bunks, pails, cat tracks, etc. should be buried on-site.

Cleared areas should be left to re-vegetate naturally, even though this will take several years to accomplish. All remedial work should be completed in a fashion that will minimise additional damage to the existing vegetation.

7.0 STANDARD LIMITATIONS

This report was prepared for the exclusive use of Public Works and Government Services Canada and it's representatives. 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 that level of care and skill normally exercised by members of the environmental science and engineering profession currently practising under similar conditions in the area.

The report is based on data and information collected during a single site investigation conducted by GeoViro Engineering Ltd. personnel. The report is based solely on the conditions of the site at the time of the field investigations.

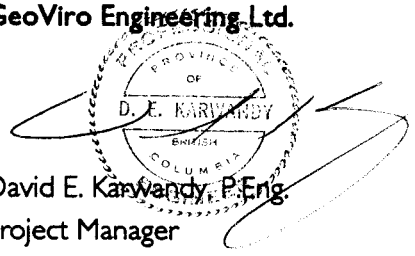
Conditions between sample locations may vary. Some potential remains for the presence of unknown, unidentified, or unforeseen surface and subsurface contamination. Further evidence of such potential site contamination would require additional surface and subsurface exploration and testing.

Some conclusions of this report are based on a comparison of chemical analytical results to criteria currently provided by CCME and BCELP. In the event that these criteria are changed, amended, or replaced, GeoViro Engineering Ltd. should be requested to re-evaluate the conclusions of this report, and provide amendments as required.

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

Respectively submitted

GeoViro Engineering Ltd.



David E. Karwandy, P.Eng.
Project Manager

Stuart Wyse, Ph.D.
Senior Review

APPENDIX A

SITE PHOTOGRAPHS

APPENDIX A
LIST OF PHOTOGRAPHS

Photo 1: Photo of typical trench, note the slow vegetation growth in the trench and the thin layer of topsoil present at the top of the trench.

Photo 2: Camp site, airstrip and Hayes creek as seen from the air.

Photo 3: Camp building.

Photo 4: Inside camp building.

Photo 5: Bunkhouse No. 1.

Photo 6: Bunkhouse No. 2.

Photo 7: Wood platform.

Photo 8: Wood shack.

Photo 9: Debris and cores 350 m east of airstrip.

Photo 10: Debris, cores and equipment north of bunkhouse No. 1.

Photo 11: Drums and campsite, pictures taken from edge of airstrip.

1

2

3

4

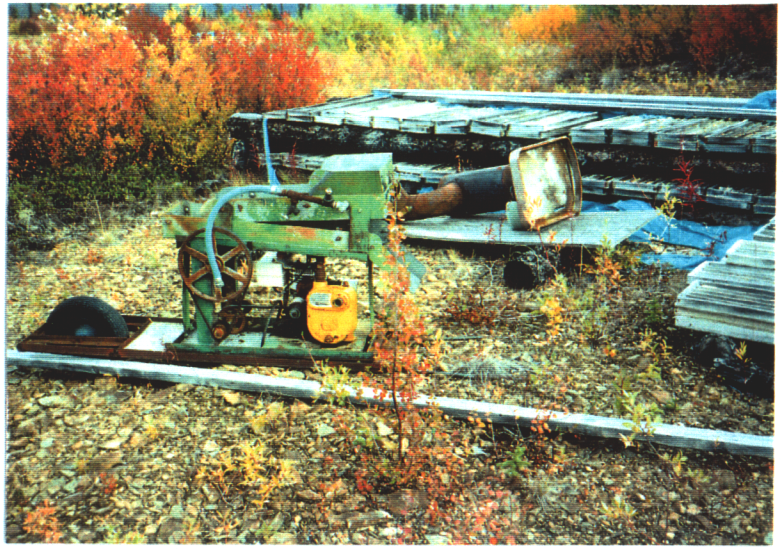
5

6

7

8

9



10

11

APPENDIX B

SAMPLING METHODS

APPENDIX B
SAMPLING METHODS

Drum Content Sampling

Drum contents were sampled using clean glass capillary tubes. The glass tubes were inserted into the drum, and uppermost open tip was sealed to maintain the sample within the tube as it was extracted from the drum or pail. The sample was then drained into 40-mil laboratory prepared glass vial and placed in a cooler for storage and shipment to the project laboratory. The sampling procedure was repeated until a sufficient volume of sample was collected in the vial. A new tube was used for each drum.

Soil Sampling

Small handdug excavations were completed in areas were near surface soil samples were to be collected. Excavations were completed using either a shovel or trowel, depending on the depth of the excavation and the volume of soil required.

Soil conditions were logged, noting colour/weathering, rock composition, particle size and distribution. Photographs of sample locations were taken and the location of the sample with a specific identification number were recorded on a site plan and in the field log book. The sample container was also identified with the sample location.

Soil samples were collected from the walls of the excavations using a clean stainless steel trowel. Samples collected for hydrocarbon analysis were placed in 250 ml laboratory prepared glass containers with teflon lids. Where the soil was to be analysed for metals and acid base accounting (ABA), approximately 2 kg of the soil was placed in plastic zip-lock bags. Soil samples were placed in coolers for storage and shipment to the project laboratory.

APPENDIX C

ANALYTICAL TABLES

TABLE C1
METAL CONCENTRATIONS IN SOIL SAMPLES
ENVIRONMENTAL ASSESSMENT MINE SITE 85 AT HAYES
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
mg/kg (ppm)

Sample No.	CCME AL	CCME PL/RL	CCME CL/IL	DETECTION LIMITS	GV206HAYSOIL01	GV206HAYSOIL02
Date sampled					10-Sep-96	10-Sep-96
Depth (m)					surface	surface
Moisture (%)				0.01	4.2	3.7
Antimony	20	20	40	10	98	<
Arsenic	20	30	50	30	1090	246
Barium	750	500	2000	0.1	99	61.1
Beryllium	4	4	8	1	<	<
Cadmium	3	5	20	0.25	1	0.59
Chromium	750	250	800	2	6	4
Cobalt	40	50	300	1	4	5
Copper	150	100	500	1	123	300
Lead	375	500	1000	1	436	41
Mercury	0.8	2	10	0.001	0.005	0.008
Molybdenum	5	10	40	4	<	<
Nickel	150	100	500	2	4	3
Selenium	2	3	10	3	<	<
Silver	20	20	40	2	<	<
Tin	5	50	300	5	<	<
Vanadium	200	200	-	0.5	13	24
Zinc	600	500	1500	1	114	91
Aluminum				10	5300	8830
Boron				0.5	14	13
Calcium				1	580	1250
Iron				2	32900	29400
Magnesium				0.1	1320	3780
Manganese				0.2	108	79
Phosphorus				20	1620	941
Sodium				5	59	52
Strontium				0.1	22	4
Titanium				0.3	8	91

AL - Agricultural PL/RL - Parkland/Residential CL/IL - Commercial/Industrial

Analyses completed by Cantest Laboratory, Vancouver, B.C.

< = less than the detection limit

exceeds the CL/IL criteria

TABLE C2
METAL CONCENTRATIONS IN PRODUCT SAMPLES
ENVIRONMENTAL ASSESSMENT MINE SITE 85 AT HAYES
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
mg/kg (ppm)

Sample No.	GV206HYD03	GV206HYD05/06	GV206HYD17/18	Detection Limits
Date sampled Location	10-Sep-96 drum 03	10-Sep-96 drums 05 & 06	10-Sep-96 drums 17 & 18	
Aluminum	<	<5	<	2
Antimony	<	<5	<	2
Arsenic	<	<7.5	<	3
Barium	<	<0.025	0.03	0.01
Beryllium	<	<0.15	<	0.06
Boron	0.1	0.5	1.6	0.1
Cadmium	<	<0.5	<	0.2
Calcium	0.2	0.25	126	0.1
Chromium	<	<0.75	<	0.3
Cobalt	<	<0.5	<	0.2
Copper	<	<0.5	0.6	0.2
Iron	2.4	10.5	264	0.3
Lead	<	<2	<	0.8
Magnesium	<	<0.025	<	0.01
Manganese	<	<0.075	0.89	0.03
Molybdenum	<	<1	<	0.4
Nickel	<	<0.75	<	0.3
Phosphorus	<	<10	<	4
Silver	<	<0.75	<	0.3
Sodium	3	<5	6	1
Strontium	<	<0.025	0.12	0.01
Tin	<	<0.75	<	0.3
Titanium	<	<0.15	<	0.06
Vanadium	<	<0.25	<	0.1
Zinc	0.3	<0.5	0.5	0.2
Zirconium	<	<0.5	<	0.2

Analyses completed by Cantest Laboratory, Vancouver, B.C.

< = less than the detection limit

TABLE C3
LEPH AND HEPH IN SOIL SAMPLES
ENVIRONMENTAL ASSESSMENT MINE SITE 85 AT HAYES
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
mg/kg

	CMCS Criteria for Soil			Detection	
Sample No.	AL	PL/RL	CL/IL	Limit	GV206HAYSOIL4
Date sampled					10-Sep-96
Location					bunk tent
Depth (m)					0-0.1
LEPH	1000	1000	2000	250	56000
HEPH	1000	1000	5000	250	17000

< = Less than detection limit
* numerical concentrations from the Criteria for Managing Contaminated Sites in B.C.
AL - Agricultural PL - Urban Park RL - Residential CL - Commercial IL - Industrial
Analysis completed by CanTest Laboratory, Vancouver, B.C.

APPENDIX D

LABORATORY REPORTS

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
STUART WYSE

DATE : October 4, 1996
CHEMEX PROJECT NO. : GEOV010-0502-96-07599
CLIENT REFERENCE : GV206
CLIENT JOB NO. :

Analytical Data Reviewed By : _____

QA/QC Reviewed By : _____

The above signatures indicate that the individuals identified have reviewed the enclosed documents.

NOTE : Soil samples and water samples (for stable parameters) will be retained for a period of 60 days after completion of analysis.
Retention beyond this period can be arranged for a fee.

CHEMEX Labs Alberta Inc. is accredited by both the Canadian Association for Environmental Analytical Laboratories and the Standards Council of Canada for specific parameters registered with the Association and the Council.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD02
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-6
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	5.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD02
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-6
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Total Organic Halogens (TOX)	02-10-96	1	DCF	N.A.	NOT APPLICABLE			102.8	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD03
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-7
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	3.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD03
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-7
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	1	DCF	N.A.	NOT APPLICABLE			102.8	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD05/06
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-8C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	9.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD05/06
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-8C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	2	DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD09/10
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-9C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	6.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD09/10
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-9C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	2 DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD17/18
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-10C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	51.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD17/18
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-10C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	2	DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD19/24
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-11C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	7.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD19/24
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : COMPOSITE
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-11C
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Total Organic Halogens (TOX)	02-10-96	2	DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD26
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-12
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	< 2	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD26
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-12
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	2 DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD34
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-13
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	< 2	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD34
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-13
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Total Organic Halogens (TOX)	02-10-96	2	DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD36
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-14
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	2.0	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD36
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-14
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Total Organic Halogens (TOX)	02-10-96	2 DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1
GV206

Sample Description : GV206HYD69
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Received Date: September 25, 1996
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-15
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996
Analysis Date : October 2, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Organic Halogens (TOX)		ug/g	< 2	2.

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

GEOVIRO ENGINEERING LTD.
ATTENTION : STUART WYSE
GV206.1

Sample Description : GV206HYD69
Sample Date & Time : N/A N/A
Sampled By :
Sample Type : GRAB
Sample Station Code : HAYES

Chemex Worksheet Number : 96-07599-15
Chemex Project Number : GEOV010-0502
Sample Access :
Sample Matrix : OIL
Report Date : October 4, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Total Organic Halogens (TOX)	02-10-96	2	DCF	N.A.	NOT APPLICABLE			100.2	80.0	120.0

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Soil Samples

REPORTED TO: GeoViro Engineering Ltd.
Suite 500
535 Thurlow Street
Vancouver, B.C.
V6E 3L2

Att'n: Mr. David Karwandy

CHAIN OF CUSTODY: 17783, 17776
PROJECT NAME: Hayes
PROJECT NUMBER: GV206.01
P.O. NUMBER: GV206.01

NUMBER OF SAMPLES: 3

REPORT DATE: September 26, 1996

DATE SUBMITTED: September 19, 1996

GROUP NUMBER: 6091916

SAMPLE TYPE: Soil

TEST METHODS:

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.

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

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

Lead in Soil - analysis was performed using background-corrected Flame 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. Moisture was determined gravimetrically at 105 on a separate sample portion.

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

(Continued)

CANTEST LTD.

Richard S. Jornitz
Supervisor, Inorganic Testing

REPORTED TO: GeoViro Engineering Ltd.

REPORT DATE: September 26, 1996

GROUP NUMBER: 6091916

CANTEST

COMMENTS:

LEPH/HEPH result is expressed as ug/g on an as received basis. The moisture for sample GV206HAYSOIL4 is 72%.

TEST RESULTS:

(See following pages)

REPORTED TO: GeoViro Engineering Ltd.

REPORT DATE: September 26, 1996

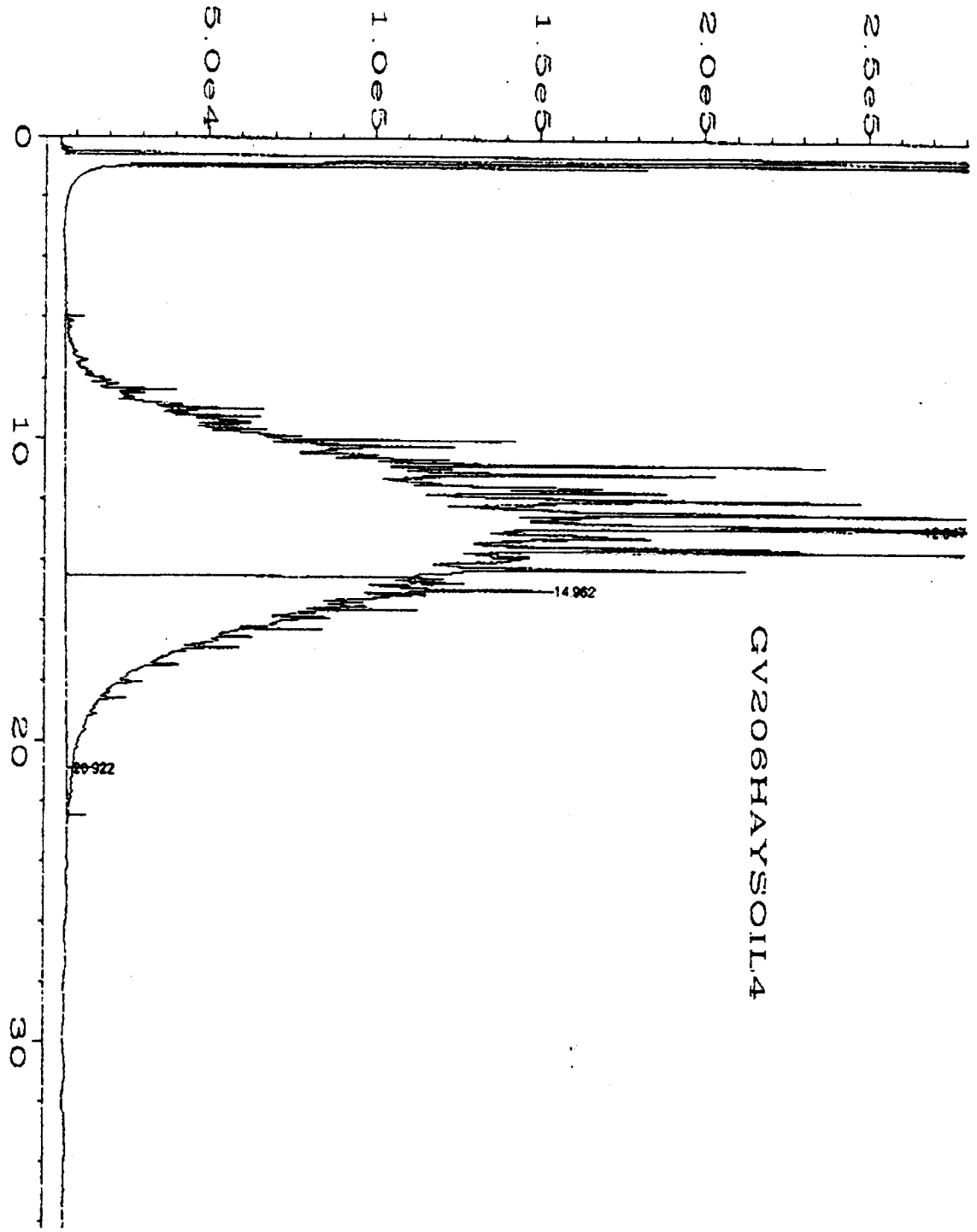
GROUP NUMBER: 6091916

CANTEST

Extractable Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CAN TEST ID	LEPH-uncorrected for PAH's	HEPH-uncorrected for PAH's
GV206HAYSOIL4	Sep 10/96	609190046	56000	17000
DETECTION LIMIT			250	250
UNITS			µg/g	µg/g

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



Data File Name : C:\HPCHEM\FID\DATA\092396B\061F1901.D
Operator : RR
Instrument : FID
Sample Name : 609190046-80ML
Run Time Bar Code:
Acquired on : 24 Sep 96 09:24 AM
Report Created on: 24 Sep 96 04:15 PM

Page Number : 1
Vial Number : 61
Injection Number : 1
Sequence Line : 19
Instrument Method: TEHBAKE.MTH
Analysis Method : !TEH.MTH

REPORTED TO: GeoViro Engineering Ltd.

REPORT DATE: September 26, 1996

GROUP NUMBER: 6091916

CANTEST

Metals Analysis in Soil

CLIENT SAMPLE IDENTIFICATION:		GV206HAYSOIL01	GV206HAYSOIL02	DETECTION LIMIT	UNITS
DATE SAMPLED:		Sep 10/96	Sep 10/96		
CAN TEST ID:		609190047	609190048		
Metals Analysis					
Moisture		4.2	3.7	0.01	%
Antimony	Sb	98	<	10	µg/g
Arsenic	As	1090	246	30	µg/g
Barium	Ba	99	61.1	0.1	µg/g
Beryllium	Be	<	<	1	µg/g
Cadmium	Cd	1.0	0.59	0.25	µg/g
Chromium	Cr	6	4	2	µg/g
Cobalt	Co	4	5	1	µg/g
Copper	Cu	123	300	1	µg/g
Lead	Pb	436	41	1	µg/g
Mercury	Hg	0.005	0.008	0.001	µg/g
Molybdenum	Mo	<	<	4	µg/g
Nickel	Ni	4	3	2	µg/g
Selenium	Se	<	<	3	µg/g
Silver	Ag	<	<	2	µg/g
Tin	Sn	<	<	5	µg/g
Vanadium	V	13	24	0.5	µg/g
Zinc	Zn	114	91	1	µg/g
Aluminum	Al	5300	8830	10	µg/g
Boron	B	14	13	0.5	µg/g
Calcium	Ca	580	1250	1	µg/g
Iron	Fe	32900	29400	2	µg/g
Magnesium	Mg	1320	3780	0.1	µg/g
Manganese	Mn	108	79	0.2	µg/g
Phosphorus	PO4	1620	941	20	µg/g
Sodium	Na	59	52	5	µg/g
Strontium	Sr	22	4	0.1	µg/g
Titanium	Ti	8	91	0.3	µg/g

% = percent

< = Less than detection limit

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

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Results of Testing

REPORTED TO: GeoViro Engineering Ltd.
Suite 500
535 Thurlow Street
Vancouver, B.C.
V6E 3L2

Att'n: Mr. Dave Karwandy

PROJECT NUMBER: GV206.01

NUMBER OF SAMPLES: 2

REPORT DATE: November 7, 1996

DATE SUBMITTED: October 29, 1996 - October 30, 1996

GROUP NUMBER: 6103005

SAMPLE TYPE: Oil

TEST METHODS:

Polychlorinated Biphenyls in Oil - analysis was using procedures based on U.S. EPA Methods 3580/8080, involving dilution, clean-up steps and analysis using GC/ECD. Aroclors 1242, 1248, 1254 and 1260 were included.

TEST RESULTS:

(See following page)

CAN TEST LTD.

M. Hartley

Matthew Hartley, M.Sc.
Supervisor, Trace Organics

REPORTED TO: GeoViro Engineering Ltd.

REPORT DATE: November 7, 1996

GROUP NUMBER: 6103005

CANTEST

Polychlorinated Biphenyls in Oil

CLIENT SAMPLE IDENTIFICATION:	~~GV206MTH OIL~~	GV206HYD 17/18	DETECTION LIMIT
DATE SAMPLED:	Sep 9/96	Sep 10/96	
CAN TEST ID:	610300040	611220153	
Arochlor 1242	<	<	0.7
Arochlor 1248	<	<	0.7
Arochlor 1254	<	<	0.7
Arochlor 1260	<	<	0.7

Results expressed as milligrams per liter (mg/L)
< = Less than detection limit

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Oil Samples

REPORTED TO: GeoViro Engineering Ltd.
Suite 500 - 535 Thurlow Street
Vancouver, B.C.
V6E 3L2

Attention: Mr. Dave Karwandy

PROJECT NUMBER: GV206.01

NUMBER OF SAMPLES: 6

REPORT DATE: November 22, 1996

DATE SUBMITTED: October 29, 1996

GROUP NUMBER: 7617K / 6103005

SAMPLE TYPE: Oil

TEST METHODS:

Metals in Oil - Samples were ashed @ 550°C. The residue was digested with nitric and hydrochloric acids. The resulting solutions were anslyzed by Inductively Coupled Argon Plasma Spectrograph (ICAP).

TEST RESULTS:

See the following pages.

CANTEST LTD.

Richard S. Jornitz
Supervisor, Inorganic Testing

RSJ/wm
C:\CANTEST\INORGAN\REPORTS\GEOV7617.DOC

CANTEST

REPORTED TO: GeoViro Engineering Ltd.

REPORT DATE: November 22, 1996

GROUP NUMBER: 7617K / 6103005

TEST RESULTS:

CLIENT SAMPLE IDENTIFICATION:		**GV206 HYD03**	**GV206 HYD05/06**	**GV206 HYD17/18**		
CANTEST ID:		7617K-4	7617K-5	7617K-5	UNITS	DETECTION LIMIT
Aluminum	Al	<	< 5	<	µg/g	2
Antimony	Sb	<	< 5	<	µg/g	2
Arsenic	As	<	< 7.5	<	µg/g	3
Barium	Ba	<	< 0.025	0.03	µg/g	0.01
Beryllium	Be	<	< 0.15	<	µg/g	0.06
Boron	B	0.1	0.5	1.6	µg/g	0.1
Cadmium	Cd	<	< 0.5	<	µg/g	0.2
Calcium	Ca	0.2	0.25	126	µg/g	0.1
Chromium	Cr	<	< 0.75	<	µg/g	0.3
Cobalt	Co	<	< 0.5	<	µg/g	0.2
Copper	Cu	<	< 0.5	0.6	µg/g	0.2
Iron	Fe	2.4	10.5	264	µg/g	0.3
Lead	Pb	<	< 2	<	µg/g	0.8
Magnesium	Mg	<	< 0.025	<	µg/g	0.01
Manganese	Mn	<	< 0.075	0.89	µg/g	0.03
Molybdenum	Mo	<	< 1	<	µg/g	0.4
Nickel	Ni	<	< 0.75	<	µg/g	0.3
Phosphorus	PO4	<	< 10	<	µg/g	4
Silver	Ag	<	< 0.75	<	µg/g	0.3
Sodium	Na	3	< 5	6	µg/g	1
Strontium	Sr	<	< 0.025	0.12	µg/g	0.01
Tin	Sn	<	< 0.75	<	µg/g	0.3
Titanium	Ti	<	< 0.15	<	µg/g	0.06
Vanadium	V	<	< 0.25	<	µg/g	0.1
Zinc	Zn	0.3	< 0.5	0.5	µg/g	0.2
Zirconium	Zr	<	< 0.5	<	µg/g	0.2

Results expressed as micrograms per gram (µg/g).
< = Less than

1.0 SAMPLES

In September, 1996, 20 samples were received at Cominco Engineering Services Ltd. (CESL) from CanTest Ltd.

1.1 Sample Preparation

Most samples were wet and therefore air-dried at ambient temperature (16-20°C). The coarse samples were jaw crushed to minus 1/4 inch. Each sample was riffled down to approximately 300 g and these fractions were pulverized for head analysis and static testing.

2.0 STATIC TESTING

Head sample assays and acid-base accounting tests were carried out on 16 of the 20 samples.

2.1 Solids Analysis

A fraction of pulverized material was submitted to CanTest Ltd. for total sulphur analysis by the LECO method. For samples with greater than 1% total sulphur, sulphate sulphur was also determined using acid digestion, precipitation as barium sulphate and gravimetric analysis.

2.2 Determination of Neutralization Potential (Acid-Base Account)

The determination of paste pH was done prior to acid-base accounting (ABA). For this test a small amount of pulverized sample was wetted with distilled water and upon saturation the pH of the paste was measured. A fizz test (adding 25% HCl to sample) was also employed to provide an additional guide to the strength and amount of acid to be initially added to each sample.

Acid-base accounting tests were carried out using the Modified Sobek method. Two grams of pulverized sample was weighed into an Erlenmeyer flask to which standardized hydrochloric acid was added to obtain a target pH of 1.5 to 2.0. The flask was then placed on an oscillating table and agitated for 24 hours at 150 RPM during which time the pH was periodically checked and adjusted as required to maintain sufficient acidity for reaction. At the end of the shaking period the contents of the flask were titrated to pH 8.3 with standardized sodium hydroxide. The neutralization potential (NP) of the sample was then calculated from the titration data. The acid producing potential (AP) was derived from the calculated sulphide sulphur analysis, assuming the total conversion of sulphide to sulphate and

the production of 4 moles H+ per mole of pyrite oxidized. In some instances, other sulphur species might be determined. The AP can be balanced against the NP to yield the net neutralization potential (Net NP).

3.0 INTERPRETATION OF RESULTS

Interpretation of the Net NP value requires judgement, since although a negative value indicates the theoretical potential of a sample to produce acid rock drainage, some samples with this classification may not be confirmed as acid producers in the field. However, this does not imply that ARD will not result given sufficient time. Likewise, a sample with a positive Net NP might, under the right conditions, produce ARD.

Although the Net NP value provides a good initial indication of ARD potential, an interpretation based on the arithmetic difference between the NP and AP values should be used with caution. A sample with a Net NP value of +10 calculated from a high sulphide content and a high acid consuming ability might have a greater likelihood of generating acid than another sample with the same Net NP but with a very low sulphide content. A ratio between NP and AP values might provide a more reliable classification guideline, especially if sulphide content is also taken into account.

Samples which have a significantly negative Net NP should be considered for kinetic ARD prediction tests. The most commonly used and accepted tests are humidity cells, columns and lysimeters. Humidity cells are weathering chambers designed to provide simple control over air, temperature and moisture conditions while allowing for leachate removal which is analyzed to determine the onset of ARD. Columns and lysimeters are larger than humidity cells and therefore allow larger samples to be used.

These tests simulate the geochemical processes of weathering and can confirm or reduce the uncertainty of the results of static ARD prediction tests. They can also determine the rate of acid generation and how it effects water quality over time.

CLIENT : GeoViro . .gineering Ltd.
PROJECT : Soil Samples
PROJECT # : GV206.01
TEST : MODIFIED SOBEK METHOD ACID-BASE ACCOUNTING

SAMPLE #	PASTE pH	S(T) %	S(SO4) %	AP	NP	NET NP	NP/AP
~~PESO BACKGROUND~~	~~4.81~~	~~0.03~~	~~#N/A~~	~~0.9~~	~~-1.4~~	~~-2.3~~	~~<0.1~~
~~GV206 PAD1-1~~	~~4.04~~	~~1.79~~	~~0.41~~	~~43.0~~	~~-1.1~~	~~-44.1~~	~~<0.1~~
~~GV206 PAD1-2~~	~~3.34~~	~~0.81~~	~~#N/A~~	~~25.3~~	~~-6.3~~	~~-31.6~~	~~<0.1~~
~~GV206 PAD1-3~~	~~2.97~~	~~1.38~~	~~0.46~~	~~28.8~~	~~-9.1~~	~~-38.0~~	~~<0.1~~
~~GV206 PAD1-5~~	~~3.09~~	~~1.2~~	~~0.68~~	~~16.1~~	~~-6.6~~	~~-22.7~~	~~<0.1~~
~~GV206 PAD1-7 3FT.~~	~~1.90~~	~~13~~	~~1.21~~	~~368~~	~~26~~	~~394~~	~~<0.1~~
~~GV206 PAD1-14~~	~~3.02~~	~~0.33~~	~~#N/A~~	~~10.3~~	~~-6.4~~	~~-16.7~~	~~<0.1~~
~~GV206 PAD1-15~~	~~3.33~~	~~0.15~~	~~#N/A~~	~~4.7~~	~~5.8~~	~~10.4~~	~~<0.1~~
~~GV206 PAD1-16~~	~~4.01~~	~~0.17~~	~~#N/A~~	~~5.3~~	~~1.0~~	~~6.3~~	~~<0.1~~
~~GV206 PAD1-17~~	~~5.02~~	~~0.07~~	~~#N/A~~	~~2.2~~	~~0.1~~	~~-2.1~~	~~<0.1~~
~~GV206PE ADIT201~~	~~3.97~~	~~0.15~~	~~#N/A~~	~~4.7~~	~~1.0~~	~~5.7~~	~~<0.1~~
~~GV206PE ADIT203~~	~~4.84~~	~~0.10~~	~~#N/A~~	~~3.1~~	~~0.4~~	~~3.6~~	~~<0.1~~
~~GV206PE ADIT203 DUP~~	~~4.74~~	~~0.06~~	~~#N/A~~	~~1.9~~	~~0.1~~	~~1.9~~	~~<0.1~~
~~GV206PESOIL01~~	~~3.69~~	~~0.84~~	~~#N/A~~	~~26.3~~	~~3.1~~	~~29.3~~	~~<0.1~~
~~GV206PESOIL02~~	~~3.79~~	~~0.48~~	~~#N/A~~	~~15.0~~	~~-1.9~~	~~-16.9~~	~~<0.1~~
GV206HAYSOIL01	6.46	0.10	0.07	0.8	-1.5	-2.3	<0.1

#NA - SAMPLE WITH S(T)<1% NOT ASSAYED FOR S(SO4). AP CALCULATION ASSUMES S(SO4)=0.

AP = ACID POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NP = NEUTRALIZATION POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NET NP = NET NEUTRALIZATION POTENTIAL = TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.